AGENDA
CODE ENFORCEMENT & APPEALS BOARD HEARING
MAY 2, 2018
5:30 PM
CITY HALL COMMISSION CHAMBERS
204 ASH STREET
FERNANDINA BEACH, FL 32034

1. CALL TO ORDER / ROLL CALL / DETERMINATION OF A QUORUM

2. APPROVAL OF MINUTES

2.1 Presenting the Minutes for the April 5, 2018 Meeting

3. NEW BUSINESS

3.1 **RICHARD GOODSELL, FRONT STREET PROPERTY LLC, 101 NORTH 2ND STREET, CASE 18-00044.** Violation(s) of the City of Fernandina Beach Code of Ordinances exist: Section 42-116 (a & b), cleaning of lots; maintenance of structures. *Requesting Board determination of the case.*

4. OLD BUSINESS

4.1 **WALTER L. CHAMPION ESTATE, 221 SOUTH 5TH STREET, CASE 18-00037**. Violation(s) of the City of Fernandina Beach Code of Ordinances exist: Section 22-26 (12), Adoption of codes by reference, Internal Maintenance Code 2012 edition, Chapter 5, Section 505 Water System; and 506 Sanitary Drainage System. *Requesting Board determination of the case.*

5. BOARD BUSINESS

5.1 Board Application - Alternate #1. Ms. Christine Harmon

5.2 City Commission Presentation May 15, 2018

6. ADJOURNMENT

Quasi-Judicial – Denotes that the item must be conducted as a Quasi -Judicial hearing in accordance with City Commission established procedure and Florida Statutes.

All members of the public are invited to be present and be heard. Non -English speaking individuals may request a language or sign interpreter at least ten (10) working days prior to this meeting. Persons with disabilities requiring accommodations in order to participate should contact the City Clerk at (904) 310 - 3115 or TTY/TDD 711 (for the hearing or speech impaired).

For information regarding this matter, please contact the Community Development Department (904) 310-3135. If any person decides to appeal any decision made by the Code Enforcement & Appeals Board with respect to any matter considered at such meeting he/she will need to ensure that a verbatim record of the proceedings is made, which record includes the testimony and evidence upon which the appeal is to be made.

1. Call to Order/ Roll Call/Determination of Quorum – The meeting was called to order at 5:29 pm.

Council Members Present

Cynthia Crow
Vice Chair Scott Steffen
Adam Kaufman
Henry Byrd
Gail Schults
Marlene Chapman

Council Members Absent
Chair Buddy Boyd

Others Present

Tammi Bach, City Attorney
Michelle Forstrom, Code Enforcement Manager
George Wells, Code Enforcement Officer
Katie Newton, Recording Secretary

Vice Chair Steffen made a motion to seat Member Kaufman as Chair. Member Crow seconded, all were in favor and Member Kaufman was seated as chair.

2. Approval of Minutes – According to the agenda support documents, the Minutes for the February 1, 2018, Regular Hearing were presented for approval. **A motion was made by Member Chapman, seconded by Member Schults, to approve the Minutes. Vote upon passage of the motion was taken by voice vote being all ayes, carried.**

City Attorney Bach explained the quasi-judicial process and asked if there had been any ex-parte communications. Ms. Newton swore in witnesses. Chair Kaufman asked if any Board members had any ex parte communications for the agenda items and all said no.

3. Old Business

There was no old business on the agenda.

4. New Business

4.1 **GEORGE LEE LANNON, 1423 HIGHLAND STREET, CASE 18-00013.**
Violation(s) of the City of Fernandina Beach Code of Ordinances exist: Section 42-116 (a&b) Cleaning of lots, maintenance of structures and of the Land Development Code Section 7.01.5 Recreational Vehicle, Boats, Trailers, or Similar Vehicles. *Requesting Board determination of the case*.

Chair Kaufman read the case.

Recording Secretary Newton swore in all witnesses for the evening's cases.

Mr. Wells presented the case for the City. During a proactive sweep, Mr. Wells observed the boat trailer in the front as well as overgrowth of weeds and the garage door in disrepair. A pre-hearing inspection showed the garage door boarded up and the boat gone, but the weeds and overgrowth still remain on the side and rear of the property. He recommended finding in violation of 42-116 (a) and a fine of $100 per day plus administrative fees incurred.

Chair Kaufman asked if anyone wished to testify on behalf of the case.There being none, he opened for Board questions and discussion.

Member Crow wanted to clarify which violations still existed, and Mr. Wells stated that the overgrowth was the only violation as of today. Vice Chair Steffen asked if Mr. Wells had spoken with the owner and Mr. Wells stated that he saw the property owner once but was unable to make contact.

Member Byrd wanted to discuss the part of town and code violation for boat trailers in general. He stated that with these proactive sweeps, many of these citizens had lived there for years and never been cited. Now, these citizens are middle class, hardworking people who are law abiding are having to spend more money to find an appropriate place to house their boat, and they live in a neighborhood without an HOA. He stated that he understands the intent of the law, but it seems as though sometimes we focus on the letter of the law rather than the intent of public safety.

Mr. Wells stated that he cited many vehicles in this area for the boat and RV code infraction and all except this property had come into compliance, and that he cannot selectively enforce the code. Member Byrd stated that he was concerned with public safety and he did not see a public safety issue.

Chair Kaufman clarified that as of this moment, the only issue before the Board is the cutting of the grass. He stated that while he is sympathetic to the property owners who may not be aware of some of these restrictions, the code was the code, unless the code was changed by the City Commission.

Member Chapman asked if the boat was able to be moved to the side yard. Mr. Wells stated that there wasn't room, and the boat would need to be stored off site. She asked if Mr. Wells had discussed with the property owner and he replied that the owner was not home when Mr. Wells had been by.

Chair Kaufman restated that the boat is an issue for another time, the violation in question is the overgrowth and cutting of the grass. He asked Mr. Wells about the recommended fine and Mr. Wells stated that it was $100 per day.

Vice Chair Steffen stated that he appreciated Member Byrd's point about the boat trailers and thought that it might be a good discussion at another time.

A motion was made by Member Crow, seconded by Member Chapman, to find the property in violation of the City of Fernandina Beach Code of Ordinances Section 42-116 (a). Vote upon passage of the motion was taken by ayes and nays, and being 5-1 for, carried. Member Byrd was the nay vote.

A motion was made by Member Crow, seconded by Member Chapman, to assess a fine of all administrative fees, as well as daily fines of $25.00 per day, beginning April 16, 2018, until the property came into compliance. Vote upon passage of the motion was taken by ayes and nays, and being 4-2, carried. Chair Kaufman and Member Byrd voted no.

4.2 **BARBARA L. H. LOVETT ESTATE, 511 NORTH 11TH STREET, CASE 18-00024**.
Violation(s) of the City of Fernandina Beach Code of Ordinances exist: 42-173 Wrecked or inoperable motor vehicles on private property declared a nuisance and prohibited. Requesting Board determination of the case.

Chair Kaufman read the case. Mr. Wells presented the case for the City. On a proactive sweep, he saw a Chevrolet with an expired tag and flat tires in the driveway. The owner has made no attempt to contact Code Enforcement, and the violation still exists as of this morning. City recommends fines of $100 per day.

Chair Kaufman opened the public hearing, and as no one was present to speak, closed the public hearing. He opened for Board discussion.

Member Crow asked if anyone lived at the residence. Mr. Wells stated yes, this is the only car he has seen there. Someone had approached him once on a visit, but it was not the property owner or a resident of the house. Member Shults asked who owned the car, and Mr. Wells stated that he wasn't sure, but it had expired tags and was on the property.

Member Crow stated that she felt like the property was in violation. Vice Chair Steffen felt that a fine of $100 per day was pretty steep. They were in agreement that it was a violation; and Member Crow stated that she thought that if the City took the time and effort to contact the homeowner at least administrative fees should be recovered.

A motion was made by Member Crow, seconded by Vice Chair Steffen, to find the property in repeat violation of the City of Fernandina Beach Code of Ordinances Section 42-173 and assess all administrative fees. Vote upon passage of the motion was taken by ayes and nays, and being all ayes, carried.

Chair Kaufman expressed concern that homeowners may not know that there is a rule that they cannot park vehicles with expired tags in their driveways. He wanted to know if there was a way to notify the public of the rules. He acknowledged that it is a violation of the Code.

Member Crow stated that when Code Enforcement places notices of violation on properties and sends mailings, it does provide information and property owners should call the City with questions. Member Byrd stated that in this case the flat tires makes the car look abandoned and is a violation.

Mr. Wells stated that the house is not vacant; when he posts notices of violation he educates the public by including the ordinance along with the notice. Chair Kaufman asked if there was a way to notify the public generally.

Ms. Forstrom explained that education is on the website, and periodically items go out in utility billing to address concerns with code. She stated that she understands the Board's concerns and will try to do more to address them. Chair Kaufman thought that maybe some ads in the newspaper may help as well.

Vice Chair Steffen stated that the City does a good job working with owners who are in violation to give them notice and to help them get into compliance, more than any HOA would. Proactive sweeps are a fairly new occurrence and some advertisement may be helpful to get the word out to the public generally.

Member Chapman asked if, when after notices are posted, when they return, are the previous notices gone? Mr. Wells stated yes.

Member Crow stated that for every case that makes it before the Code Board, there are about 10 that are cited and come into compliance prior to the hearing. Mr. Wells stated he thought there was about a 90% compliance rate, and it there is progress, they try to work with people. When progress stops, that is when they fin in violation.

A motion was made by Member Kaufman, seconded by Member Chapman, to assess a daily fines of $50.00 per day, beginning April 16, 2018, until the property comes into compliance. Vote upon passage of the motion was taken by ayes and nays, and being all ayes, carried.

Vice Chair Steffen excused himself and left the meeting.

4.3 **WALTER L. CHAMPION ESTATE, 221 SOUTH 5TH STREET, CASE 18-00037.**
Violation(s) of the City of Fernandina Beach Code of Ordinances exist: Section 22-26 (12) Adoption of codes by reference, Internal Maintenance Code 2012 edition, Chapter 5, Section 505 Water System; and 506 Sanitary Drainage System.
Requesting Board determination of the case.

Chair Kaufman read the case. Ms. Susan McCarthy, who arrived after the oath had been administered, was sworn in.

Ms. Forstrom presented the case for the City. She distributed additional evidence to the Board members and Chair Kaufman entered it into the record. Ms. Forstrom explained that the violation of 22-26 (12) was enforcement of the International Maintenance Code and she had received a complaint, Mr. Dennis Champion, living on the property without water and sewer hookup. Ms. Susan McCarthy had turned off the water and sewer because the bill had been run up. Ms. Forstrom spoke with Mr. Champion in February and he stated that he was not living there, and he would clean up the yard. Several conversations yielded no progress, he was living there without sewer and water and nothing had been done to the yard. Ms. McCarthy, escorted by Captain Bishop of FBPD, issued Mr. Dennis Champion an eviction notice to vacate the premises by March 21. Ms. McCarthy returned to the judge to receive additional paperwork to remove Mr. Champion from the property. Ms. Forstrom's recommendation has changed from the staff report – the eviction process is ongoing and she does not think putting a fine on the property will make a difference and the property's owners are trying to make it right.

Ms. Susan McCarthy, 702 Centre Street, explained that she had filled out additional paperwork to have Mr. Dennis Champion evicted. As of now, the police officer has not served him, and then he will have 5 days to get out. She is not inclined to fix anything on the property while he is living there, as there are several other people staying there with him and they are leaving it in disrepair. She had the water shut off after two months of bills totaling $900, and she thinks that there is some damage that could be made worse if the water comes back on. Mr. Champion was not living there at the time the water was turned off., but he came back.

Member Chapman asked if he had received the paperwork yet, and Ms. McCarthy said that she wasn't sure. She's in the next stage of eviction after serving the initial notice. She has the property listed to be sold but can't show it until he is out and they can clean it up.

Member Byrd stated that the guilty party in this case is Dennis Champion. Ms. Forstrom stated that she had done everything she could to notice and get him to compliance. Member Byrd and Member Crow wanted to know what staff recommended as far as administrative fees were concerned. Chair Kaufman asked what the administrative fees were. Ms. Forstrom stated that she did not think that it was fair to the estate to pay a daily fine since they are working resolving the issue, but she would like to see the Board find the property in violation.

Chair Kaufman asked if staff could provide an update at the next meeting. City Attorney Bach stated that this case has been going on for years, and the property is a blight on the street, and the City has received many complaints. She recommends that they find in violation, and that they revisit the case in May to determine whether they should impose fines. Ms. McCarthy thought that if he didn't leave after being served, the police could physically remove him.

A motion was made by Member Crow, seconded by Member Chapman, to find the property in violation of the City of Fernandina Beach Code of Ordinances Section 42-116 (a). Vote upon passage of the motion was taken by ayes and nays, and being all ayes, carried.

The Board, by consensus, requested that the case be brought back to the Board on May 2, 2018, to for an update and determination of fines.

5. STAFF REPORT

5.1 City Attorney Bach gave an update on Taylor Rental: She had visited with Mr. O'Brien to explain that the City was ready to file a foreclosure on the property located at 400 S. 8th Street, but she hired a local attorney to draft the paperwork. She said that Mayor Miller had visited the property owner and talked to him about the seriousness of this. She said that when the draft complaint was ready, she was going to visit Mr. O'Brien and explain it all to him before filing. There was discussion as to whether he understood the ramifications, and she stated that Mr. O'Brien was actually running a business out of the property. Member Kaufman said that the property is an eyesore and has only gotten worse. Attorney Bach stated that once there is a Code Enforcement lien, the fines attach to all properties. Ms. Forstrom stated that there were currently over $150,000 in fines for the property.

Ms. Forstrom reminded the Board that there are still two alternate member vacancies and that the May meeting would be held on Wednesday, May 2, to avoid conflict with the Shrimp Festival parade.

Ms. Forstrom announced that beginning with the May meeting, all Code Enforcement meetings will be aired on the local PEG (cable) channel. City Attorney Bach asked if there were any concerns for having this meeting on television. Member Crow and Member Shults did express concerns over their safety and the privacy of individuals coming before the Board. Chair Kaufman stated he didn't think that Code Board was any different from the other Boards, and that the members had signed up for public service and that this might provide the community insight to the process. He advised that perhaps the notice of violation/notice of hearing should advise owners that hearings are televised.

6. Adjournment - There being no further business to come before the Planning Advisory Board, the meeting was adjourned at 6:43 p.m.

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Katie Newton, Recording Secretary

____
Adam Kaufman, Acting Chair

STAFF REPORT

Case 18-00044
City of Fernandina Beach Code Enforcement & Appeals Board
May 2, 2018

Violation Information

Owner	Richard Goodsell, Front Street Property, LLC, 2970 New Paces Ferry Road, Atlanta, GA 30339
Violation	City of Fernandina Beach Code of Ordinances, Section 42-116 (a & b), cleaning of lots; maintenance of structures.
Location:	101 North 2nd Street, Fernandina Beach FL 32034

Summary and Background Information

This property has been on the City's radar for quite some time, years. Many conversations have transpired between the City and Mr. Goodsell over the last few years about the condition of the building and the future of this property.

Over time the building has gone into disrepair, with broken window panes, window frame deterioration, missing downspouts and scuppers and /or in disrepair, paint failure, graffiti, water intrusion, and holes in the roof. The fences have vegetation growing on them and there is debris that has fallen off the north side of the addition on the ground.

On March 15, 2018, The Historic District Council found this property to be suffering severe deterioration due to deferred maintenance.

March 21, 2018, I sent a Notice of Violation/Notice of Hearing letter for both Demolition by Neglect and 42-116 (a & b), cleaning of lots; maintenance of structures.

I have had several conversations with Mr. Goodsell about what the bare minimum requirements would be to bring this property into compliance. I told him that everything that I just mentioned, plus cutting the lot would need to be addressed. He told me that he would start getting some estimates. He continued to keep me updated with his progress.

April 10, 2018, Sal Cumella, Historic Preservation Planner for the City of Fernandina Beach and I met with Bruce Porter, Mr. Goodsell's property manager, of sorts, at Standard Marine. We went over everything that I have mentioned with the exception of the roof and the cutting of the lot. The Shrimp Festival Committee had someone take care of cutting the lot. Mr. Porter said that he would get started on the list right of way.

April 10, 2018, A meeting took place at the City Attorney's office. The following were in attendance to discuss this case: Mr. Goodsell and his two attorneys; Ms. Bach, City Attorney; Sal Cumella, and myself. We discussed that while this property is historic in nature, it does not fall within the Downtown Historic District boundaries and is not subject to that section of the Land Development Code. I explained that I would proceed with the case as a violation of 42-116 (a & b), cleaning of lots; maintenance of structures. I left there with the understanding that Mr. Porter was going to start working on the laundry list.

I continued ongoing conversations with Mr. Goodsell on the progress that he was making. He had hired Mr. Jose Miranda, Architect, specializing in historic preservation. Mr. Miranda was working on getting us a report of what needed to be done and a probable timeline.

April 17, 2018, I talked to Mr. Miranda. He told me that he would have the report by May 2, 2018 for the hearing.

April 26, 2018, I re-inspected the property. No progress had been made. I took pictures.

Conclusion

The property is still in violation.

Recommendation

Staff recommends assessing a $250.00 fine per violation per day and administrative fees incurred until compliance is achieved.

Submitted by:

Michelle D. Forstrom
Code Enforcement Manager


10/19/2015 10:28 AM


10/19/2015 10:31 AM


10/19/2015 10:27 AM


10/19/2015 10:30 AM


04/07/2016 11:22 AM


04/07/2016 11:22 AM


04/07/2016 11:22 AM


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04/07/2016 11:25 AM


04/07/2016 11:23 AM


04/07/2016 11:24 AM


04/07/2016 11:25 AM


04/07/2016 11:25 AM

FINDINGS OF FACT
CERTIFICATE OF APPROVAL
HISTORIC DISTRICT COUNCIL
FERNANDINA BEACH, FLORIDA

Whereas, the Fernandina Beach Historic District Council shall in all cases heard by the Council make written findings of fact and conclusions of law that support the Council's decisions in accordance with Section 8.01.01 of the Land Development Code, STANDARDS FOR DEVELOPMENT IN THE HISTORIC DISTRICT OVERLAYS;

Whereas, the **FERNANDINA BEACH HISTORIC DISTRICT COUNCIL** has held a public hearing on **March 15, 2018** and has given consideration to the following application:

Case Number:	**Presentation: 101 N. 2nd Street (C.H. Huot 1882 Building) Demolition By Neglect**
Property Location:	**101 N. 2nd Street**
Requested Action:	**Evaluate structure for demolition by neglect**

Whereas, the Fernandina Beach Historic District Council, having given consideration to the application as per Section 8.03.03 of the Land Development Code, makes the following findings of fact and conclusions of law based on the following:

1. CITY OF FERNANDINA BEACH COMPREHENSIVE PLAN

OBJECTIVE 11.04. Historic Structures
The City shall actively encourage maintenance and preservation of historic structures.

Policy 11.04.01. The City's historic preservation ordinance shall continue to include a demolition by neglect provision, and the City shall regularly evaluate such provision to ensure that it is effectively preventing or reducing demolition by neglect in the historic districts.

2. CITY OF FERNANDINA BEACH LAND DEVELOPMENT CODE

8.02.02 Historic District Council Roles and Responsibilities
The HDC shall have the duty and responsibility to:
C. Review and approve or deny applications for a certificate of Approval for construction, alteration, demolition, or removal of historic landmarks, historic sites, archaeological sites, properties in historic districts, or properties in the CRA Overlay.

8.03.07 Demolition by Neglect
A. The following shall apply to maintenance and repair to structures in the locally designated historic districts, as well as any structure or property in the City that has been listed individually or deemed eligible for individual listing in the National Register:
1. The owner, lessee, or other person in physical control of the structure shall comply with all applicable codes, laws and regulations governing the maintenance and safety of property including but not limited to City Codes, as applicable. It is the intent of this section to preserve from deliberate or inadvertent neglect of the exterior features of a building designated as a contributing structure to a historic district, and the interior portions therefore when such maintenance is necessary to prevent deterioration and decay of the exterior. All such buildings shall be preserved against such decay and

deterioration and shall be free from structural defects through prompt correction of any of the following defects:

a. Facades which may fall and injure members of the public or property;
b. Deteriorated or inadequate foundation, defective or deteriorated flooring or floor supports, deteriorated walls or other vertical structural supports;
c. Members of ceilings, roofs, ceiling and roof supports or other horizontal members which sag, split, or buckle due to defective material or deterioration;
d. Deteriorated or ineffective waterproofing of exterior walls, roofs, foundations or floors, including broken windows or doors;
e. Defective or insufficient weather protection for exterior wall covering, including lack of paint or weathering due to lack of paint or other protective covering.;
f. Any fault or defect in the building which renders it not properly watertight or structurally unsafe; and
g. Any fault or defect in the building rendering such structure an unsafe structure as defined under the provisions of Chapter 22, City Code of Ordinances.

2. Where the property is an archaeological site, the owner shall be required to maintain his property in such a manner so as not to adversely affect the archaeological integrity of the site.
3. It shall be the joint responsibility of the Building Department, Planning Department, and Code Enforcement staff to enforce the provisions of this section, and the divisions may refer violations to the Code Enforcement and Appeals Board for enforcement proceedings pursuant to Chapter 2, City Code of Ordinances.

3. APPLICABLE CITY DESIGN GUIDELINES

CRA ☒ Downtown Historic District ☐ Old Town ☐

WHEREAS after closing the public hearing and additional discussion, a motion was made:

Made by Board Member Spino and

Seconded by Board Member Erickson that:

The Historic District Council make a finding of demolition by neglect, and that the property be referred to the Code Enforcement and Appeals Board for further action.

Voting Record

Member	For	Against
Michael Harrison (Chair)	X	
William Tilson (Vice-Chair)		
Robert Erickson	X	
Angela Conway	X	
Michael Spino	X	
James Pozzetta, Alternate #1	X	
Benjamin Morrison, Alternate #2	--	--
TOTALS	**5**	**0**

The Motion **[PASSED]** **[FAILED]**

____
Michael Harrison, Chair

____
Date

Historic District Council

February 15, 2018
5:00 PM
City Hall Commission Chambers
204 Ash Street

101 N. 2nd Street C.H. Huot 1882 Building

March 15, 2018

101 N. 2nd St.

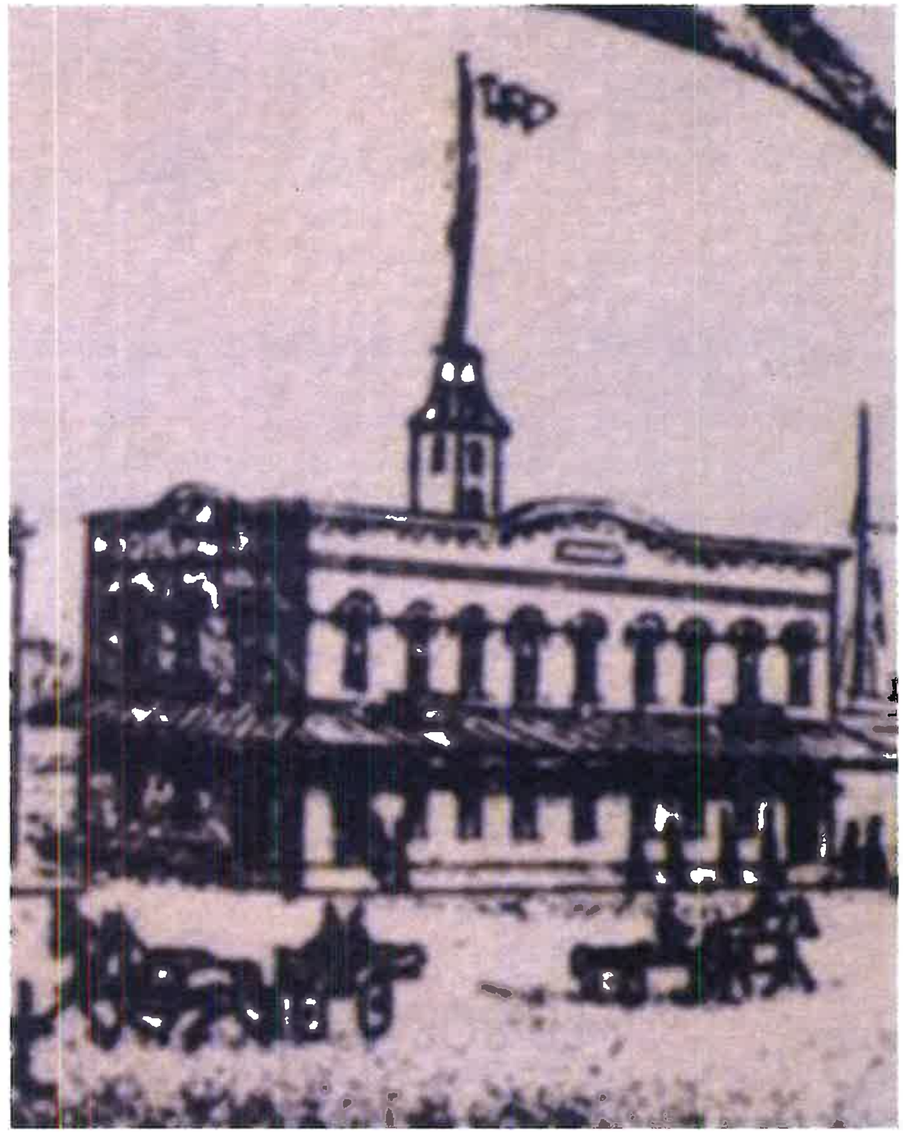
Address: 101 N. 2nd Street, Block 2 Lots 30&31
Year Built: 1882
FL Master Site File: 8NA0244
Historic District: No **CRA:** Yes
Owner of Record: Front Street Property, LLC
Zoning: C-3

1884 Birdseye View of Fernandina

101 N. 2nd St.

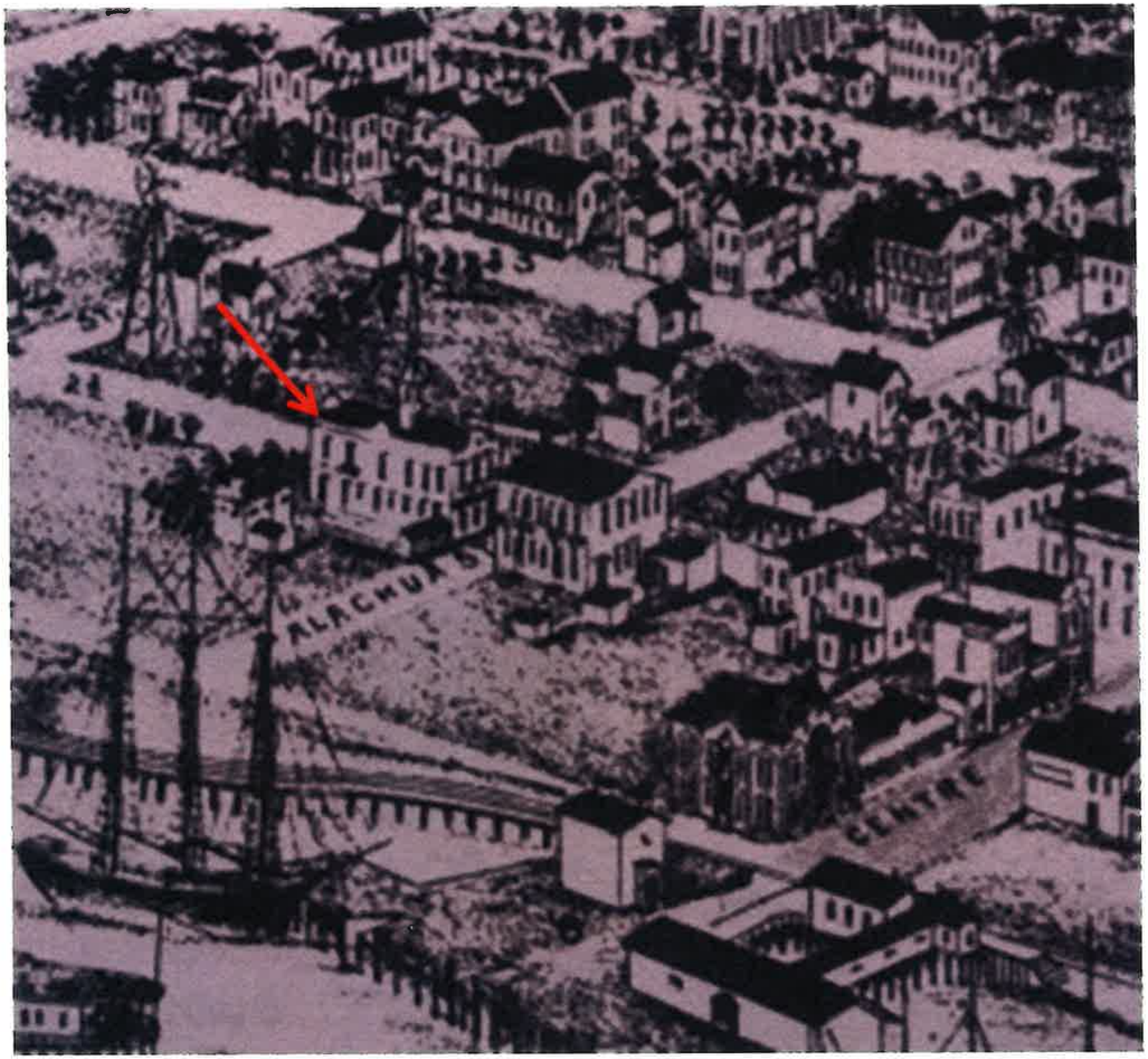
Historic Significance of Structure:

"Constructed in 1882, C.H. Huot's 1882 building is a two-story masonry vernacular commercial building. It is noteworthy for its rounded parapets, continuous molding on second-story windows and for its fleur-de-lis motif on the keystones. It has been significantly altered by stuccoing. It was originally the second building which C.H.Huot, of France, erected for his sawmill and merchandise enterprise." - Florida Master Site File 8NA00244



101 N. 2nd St.

1884 Birdseye View of Fernandina

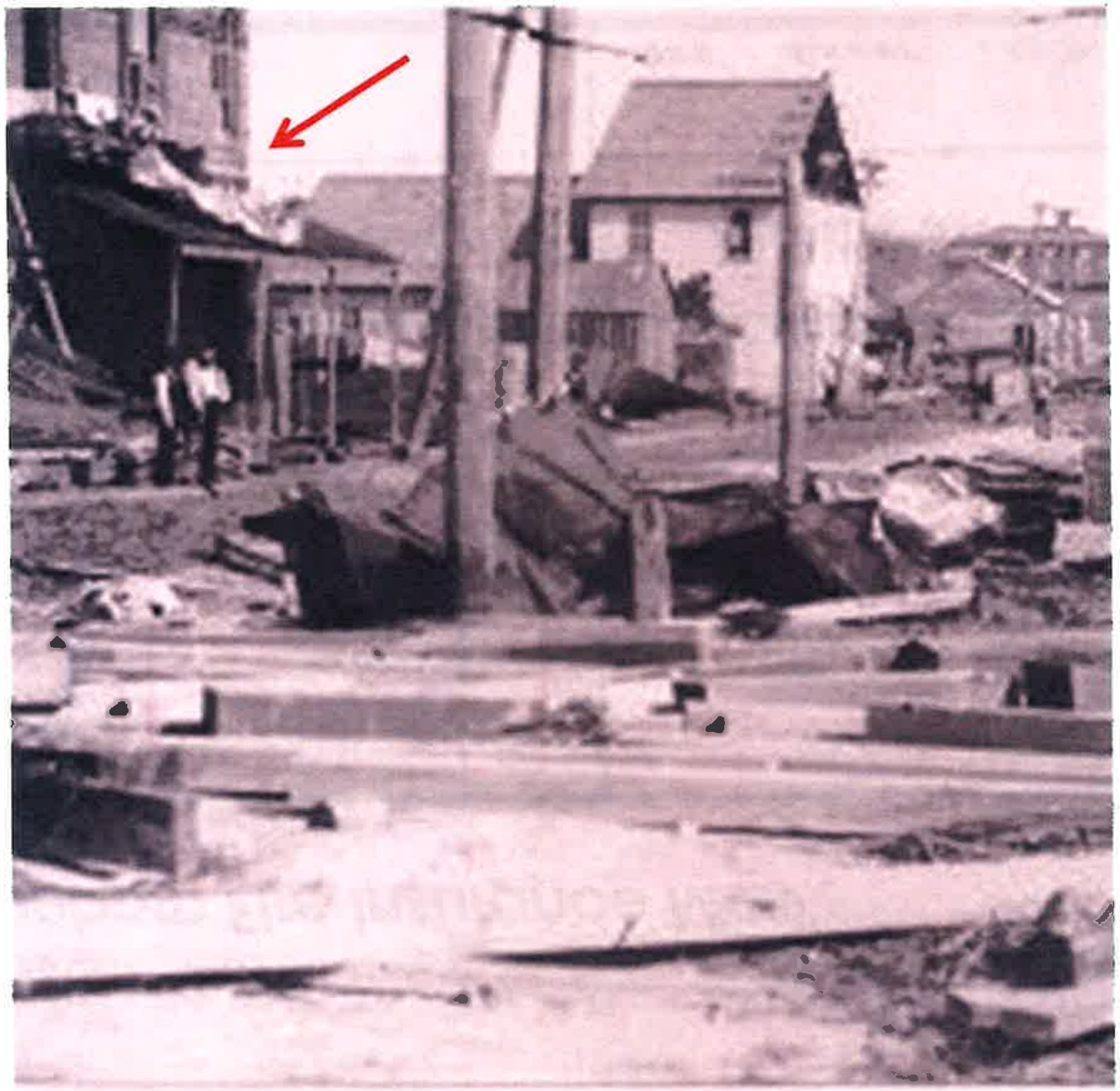


101 N. 2nd St.

1898 Hurricane

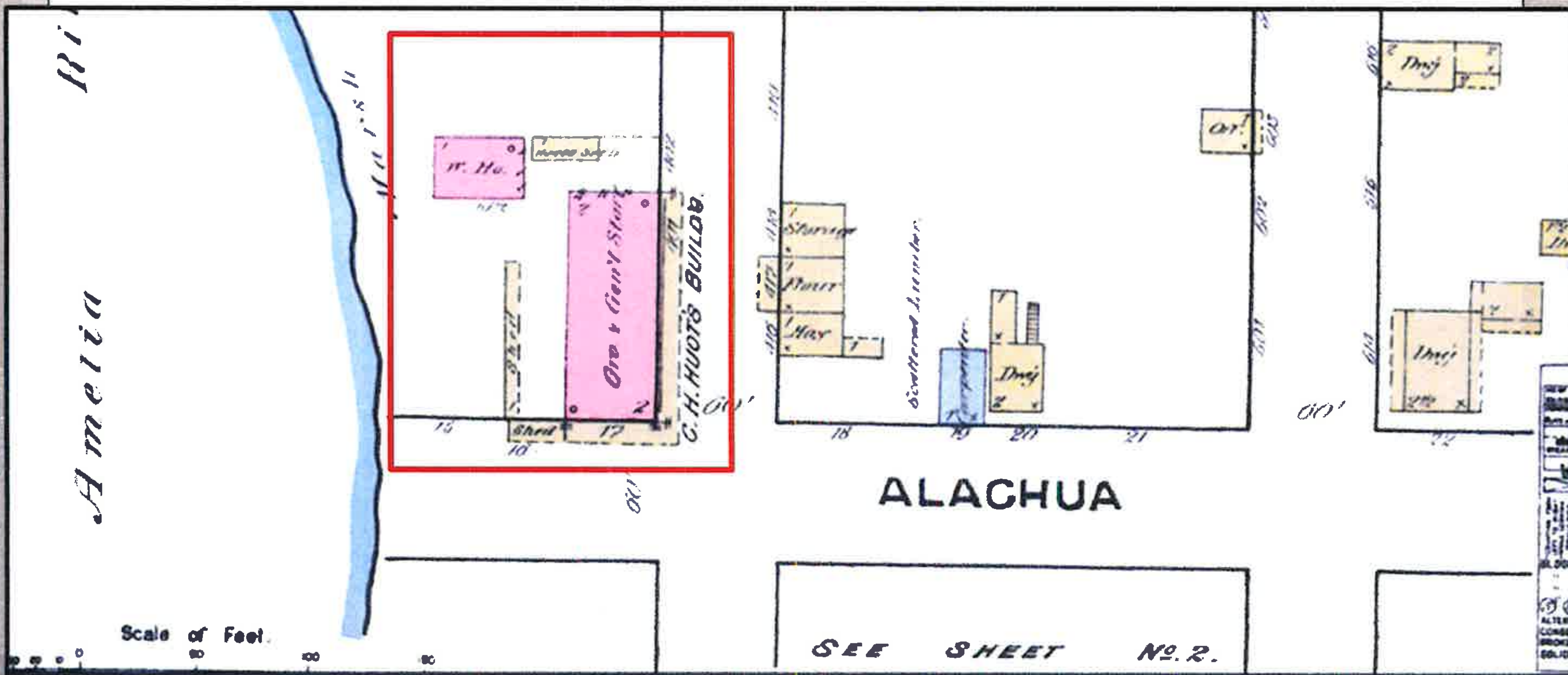
101 N. 2nd St.

1898 Hurricane



101 N. 2nd St.

1884 Sanborn Fire Insurance Map



101 N. 2nd St.


BROOME ST
N 2ND ST
N FRONT ST
ALACHUA ST
N 3RD ST
City of Fernandina Beach
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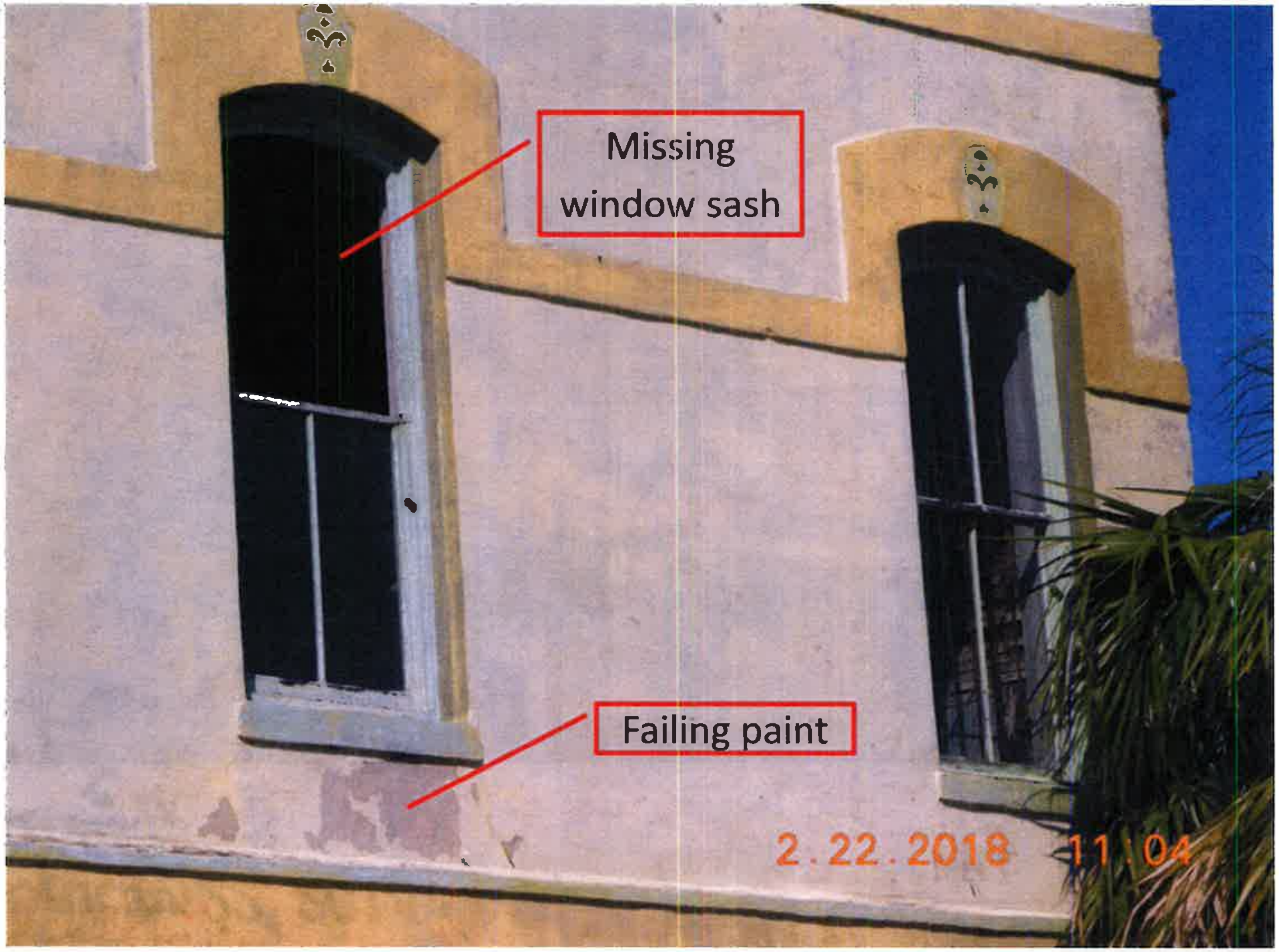
101 N. 2nd St.

101 N. 2nd St.

February 22, 2018
Site Visit

101 N. 2nd St.

February 22, 2018
Site Visit



101 N. 2nd St.

February 22, 2018
Site Visit

Roof failure as seen through open window

101 N. 2nd St.

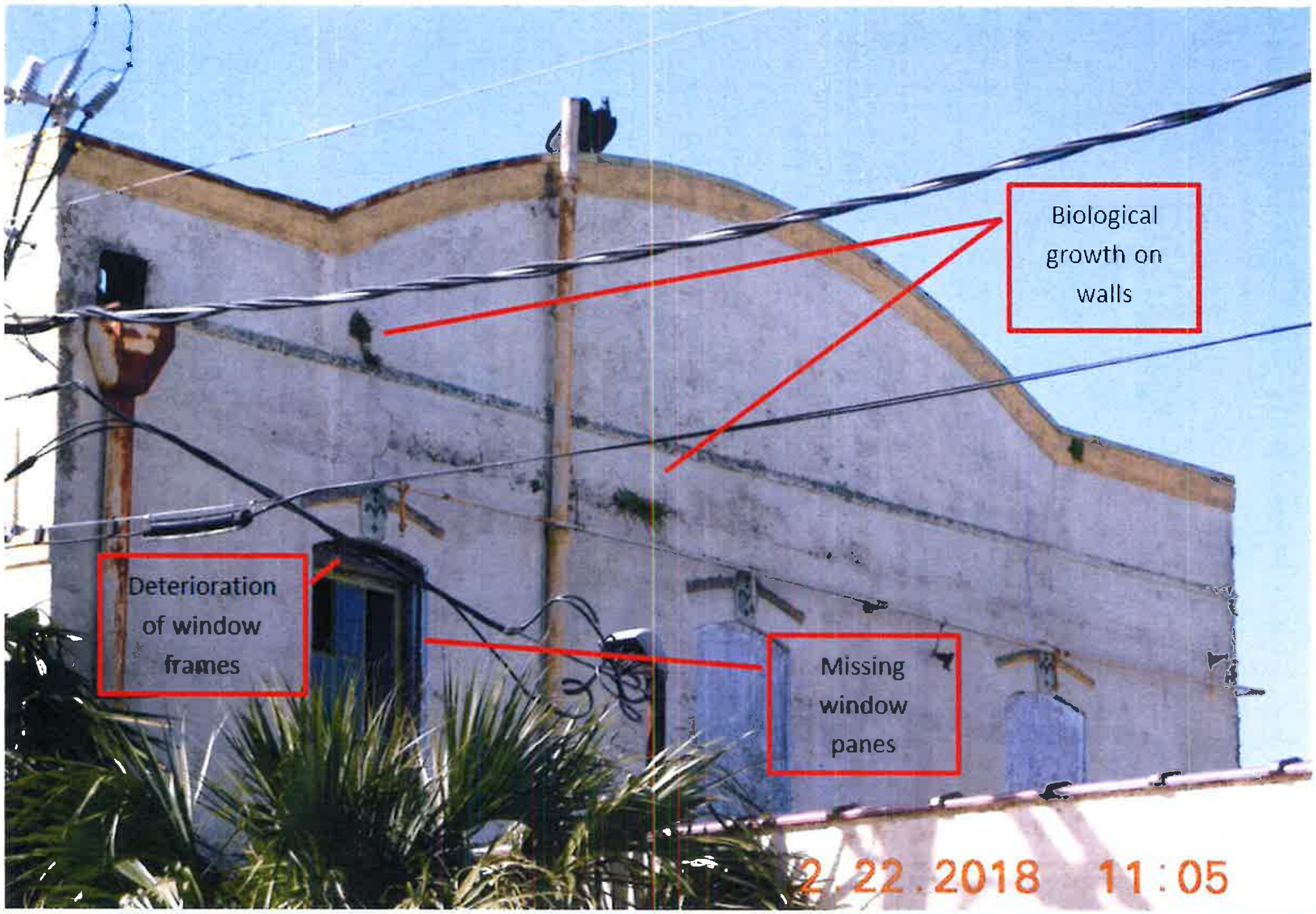
February 22, 2018
Site Visit

101 N. 2nd St.

February 22, 2018
Site Visit

101 N. 2nd St.

February 22, 2018
Site Visit



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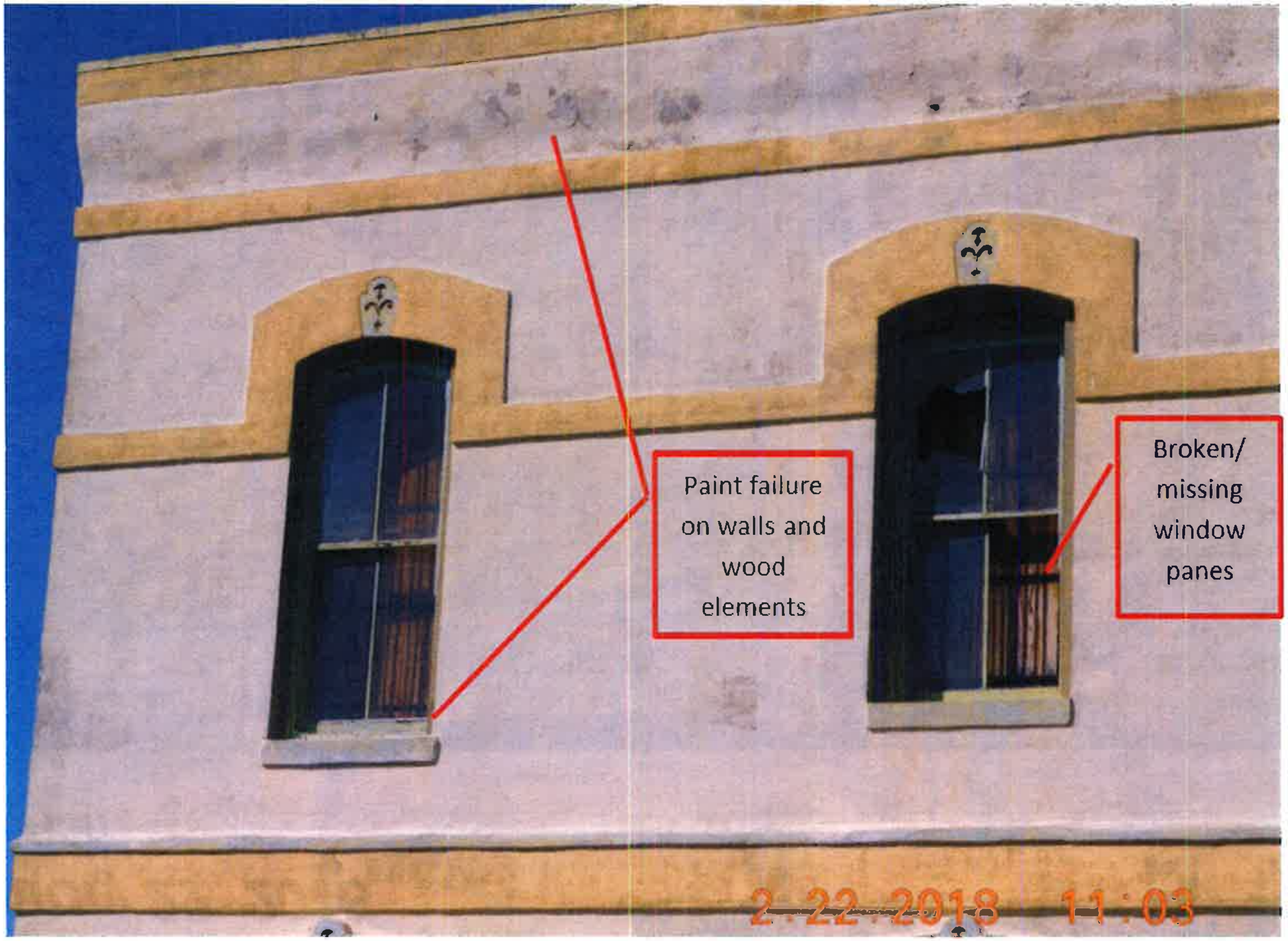

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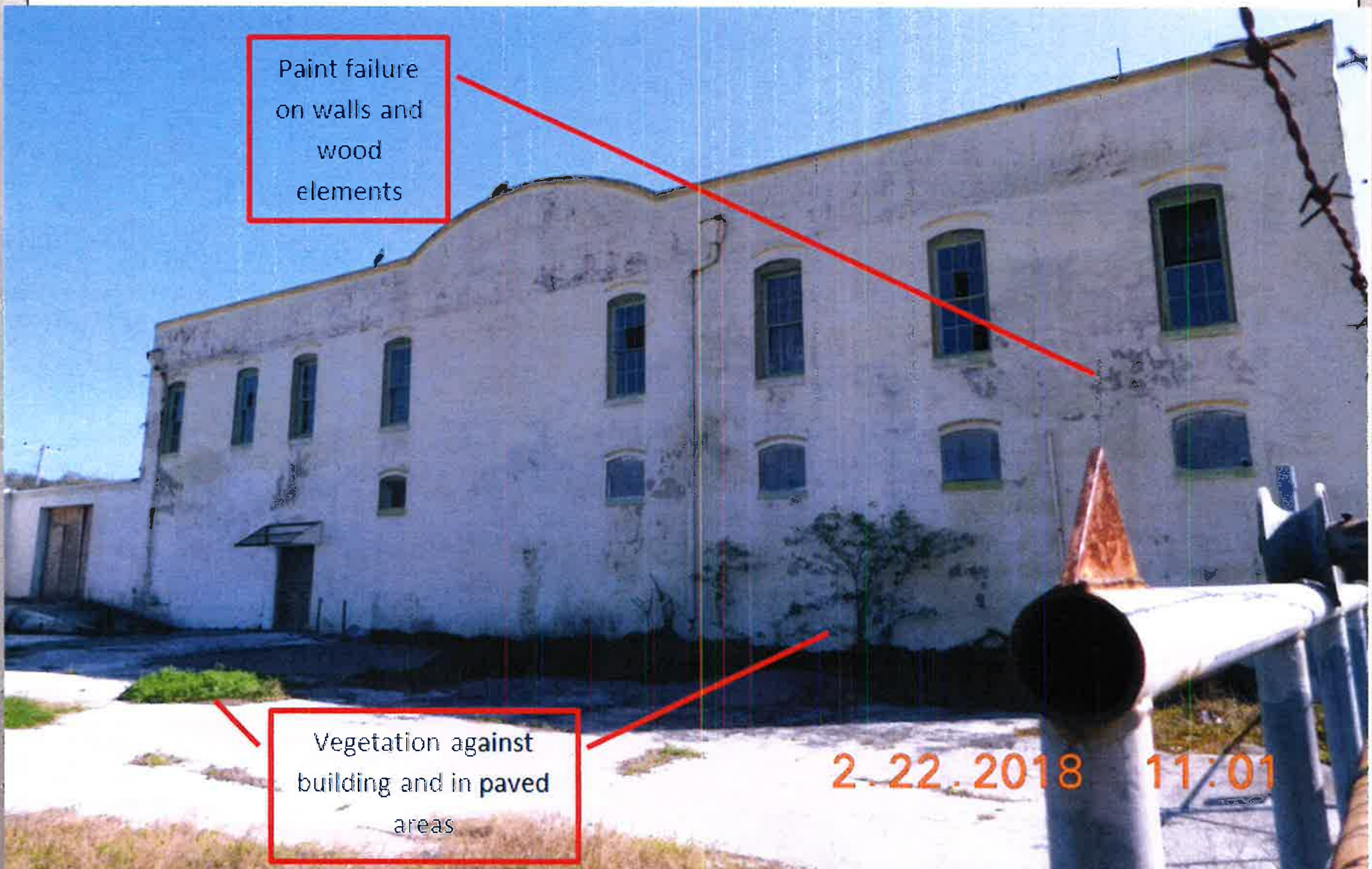


101 N. 2nd St.

February 22, 2018
Site Visit

101 N. 2nd St.

February 22, 2018
Site Visit

101 N. 2nd St.

February 22, 2018
Site Visit

Land Development Code
8.03.07 Demolition by Neglect

A. The following shall apply to maintenance and repair to structures in the locally designated historic districts, as well as any structure or property in the City that has been listed individually or deemed eligible for individual listing in the National Register:

1. The owner, lessee, or other person in physical control of the structure shall comply with all applicable codes, laws and regulations governing the maintenance and safety of property including but not limited to City Codes, as applicable. It is the intent of this section to preserve from deliberate or inadvertent neglect of the exterior features of a building designated as a contributing structure to a historic district, and the interior portions therefore when such maintenance is necessary to prevent deterioration and decay of the exterior. All such buildings shall be preserved against such decay and deterioration and shall be free from structural defects through prompt correction of any of the following defects:

101 N. 2nd St.

Land Development Code

8.03.07 Demolition by Neglect

a. Facades which may fall and injure members of the public or property;
b. Deteriorated or inadequate foundation, defective or deteriorated flooring or floor supports, deteriorated walls or other vertical structural supports;
c. Members of ceilings, roofs, ceiling and roof supports or other horizontal members which sag, split, or buckle due to defective material or deterioration;
d. Deteriorated or ineffective waterproofing of exterior walls, roofs, foundations or floors, including broken windows or doors;
e. Defective or insufficient weather protection for exterior wall covering, including lack of paint or weathering due to lack of paint or other protective covering.;
f. Any fault or defect in the building which renders it not properly watertight or structurally unsafe; and
g. Any fault or defect in the building rendering such structure an unsafe structure as defined under the provisions of Chapter 22, City Code of Ordinances.

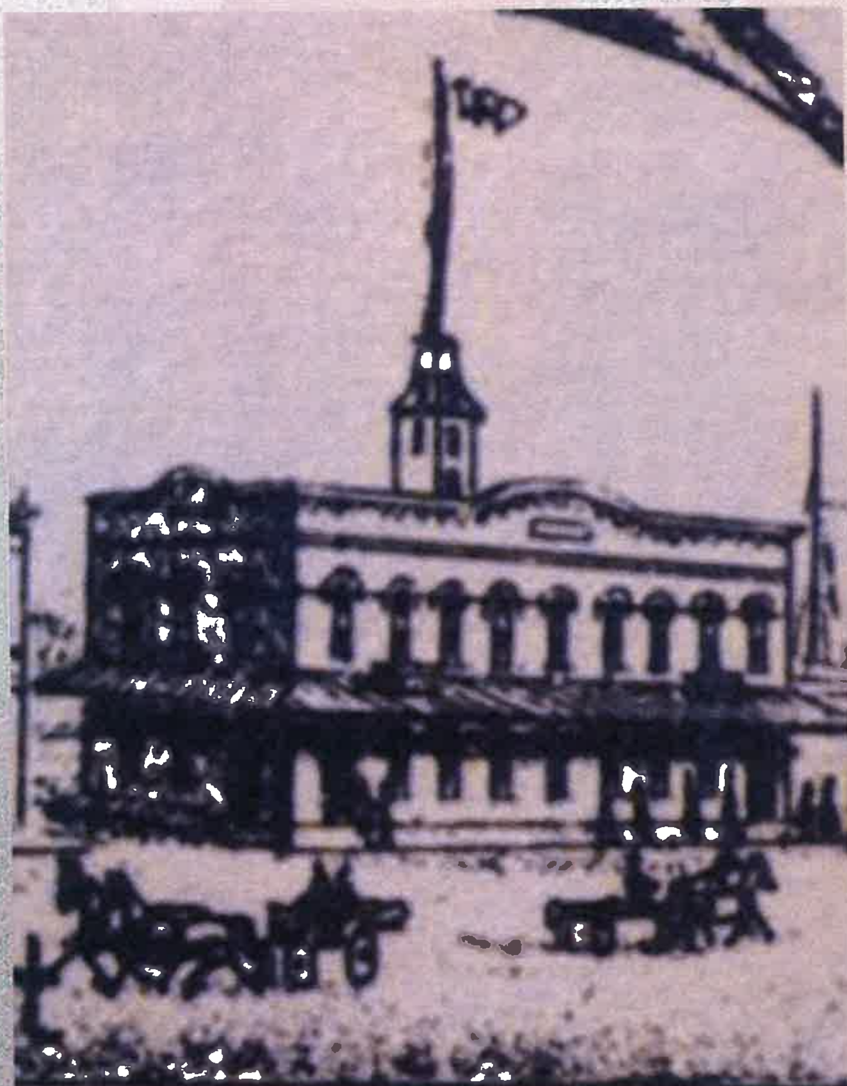
101 N. 2nd St.

Land Development Code

8.03.07 Demolition by Neglect

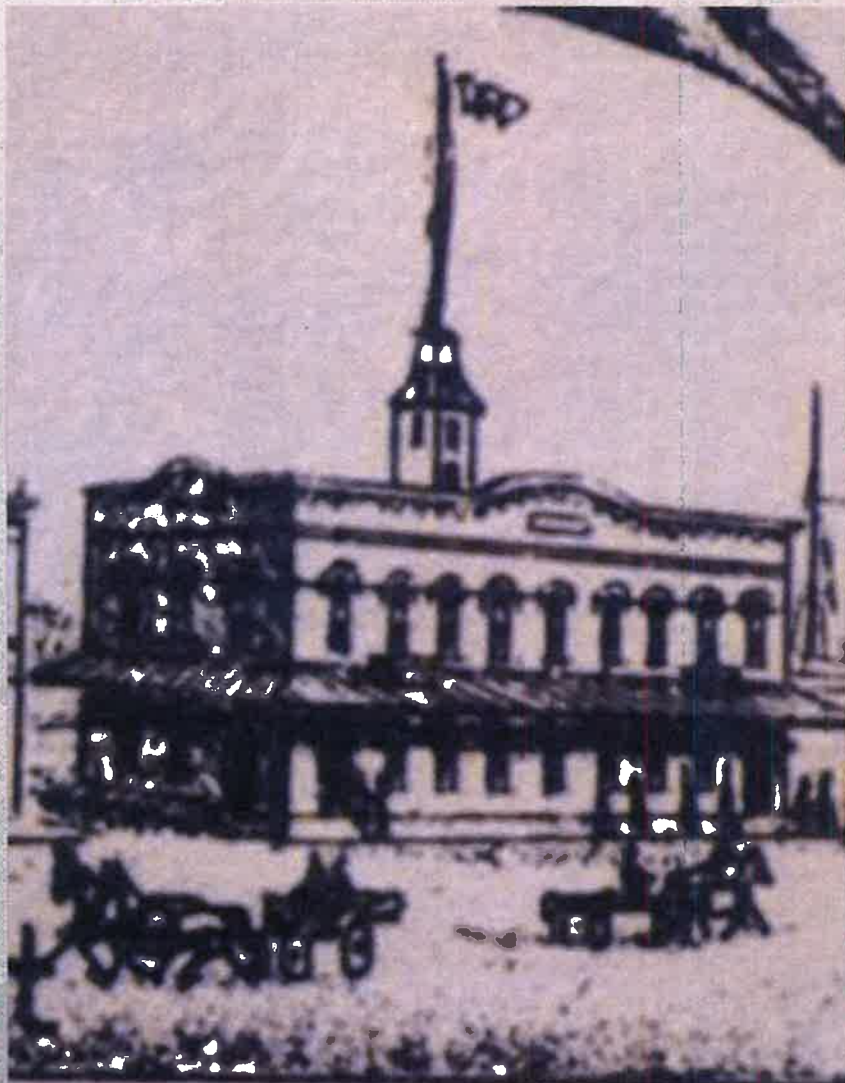
2. Where the property is an archaeological site, the owner shall be required to maintain his property in such a manner so as not to adversely affect the archaeological integrity of the site.

3. It shall be the joint responsibility of the Building Department, Planning Department, and Code Enforcement staff to enforce the provisions of this section, and the divisions may refer violations to the Code Enforcement and Appeals Board for enforcement proceedings pursuant to Chapter 2, City Code of Ordinances.



Staff Recommendation

HDC make a finding of Demolition By Neglect, and refer case to Code Enforcement And Appeals Board for action.



101 N. 2nd Street C.H. Huot 1882 Building

March 15, 2018

Technical Preservation Services
Preservation Briefs

Preservation Briefs provide guidance on **preserving, rehabilitating,** and **restoring** historic buildings. These NPS Publications help historic building owners recognize and resolve common problems prior to work. The briefs are especially useful to **Historic Preservation Tax Incentives Program** applicants because they recommend methods and approaches for rehabilitating historic buildings that are consistent with their historic character.

1. **Cleaning and Water-Repellent Treatments** for Historic Masonry Buildings
2. **Repointing Mortar Joints** in Historic Masonry Buildings
3. **Improving Energy Efficiency** in Historic Buildings
4. **Roofing** for Historic Buildings
5. The Preservation of Historic **Adobe Buildings**
6. **Dangers of Abrasive Cleaning** to Historic Buildings
7. The Preservation of Historic Glazed Architectural **Terra-Cotta**
8. **Aluminum and Vinyl Siding** on Historic Buildings: The Appropriateness of Substitute Materials for Resurfacing Historic Wood Frame Buildings
9. The Repair of Historic **Wooden Windows**
10. Exterior **Paint Problems** on Historic Woodwork
11. Rehabilitating Historic **Storefronts**
12. The Preservation of Historic Pigmented **Structural Glass**(Vitrolite and Carrara Glass)
13. The Repair and Thermal Upgrading of Historic **Steel Windows**
14. New **Exterior Additions** to Historic Buildings: Preservation Concerns
15. Preservation of Historic **Concrete**
16. The Use of **Substitute Materials** on Historic Building Exteriors
17. **Architectural Character**—Identifying the Visual Aspects of Historic Buildings as an Aid to Preserving their Character
18. Rehabilitating **Interiors** in Historic Buildings—Identifying Character-Defining Elements
19. The Repair and Replacement of Historic **Wooden Shingle Roofs**
20. The Preservation of Historic **Barns**
21. Repairing Historic **Flat Plaster**—Walls and Ceilings
22. The Preservation and Repair of Historic **Stucco**
23. Preserving Historic **Ornamental Plaster**
24. **Heating, Ventilating, and Cooling** Historic Buildings: Problems and Recommended Approaches
25. The Preservation of Historic **Signs**
26. The Preservation and Repair of Historic **Log Buildings**

27. The Maintenance and Repair of Architectural **Cast Iron**
28. **Painting** Historic Interiors
29. The Repair, Replacement, and Maintenance of Historic **Slate Roofs**
30. The Preservation and Repair of Historic **Clay Tile Roofs**
31. **Mothballing** Historic Buildings
32. Making Historic Properties **Accessible**
33. The Preservation and Repair of Historic **Stained and Leaded Glass**
34. Applied Decoration for Historic Interiors: Preserving Historic **Composition Ornament**
35. Understanding Old Buildings: The Process of **Architectural Investigation**
36. Protecting **Cultural Landscapes**: Planning, Treatment and Management of Historic Landscapes
37. Appropriate Methods of Reducing **Lead-Paint Hazards** in Historic Housing
38. **Removing Graffiti** from Historic Masonry
39. Holding the Line: **Controlling Unwanted Moisture** in Historic Buildings
40. Preserving Historic **Ceramic Tile Floors**
41. The **Seismic Rehabilitation** of Historic Buildings
42. The Maintenance, Repair and Replacement of Historic **Cast Stone**
43. The Preparation and Use of Historic **Structure Reports**
44. The Use of **Awnings** on Historic Buildings: Repair, Replacement and New Design
45. Preserving Historic **Wooden Porches**
46. The Preservation and Reuse of Historic **Gas Stations**
47. **Maintaining the Exterior** of Small and Medium Size Historic Buildings
48. **Preserving Grave Markers** in Historic Cemeteries
49. **Historic Decorative Metal Ceilings and Walls:** Use, Repair, and Replacement
50. **Lightning Protection** for Historic Buildings

31 PRESERVATION BRIEFS

Mothballing Historic Buildings

Sharon C. Park, AIA

U.S. Department of the Interior
National Park Service
Cultural Resources
Heritage Preservation Services

When all means of finding a productive use for a historic building have been exhausted or when funds are not currently available to put a deteriorating structure into a useable condition, it may be necessary to close up the building temporarily to protect it from the weather as well as to secure it from vandalism. This process, known as mothballing, can be a necessary and effective means of protecting the building while planning the property's future, or raising money for a preservation, rehabilitation or restoration project. If a vacant property has been declared unsafe by building officials, stabilization and mothballing may be the only way to protect it from demolition.

This Preservation Brief focuses on the steps needed to "de-activate" a property for an extended period of time. The project team will usually consist of an architect, historian, preservation specialist, sometimes a structural engineer, and a contractor. Mothballing should not be done without careful planning to ensure that needed physical repairs are made prior to securing the building. The steps discussed in this Brief can protect buildings for periods of up to ten years; long-term success will also depend on continued, although somewhat limited, monitoring and maintenance. For all but the simplest projects, hiring a team of preservation specialists is recommended to assess the specific needs of the structure and to develop an effective mothballing program.

A vacant historic building cannot survive indefinitely in a boarded-up condition, and so even marginal interim uses where there is regular activity and monitoring, such as a caretaker residence or non-flammable storage, are generally preferable to mothballing. In a few limited cases when the vacant building is in good condition and in a location where it can be watched and checked regularly, closing and locking the door, setting heat levels at just above freezing, and securing the windows may provide sufficient protection for a period of a few years. But if long-term mothballing is the only remaining option, it must be done properly (see fig. 1 & 2). This will require stabilization of the exterior, properly designed security protection, generally some form of interior ventilation - either through mechanical or natural air exchange systems - and continued maintenance and surveillance monitoring.

Comprehensive mothballing programs are generally expensive and may cost 10% or more of a modest rehabilitation budget. However, the money spent on well-planned protective measures will seem small when amortized over the life of the resource. Regardless of the location and condition of the property or the funding available, the following 9 steps are involved in properly mothballing a building:

Figure 1. Proper mothballing treatment: This building has been successfully mothballed for 10 years because the roof and walls were repaired and structurally stabilized, ventilation louvers were added, and the property is maintained. Photo: Charles E. Fisher, NPS.

Figure 2. Improper treatment: Boarding up without adequate ventilation, lack of maintenance, and neglect of this property have accelerated deterioration. Photo; NPS file.

Documentation

1. Document the architectural and historical significance of the building.
2. Prepare a condition assessment of the building.

Stabilization

3. Structurally stabilize the building, based on a professional condition assessment.
4. Exterminate or control pests, including termites and rodents.
5. Protect the exterior from moisture penetration.

Mothballing

6. Secure the building and its component features to reduce vandalism or break-ins.
7. Provide adequate ventilation to the interior.
8. Secure or modify utilities and mechanical systems.
9. Develop and implement a maintenance and monitoring plan for protection.

These steps will be discussed in sequence below. Documentation and stabilization are critical components of the process and should not be skipped over. Mothballing measures should not result in permanent damage, and so each treatment should be weighed in terms of its reversibility and its overall benefit.

Documentation

Documenting the historical significance and physical condition of the property will provide information necessary for setting priorities and allocating funds. The project team should be cautious when first entering the structure if it has been vacant or is deteriorated. It may be advisable to shore temporarily areas appearing to be structurally unsound until the condition of the structure can be fully assessed (see fig. 3). If pigeon or bat droppings, friable asbestos or other health hazards are present, precautions must be taken to wear the appropriate safety equipment when first inspecting the building. Consideration should be given to hiring a firm specializing in hazardous waste removal if these highly toxic elements are found in the building.

Documenting and recording the building. Documenting a building's history is important because evidence of its true age and architectural significance may not be readily evident. The owner should check with the State Historic Preservation Office or local preservation commission for assistance in researching the building. If the building has never been researched for listing in the National Register of Historic Places or other historic registers, then, at a minimum, the following should be determined:

- The overall historical significance of the property and dates of construction;
- the chronology of alterations or additions and their approximate dates; and,
- types of building materials, construction techniques, and any unusual detailing or regional variations of craftsmanship.

Old photographs can be helpful in identifying early or original features that might be hidden under modern materials. On a walk-through, the architect, historian, or preservation specialist should identify the architecturally significant elements of the building, both inside and out (see fig.4).

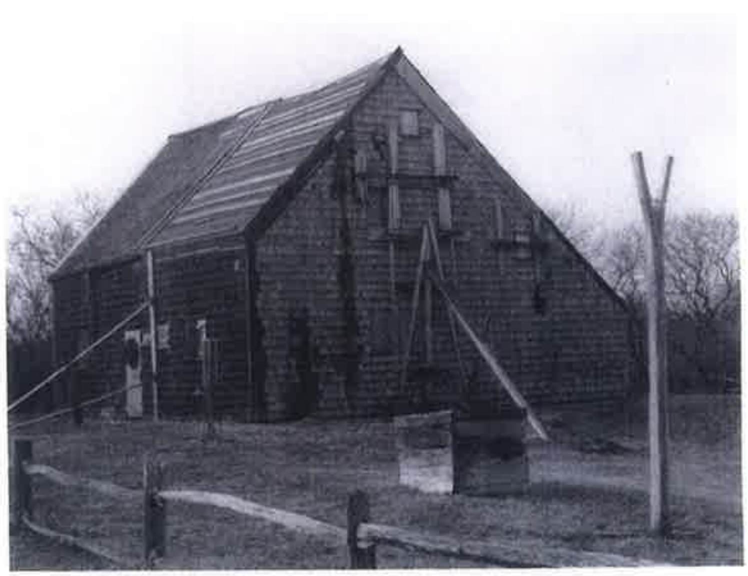


Figure 3. Buildings seriously damaged by storms or deterioration may need to be braced before architectural evaluations can be made. Jethro Coffin House. Photo: John Milner Architects.

Figure 4. Documenting the building's history, preparing schematic plans, and assessing the condition of the building will provide necessary information on which to set priorities for stabilization and repair prior to securing the building. Photo: Frederick Lindstrom, HABS.

By understanding the history of the resource, significant elements, even though deteriorated, may be spared the trash pile. For that reason alone, any materials removed from the building or site as part of the stabilization effort should be carefully scrutinized and, if appearing historic, should be photographed, tagged with a number, inventioried, and safely stored, preferably in the building, for later retrieval (see fig. 5).

A site plan and schematic building floor plans can be used to note important information for use when the building is eventually preserved, restored, or rehabilitated. Each room should be given a number and notations added to the plans regarding the removal of important features to storage or recording physical treatments undertaken as part of the stabilization or repair.

Because a mothballing project may extend over a long period of time, with many different people involved, clear records should be kept and a building file established. Copies of all important data, plans, photographs, and lists of consultants or contractors who have worked on the property should be added to the file as the job progresses.

Figure 5. Loose or detached elements should be identified, tagged and stored, preferably on site. Photo: NPS files.

Recording all actions taken on the building will be helpful in the future.

The project coordinator should keep the building file updated and give duplicate copies to the owner. A list of emergency numbers, including the number of the key holder, should be kept at the entrance to the building or on a security gate, in a transparent vinyl sleeve.

Preparing a condition assessment of the building. A condition assessment can provide the owner with an accurate overview of the current condition of the property. If the building is deteriorated or if there are significant interior architectural elements that will need special protection during the mothballing years, undertaking a condition assessment is highly recommended, but it need not be exhaustive.

A modified condition assessment, prepared by an architect or preservation specialist, and in some case a structural engineer, will help set priorities for repairs necessary to stabilize the property for both the short and long-term. It will evaluate the age and condition of the following major elements: foundations; structural systems; exterior materials; roofs and gutters; exterior porches and steps; interior finishes; staircases; plumbing, electrical, mechanical systems; special features such as chimneys; and site drainage.

To record existing conditions of the building and site, it will be necessary to clean debris from the building and to remove unwanted or overgrown vegetation to expose foundations. The interior should be emptied of its furnishing (unless provisions are made for mothballing these as well), all debris removed, and the interior swept with a broom. Building materials too deteriorated to repair, or which have come detached, such as moldings, balusters, and decorative plaster, and which can be used to guide later preservation work, should be tagged, labeled and saved.

Photographs or a videotape of the exterior and all interior spaces of the resource will provide an invaluable record of "as is" conditions. If a videotape is made, oral commentary can be provided on the significance of each space and architectural feature. If 35mm photographic prints or slides are made, they should be numbered, dated, and appropriately identified. Photographs should be cross-referenced with the room numbers on the schematic plans. A systematic method for photographing should be developed; for example, photograph each wall in a room and then take a corner shot to get floor and ceiling portions in the picture. Photograph any unusual details as well as examples of each window and door type.

For historic buildings, the great advantage of a condition assessment is that architectural features, both on the exterior as well as the interior, can be rated on a scale of their importance to the integrity and significance of the building. Those features of the highest priority should receive preference when repairs or protection measures are outlined as part of the mothballing process. Potential problems with protecting these features should be identified so that appropriate interim solutions can be selected. For example, if a building has always been heated and if murals, decorative plaster walls, or examples of patterned wall paper are identified as highly significant, then special care should be taken to regulate the interior climate and to monitor it adequately during the mothballing years. This might require retaining electrical service to provide minimal heat in winter, fan exhaust in summer, and humidity controls for the interior.

Stabilization

Stabilization as part of a mothballing project involves correcting deficiencies to slow down the deterioration of the building while it is vacant. Weakened structural members that might fail altogether in the forthcoming years must be braced or reinforced; insects and other pests removed and discouraged from returning; and the building protected from moisture damage both by weatherizing the exterior envelope and by handling water run-off on the site. Even if a modified use or caretaker services can eventually be found for the building, the following steps should be addressed.

Structurally stabilizing the building. While bracing may have been required to make the building temporarily safe for inspection, the condition assessment may reveal areas of hidden structural damage. Roofs, foundations, walls, interior framing, porches and dormers all have structural components that may need added reinforcement. Structural stabilization by a qualified contractor should be done under the direction of a structural engineer or a preservation specialist to ensure that the added weight of the reinforcement can be sustained by the building and that the new members do not harm historic finishes (see fig. 6). Any major vertical post added during the stabilization should be properly supported and, if necessary, taken to the ground and underpinned.

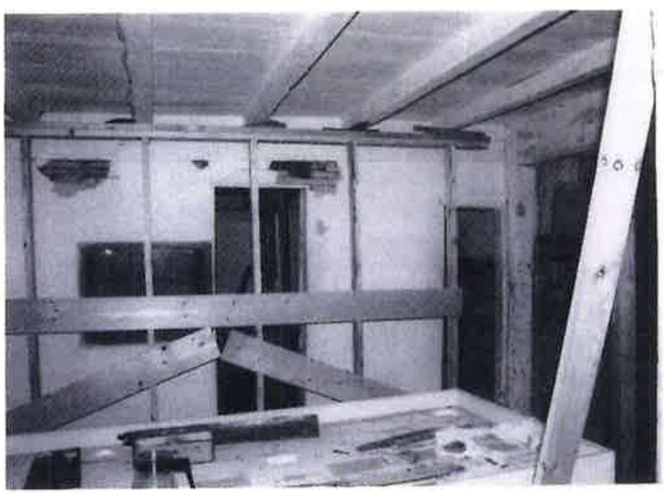


Figure 6. Interior bracing which will last the duration of the mothballing will protect weakened structural members. Jethro Coffin House. Photo: John Milner Architects.

If the building is in a northern climate, then the roof framing must be able to hold substantial snow loads. Bracing the roof at the ridge and mid-points should be considered if sagging is apparent. Likewise, interior framing around stair openings or under long ceiling spans should be investigated. Underpinning or bracing structural piers weakened by poor drainage patterns may be a good precaution as well. Damage caused by insects, moisture, or from other causes should be repaired or reinforced and, if possible, the source of the damage removed. If features such as porches and dormers are so severely deteriorated that they must be removed, they should be documented, photographed, and portions salvaged for storage prior to removal.

If the building is in a southern or humid climate and termites or other insects are a particular problem, the foundation and floor framing should be inspected to ensure that there are no major structural weaknesses. This can usually be done by observation from the crawl space or basement. For those structures where this is not possible, it may be advisable to lift selective floor boards to expose the floor framing. If there is evidence of pest damage, particularly termites, active colonies should be treated and the structural members reinforced or replaced, if necessary.

Controlling pests. Pests can be numerous and include squirrels, raccoons, bats, mice, rats, snakes, termites, moths, beetles, ants, bees and wasps, pigeons, and other birds. Termites, beetles, and carpenter ants destroy wood. Mice, too, gnaw wood as well as plaster, insulation, and electrical wires. Pigeon and bat droppings not only damage wood finishes but create a serious and sometimes deadly health hazard.

If the property is infested with animals or insects, it is important to get them out and to seal off their access to the building. If necessary, exterminate and remove any nests or hatching colonies. Chimney flues may be closed off with exterior grade plywood caps, properly ventilated, or protected with framed wire screens. Existing vents, grills, and louvers in attics and crawl spaces should be screened with bug mesh or heavy duty wire, depending on the type of pest being controlled. It may be advantageous to have damp or infected wood treated with insecticides (as permitted by each state) or preservatives, such as borate, to slow the rate of deterioration during the time that the building is not in use.

Securing the exterior envelope from moisture penetration. It is important to protect the exterior envelope from moisture penetration before securing the building. Leaks from deteriorated or damaged roofing, from around windows and doors, or through deteriorated materials, as well as ground moisture from improper site run-off or rising damp at foundations, can cause long-term damage to interior finishes and structural systems. Any serious deficiencies on the exterior, identified in the condition assessment, should be addressed.

To the greatest extent possible, these weatherization efforts should not harm historic materials. The project budget may not allow deteriorated features to be fully repaired or replaced in-kind. Non-historic or modern materials may be used to cover historic surfaces temporarily, but these treatments should not destroy valuable evidence necessary for future preservation work. Temporary modifications should be as visually compatible as possible with the historic building.

Roofs are often the most vulnerable elements on the building exterior and yet in some ways they are the easiest element to stabilize for the long term, if done correctly. "Quick fix" solutions, such as tar patches on slate roofs, should be avoided as they will generally fail within a year or so and may accelerate damage by trapping moisture. They are difficult to undo later when more permanent repairs are undertaken. Use of a tarpaulin over a leaking roof should be thought of only as a very temporary

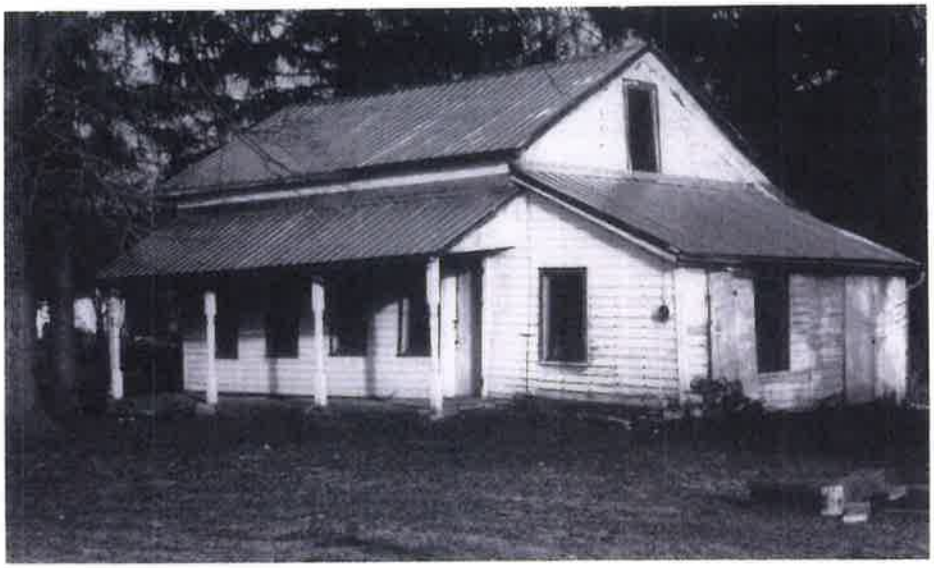


Figure 7. Non-historic materials are appropriate for mothballing projects when they are used to protect historic evidence remaining for future preservation. This lightweight aluminum channel frame and roofing covers the historic wooden shingle roof. Galvanized mesh panels secure the window openings from intrusion by raccoons and other unwanted guests. Photo: Williamsport Preservation Training Center, NPS.

Figure 8. Appropriate mortar mixes should be used when masonry repairs are undertaken. In this case, a soft lime based mortar is used as an infill between the brick and wooden elements. When full repairs are made during the restoration phase, this soft mortar can easily be removed and missing bricks replaced.

emergency repair because it is often blown off by the wind in a subsequent storm.

If the existing historic roof needs moderate repairs to make it last an additional ten years, then these repairs should be undertaken as a first priority. Replacing cracked or missing shingles and tiles, securing loose flashing, and reanchoring gutters and downspouts can often be done by a local roofing contractor. If the roof is in poor condition, but the historic materials and configuration are important, a new temporary roof, such as a lightweight aluminum channel system over the existing, might be considered (see fig. 7). If the roofing is so deteriorated that it must be replaced and a lightweight aluminum system is not affordable, various inexpensive options might be considered. These include covering the existing deteriorated roof with galvanized corrugated metal roofing panels, or 90 lb. rolled roofing, or a rubberized membrane (refer back to cover photo). These alternatives should leave as much of the historic sheathing and roofing in place as evidence for later preservation treatments.

For masonry repairs, appropriate preservation approaches are essential. For example, if repointing deteriorated brick chimneys or walls is necessary to prevent serious moisture penetration while the building is mothballed, the mortar should match the historic mortar in composition, color, and tooling. The use of hard portland cement mortars or vapor-impermeable waterproof coatings are not appropriate solutions as they can cause extensive damage and are not reversible treatments (see fig. 8).

For wood siding that is deteriorated, repairs necessary to keep out moisture should be made; repainting is generally warranted. Cracks around windows and doors can be beneficial in providing ventilation to the interior and so should only be caulked if needed to keep out bugs and moisture. For very deteriorated wall surfaces on wooden frame structures, it may be necessary to sheathe in plywood panels, but care should be taken to minimize installation damage by planning the location of the nailing or screw patterns or by installing panels over a frame of battens (see fig. 9). Generally, however, it is better to repair deteriorated features than to cover them over.

Foundation damage may occur if water does not drain away from the building. Run-off from gutters and downspouts should be directed far away from the foundation wall by using long flexible extender pipes equal in length to twice the depth of the basement or crawl space. If underground drains are susceptible to clogging, it is recommended that the downspouts be disconnected from the drain boot and attached to flexible piping. If gutters and downspouts are in bad condition, replace them with inexpensive aluminum units.

Figure 9. Severely deteriorated wooden siding on a farm building has been covered over with painted plywood panels as a temporary measure to eliminate moisture penetration to the interior. Foundation vents and loose floor boards allow air to circulate inside.

If there are no significant landscape or exposed archeological elements around the foundation, consideration should be given to regrading the site if there is a documented drainage problem (see fig. 10). If building up the grade, use a fiber mesh membrane to separate the new soil from the old and slope the new soil 6 to 8 feet (200 cm-266 cm) away from the foundation making sure not to cover up the dampcourse layer or come into contact with skirting boards. To keep vegetation under control, put down a layer of 6 mil black polyethylene sheeting or fiber mesh matting covered with a 2"-4" (5-10 cm.) of washed gravel. If the building suffers a serious rising damp problem, it may be advisable to eliminate the plastic sheeting to avoid trapping ground moisture against foundations.

Figure 10. Regrading around the Booker Tenement at Colonial Williamsburg has protected the masonary foundation wall from excessive damp. This building has been successfully mothballed for over 10 years. Note the attic and basement vents, the temporary stairs, and the informative sign interpreting the history of this building.

Mothballing

The actual mothballing effort involves controlling the long-term deterioration of the building while it is unoccupied as well as finding methods to protect it from sudden loss by fire or vandalism. This requires securing the building from unwanted entry, providing adequate ventilation to the interior, and shutting down or modifying existing utilities. Once the building is de-activated or secured, the long-term success will depend on periodic maintenance and surveillance monitoring.

Securing the building from vandals, break-ins, and natural disasters. Securing the building from sudden loss is a critical aspect of mothballing. Because historic buildings are irreplaceable, it is vital that vulnerable entry points are sealed. If the building is located where fire and security service is available then it is highly recommeded that some form of monitoring or alarm devices be used.

To protect decorative features, such as mantels, lighting fixtures, copper downspouts, iron roof cresting, or stained glass windows from theft or vandalism, it may be advisable to temporarily remove them to a more secure location if they cannot be adequately protected within the structure.

Mothballed buildings are usually boarded up, particularly on the first floor and basement, to protect fragile glass windows from breaking and to reinforce entry points (see fig. 11). Infill materials for closing door and window openings include plywood, corrugated panels, metal grates, chain fencing, metal grills, and cinder or cement blocks (see fig. 12). The method of installation should not result in the destruction of the opening and all associated sash, doors, and frames should be protected or stored for future reuse.

Figure 11. Urban buildings often need additional protection from unwanted entry and graffiti. This commercial building uses painted plywood panels to cover expansive glass storefronts and chain link fencing is applied on top of the panels. The upper windows on the street sides have been covered and painted to resemble 19th century sash. Photo: Thomas Jester, NPS.

Generally exterior doors are reinforced and provided with strong locks, but if weak historic doors would be damaged or disfigured by adding reinforcement or new locks, they may be removed temporarily and replaced with secure modern doors (see fig. 13). Alternatively, security gates in a new metal frame can be installed within existing door openings, much like a storm door, leaving the historic door in place. If plywood panels are installed over door openings, they should be screwed in place, as opposed to nailed, to avoid crowbar damage each time the panel is removed. This also reduces pounding vibrations from hammers and eliminates new nail holes each time the panel is replaced.

For windows, the most common security feature is the closure of the openings; this may be achieved with wooden or pre-formed panels or, as needed, with metal sheets or concrete blocks. Plywood panels, properly installed to protect wooden frames and properly ventilated, are the preferred treatment from a preservation standpoint.

There are a number of ways to set insert plywood panels into windows openings to avoid damage to frame and sash (see fig. 14). One common method is to bring the upper and lower sash of a double hung unit to the mid-point of the opening and then to install pre-cut plywood panels using long carriage bolts anchored into horizontal wooden bracing, or strong backs, on the inside face of the window. Another means is to build new wooden blocking frames set into deeply recessed openings, for example in an industrial mill or warehouse, and then to affix the plywood panel to the blocking frame. If sash must be removed prior to installing panels, they should be labeled and stored safely within the building.

Plywood panels are usually 1/2"-3/4" (1.25-1.875 cm.) thick and made of exterior grade stock, such as CDX, or marine grade plywood. They should be painted to protect them from delamination and to provide a neater appearance. These panels may be painted to resemble operable windows or treated decoratively (see fig. 15). With extra attention to detail, the plywood panels can be

Figure 12. First floor openings have been filled with cinderblocks and doors, window sash and frames have been removed for safe keeping. Note the security light over the windows and the use of a security metal door with heavy duty locks. Photo: H. Ward Jandl, NPS.

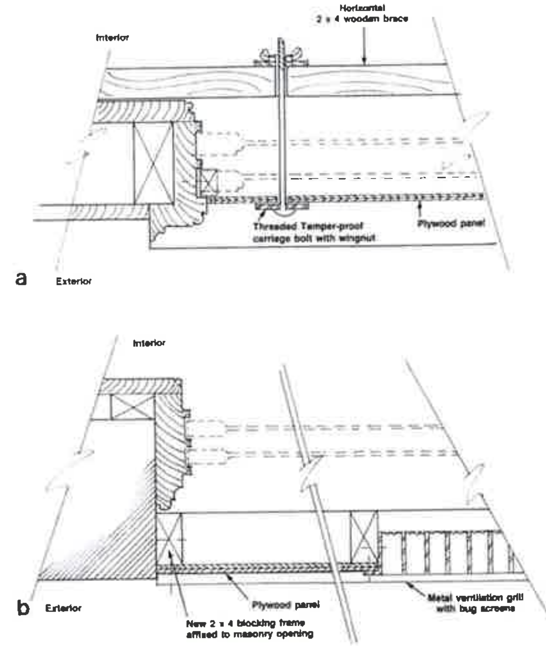


Figure 14. A: Plan detail showing plywood security panel anchored with carriage bolts through to the inside horizontal bracing, or strong backs. B: Plan detail showing section of plywood window panel attached to a new pressure treated wood frame set within the masonry opening. Ventilation should be included whenever possible or necessary.

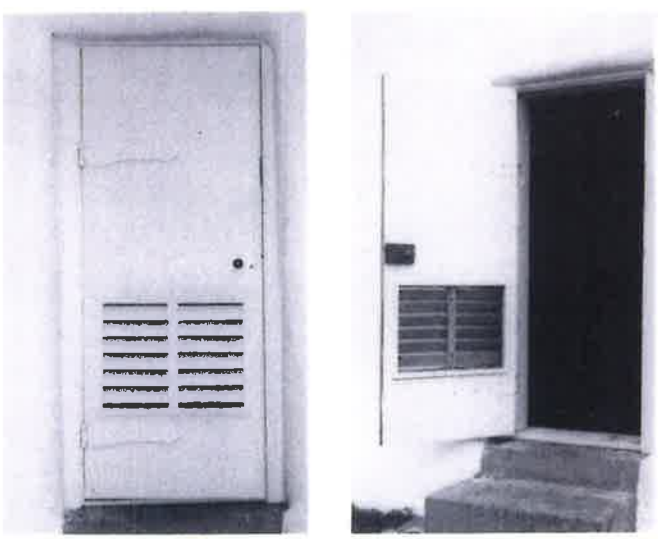


Figure 13. If historic doors would be damaged by adding extra locks, they should be removed and stored and new security doors added. At this lighthouse, the historic door has been replaced with a new door (seen both inside and outside) with an inset vent and new deadbolt locks. The heavy historic hinges have not been damaged. Photo: Williamsport Preservation Training Center, NPS.

Figure 15. Painting trompe l'oeil scenes on plywood panels is a neighborhood friendly device. In addition, the small sign at the bottom left corner gives information for contacting the organization responsible for the care of the mothballed building. Photo: Lee H. Nelson, FAIA.

trimmed out with muntin strips to give a shadow line simulating multi-lite windows. This level of detail is a good indication that the building is protected and valued by the owner and the community.

If the building has shutters, simply close the shutters and secure them from the interior (see fig. 16). If the building had shutters historically, but they are missing, it may be appropriate to install new shutters, even in a modern material, and secure them in the closed position. Louvered shutters will help with interior ventilation if the sash are propped open behind the shutters.

Figure 16. Historic louvered shutters make excellent security closures with passive ventilation.

There is some benefit from keeping windows unboarded if security is not a problem. The building will appear to be occupied, and the natural air leakage around the windows will assist in ventilating the interior. The presence of natural light will also help when periodic inspections are made. Rigid polycarbonate clear storm glazing panels may be placed on the window exterior to protect against glass breakage. Because the sun's ultraviolet rays can cause fading of floor finishes and wall surfaces, filtering pull shades or inexpensive curtains may be options for reducing this type of deterioration for significant interiors. Some acrylic sheeting comes with built-in ultraviolet filters.

Securing the building from catastrophic destruction from fire, lightning, or arson will require additional security devices. Lightning rods properly grounded should be a first consideration if the building is in an area susceptible to lightning storms. A high security fence should also be installed if the property cannot be monitored closely. These interventions do not require a power source for operation. Since many buildings will not maintain electrical power, there are some devices available using battery packs, such as intrusion alarms, security lighting, and smoke detectors which through audible horn alarms can alert nearby neighbors. These battery packs must be replaced every 3 months to 2 years, depending on type and usage. In combination with a cellular phone, they can also provide some level of direct communication with police and fire departments.

If at all possible, new temporary electric service should be provided to the building (see fig. 17). Generally a telephone

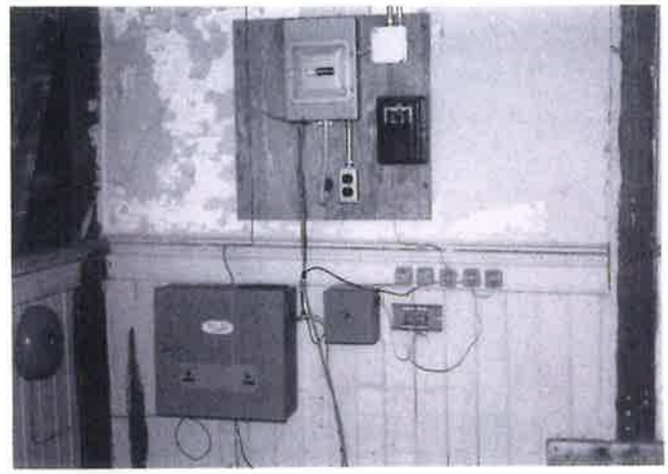


Figure 17. Security systems are very important for mothballed buildings if they are located where fire and security services are available. A temporary electric service with battery back-up has been installed in this building. Intrusion alarms and ionization smoke/fire detectors are wired directly to the nearby security service.

line is needed as well. A hard wired security system for intrusion and a combination rate-of-rise and smoke detector can send an immediate signal for help directly to the fire department and security service. Depending on whether or not heat will be maintained in the building, the security system should be designed accordingly. Some systems cannot work below 32°F (0°C). Exterior lighting set on a timer, photo electric sensor, or a motion/infra-red detection device provides additional security.

Providing adequate ventilation to the interior. Once the exterior has been made weathertight and secure, it is essential to provide adequate air exchange throughout the building. Without adequate air exchange, humidity may rise to unsafe levels, and mold, rot, and insect infestation are likely to thrive (see fig. 18). The needs of each historic resource must be individually evaluated because there are so many variables that affect the performance of each interior space once the building has been secured. A

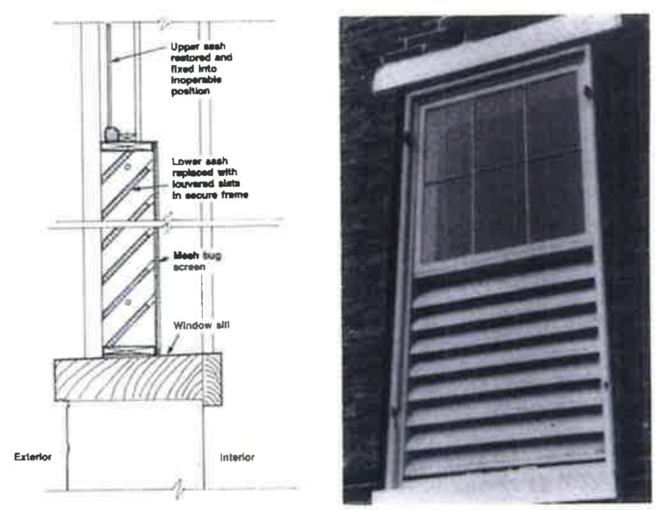


Figure 18. Heavy duty wooden slated louvers were custom fabricated to replace the deteriorated lower sash. The upper sash were rebuilt to retain the historic appearance and to allow light into this vacant historic building. Refer back to Fig. 1 for a view of the building. Photo: Charles E. Fisher, NPS. Drawing by Thomas Vitanza.

mechanical engineer or a specialist in interior climates should be consulted, particularly for buildings with intact and significant interiors. In some circumstances, providing heat during the winter, even at a minimal 45° F (7°C), and utilizing forced-fan ventilation in summer will be recommended and will require retaining electrical service. For masonry buildings it is often helpful to keep the interior temperature above the spring dew point to avoid damaging condensation. In most buildings it is the need for summer ventilation that outweighs the winter requirements.

Many old buildings are inherently leaky due to loose-fitting windows and floorboards and the lack of insulation. The level of air exchange needed for each building, however, will vary according to geographic location, the building's construction, and its general size and configuration.

There are four critical climate zones when looking at the type and amount of interior ventilation needed for a closed up building: hot and dry (southwestern states); cold and damp (Pacific northwest and northeastern states); temperate and humid (Mid-Atlantic states, coastal areas); and hot and humid (southern states and the tropics). (See fig. 19 for a chart outlining guidance on ventilation.)

Once closed up, a building interior will still be affected by the temperature and humidity of the exterior. Without proper ventilation, moisture from condensation may occur and cause damage by wetting plaster, peeling paint, staining woodwork, warping floors, and in some cases even causing freeze thaw damage to plaster. If moist conditions persist in a property, structural damage can result from rot or returning insects attracted to moist conditions. Poorly mothballed masonry buildings, particularly in damp and humid zones have been so damaged on the interior with just one year of unventilated closure that none of the interior finishes were salvageable when the buildings were rehabilitated.

The absolute minimum air exchange for most mothballed buildings consists of one to four air exchanges every hour; one or two air exchanges per hour in winter and often twice that amount in summer. Even this minimal exchange may foster mold and mildew in damp climates, and so monitoring the property during the stabilization period and after the building has been secured will provide useful information on the effectiveness of the ventilation solution.

There is no exact science for how much ventilation should be provided for each building. There are, however, some general rules of thumb. Buildings, such as adobe structures, located in hot and arid climates may need no additional ventilation if they have been well weatherized and no moisture is penetrating the interior. Also frame buildings with natural cracks and fissures for air infiltration may have a natural air exchange rate of 3 or 4 per hour, and so in arid as well as temperate climates may need no additional ventilation once secured. The most difficult

VENTILATION GUIDANCE CHART

CLIMATE	AIR EXCHANGES		VENTILATION				
Temperature and Humidity	Winter air exchange per hour	Summer air exchange per hour	Frame Buildings passive louvering % of openings louvered winter	 summer	Masonry Buildings passive louvering % of openings louvered winter	 summer	Masonry Buildings fan combination one fan + % louvered summer
hot and dry Southwestern areas	less than 1	less than 1	N/A	N/A	N/A	N/A	N/A
cold and damp Northeastern & Pacific northwestern areas	1	2-3	5%	10%	10%	30%	20%
temperate/humid Mid-Atlantic & coastal areas	2	3-4	10%	20%	20%	40%	30%
hot and humid Southern states & tropical areas	3	4 or more	20%	30%	40% or more	80%	40% or more

Figure 19. This is a general guide for the amount of louvering which might be expected for a medium size residential structure with an average amount of windows, attic, and crawl space ventilation. There is currently research being done on effective air exchanges, but each project should be evaluated individually. It will be noticed from the chart that summer louvering requirements can be reduced with the use of an exhaust fan. Masonry buildings need more ventilation than frame buidings. Chart prepared by Sharon C. Park, AIA and Ernest A. Conrad, PE.

buildings to adequately ventilate without resorting to extensive louvering and/or mechanical exhaust fan systems are masonry buildings in humid climates. Even with basement and attic vent grills, a masonry building many not have more than one air exchange an hour. This is generally unacceptable for summer conditions. For these buildings, almost every window opening will need to be fitted out with some type of passive, louvered ventilation.

Depending on the size, plan configuration, and ceiling heights of a building, it is often necessary to have louvered opening equivalent to 5%-10% of the square footage of each floor. For example, in a humid climate, a typical 20'x30' (6.1m x 9.1m) brick residence with 600 sq. ft.(55.5 sq.m) of floor space and a typical number of windows, may need 30-60 sq. ft.(2.75sq.m-5.5 sq. m) of louvered openings per floor. With each window measuring 3'x5'(.9m x 1.5 m) or 15 sq. ft. (1.3 sq.m), the equivalent of 2 to 4 windows per floor may need full window louvers.

Small pre-formed louvers set into a plywood panel or small slit-type registers at the base of inset panels generally cannot provide enough ventilation in most moist climates to offset condensation, but this approach is certainly better than no louvers at all. Louvers should be located to give cross ventilation, interior doors should be fixed ajar at least 4" (10cm) to allow air to circulate, and hatches to the attic should be left open.

Monitoring devices which can record internal temperature and humidity levels can be invaluable in determining if the internal climate is remaining stable. These units can be powered by portable battery packs or can be wired into electric service with data downloaded into laptop computers periodically (see fig. 20). This can also give long-term information throughout the mothballing years. If it is determined that there are inadequate air exchanges to keep interior moisture levels under control, additional passive ventilation can be increased, or, if there is electric service, mechanical exhaust fans can be installed. One fan in a small to medium sized building can reduce the amount of louvering substantially.

Figure 20. Portable monitors used to record temperature and humidity conditions in historic buildings during mothballing can help identify ventilation needs. This data can be downloaded directly into a lap top computer on site. These monitors are especially helpful over the long term for buildings with significant historic interiors or which are remaining furnished. If interiors are remaining damp or humid, additional ventilation should be added or the source of moisture controlled.

If electric fans are used, study the environmental conditions of each property and determine if the fans should be controlled by thermostats or automatic timers. Humidistats, designed for enclosed climate control systems, generally are difficult to adapt for open mothballing conditions. How the system will draw in or exhaust air is also important. It may be determined that it is best to bring dry air in from the attic or upper levels and force it out through lower basement windows (see fig. 21). If the basement is damp, it may be best to zone it from the rest of the building and exhaust its air separately. Additionally, less humid day air is preferred over damper night air, and this can be controlled with a timer switch mounted to the fan.

The type of ventilation should not undermine the security of the building. The most secure installations use custom-made grills well anchored to the window frame, often set in plywood security panels. Some vents are formed using heavy millwork louvers set into existing window openings (refer back to fig.18). For buildings where security is not a primary issue, where the interior is modest, and where there has been no heat for a long time, it may be possible to use lightweight galvanized metal grills in the window openings (refer back to fig.7). A cost effective grill can be made from the expanded metal mesh lath used by plasterers and installed so that the mesh fins shed rainwater to the exterior.

Securing mechanical systems and utilities. At the outset, it is important to determine which utilities and services, such as electrical or telephone lines, are kept and which are cut off. As long as these services will not constitute a fire

Figure 21. This electric thermostat/humidistat mounted in the attic vent controls a modified ducted air/fan system. The unit uses temporary exposed sheet metal ducts to pull air through the building and exhaust it out of the basement. For over ten years this fan system in combination with 18" x 18" preformed louvers in selective windows has kept the interior dry and with good air exchanges.

hazard, it is advisable to retain those which will help protect the property. Since the electrical needs will be limited in a vacant building, it is best to install a new temporary electric line and panel (100 amp) so that all the wiring is new and exposed. This will be much safer for the building, and allows easy access for reading the meter (see fig. 22).

Most heating systems are shut down in long term mothballing. For furnaces fueled by oil, there are two choices for dealing with the tank. Either it must be filled to the top with oil to eliminate condensation or it should be drained. If it remains empty for more than a year, it will likely rust and not be reusable. Most tanks are drained if a newer type of system is envisioned when the building is put back into service. Gas systems with open flames should be turned off unless there is regular maintenance and frequent surveillance of the property. Gas lines are shut off by the utility company.

If a hot water radiator system is retained for low levels of heat, it generally must be modified to be a self-contained system and the water supply is capped at the meter. This recirculating system protects the property from extensive damage from burst pipes. Water is replaced with a water/glycol mix and the reserve tank must also be filled with this mixture. This keeps the modified system from freezing, if there is a power failure. If water service is cut off, pipes should be drained. Sewerage systems will require special care as sewer gas is explosive. Either the traps must be filled with glycol or the sewer line should be capped off at the building line.

Figure 22. All systems except temporary electric have been shut off at this residence which has been mothballed over 20 years. An electric meter and 100 amp panel box have been set on a plywood panel at the front of the building. It is used for interior lighting and various alarm systems. The building, however, is showing signs of moisture problems with efflourescent stains on the masonry indicating the need for gutter maintenance and additional ventilation for the interior. The vegetation on the walls, although picturesque, traps moisture and is damaging to the masonry. Photo: H. Ward Jandl, NPS.

Developing a maintenance and monitoring plan. While every effort may have been made to stabilize the property and to slow the deterioration of materials, natural disasters, storms, undetected leaks, and unwanted intrusion can still occur. A regular schedule for surveillance, maintenance, and monitoring should be established: (See fig. 23 for maintenance chart).

MAINTENANCE CHART

periodic
- ❑ regular drive by surveillance
- ❑ check attic during storms if possible

monthly walk arounds
- ❑ check entrances
- ❑ check window panes for breakage
- ❑ mowing as required
- ❑ check for graffiti or vandalism

enter every 3 months to air out
- ❑ check for musty air
- ❑ check for moisture damage
- ❑ check battery packs and monitoring equipment
- ❑ check light bulbs
- ❑ check for evidence of pest intrusion

every 6 months; spring and fall
- ❑ site clean-up; pruning and trimming
- ❑ gutter and downspout check
- ❑ check crawlspace for pests
- ❑ clean out storm drains

every 12 months
- ❑ maintenance contract inspections for equipment/utilities
- ❑ check roof for loose or missing shingles
- ❑ termite and pest inspection/treatment
- ❑ exterior materials spot repair and touch up painting
- ❑ remove bird droppings or other stains from exterior
- ❑ check and update building file

Figure 23. Maintenance Chart. Many of the tasks on the maintenance chart can be done by volunteer help or service contracts. Regular visits to the site will help detect intrusion, storm damage, or poor water drainage.

The fire and police departments should be notified that the property will be vacant. A walk-through visit to familiarize these officials with the building's location, construction materials, and overall plan may be invaluable if they are called on in the future.

The optimum schedule for surveillance visits to the property will depend on the location of the property and the number of people who can assist with these activities. The more frequent the visits to check the property, the sooner that water leaks or break-ins will be noticed. Also, the more frequently the building is entered, the better the air exchange. By keeping the site clear and the building in good repair, the community will know that the building has not been abandoned (see fig. 24). The involvement of neighbors and community groups in caring for the property can ensure its protection from a variety of catastrophic circumstances.

The owner may utilize volunteers and service companies to undertake the work outlined in the maintenance chart. Service companies on a maintenance contract can provide yard, maintenance, and inspection services, and their reports or itemized bills reflecting work undertaken should be added to update the building file.

Figure 24. Once mothballed, a property must still be monitored and maintained. The openings in this historic barn has been modified with a combination of wood louvers and metal mesh panels which require little maintenance. The grounds are regularly mowed, even inside the chain link security fence. Photo: Williamsport Preservation Training Center, NPS.

Components of a Mothballing Project

Document: Brearley House, New Jersey; 2½ story center hall plan house contains a high degree of integrity of circa 1761 materials and significant early 19th century additions. Deterioration was attributable to leaking roof, unstable masonry at gables and chimneys, deteriorating attic windows, poor site drainage, and partially detached gutters. Mothballing efforts are required for approximately 7-10 years.

Stabilize: Remove bat droppings from attic using great caution. Secure historic chimneys and gable ends with plywood panels. Do not take historic chimneys down. Reroof with asphalt shingles and reattach or add new gutters and downspouts. Add extenders to downspouts. Add bug screens to any ventilation areas. Add soil around foundation and slope to gain positive drain; do not excavate as this will disturb archeological evidence.

Mothball: Install security fence around the property. Secure doors and windows with plywood panels (½" exterior grade). Install preformed metal grills in basement and attic openings. Add surface mounted wiring for ionization smoke and fire detection with direct wire to police and fire departments. Shut off heat and drain pipes. Add window exhaust fan set on a thermostatic control. Provide for periodic monitoring and maintenance of the property.

a. A view showing the exterior of the house in its mothballed condition.

b. Plywood panels stabilize the chimneys. Note the gable vents.

c. The exhaust fan has tamper-proof housing.

Figure 25. Above is a summary of the tasks that were necessary in order to protect this significant property while restoration funds are raised. Photographs: Michael Mills; Ford Farewell Mills Gatsch Architects.

MOTHBALLING CHECKLIST

Mothballing Checklist In reviewing mothballing plans, the following checklist may help to ensure that work items are not inadvertently omitted.	Yes	No	Date of action or comment.
Moisture • Is the roof watertight? • Do the gutters retain their proper pitch and are they clean? • Are downspout joints intact? • Are drains unobstructed? • Are windows and doors and their frames in good condition? • Are masonry walls in good condition to seal out moisture? • Is wood siding in good condition? • Is site properly graded for water run-off? • Is vegetation cleared from around the building foundation to avoid trapping moisture?			
Pests • Have nests/pests been removed from the building's interior and eaves? • Are adequate screens in place to guard against pests? • Has the building been inspected and treated for termites, carpenter ants, and rodents? • If toxic droppings from bats and pigeons are present, has a special company been brought in for its disposal?			
Housekeeping • Have the following been removed from the interior: trash, hazardous materials such as inflammable liquids, poisons, and paints and canned goods that could freeze and burst? • Is the interior broom-clean? • Have furnishings been removed to a safe location? • If furnishings are remaining in the building, are they properly protected from dust, pests, ultraviolet light, and other potentially harmful problems? • Have significant architectural elements that have become detached from the building been labeled and stored in a safe place? • Is there a building file?			
Security • Have fire and police departments been notified that the building will be mothballed? • Are smoke and fire detectors in working order? • Are the exterior doors and windows securely fastened? • Are plans in place to monitor the building on a regular basis? • Are the keys to the building in a secure but accessible location? • Are the grounds being kept from becoming overgrown?			
Utilities • Have utility companies disconnected/shut off or fully inspected water, gas, and electric lines? • If the building will not remain heated, have water pipes been drained and glycol added? • If the electricity is to be left on, is the wiring in safe condition?			
Ventilation • Have steps been taken to ensure proper ventilation of the building? • Have interior doors been left open for ventilation purposes? • Has the secured building been checked within the last 3 months for interior dampness or excessive humidity?			

Figure 26.. MOTHBALL CHECKLIST. This checklist will give the building owner or manager a handy reference guide to items that should be addressed when mothballing a historic building. Prepared by H. Ward Jandl, NPS.

Conclusion

Providing temporary protection and stabilization for vacant historic buildings can arrest deterioration and buy the owner valuable time to raise money for preservation or to find a compatible use for the property. A well planned mothballing project involves documenting the history and condition of the building, stabilizing the structure to slow down its deterioration, and finally mothballing the structure to secure it (See fig. 25). The three highest priorities for the building while it is mothballed are 1) to protect the building from sudden loss, 2) to weatherize and maintain the property to stop moisture penetration, and 3) to control the humidity levels inside once the building has been secured. See Mothballing Checklist Figure 26.

While issues regarding mothballing may seem simple, the variables and intricacies of possible solutions make the decision-making process very important. Each building must be individually evaluated prior to mothballing. In addition, a variety of professional services as well as volunteer assistance are needed for careful planning and repair, sensitively designed protection measures, follow-up security surveillance, and cyclical maintenance (see fig. 27).

In planning for the future of the building, complete and systematic records must be kept and generous funds allocated for mothballing. This will ensure that the historic property will be in stable condition for its eventual preservation, rehabilitation, or restoration.

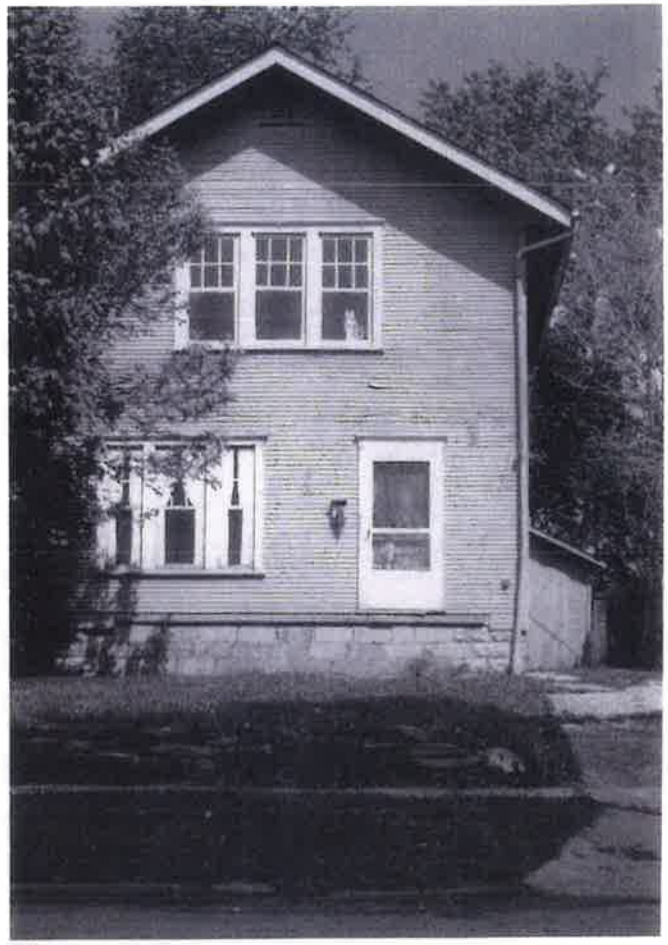


Figure 27. This residential building blends into its neighborhood even though all the windows have been covered over and the front steps are missing. The grounds are maintained and the special attention to decoratively painting the window panels shows that the property is being well cared for until it can be rehabilitated. Photo: Ohio Historical Society.

Acknowledgements

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All photographs and drawings are by the author unless otherwise noted.

Cover photograph: Mothballing of this historic house involved a new membrane roof covering over the historic roof and slatted window covers for security and ventilation. Photo: Williamsport Preservation Training Center, NPS.

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Further Reading

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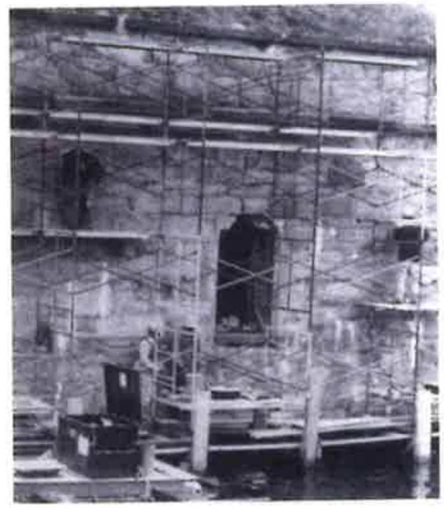
39 PRESERVATION BRIEFS



Holding the Line: Controlling Unwanted Moisture in Historic Buildings

Sharon C. Park, AIA

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National Park Service
Cultural Resources
Heritage Preservation Services

Uncontrolled moisture is the most prevalent cause of deterioration in older and historic buildings. It leads to erosion, corrosion, rot, and ultimately the destruction of materials, finishes, and eventually structural components. Ever-present in our environment, moisture can be *controlled* to provide the differing *levels* of moisture necessary for human comfort as well as the longevity of historic building materials, furnishings, and museum collections. The challenge to building owners and preservation professionals alike is to understand the patterns of moisture movement in order to better manage it — not to eliminate it. There is never a single answer to a moisture problem. Diagnosis and treatment will always differ depending on where the building is located, climatic and soil conditions, ground water effects, and local traditions in building construction.

Remedial Actions within an Historic Preservation Context

In this Brief, advice about controlling the sources of unwanted moisture is provided within a preservation context based on philosophical principles contained in the *Secretary of the Interior's Standards for the Treatment of Historic Properties.* Following the Standards means significant materials and features that contribute to the historic character of the building should be preserved, not damaged during remedial treatment (see fig.1). It also means that physical treatments should be reversible, whenever possible. The majority of treatments for moisture management in this Brief stress preservation maintenance for materials, effective drainage of troublesome ground moisture, and improved interior ventilation.

The Brief encourages a systematic approach for evaluating moisture problems which, in some cases, can be undertaken by a building owner. Because the source of moisture can be elusive, it may be necessary to consult with historic preservation professionals prior to starting work that would affect historic materials. Architects, engineers, conservators, preservation contractors, and staff of State Historic Preservation Offices (SHPOs) can provide such advice.

Regardless of who does the work, however, these are the principles that should guide treatment decisions:

- Avoid remedial treatments without prior careful diagnosis.
- Undertake treatments that protect the historical significance of the resource.
- Address issues of ground-related moisture and rain run-off thoroughly.
- Manage existing moisture conditions before introducing humidified / dehumidified mechanical systems.
- Implement a program of ongoing monitoring and maintenance once moisture is controlled or managed.
- Be aware of significant landscape and archeological resources in areas to be excavated.

Finally, mitigating the effects of catastrophic moisture, such as floods, requires a different approach and will not be addressed fully in this Brief.

Fig. 1. Moisture problems, if not properly corrected, will increase damage to historic buildings. This waterproof coating trapped moisture from the leaking roof, causing portions of the masonry parapet to fail. Photo: NPS Files.

How and Where to Look for Damaging Moisture

Finding, treating, and managing the sources of damaging moisture requires a systematic approach that takes time, patience, and a thorough examination of all aspects of the problem—including a series of variable conditions (See this page). Moisture problems may be a direct result of one of these factors or may be attributable to a combination of interdependent variables.

Factors Contributing to Moisture Problems

A variety of simultaneously existing conditions contribute to moisture problems in old buildings. For recurring moisture problems, it may be necessary for the owner or preservation professional to address many, if not all, of the following variables:

- Types of building materials and construction systems
- Type and condition of roof and site drainage systems and their rates of discharge
- Type of soil, moisture content, and surface / subsurface water flow adjacent to building
- Building usage and moisture generated by occupancy
- Condition and absorption rates of materials
- Type, operation, and condition of heating, ventilating, cooling, humidification / dehumidification, and plumbing systems
- Daily and seasonal changes in sun, prevailing winds, rain, temperature, and relative humidity (inside and outside), as well as seasonal or tidal variations in groundwater levels
- Unusual site conditions or irregularities of construction
- Conditions in affected wall cavities, temperature and relative humidity, and dewpoints
- Amount of air infiltration present in a building
- Adjacent landscape and planting materials

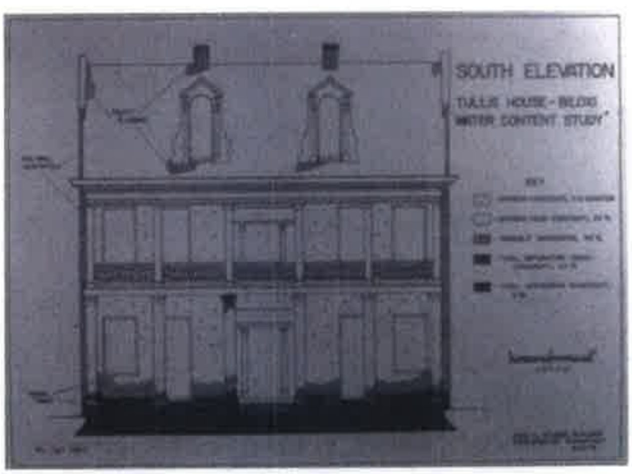


Fig. 2. Historic buildings plagued by dampness problems will benefit from systematic documentation to set a baseline against which moisture changes can be measured. Exterior areas with higher moisture levels may have algae growth or discoloration stains. Drawing: John H. Stubbs.

Diagnosing and treating the cause of moisture problems requires looking at both the localized decay, as well as understanding the performance of the entire building and site. Moisture is notorious for traveling far from the source, and moisture movement within concealed areas of the building construction make accurate diagnosis of the source and path difficult. Obvious deficiencies, such as broken pipes, clogged gutters, or cracked walls that contribute to moisture damage, should always be corrected promptly.

For more complicated problems, it may take several months or up to four seasons of monitoring and evaluation to complete a full diagnosis. Rushing to a solution without adequate documentation can often result in the unnecessary removal of historic materials—and worse—the creation of long-term problems associated with an increase, rather than a decrease, in the unwanted moisture.

Looking for Signs

Identifying the type of moisture damage and discovering its source or sources usually involves the human senses of sight, smell, hearing, touch, and taste combined with intuition. Some of the more common signs of visible as well as hidden moisture damage (see fig. 2, 3) include:

- Presence of standing water, mold, fungus, or mildew
- Wet stains, eroding surfaces, or efflorescence (salt deposits) on interior and exterior surfaces
- Flaking paint and plaster, peeling wallpaper, or moisture blisters on finished surfaces
- Dank, musty smells in areas of high humidity or poorly ventilated spaces
- Rust and corrosion stains on metal elements, such as anchorage systems and protruding roof nails in the attic
- Cupped, warped, cracked, or rotted wood
- Spalled, cracked masonry or eroded mortar joints
- Faulty roofs and gutters including missing roofing slates, tiles, or shingles and poor condition of flashing or gutters
- Condensation on window and wall surfaces
- Ice dams in gutters, on roofs, or moisture in attics

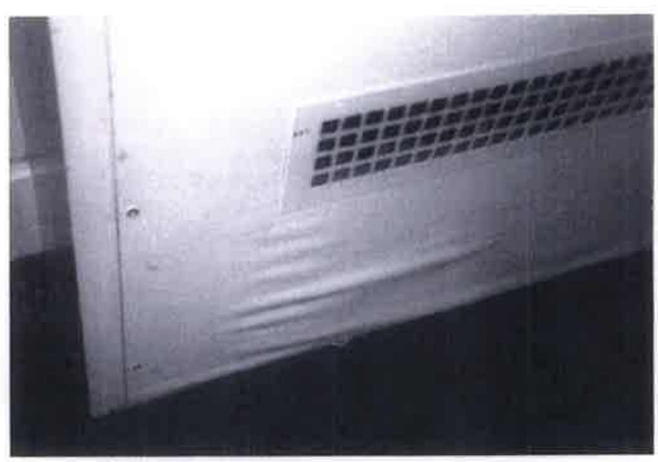


Fig. 3. The deterioration of this wooden cover was a sign that water was leaking from the fan coil unit behind. Photo: author.

Uncovering and Analyzing Moisture Problems

Moisture comes from a variety of external sources. Most problems begin as a result of the weather in the form of rain or snow, from high ambient relative humidity, or from high water tables. But some of the most troublesome moisture damage in older buildings may be from internal sources, such as leaking plumbing pipes, components of heating, cooling, and climate control systems, as well as sources related to use or occupancy of the building. In some cases, moisture damage may be the result of poorly designed original details, such as projecting outriggers in rustic structures that are vulnerable to rotting, and may require special treatment.

The five most common sources of unwanted moisture include:

- Above grade exterior moisture entering the building
- Below grade ground moisture entering the building
- Leaking plumbing pipes and mechanical equipment
- Interior moisture from household use and climate control systems
- Water used in maintenance and construction materials.

Above grade exterior moisture generally results from weather related moisture entering through deteriorating materials as a result of deferred maintenance, structural settlement cracks, or damage from high winds or storms (see fig. 4). Such sources as faulty roofs, cracks in walls, and open joints around window and door openings can be corrected through either repair or limited replacement. Due to their age, historic buildings are notoriously "drafty," allowing rain, wind, and damp air to enter through missing mortar joints; around cracks in windows, doors, and wood siding; and into uninsulated attics. In some cases, excessively absorbent materials, such as soft sandstone, become saturated from rain or gutter overflows, and can allow moisture to dampen interior surfaces. Vines or other vegetative materials allowed to grow directly on building materials without trellis or other framework can cause damage from roots eroding mortar joints and foundations as well as dampness being held against surfaces. In most cases, keeping vegetation off buildings, repairing damaged materials, replacing flashings, rehanging gutters, repairing downspouts, repointing mortar, caulking perimeter joints around windows and doors, and repainting surfaces can alleviate most sources of unwanted exterior moisture from entering a building above grade.

Below grade ground moisture is a major source of unwanted moisture for historic and older buildings. *Proper handling of surface rain run-off is one of the most important measures of controlling unwanted ground moisture.* Rain water is often referred to as "bulk moisture" in areas that receive significant annual rainfalls or infrequent, but heavy, precipitation. For example, a heavy rain of 2" per hour can produce 200 gallons of water from downspout discharge alone for a house during a one hour period. When soil is saturated at the base of the building, the moisture will wet footings and crawl spaces or find its way through cracks in foundation walls and enter into basements (see fig. 5). Moisture in saturated basement or foundation walls—also exacerbated by high water tables—will generally rise up within a wall and eventually cause deterioration of the masonry and adjacent wooden structural elements.

Builders traditionally left a working area, known as a builder's trench, around the exterior of a foundation wall. These trenches have been known to increase moisture problems if the infill soil is less than fully compacted or includes rubble backfill, which, in some cases, may act as a reservoir holding damp materials against masonry walls. Broken subsurface pipes or downspout drainage can leak into the builder's trench and dampen walls some distance from the source. Any subsurface penetration of the foundation wall for sewer, water, or other piping also can act as a direct conduit of ground moisture unless these holes are well sealed. A frequently unsuspected, but serious, modern source of ground moisture is a landscape irrigation system set too close to the building. Incorrect placement of sprinkler heads can add a tremendous amount of moisture at the foundation level and on wall surfaces.

Fig. 4. Deferred maintenance often leads to blocked gutters and downspouts. This cracked gutter system allowed moisture to penetrate the upper exterior wall, erode mortar joints, and rot fascia boards. Photo: NPS files.

Fig. 5. Excavating this foundation revealed that the downspout pipe had corroded at the " u-trap" and was leaking moisture into the soil. Openings around the horizontal water supply line and cracks in the wall allowed moisture to penetrate the basement in multiple locations. Photo: author.

The ground, and subsequently the building, will stay much drier by 1) re-directing rain water away from the foundation through sloping grades, 2) capturing and disposing downspout water well away from the building, 3) developing a controlled ground gutter or effective drainage for buildings historically without gutters and downspouts, and 4) reducing splash-back of moisture onto foundation walls. The excavation of foundations and the use of dampproof coatings and footing drains should only be used after the measures of reducing ground moisture listed above have been implemented.

Leaking plumbing pipes and mechanical equipment can cause immediate or long-term damage to historic building interiors. Routine maintenance, repair, or, if necessary, replacement of older plumbing and mechanical equipment are common solutions. Older water and sewer pipes are subject to corrosion over time. Slow leaks at plumbing joints hidden within walls and ceilings can ultimately rot floor boards, stain ceiling plaster, and lead to decay of structural members. Frozen pipes that crack can damage interior finishes (see fig. 6). In addition to leaking plumbing pipes, old radiators in some historic buildings have been replaced with water-supplied fan coil units which tend to leak. These heating and cooling units, as well as central air equipment, have overflow and condensation pans that require cyclical maintenance to avoid mold and mildew growth and corrosion blockage of drainage channels. Uninsulated forced-air sheet metal ductwork and cold water pipes in walls and ceilings often allow condensation to form on the cold metal, which then drips and causes bubbling plaster and peeling paint. Careful design and vigilant maintenance, as well as repair and insulating pipes or ductwork, will generally rid the building of these common sources of moisture.

Fig. 6. Uninsulated plumbing pipes close to the exterior wall froze and cracked, wetting this ornamental plaster ceiling before the water supply line could be shut off. As a result, limited portions of the ceiling needed reattaching. Photo: author.

Interior moisture from building use and modern humidified heating and cooling systems can create serious problems. In northern U.S. climates, heated buildings will have winter-time relative humidity levels ranging from 10%-35% Relative Humidity (RH). A house with four occupants generates between 10 and 16 pounds of water a day (approximately 1 – 2 gallons) from human residents. Moisture from food preparation, showering, or laundry use will produce condensation on windows in winter climates.

When one area or floor of a building is air-conditioned and another area is not, there is the chance for condensation to occur between the two areas. Most periodic condensation does not create a long-term problem.

Humidified climate control systems are generally a major problem in museums housed within historic buildings. They produce between 35%-55% RH on average which, as a vapor, will seek to dissipate and equalize with adjacent spaces (see fig. 7). Moisture can form on single-glazed windows in winter with exterior temperatures below 30 F and interior temperatures at 70 F with as little as 35% RH. Frequent condensation on interior window surfaces is an indication that moisture is migrating into exterior walls, which can cause long-term damage to historic materials. Materials and wall systems around climate controlled areas may need to be made of moisture resistant finishes in order to handle the additional moisture in the air. Moist interior conditions in hot and humid climates will generate mold and fungal growth. Unvented mechanical equipment, such as gas stoves, driers, and kerosene heaters, generate large quantities of moisture. It is important to provide adequate ventilation and find a balance between interior temperature, relative humidity, and airflow to avoid interior moisture that can damage historic buildings.

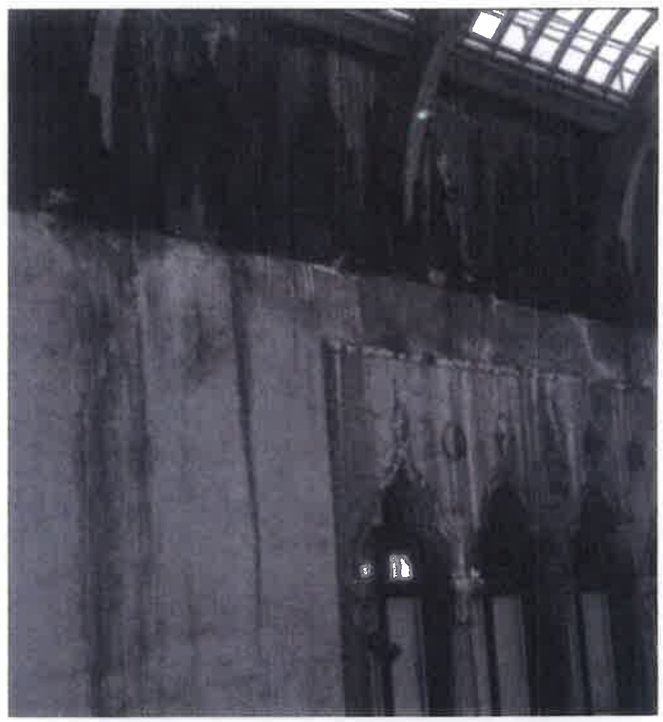


Fig. 7. Condensation dripping from the large overhead courtyard skylight was damaging the masonry in this museum. A new skylight with thermal glazing was installed, replacing the deteriorated single-glazed unit. A new climate control system monitors interior temperature and humidity. Photo: © Isabella Stewart Gardner Museum, Boston.

Moisture from maintenance and construction materials can cause damage to adjacent historic materials. Careless use of liquids to wash floors can lead to water seepage through cracks and dislodge adhesives or cup and curl materials. High-pressure power washing of exterior walls and roofing materials can force water into construction joints where it can dislodge mortar, lift roofing tiles, and saturate frame walls and masonry. Replastered or newly plastered interior walls or the construction of new additions attached to historic buildings may hold moisture for months; new plaster, mortar, or concrete should be fully cured before they are painted or finished. The use of materials in projects that have been damaged by moisture prior to installation or have too high a moisture content may cause concealed damage (see fig. 8).

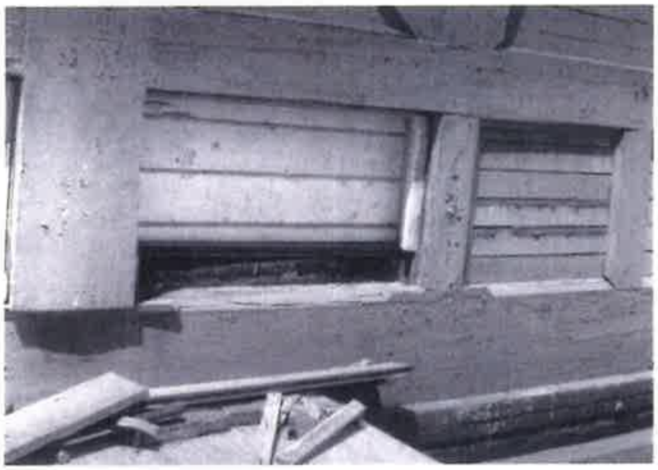


Fig. 8. Damaging moisture conditions can occur during construction. Peeling paint on this newly rehabilitated frame wall was attributed to wall insulation that had become wet during the project and was not discovered. Photo: NPS Files.

Transport or Movement of Moisture

Knowing the five most common sources of moisture that cause damage to building materials is the first step in diagnosing moisture problems. But it is also important to understand the basic mechanisms that affect moisture movement in buildings. Moisture transport, or movement, occurs in two states: liquid and vapor. It is directly related to pressure differentials. For example, water in a gaseous or vapor state, as warm moist air, will move from its high pressure area to a lower pressure area where the air is cooler and drier. Liquid water will move as a result of differences in hydrostatic pressure or wind pressure. *It is the pressure differentials that drive the rate of moisture migration in either state.* Because the building materials themselves resist this moisture movement, the rate of movement will depend on two factors: the permeability of the materials when affected by vapor and the absorption rates of materials in contact with liquid.

The mechanics, or physics, of moisture movement is complex, but if the driving force is difference in pressure, then an approach to reducing moisture movement and its damage is to reduce the difference in pressure, not to increase it. That is why the treatments discussed in this Brief will look at *managing moisture by draining bulk moisture and ventilating vapor moisture* before setting up new barriers with impermeable coatings or over-pressurized new climate control systems that threaten aging building materials and archaic construction systems.

Three forms of moisture transport are particularly important to understand in regards to historic buildings — *infiltration, capillary action, and vapor diffusion* —remembering, at the same time, that the subject is infinitely complex and, thus, one of continuing scientific study (see fig. 9). Buildings were traditionally designed to deal with the movement of air. For example, cupolas and roof lanterns allowed hot air to rise and provided a natural draft to pull air through buildings. Cavity walls in both frame and masonry buildings were constructed to allow moisture to dissipate in the air space between external and internal walls. Radiators were placed in front of windows to keep cold surfaces warm, thereby reducing condensation on these surfaces. Many of these features, however, have been altered over time in an effort to modernize appearances, improve energy efficiency, or accommodate changes in use. The change in use will also affect moisture movement, particularly in commercial and industrial buildings with modern mechanical systems. Therefore, the way a building handles air and moisture today may be different from that intended by the original builder or architect, and poorly conceived changes may be partially responsible for chronic moisture conditions.

Moisture moves into and through materials as both a visible liquid (capillary action) and as a gaseous vapor (infiltration and vapor diffusion). Moisture from leaks, saturation, rising damp, and condensation can lead to the deterioration of materials and cause an unhealthy environment. Moisture in its solid form, ice, can also cause damage from frozen, cracked water pipes, or split gutter seams or spalled masonry from freeze-thaw action. Moisture from melting ice dams, leaks, and condensation often can travel great distances down walls and along construction surfaces, pipes, or conduits. The amount of moisture and how it deteriorates materials is dependent upon complex forces and variables that must be considered for each situation.

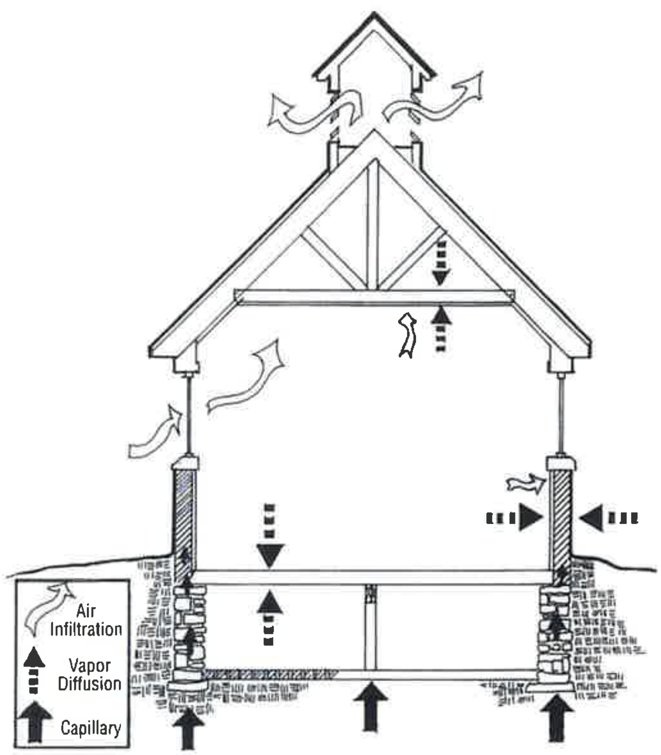


Fig. 9. The dynamic forces that move air and moisture through a building are important to understand particularlly when selecting a treatment to correct a moisture problem. Air infiltration, capillary action, and vapor diffusion all affect the wetting and drying of materials. Drawing; NPS Files.

Determining the way moisture is handled by the building is further complicated because each building and site is unique. Water damage from blocked gutters and downspouts can saturate materials on the outside, and high levels of interior moisture can saturate interior materials. Difficult cases may call for technical evaluation by consultants specializing in moisture monitoring and diagnostic evaluation. In other words, it may take a team to effectively evaluate a situation and determine a proper approach to controlling moisture damage in old buildings.

Infiltration is created by wind, temperature gradients (hot air rising), ventilation fan action, and the stack or chimney effect that draws air up into tall vertical spaces. Infiltration as a dynamic force does not actually move liquid water, but is the vehicle by which dampness, as a component of air, finds its way into building materials. Older buildings have a natural air exchange, generally from 1 to 4 changes per hour, which, in turn, may help control moisture by diluting moisture within a building. The tighter the building construction, however, the lower will be the infiltration rate and the natural circulation of air. In the process of infiltration, however, moisture that has entered the building and saturated materials can be drawn in and out of materials, thereby adding to the dampness in the air (see fig. 10). Inadequate air circulation where there is excessive moisture (i.e., in a damp basement), accelerates the deterioration of historic materials. To reduce the unwanted moisture that accompanies infiltration, it is best to incorporate maintenance and repair treatments to close joints and weatherstrip windows, while providing controlled air exchanges elsewhere. The worst approach is to seal the building so completely, while limiting fresh air intake, that the building cannot breathe.

Fig. 10. Infiltration of damp air can occur around loose-fitting or deteriorated window sash and through cracks or open joints in building exteriors. Photo: Ann Brooks Prueher.

Capillary action occurs when moisture in saturated porous building materials, such as masonry, wicks up or travels vertically as it evaporates to the surface. In capillary attraction, liquid in the material is attracted to the solid surface of the pore structure causing it to rise vertically; thus, it is often called "rising damp," particularly when found in conjunction with ground moisture. It should not, however, be confused with moisture that laterally penetrates a foundation wall through cracks and settles in the basement. Not easily controlled, most rising damp comes from high water tables or a constant source under the footing. In cases of damp masonry walls with capillary action, there is usually a whitish stain or horizontal tide mark of efflorescence that seasonally fluctuates about 1- 3 feet above grade where the excess moisture evaporates from the wall (see fig. 11). This tide mark is full of salt crystals, that have been drawn from the ground and building materials along with the water, making the masonry even more sensitive to additional moisture absorption from the surrounding air. Capillary migration of moisture may occur in any material with a pore structure where there is a constant or recurring source of moisture.

Fig. 11. Capillary rise of moisture in masonry is often accompanied with a horizontal tide-mark line several feet above the grade, as seen here. Removing or redirecting as much ground moisture as possible usually helps reduce moisture within a wall. Photo: NPS Files.

The best approach for dealing with capillary rise in building materials is to reduce the amount of water in contact with historic materials. If that is not possible due to chronically high water tables, it may be necessary to introduce a horizontal damp-proof barrier, such as slate course or a lead or plastic sheet, to stop the vertical rise of moisture. Moisture should not be sealed into the wall with a waterproof coating, such as cement parging or vinyl wall coverings, applied to the inside of damp walls. This will only increase the pressure differential as a vertical barrier and force the capillary action, and its destruction of materials, higher up the wall.

Vapor diffusion is the natural movement of pressurized moisture vapor through porous materials. It is most readily apparent as humidified interior air moves out through walls to a cooler exterior. In a hot and humid climate, the reverse will happen as moist hot air moves into cooler, dryer, air-conditioned, interiors. The movement of the moisture vapor is not a serious problem until the dewpoint temperature is reached and the vapor changes into liquid moisture known as *condensation*. This can occur within a wall or on interior surfaces. Vapor diffusion will be more of a problem for a frame structure with several layers of infill materials within the frame cavity than a dense masonry structure. Condensation as a result of vapor migration usually takes place on a surface or film, such as paint, where there is a change in permeability.

The installation of climate control systems in historic buildings (mostly museums) that have *not* been properly designed or regulated and that force pressurized damp air to diffuse into perimeter walls is an ongoing concern. These newer systems take constant monitoring and back-up warning systems to avoid moisture damage.

Long-term and undetected condensation or high moisture content can cause serious structural damage as well as an unhealthy environment, heavy with mold and mildew spores. Reducing the interior/exterior pressure differential and the difference between interior and exterior temperature and relative humidity helps control unwanted vapor diffusion. This can sometimes be achieved by reducing interior relative humidity. In some instances, using vapor barriers, such as heavy plastic sheeting laid over damp crawl spaces, can have remarkable success in stopping vapor diffusion from damp ground into buildings. Yet, knowledgeable experts in the field differ regarding the appropriateness of vapor barriers and when and where to use them, as well as the best way to handle natural diffusion in insulated walls.

Adding insulation to historic buildings, particularly in walls of wooden frame structures, has been a standard modern weatherization treatment, but it can have a disastrous effect on historic buildings. The process of installing the insulation destroys historic siding or plaster, and it is very difficult to establish a tight vapor barrier. While insulation has the benefit of increasing the efficiency of heating and cooling by containing temperature controlled air, it does not eliminate surfaces on which damaging moisture can condense. For insulated residential frame structures, the most obvious sign of a moisture

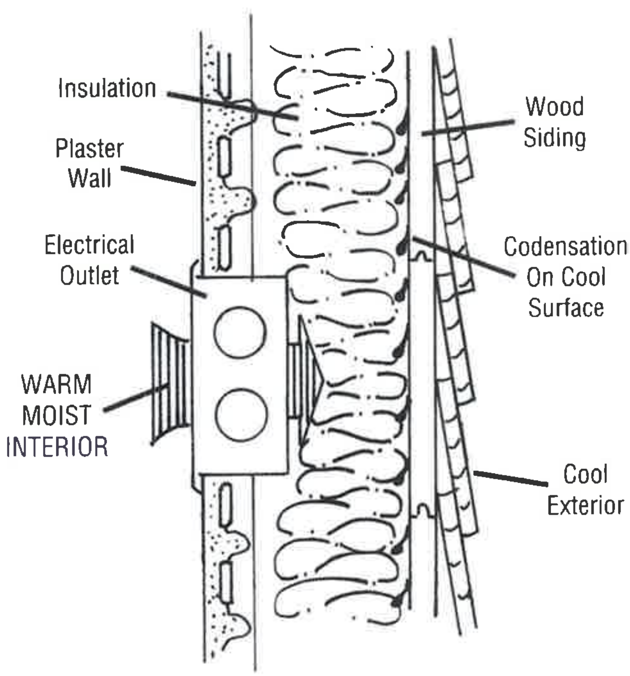


Fig. 12. Vapor diffusion can result in damp air migrating into absorbent materials and condensing on colder surfaces, thereby wetting insulation, damaging electrical conduits, and causing deterioration of the wooden framing. Drawing: NPS Files.

diffusion problem is peeling paint on wooden siding, even after careful surface preparation and repainting. Vapor impermeable barriers such as plastic sheeting, or more accurately, *vapor retarders,* in cold and moderate climates generally help slow vapor diffusion where it is not wanted.

In regions where *humidified* climate control systems are installed into insulated frame buildings, it is important to stop *interstitial*, or in-wall, dewpoint condensation. This is very difficult because humidified air can penetrate breaches in the vapor barrier, particularly around electrical outlets (see fig. 12). Improperly or incompletely installed retrofit vapor barriers will cause extensive damage to the building, just in the installation process, and will allow trapped condensation to wet the insulation and sheathing boards, corrode metal elements such as wiring cables and metal anchors, and blister paint finishes. Providing a tight wall vapor barrier, as well as a ventilated cavity behind wooden clapboards or siding appears to help insulated frame walls, if the interior relative humidity can be adjusted or monitored to avoid condensation. Correct placement of vapor retarders within building construction will vary by region, building construction, and type of climate control system.

Surveying and Diagnosing Moisture Damage: Key Questions to Ask

It is important for the building to be surveyed first and the evidence and location of suspected moisture damage systematically recorded before undertaking any major work to correct the problem. This will give a baseline from which relative changes in condition can be noted.

When materials become wet, there are specific physical changes that can be detected and noted in a record book or on survey sheets. Every time there is a heavy rain, snow storm, water in the basement, or mechanical systems failure, the owner or consultant should note and record the way moisture is moving, its appearance, and what variables might contribute to the cause. *Standing outside to observe a building in the rain may answer many questions and help trace the movement of water into the building.* Evidence of deteriorating materials that cover more serious moisture damage should also be noted, even if it is not immediately clear what is causing the damage. (For example, water stains on the ceiling may be from leaking pipes, blocked fan coil drainage pans above, or from moisture which has penetrated around a poorly sloped window sill above.) Don't jump to conclusions, but use a systematic approach to help establish an educated theory — or hypothesis — of what is causing the moisture problem or what areas need further investigation.

Surveying moisture damage must be systematic so that relative changes can be noted. Tools for investigating can be as simple as a notebook, sketch plans, binoculars, camera, aluminum foil, smoke pencil, and flashlight. The systematic approach involves looking at buildings from the top down and from the outside to the inside. Photographs, floor plans, site plan, and exterior elevations — even roughly sketched — should be used to indicate all evidence of damp or damaged materials, with notations for musty or poorly ventilated areas. Information might be needed on the absorption and permeability characteristics of the building materials and soils. Exterior drainage patterns should be noted and these base plans referred to on a regular basis in different seasons and in differing types of weather (see fig. 13).

Glossary:

Air flow/ infiltration: The movement that carries moist air into and through materials. Air flow depends on the difference between indoor and outdoor pressures, wind speed and direction as well as the permeability of materials.

Bulk water: The large quantity of moisture from roof and ground run-off that can enter into a building either above grade or below grade.

Capillary action: The force that moves moisture through the pore structure of materials. Generally referred to as rising damp, moisture at or below the foundation level will rise vertically in a wall to a height at which the rate of evaporation balances the rate at which it can be drawn up by capillary forces.

Condensation: The physical process by which water vapor is transformed into a liquid when the relative humidity of the air reaches 100% and the excess water vapor forms, generally as droplets, on the colder adjacent surface.

Convection: Heat transfer through the atmosphere by a difference in force or air pressure is one type of air transport. Sometimes referred to as the "stack effect," hotter less dense air will rise, colder dense air will fall creating movement of air within a building.

Dewpoint: The temperature at which water vapor condenses when the air is cooled at a constant pressure and constant moisture content.

Diffusion: The movement of water vapor through a material. Diffusion depends on vapor pressure, temperature, relative humidity, and the permeability of a material.

Evaporation: The transformation of liquid into a vapor, generally as a result of rise of temperature, is the opposite of condensation. Moisture in damp soil, such as in a crawl space, can evaporate into the air, raise the relative humidity in that space, and enter the building as a vapor.

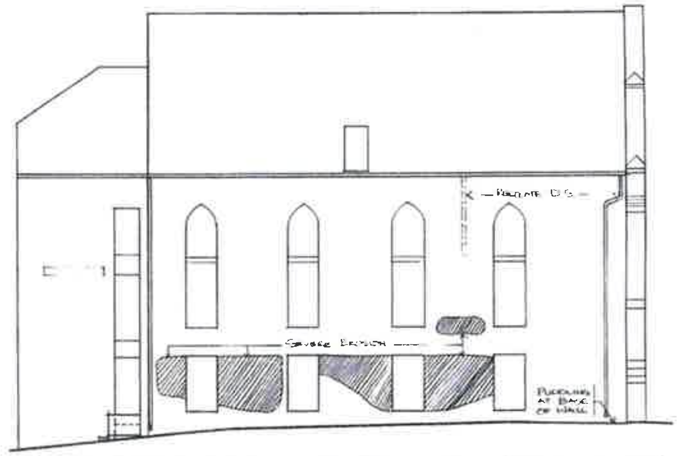
Ground moisture: The saturated moisture in the ground as a result of surface run-off and naturally occuring water tables. Ground moisture can penetrate through cracks and holes in foundation walls or can migrate up from moisture under the foundation base.

Monitoring instrumentation: These devices are generally used for long term diagnostic analysis of a problem, or to measure the preformance of a treatment, or to measure changes of conditions or environment. In-wall probes or sensors are often attached to data-loggers which can be down-loaded into computers.

Permeability: A characteristic of porosity of a material generally listed as the rate of diffusion of a pressurized gas through a material. The pore structure of some materials allows them to absorb or adsorb more moisture than other materials. Limestones are generally more permeable than granites.

Relative humidity (RH): Dampness in the air is measured as the percent of water vapor in the air at a specific temperature relative to the amount of water vapor that can be held in a vapor form at that specific temperature.

Survey instrumentation: technical instrumentation that is used on-site to provide quick readings of specific physical conditions. Generally these are hand-held survey instruments, such as moisture, temperature and relative humidity readers, dewpoint sensors, and fiber optic boroscopes.



DATE: June 2, 1992	TEMP: 70°	OTHER: Thunderstorm
WEATHER: Fair	TIME: 10:00AM	previous day

Fig. 13. Using sketch plans and elevation drawings to record the moisture damage along with the date, time, and weather conditions will show how moisture is affecting buildings over time. Drawing: Courtesy, Quinn Evans Architects.

It is best to start with one method of periodic documentation and to use this same method each time. Because moisture is affected by gravity, many surveys start with the roof and guttering systems and work down through the exterior walls. Any obvious areas of water penetration, damaged surfaces, or staining should be noted. Any recurring damp or stain patterns, both exterior and interior, should also be noted with a commentary on the temperature, weather, and any other facts that may be relevant (driving rains, saturated soil, high interior humidity, recent washing of the building, presence of a lawn watering system, etc.).

The interior should be recorded as well, beginning with the attic and working down to the basement and crawl space. It may be necessary to remove damaged materials selectively in order to trace the path of moisture or to pinpoint a source, such as a leaking pipe in the ceiling. The use of a basic resistance moisture meter, available in many hardware stores, can identify moisture contents of materials and show, over time, if wall surfaces are drying or becoming damper (see fig. 14). A smoke pencil can chart air infiltration around windows or draft patterns in interior spaces. For a quick test to determine if a damp basement is caused by saturated walls or is a result of condensation, tape a piece of foil onto a masonry surface and check it after a day or two; if moisture has developed behind the foil, then it is coming from the masonry. If condensation is on the surface of the foil, then moisture is from the air.

Comparing current conditions with previous conditions, historic drawings, photographs, or known alterations may also assist in the final diagnosis. A chronological record, showing improvement or deterioration, should be backed up with photographs or notations as to the changing size, condition, or features of the deterioration and how these changes have been affected by variables of temperature and rainfall. If a condition can be related in time to a particular event, such as efflorescence developing on a chimney after the building is no longer heated, it may be possible to isolate a cause, develop a hypothesis, and then test the hypothesis (by adding some temporary heat), before applying a remedial treatment.

Fig. 14. Using instruments in this damp-check kit can help determine the relative change in wet conditions over time. This involves readings of air temperature, computing dewpoint temperatures, and tracking the moisture content of materials to indicate if they are drying properly. Photo: Dell Corporation.

If the owner or consultant has access to moisture survey and monitoring equipment such as resistance moisture meters, dewpoint indicators, salt detectors, infrared thermography systems, psychrometer, fiber-optic boroscopes, and miniaturized video cameras, additional quantified data can be incorporated into the survey (see fig. 15). If it is necessary to track the wetting and drying of walls over a period of time, deep probes set into walls and in the soil with connector cables to computerized data loggers or the use of long-term recording of hygrothermographs may require a trained specialist. Miniaturized fiber-optic video cameras can record the condition of subsurface drain lines without excavation (see fig. 16). It should be noted, however, that *instrumentation, while extremely useful, cannot take the place of careful personal observation and analysis.* Relying on instrumentation alone rarely will give the owner the information needed to fully diagnose a moisture problem.

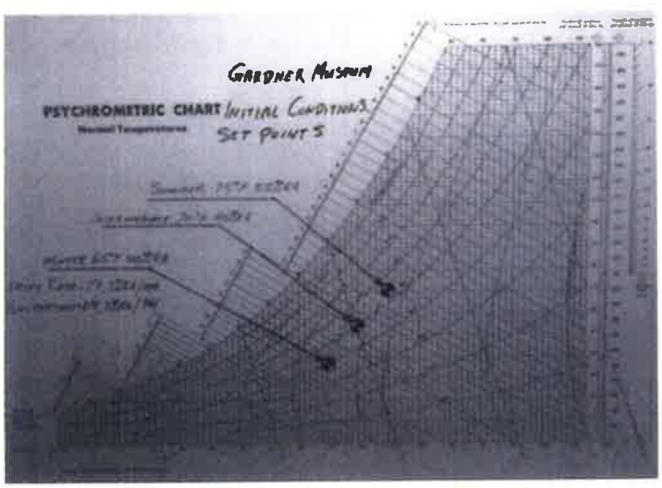


Fig. 15. Psychrometric charts quantify the amount of relative humidity a building can tolerate before dewpoint condensation occurs. This is important when the range of temperature and humidity are critical to both collections management and historic building preservation. Chart: Landmark Facilities Group.

Fig. 16. Contractors specializing in building diagnostics often have video cameras or fiber optic equipment that allow the viewing of inaccessible areas. This is particularly helpful in chimney flues or subsurface drains, as shown here. In the past, these areas would need to be excavated for visual inspection. Photo: author.

To avoid jumping to a quick—potentially erroneous—conclusion, a series of questions should be asked first. This will help establish a theory or hypothesis that can be tested to increase the chances that a remedial treatment will control or manage existing moisture.

How is water draining around building and site? What is the effectiveness of gutters and downspouts? Are the slopes or grading around foundations adequate? What are the locations of subsurface features such as wells, cisterns, or drainage fields? Are there subsurface drainage pipes (or drainage boots) attached to the downspouts and are they in good working condition? Does the soil retain moisture or allow it to drain freely? Where is the water table? Are there window wells holding rain water? What is the flow rate of area drains around the site (can be tested with a hose for several minutes)? Is the storm piping out to the street sufficient for heavy rains, or does water chronically back up on the site? Has adjacent new construction affected site drainage or water table levels?

How does water/moisture appear to be entering the building? Have all five primary sources of moisture been evaluated? What is the condition of construction materials and are there any obvious areas of deterioration? Did this building have a builder's trench around the foundation that could be holding water against the exterior walls? Are the interior bearing walls as well as the exterior walls showing evidence of rising damp? Is there evidence of hydrostatic pressure under the basement floor such as water percolating up through cracks? Has there been moisture damage from an ice dam in the last several months? Is damage localized, on one side of the building only, or over a large area?

What are the principal moisture dynamics? Is the moisture condition from liquid or vapor sources? Is the attic moisture a result of vapor diffusion as damp air comes up through the cavity walls from the crawl space or is it from a leaking roof? Is the exterior wall moisture from rising damp with a tide mark or are there uneven spots of dampness from foundation splash back, or other ground moisture conditions? Is there adequate air exchange in the building, particularly in damp areas, such as the basement? Has the height of the water table been established by inserting a long pipe into the ground in order to record the water levels?

How is the interior climate handling moisture? Are there areas in the building that do not appear to be ventilating well and where mold is growing? Are there historic features that once helped the building control air and moisture that can be reactivated, such as operable skylights or windows? Could dewpoint condensation be occurring behind surfaces, since there is often condensation on the windows? Does the building feel unusually damp or smell in an unusual way that suggest the need for further study? Is there evidence of termites, carpenter ants, or other pests attracted to moist conditions? Is a dehumidifier keeping the air dry or is it, in fact, creating a cycle where it is actually drawing moisture through the foundation wall?

Does the moisture problem appear to be intermittent, chronic, or tied to specific events? Are damp conditions occuring within two hours of a heavy rain or is there a delayed reaction? Does rust on most nail heads in the attic indicate a condensation problem? What are the wet patterns that appear on a building wall during and after a rain storm? Is it localized or in large areas? Can these rain patterns be tied to gutter over-flows, faulty flashing, or saturation of absorbent materials? Is a repaired area holding up well over time or is there evidence that moisture is returning? Do moisture meter readings of wall cavities indicate they are wet, suggesting leaks or condensation in the wall?

Once a hypothesis of the source or sources of the moisture has been developed from observation and recording of data, it is often useful to prove or disprove this hypothesis with interim treatments, and, if necessary, the additional use of instrumentation to verify conditions. For damp basements, test solutions can help determine the cause. For example, surface moisture in low spots should be redirected away from the foundation wall with regrading to determine if basement dampness improves. If there is still a problem, determine if subsurface downspout collection pipes or cast iron boots are not functioning properly. The above grade downspouts can be disconnected and attached to long, flexible extender pipes and redirected away from the foundation (see fig. 17). If, after a heavy rain or a simulation using a hose, there is no improvement, look for additional ground moisture sources such as high water tables, hidden cisterns, or leaking water service lines as a cause of moisture in the basement. New data will lead to a new hypothesis that should be tested and verified. *The process of elimination can be frustrating, but is required if a systematic method of diagnosis is to be successful.*

Selecting an Appropriate Level of Treatment

The treatments in chart format at the back of this publication are divided into levels based on the degree of moisture problems. Level I covers preservation maintenance; Level II focuses on repair using historically compatible materials and essentially mitigating damaging moisture conditions; and Level III discusses replacement and alteration of materials that permit continued use in a chronically moist environment. It is important to begin

Fig. 17. In testing a theory for the cause of basement wetness, the owner used long black extender pipes to direct roof run-off away from the foundation. This test established that the owner did not need expensive waterproofing of the foundation, but a better drainage system. Photo: Baird M. Smith.

with Level I and work through to a manageable treatment as part of the control of moisture problems. Buildings in serious decay will require treatments in Level II, and difficult or unusual site conditions may require more aggressive treatments in Level III. Caution should always be exercised when selecting a treatment. The treatments listed are a guide and not intended to be recommendations for specific projects as the key is always proper diagnosis.

Start with the repair of any obvious deficiencies using sound preservation maintenance. If moisture cannot be managed by maintenance alone, it is important to reduce it by mitigating problems *before* deteriorated historic materials are replaced (see fig. 18). Treatments should not remove materials that can be preserved; should not involve extensive excavation unless there is a documented need; and should not include coating buildings with waterproof sealers that can exacerbate an existing problem. Some alteration to historic materials, structural systems, mechanical systems, windows, or finishes may be needed when excessive site moisture cannot be controlled by drainage systems, or in areas prone to floods. These changes, however, should, be sensitive to preserving those materials, features, and finishes that convey the historic character of the building and site.

Ongoing Care

Once the building has been repaired and the larger moisture issues addressed, it is important to keep a record of additional evidence of moisture problems and *to protect the historic or old building through proper cyclical maintenance* (see fig. 19) In some cases, particularly in museum environments, it is critical to monitor areas vulnerable to moisture damage. In a number of historic buildings, in-wall moisture monitors are used to ensure that the moisture purposely generated to keep relative humidity at ranges appropriate to a museum collection does not migrate into walls and cause deterioration. The potential problem with all systems is the failure of controls, valves, and panels over time. Back-up systems, warning devices, properly trained staff and an emergency plan will help control damage if there is a system failure.

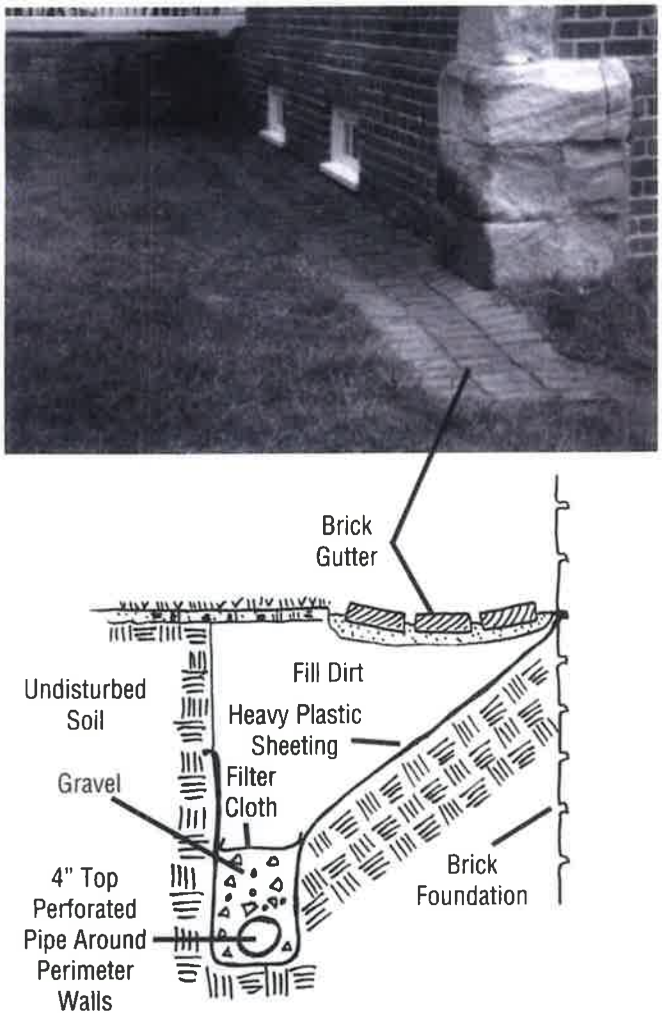


Fig. 18. This detail drawing shows a sub-surface perimeter drain in conjunction with a historic brick ground gutter system to help control roof run-off moisture from entering the historic foundation. Detail: Courtesy, Gunston Hall Plantation. Photo: Elizabeth Sasser.

Fig. 19. Maintaining gutters and downspouts in good operable condition, repairing exteriors to keep water out, redirecting damaging moisture away from foundations and controlling interior moisture and condensation are all important when holding the line on moisture deterioration. Photo: Nebraska State Historical Society.

Ongoing maintenance and vigilance to situations that could potentially cause moisture damage must become a routine part of the everyday life of a building. The owner or staff responsible for the upkeep of the building should inspect the property weekly and note any leaks, mustiness, or blocked drains. Again, observing the building during a rain will test whether ground and gutter drainage are working well.

For some buildings a back-up power system may be necessary to keep sump pumps working during storms when electrical power may be lost. For mechanical equipment rooms, condensation pans, basement floors, and laundry areas where early detection of water is important, there are alarms that sound when their sensors come into contact with moisture.

Conclusion

Moisture in old and historic buildings, though difficult to evaluate, can be systematically studied and the appropriate protective measures taken. Much of the documentation and evaluation is based on common sense combined with an understanding of historic building materials, construction technology, and the basics of moisture and air movement. Variables can be evaluated step by step and situations creating direct or secondary moisture damage can generally be corrected. The majority of moisture problems can be mitigated with maintenance, repair, control of ground and roof moisture, and improved ventilation. For more complex situations, however, a thorough diagnosis and an understanding of how the building handles moisture at present, can lead to a treatment that solves the problem without damaging the historic resource.

It is usually advantageous to eliminate one potential source of moisture at a time. Simultaneous treatments may set up a new dynamic in the building with its own set of moisture problems. Implementing changes sequentially will allow the owner or preservation professional to track the success of each treatment.

Moisture problems can be intimidating to a building owner who has diligently tried to control them. Keeping a record of evidence of moisture damage, results of diagnostic tests, and remedial treatments, is beneficial to a building's long-term care. The more complete a survey and evaluation, the greater the success in controlling unwanted moisture now and in the future.

Holding the line on unwanted moisture in buildings will be successful if 1) there is constant concern for signs of problems and 2) there is ongoing physical care provided by those who understand the building, site, mechanical systems, and the previous efforts to deal with moisture. For properties with major or difficult-to-diagnose problems, a team approach is often most effective. The owner working with properly trained staff, contractors and consultants can monitor, select, and implement treatments within a preservation context in order to manage moisture and to protect the historic resource.

MOISTURE: LEVEL I PRESERVATION MAINTENANCE

Exterior: Apply cyclical maintenance procedures to eliminate rain and moisture infiltration.

Roofing/ guttering: Make weather-tight and operational; inspect and clean gutters as necessary depending on number of nearby trees, but at least twice a year; inspect roofing at least once a year, preferably spring; replace missing or damaged roofing shingles, slates, or tiles; repair flashing; repair or replace cracked downspouts.

Walls: Repair damaged surface materials; repoint masonry with appropriately formulated mortar; prime and repaint wooden, metal, or masonry elements or surfaces; remove efflorescence from masonry with non-metallic bristle brushes.

Window and door openings: Eliminate cracks or open joints; caulk or repoint around openings or steps; repair or reset weatherstripping; check flashing; repaint, as necessary.

A. Inspecting the overall building on at least an annual basis will identify areas needing maintenance. A bucket lift is helpful for large buildings. Photo: author.

Ground: Apply regular maintenance procedures to eliminate standing water and vegetative threats to building/site.

Grade: Eliminate low spots around building foundations; clean out existing downspout boots twice a year or add extension to leaders to carry moisture away from foundation; do a hose test to verify that surface drains are functioning; reduce moisture used to clean steps and walks; eliminate the use of chlorides to melt ice which can increase freeze/thaw spalling of masonry; check operation of irrigation systems, hose bib leaks, and clearance of air conditioning condensate drain outlets.

Crawl space: Check crawl space for animal infestation, termites, ponding moisture, or high moisture content; check foundation grilles for adequate ventilation; seasonally close grilles when appropriate — in winter, if not needed, or in summer if hot humid air is diffusing into air conditioned space.

Foliage: Keep foliage and vines off buildings; trim overhanging trees to keep debris from gutters and limbs from rubbing against building; remove moisture retaining elements, such as firewood, from foundations.

B. Repair exterior surfaces, paint, and recaulk as needed. Photo: Williamsport Preservation Training Center (WPTC), NPS.

Basements and foundations: Increase ventilation and maintain surfaces to avoid moisture.

Equipment: Check dehumidifiers, sump pump, vent fans, and water detection or alarm systems for proper maintenance as required; check battery back-up twice a year.

Piping/ductwork: Check for condensation on pipes and insulate/seal joints, if necessary.

C. Cleaning out gutters and downspouts should be done at least twice a year. Photo: WPTC, NPS.

Interior: Maintain equipment to reduce leaks and interior moisture.

Plumbing pipes: Add insulation to plumbing or radiator pipes located in areas subject to freezing, such as along outside walls, in attics, or in unheated basements.

Mechanical equipment: Check condensation pans and drain lines to keep clear; insulate and seal joints in exposed metal ductwork to avoid drawing in moist air.

Cleaning: Routinely dust and clean surfaces to reduce the amount of water or moist chemicals used to clean building; caulk around tile floor and wall connections; and maintain floor grouts in good condition.

Ventilation: Reduce household-produced moisture, if a problem, by increasing ventilation; vent clothes driers to the outside; install and always use exhaust fans in restrooms, bathrooms, showers, and kitchens, when in use.

D. Protect the building from damage by maintaining equipment and using alarms, like this floor water sensor. Photo: Dell Corporation.

MOISTURE: LEVEL II REPAIR AND CORRECTIVE ACTION

Exterior: Repair features that have been damaged. Replace an extensively deteriorated feature with a new feature that matches in design, color, texture, and where possible, materials.

Roofing: Repair roofing, parapets and overhangs that have allowed moisture to enter; add ice and water shield membrane to lower 3-4 feet or roofing in cold climates to limit damage from ice dams; increase attic ventilation, if heat and humidity build-up is a problem. Make gutters slope @ 1/8" to the foot. Use professional handbooks to size gutters and reposition, if necessary and appropriate to historic architecture. Add ventilated chimney caps to unused chimneys that collect rain water.

Walls: Repair spalled masonry, terra cotta, etc. by selectively installing new masonry units to match; replace rotted clapboards too close to grade and adjust grade or clapboards to achieve adequate clearance; protect or cover open window wells.

A. Mitigate poor drainage with gravel, filter cloth, or the use of subsurface drainage mats under finished paving. Photo: Larry D. Dermody.

Ground: Correct serious ground water problems; capture and dispose of downspout water away from foundation; and control vapor diffusion of crawlspace moisture.

Grade: Re-establish positive sloping of grade; try to obtain 6" of fall in the first 10' surrounding building foundation; for buildings without gutter systems, regrade and install a positive subsurface collection system with gravel, or waterproof sheeting and perimeter drains; adjust pitch or slope of eave line grade drains or French drains to reduce splash back onto foundation walls; add subsurface drainage boots or extension pipes to take existing downspout water away from building foundation to the greatest extent feasible.

Crawl space: Add polyethylene vapor barrier (heavy construction grade or Mylar) to exposed dirt in crawlspace if monitoring indicates it is needed and there is no rising damp; add ventilation grilles for additional cross ventilation, if determined advisable.

B. Repair roofs and add ice and water shields at eaves and under valleys in cold climates. Photo: Larry D. Dermody.

Foundations and Basements: Correct existing high moisture levels, if other means of controlling ground moisture are inadequate.

Mechanical devices: Add interior perimeter drains and sump pump; add dehumidifiers for seasonal control of humidity in confined, unventilated space (but don't create a problem with pulling dampness out of walls); add ventilator fans to improve air flow, but don't use both the dehumidifier and ventilator fan at the same time.

Walls: Remove commentates coatings, if holding rising damp in walls; coat walls with vapor permeable lime based rendering plaster, if damp walls need a sacrificial coating to protect mortar from erosion; add termite shields, if evidence of termites and dampness cannot be controlled.

Framing: Reinforce existing floor framing weakened by moisture by adding lolly column support and reinforcing joist ends with sistered or parallel supports. Add a vapor impermeable shield, preferably non-ferrous metal, under wood joists coming into contact with moist masonry.

C. Develop new drainage systems for roof run-off that remove moisture from the base of the building. Photo: WPTC, NPS.

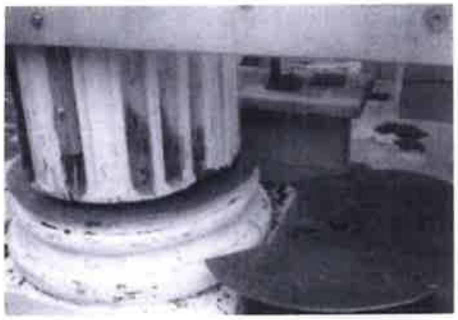
Interior: Eliminate areas where moisture is leaking or causing a problem.

Plumbing: Replace older pipes and fixtures subject to leaking or overflowing; insulate water pipes subject to condensation.

Ventilation: Add exhaust fans and whole house fans to increase air flow through buildings, if areas are damp or need more ventilation to control mold and mildew.

Climate: Adjust temperature and relative humidity to manage interior humidity; Correct areas of improperly balanced pressure for HVAC systems that may be causing a moisture problem.

D. Install ventilating fans when additional air circulation will improve damp conditions in buildings or reduce cooling loads. Photo: Ernest A. Conrad, P. E.



A. This lead sheet was installed at the base of the replacement column to stop rising damp. Photo: Bryan Blundell.

Exterior: Undertake exterior rehabilitation work that follows professional repair practices —i.e., replace a deteriorated feature with a new feature to match the existing in design, color, texture, and when possible, materials. In some limited situations, non-historic materials may be necessary in unusually wet areas.

Roofs: Add ventilator fans to exhaust roofs but avoid large projecting features whose designs might negatively affect the appearance of the historic roof. When replacing roofs, correct conditions that have caused moisture problems, but keep the overall appearance of the roof; for example, ventilate under wooden shingles, or detail standing seams to avoid buckling and cracking. Be attentive to provide extra protection for internal or built-in gutters by using the best quality materials, flashing, and vapor impermeable connection details.

Walls: If insulation and vapor barriers are added to frame walls, consider maintaining a ventilation channel behind the exterior cladding to avoid peeling and blistering paint occurrences.

Windows: Consider removable exterior storm windows, but allow operation of windows for periodic ventilation of cavity between exterior storm and historic sash. For stained glass windows using protective glazing, use only ventilated storms to avoid condensation as well as heat build-up.

B. Wood sills set on grade were replaced with concrete pier foundation and new wooden sill plates. Changes were not visible on the exterior (see C). Photo: WPTC, NPS.

Ground: Control excessive ground moisture. This may require extensive excavations, new drainage systems, and the use of substitute materials. These may include concrete or new sustainable recycled materials for wood in damp areas when they do not impact the historic appearance of the building.

Grade: Excavate and install water collection systems to assist with positive run-off of low lying or difficult areas of moisture drainage; use drainage mats under finished grade to improve run-off control; consider the use of column plinth blocks or bases that are ventilated or constructed of non-absorbent substitute materials in chronically damp areas. Replace improperly sloped walks; repair non-functioning catch basins and site drains; repair settled areas around steps and other features at grade.

C. The new ground gutter gravel base helps drainage around the concrete foundation (see B above) which is not visible behind the replaced wooden wall shingles. Photo: WPTC, NPS.

D. In a flood plain, rotted joists were replaced with a concrete slab and sleepers designed to drain water. Spaced flooring allowed drainage and room for damp wood to swell without buckling. Harper's Ferry Center, NPS.

E. Mechanical systems on the lower level were placed on platforms above the flood line. Harper's Ferry Center, NPS.

— — FOR CHRONICALLY DAMP CONDITIONS

Foundations: Improve performance of foundation walls with damp-proof treatments to stop infiltration or damp course layers to stop rising damp. Some substitute materials may need to be selectively integrated into new features.

Walls: excavate, repoint masonry walls, add footing drains, and waterproof exterior subsurface walls; replace wood sill plates and deteriorated structural foundations with new materials, such as pressure treated wood, to withstand chronic moisture conditions; materials may change, but overall appearance should remain similar. Add dampcourse layer to stop rising damp; avoid chemical injections as these are rarely totally effective, are not reversible, and are often visually intrusive.

Interior: Control the amount of moisture and condensation on the interiors of historic buildings. Most designs for new HVAC systems will be undertaken by mechanical engineers, but systems should be selected that are appropriate to the resource and intended use.

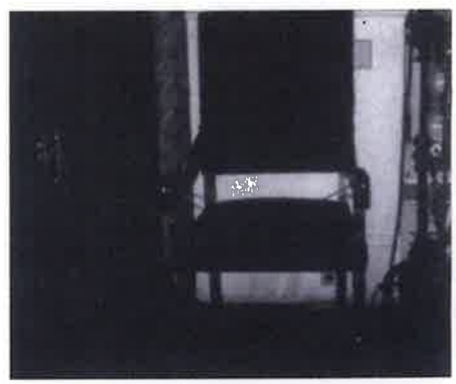
Windows, skylights: Add double and triple glazing, where necessary to control condensation. Avoid new metal sashes or use thermal breaks where prone to heavy condensation.

Mechanical systems: Design new systems to reduce stress on building exterior. This might require insulating and tightening up the building exterior, but provisions must be made for adequate air flow. A new zoned system, with appropriate transition insulation, may be effective in areas with differing climatic needs.

Control devices/Interior spaces: If new climate control systems are added design back-up controls and monitoring systems to protect from interior moisture damage.

Walls: If partition walls sit on floors that periodically flood, consider spacers or isolation membranes behind baseboards to stop moisture from wicking up through absorbent materials.

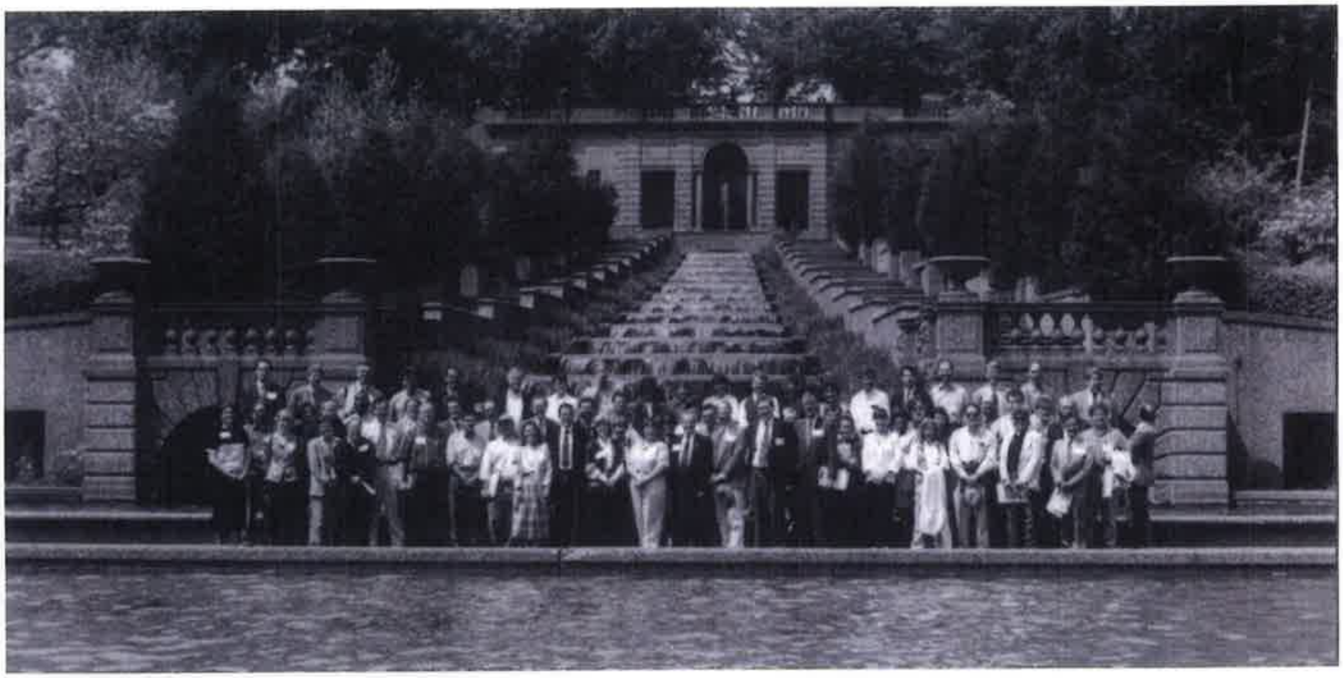
F. Triple glazed windows replaced the originals to control condensation. Photo: © Isabella Stewart Gardner Museum, Boston.



G. New sensors which monitor temperature and relative humidity are located throughout this museum and tied to a computer that controls the climate control system. Photo: © Isabella Stewart Gardner Museum, Boston.

H. New computers tie a variety of monitoring and security features into a comprehensive system which provides warning and backup alerts when any of the system components are not functioning properly. Photo: © Isabella Stewart Gardner Museum, Boston.

I. Critically damp foundation walls were protected with a layer of bentonite clay to reduce moisture penetration. This work was in combination with new downspouts that were connected to drainage boots that deposited captures roof run-off away from the foundation. Photo: Courtesy, Larry D. Dermody and the National Trust for Historic Preservation.



Back Cover: The Diagnosing Moisture in Historic Building Symposium held in Washington, DC, May, 1996, brought together practitioners in the field of historic preservation to discuss the issues contained in this Preservation Brief. Attendees are standing in front of the cascading fountains at Meridian Hill Park, a National Historic Landmark. Photo: Eric Avner.

Reading List

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This publication has been prepared pursuant to the National Historic Preservation Act, as amended, which directs the Secretary of the Interior to develop and make available information concerning historic properties. Comments about this publication should be directed to de Teel Patterson Tiller, Acting Manager, Heritage Preservation Services Program, National Park Service, P.O. Box 37127, Washington, DC 20013-7127. This publication is not copyrighted and can be reproduced without penalty. Copyright photographs included in this publication may not be used to illustrate publications other than as a reference to this Preservation Brief, without permission of the owners. Normal procedures for credit to the authors and the National Park Service are appreciated.

Cover Photo: Masonry repointing in a wet environment.
Photo: Williamsport Preservation Training Center, NPS.

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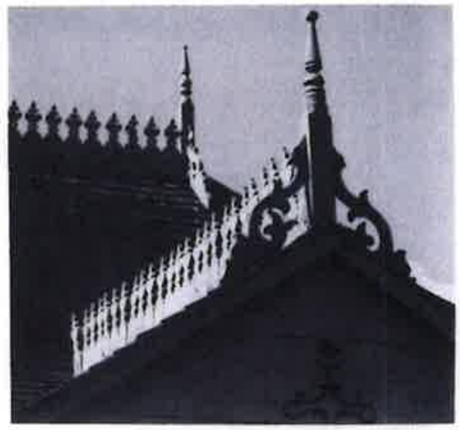
4 PRESERVATION BRIEFS



HABS

Roofing for Historic Buildings

Sarah M. Sweetser

U.S. Department of the Interior
National Park Service
Cultural Resources
Heritage Preservation Services

Significance of the Roof

A weather-tight roof is basic in the preservation of a structure, regardless of its age, size, or design. In the system that allows a building to work as a shelter, the roof sheds the rain, shades from the sun, and buffers the weather.

During some periods in the history of architecture, the roof imparts much of the architectural character. It defines the style and contributes to the building's aesthetics. The hipped roofs of Georgian architecture, the turrets of Queen Anne, the Mansard roofs, and the graceful slopes of the Shingle Style and Bungalow designs are examples of the use of roofing as a major design feature.

But no matter how decorative the patterning or how compelling the form, the roof is a highly vulnerable element of a shelter that will inevitable fail. A poor roof will permit the accelerated deterioration of historic building materials—masonry, wood, plaster, paint—and will cause general disintegration of the basic structure. Furthermore, there is an urgency involved in repairing a leaky roof since such repair costs will quickly become prohibitive. Although such action is desirable as soon as a failure is discovered, temporary patching methods should be carefully chosen to prevent inadvertent damage to sound or historic roofing materials and related features. Before any repair work is performed, the historic value of the materials used on the roof should be understood. Then a complete internal and external inspection of the roof should be planned to determine all the causes of failure and to identify the alternatives for repair or replacement of the roofing.

Historic Roofing Materials in America

Clay Tile: European settlers used clay tile for roofing as early as the mid-17th century; many pantiles (S-curved tiles), as well as flat roofing tiles, were used in Jamestown, Virginia. In some cities such as New York and Boston, clay was popularly used as a precaution against such fire as those that engulfed London in 1666 and scorched Boston in 1679.

Tiles roofs found in the mid-18th century Moravian settlements in Pennsylvania closely resembled those found in Germany. Typically, the tiles were 14–15" long, 6–7" wide with a curved butt. A lug on the back allowed the tiles to hang on the lathing without nails or pegs. The tile surface was usually scored with finger marks to promote drainage. In the Southwest, the tile roofs of the Spanish missionaries (mission tiles) were first manufactured (ca. 1780) at the Mission San Antonio de Padua in California. These semicircular tiles were

Repairs on this pantile roof were made with new tiles held in place with metal hangers. (Main Building, Ellis Island, New York)

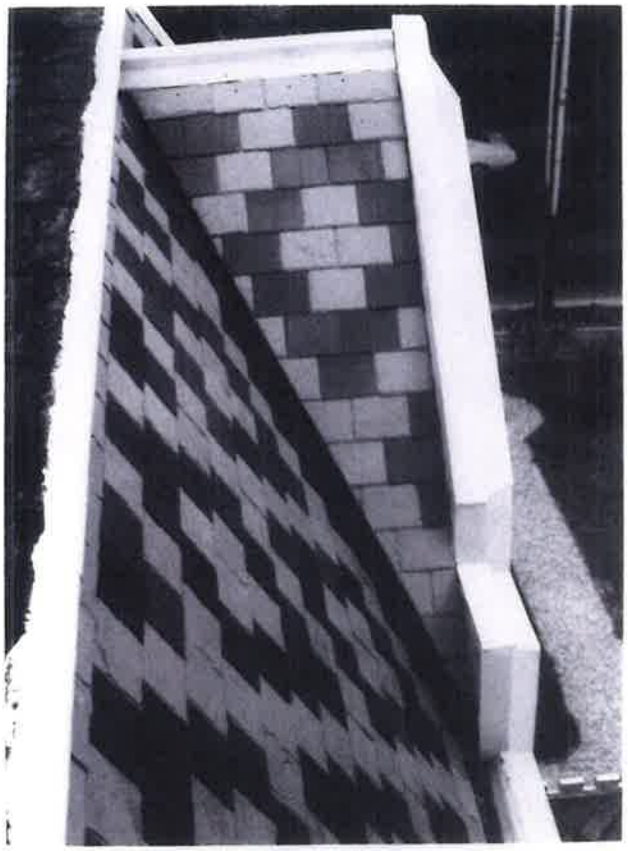
made by molding clay over sections of logs, and they were generally 22" long and tapered in width.

The plain or flat rectangular tiles most commonly used from the 17th through the beginning of the 19th century measured about 10" by 6" by ½", and had two holes at one end for a nail or peg fastener. Sometimes mortar was applied between the courses to secure the tiles in a heavy wind.

In the mid-19th century, tile roofs were often replaced by sheet-metal roofs, which were lighter and easier to install and maintain. However, by the turn of the century, the Romanesque Revival and Mission style buildings created a new demand and popularity for this picturesque roofing material.

Slate: Another practice settlers brought to the New World was slate roofing. Evidence of roofing slates have been found also among the ruins of mid-17th-century Jamestown. But because of the cost and the time required to obtain the material, which was mostly imported from Wales, the use of slate was initially limited. Even in Philadelphia (the second largest city in the English-speaking world at the time of the Revolution) slates were so rare that "The Slate Roof House" distinctly referred to William Penn's home built late in the 1600s. Sources of native slate were known to exist along the eastern seaboard from Maine to Virginia, but difficulties in inland transportation limited its availability to the cities, and contributed to its expense. Welsh slate continued to be imported until the development of canals and railroads in the mid-19th century made American slate more accessible and economical.

Slate was popular for its durability, fireproof qualities, and



The Victorians loved to used different colored slates to create decorative patterns on their roofs, an effect which cannot be easily duplicated by substitute materials. Before any repair work on a roof such as this, the slate sizes, colors, and position of the patterning should be carefully recorded to assure proper replacement. (Ebenezer Maxwell Mansion, Philadelphia, Pennsylvania, photo courtesy of William D. Hershey)

Replacement of particular historic details is important to the individual historic character of a roof, such as the treatment at the eaves of this rounded butt wood shingle roof. Also note that the surface of the roof was carefully sloped to drain water away from the side of the dormer. In the restoration, this function was augmented with the addition of carefully concealed modern metal flashing. (Mount Vernon, Virginia)

Galvanized sheet-metal shingles imitating the appearance of pantiles remained popular from the second half of the 19th century into the 20th century. (Episcopal Church, now the Jerome Historical Society Building, Jerome, Arizona, 1927)

aesthetic potential. Because slate was available in different colors (red, green, purple, and blue-gray), it was an effective material for decorative patterns on many 19th-century roofs (Gothic and Mansard styles). Slate continued to be used well into the 20th century, notably on many Tudor revival style buildings of the 1920s.

Shingles: Wood shingles were popular throughout the country in all periods of building history. The size and shape of the shingles as well as the detailing of the shingle roof differed according to regional craft practices. People within particular regions developed preferences for the local species of wood that most suited their purposes. In New England and the Delaware Valley, white pine was frequently used: in the South, cypress and oak; in the far west, red cedar or redwood. Sometimes a protective coating was applied to increase the durability of the shingle such as a mixture of brick dust and fish oil, or a paint made of red iron oxide and linseed oil.

Commonly in urban areas, wooden roofs were replaced with more fire resistant materials, but in rural areas this was not a major concern. On many Victorian country houses, the practice of wood shingling survived the technological advances of metal roofing in the 19th century, and near the turn of the century enjoyed a full revival in its namesake, the Shingle Style. Colonial revival and the Bungalow styles in the 20th century assured wood shingles a place as one of the most fashionable, domestic roofing materials.

Metal: Metal roofing in America is principally a 19th-century phenomenon. Before then the only metals commonly used were lead and copper. For example, a lead roof covered "Rosewell," one of the grandest mansions in 18th-century Virginia. But more often, lead was used for protective flashing. Lead, as well as copper, covered roof surfaces where wood, tile, or slate shingles were inappropriate because of the roof's pitch or shape.

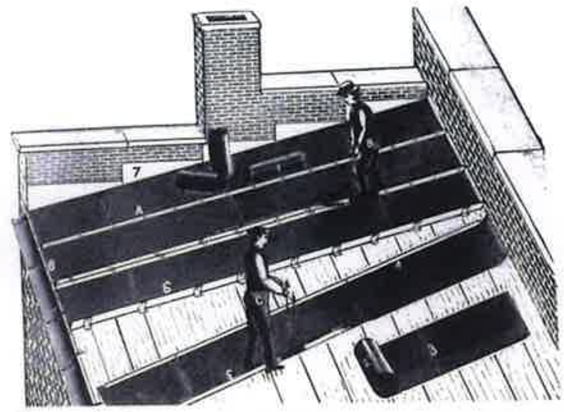
Copper with standing seams covered some of the more notable early American roofs including that of Christ Church (1727–1744) in Philadelphia. Flat-seamed copper was used on many domes and cupolas. The copper sheets were imported from England until the end of the 18th century when facilities for rolling sheet metal were developed in America.

Sheet iron was first known to have been manufactured here by the Revolutionary War financier, Robert Morris, who had a rolling mill near Trenton, New Jersey. At his mill Morris produced the roof of his own Philadelphia mansion, which he started in 1794. The architect Benjamin H. Latrobe used sheet iron to replace the roof on Princeton's "Nassau Hall," which had been gutted by fire in 1802.

The method for corrugating iron was originally patented in England in 1829. Corrugating stiffened the sheets, and allowed greater span over a lighter framework, as well as reduced installation time and labor. In 1834 the American architect William Strickland proposed corrugated iron to cover his design for the market place in Philadelphia.

Galvanizing with zinc to protect the base metal from rust was developed in France in 1837. By the 1850s the material was used on post offices and customhouses, as well as on train sheds and factories. In 1857 one of the first metal roofs in the

Repeated repair with asphalt, which cracks as it hardens, has created a blistered surface on this sheet-metal roof and built-in gutter, which will retain water. Repairs could be made by carefully heating and scraping the surface clean, repairing the holes in the metal with a flexible mastic compound or a metal patch, and coating the surface with a fibre paint. (Roane County Courthouse, Kingston, Tennessee, photo courtesy of Building Conservation Technology, Inc.)



A Chicago firm's catalog dated 1896 illustrates a method of unrolling, turning the edges, and finishing the standing seam on a metal roof.

Tin shingles, commonly embossed to imitate wood or tile, or with a decorative design, were popular as an inexpensive, textured roofing material. These shingles $8^{3}/_{8}$ inch by $12^{1}/_{2}$ inch on the exposed surface) were designed with interlocking edges, but they have been repaired by surface nailing, which may cause future leakage. (Ballard House, Yorktown, Virgina, photo by Gordie Whittington, National Park Service)

South was installed on the U.S. Mint in New Orleans. The Mint was thereby "fireproofed" with a 20-gauge galvanized, corrugated iron roof on iron trusses.

Tin-plate iron, commonly called "tin roofing," was used extensively in Canada in the 18th century, but it was not as common in the United States until later. Thomas Jefferson was an early advocate of tin roofing, and he installed a standing-seam tin roof on "Monticello" (ca. 1770–1802). The Arch Street Meetinghouse (1804) in Philadelphia had tin shingles laid in a herringbone pattern on a "piazza" roof.

However, once rolling mills were established in this country, the low cost, light weight, and low maintenance of tin plate made it the most common roofing material. Embossed tin shingles, whose surfaces created interesting patterns, were popular throughout the country in the late 19th century. Tin roofs were kept well-painted, usually red; or, as the architect A. J. Davis suggested, in a color to imitate the green patina of copper.

Terne plate differed from tin plate in that the iron was dipped in an alloy of lead and tin, giving it a duller finish. Historic, as well as modern, documentation often confuses the two, so much that it is difficult to determine how often actual "terne" was used.

Zinc came into use in the 1820s, at the same time tin plate was becoming popular. Although a less expensive substitute for lead, its advantages were controversial, and it was never widely used in this country.

Other Materials: Asphalt shingles and roll roofing were used in the 1890s. Many roofs of asbestos, aluminum, stainless steel, galvanized steel, and lead-coated copper may soon have historic values as well. Awareness of these and other traditions of roofing materials and their detailing will contribute to more sensitive preservation treatments.

Locating the Problem

Failures of Surface Materials

When trouble occurs, it is important to contact a professional, either an architect, a reputable roofing contractor, or a craftsman familiar with the inherent characteristics of the particular historic roofing system involved. These professionals may be able to advise on immediate patching procedures and help plan more permanent repairs. A thorough examination of the roof should start with an appraisal of the existing condition and quality of the roofing material itself. Particular attention should be given to any southern slope because year-round exposure to direct sun may cause it to break down first.

Wood: Some historic roofing materials have limited life expectancies because of normal organic decay and "wear." For example, the flat surfaces of wood shingles erode from exposure to rain and ultraviolet rays. Some species are more hardy than others, and heartwood, for example, is stronger and more durable than sapwood.

Ideally, shingles are split with the grain perpendicular to the surface. This is because if shingles are sawn across the grain, moisture may enter the grain and cause the wood to deteriorate. Prolonged moisture on or in the wood allows moss or fungi to grow, which will further hold the moisture and cause rot.

Metal: Of the inorganic roofing materials used on historic buildings, the most common are perhaps the sheet metals: lead, copper, zinc, tin plate, terne plate, and galvanized iron. In varying degrees each of these sheet metals are likely to deteriorate from chemical action by pitting or streaking. This can be caused by airborn pollutants; acid rainwater; acids from lichen or moss; alkalis found in lime mortars or portland cement, which might be on adjoining features and washes down on the roof surface; or tannic acids from adjacent wood sheathings or shingles made of red cedar or oak.

Corrosion from "galvanic action" occurs when dissimilar metals, such as copper and iron, are used in direct contact. Corrosion may also occur even though the metals are physically separated; one of the metals will react chemically against the other in the presence of an electrolyte such as rainwater. In roofing, this situation might occur when either a copper roof is decorated with iron cresting, or when steel nails are used in copper sheets. In some instances the corrosion can be prevented by inserting a plastic insulator between the dissimilar materials. Ideally, the fasteners should be a metal sympathetic to those involved.

Iron rusts unless it is well-painted or plated. Historically this problem was avoided by use of tin plating or galvinizing. But this method is durable only as long as the coating remains intact. Once the plating is worn or damaged, the exposed iron will rust. Therefore, any iron-based roofing material needs to be undercoated, and its surface needs to be kept well-painted to prevent corrosion.

One cause of sheet metal deterioration is fatigue. Depending upon the size and the gauge of the metal sheets, wear and metal failure can occur at the joints or at any protrusions in the sheathing as a result from the metal's alternating movement to thermal changes. Lead will tear because of "creep," or the gravitational stress that causes the material to move down the roof slope.

Slate: Perhaps the most durable roofing materials are slate and tile. Seemingly indestructable, both vary in quality. Some slates are hard and tough without being brittle. Soft slates are more subject to erosion and to attack by airborne and rainwater chemicals, which cause the slates to wear at nail holes, to delaminate, or to break. In winter, slate is very susceptible to breakage by ice, or ice dams.

Tile: Tiles will weather well, but tend to crack or break if hit, as by tree branches, or if they are walked on improperly. Like slates, tiles cannot support much weight. Low quality tiles that have been insufficiently fired during manufacture, will craze and spall under the effects of freeze and thaw cycles on their porous surfaces.

Failures of Support Systems

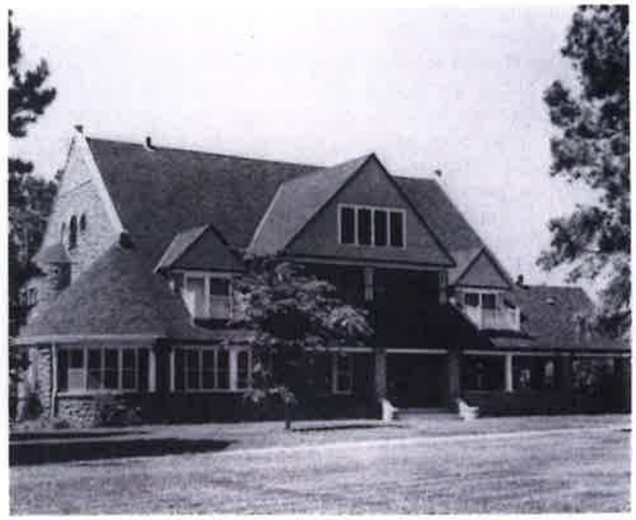
Once the condition of the roofing material has been determined, the related features and support systems should be examined on the exterior and on the interior of the roof. The gutters and downspouts need periodic cleaning and maintenance since a variety of debris fill them, causing water to back up and seep under roofing units. Water will eventually cause fasteners, sheathing, and roofing structure to deteriorate. During winter, the daily freeze-thaw cycles can cause ice floes to develop under the roof surface. The pressure from these ice floes will dislodge the roofing material, especially slates, shingles, or tiles. Moreover, the buildup of ice dams above the gutters can trap enough moisture to rot the sheathing or the structural members.

Many large public buildings have built-in gutters set within the perimeter of the roof. The downspouts for these gutters may run within the walls of the building, or drainage may be through the roof surface or through a parapet to exterior downspouts. These systems can be effective if properly maintained; however, if the roof slope is inadequate for good runoff, or if the traps are allowed to clog, rainwater will form pools on the roof surface. Interior downspouts can collect debris and thus back up, perhaps leaking water into the surrounding walls. Exterior downspouts may fill with water, which in cold weather may freeze and crack the pipes. Conduits from the built-in gutter to the exterior downspout may also leak water into the surrounding roof structure or walls.

Failure of the flashing system is usually a major cause of roof deterioration. Flashing should be carefully inspected for failure caused by either poor workmanship, thermal stress, or metal deterioration (both of flashing material itself and of the fasteners). With many roofing materials, the replacement of flashing on an existing roof is a major operation, which may require taking up large sections of the roof surface. Therefore, the installation of top quality flashing material on

This detail shows slate delamination caused by a combination of weathering and pollution. In addition, the slates have eroded around the repair nails, incorrectly placed in the exposed surface of the slates. (Lower Pontalba Building, New Orleans, photo courtesy of Building Conservation Technology, Inc.)

Temporary stabilization or "mothballing" with materials such as plywood and building paper can protect the roof of a project until it can be properly repaired or replaced. (Narbonne House, Salem, Massachusetts)



These two views of the same house demonstrate how the use of a substitute material can drastically affect the overall character of a structure. The textural interest of the original tile roof was lost with the use of asphalt shingles. Recent preservation efforts are replacing the tile roof. (Frank House, Kearney, Nebraska, photo courtesy of the Nebraska State Historical Society, Lincoln, Nebraska)

a new or replaced roof should be a primary consideration. *Remember, some roofing and flashing materials are not compatible.*

Roof fasteners and clips should also be made of a material compatible with all other materials used, or coated to prevent rust. For example, the tannic acid in oak will corrode iron nails. Some roofs such as slate and sheet metals may fail if nailed too rigidly.

If the roof structure appears sound and nothing indicates recent movement, the area to be examined most closely is the roof substrate—the sheathing or the battens. The danger spots would be near the roof plates, under any exterior patches, at the intersections of the roof planes, or at vertical surfaces such as dormers. Water penetration, indicating a breach in the roofing surface or flashing, should be readily apparent, usually as a damp spot or stain. Probing with a small pen knife may reveal any rot which may indicate previously undetected damage to the roofing membrane. Insect infestation evident by small exit holes and frass (a sawdust-like debris) should also be noted. Condensation on the underside of the roofing is undesirable and indicates improper ventilation. Moisture will have an adverse effect on any roofing material; a good roof stays dry inside and out.

Repair or Replace

Understanding potential weaknesses of roofing material also requires knowledge of repair difficulties. Individual slates can be replaced normally without major disruption to the rest of the roof, but replacing flashing on a slate roof can require substantial removal of surrounding slates. If it is the substrate or a support material that has deteriorated, many surface materials such as slate or tile can be reused if handled carefully during the repair. Such problems should be evaluated at the outset of any project to determine if the roof can be effectively patched, or if it should be completely replaced.

Will the repairs be effective? Maintenance costs tend to multiply once trouble starts. As the cost of labor escalates, repeated repairs could soon equal the cost of a new roof.

The more durable the surface is initially, the easier it will be to maintain. Some roofing materials such as slate are expensive to install, but if top quality slate and flashing are used, it will last 40–60 years with minimal maintenance. Although the installation cost of the roof will be high, low maintenance needs will make the lifetime cost of the roof less expensive.

Historical Research

In a restoration project, research of documents and physical investigation of the building usually will establish the roof's history. Documentary research should include any original plans or building specifications, early insurance surveys, newspaper descriptions, or the personal papers and files of people who owned or were involved in the history of the building. Old photographs of the building might provide evidence of missing details.

Along with a thorough understanding of any written history of the building, a physical investigation of the roofing and its structure may reveal information about the roof's construction history. Starting with an overall impression of the structure, are there any changes in the roof slope, its configuration, or roofing materials? Perhaps there are obvious patches or changes in patterning of exterior brickwork where a gable roof was changed to a gambrel, or where a whole upper story was added. Perhaps there are obvious stylistic changes in the roof line, dormers, or ornamentation. These observations could help one understand any important alteration, and could help establish the direction of further investigation.

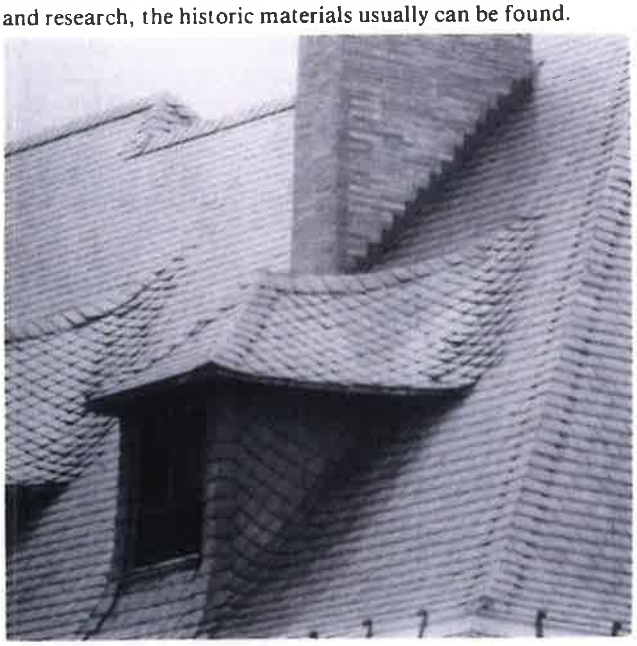
Because most roofs are physically out of the range of careful scrutiny, the "principle of least effort" has probably limited the extent and quality of previous patching or replacing, and usually considerable evidence of an earlier roof surface remains. Sometimes the older roof will be found as an underlayment of the current exposed roof. Original roofing may still be intact in awkward places under later features on a roof. Often if there is any unfinished attic space, remnants of roofing may have been dropped and left when the roof was being built or repaired. If the configuration of the roof has been changed, some of the original material might still be in place under the existing roof. Sometimes whole sections of the roof and roof framing will have been left intact under the higher roof. The profile and/or flashing of the earlier roof may be apparent on the interior of the walls at the level of the alteration. If the sheathing or lathing appears to have survived changes in the roofing surface, they may contain evidence of the roofing systems. These may appear either as dirt marks, which provide "shadows" of a roofing material, or as nails broken or driven down into the wood, rather than pulled out during previous alterations or repairs. Wooden headers in the roof framing may indicate that earlier chimneys or skylights have been removed. Any metal ornamentation that might have existed may be indicated by anchors or unusual markings along the ridge or at other edges of the roof. This primary evidence is essential for a full understanding of the roof's history.

Caution should be taken in dating early "fabric" on the evidence of a single item, as recycling of materials is not a mid-20th-century innovation. Carpenters have been reusing materials, sheathing, and framing members in the interest of economy for centuries. Therefore, any analysis of the materials found, such as nails or sawmarks on the wood, requires an accurate knowledge of the history of local building practices before any final conclusion can be accurately reached. It is helpful to establish a sequence of construction history for the roof and roofing materials; any historic fabric or pertinent evidence in the roof should be photographed, measured, and recorded for future reference.

During the repair work, useful evidence might unexpectedly appear. It is essential that records be kept of any type of work on a historic building, before, during, and after the project. Photographs are generally the easiest and fastest method, and should include overall views and details at the gutters, flashing, dormers, chimneys, valleys, ridges, and eaves. All photographs should be immediately labeled to insure accurate identification at a later date. Any patterning or design on the roofing deserves particular attention. For example, slate roofs are often decorative and have subtle changes in size, color, and texture, such as a gradually decreasing coursing length from the eave to the peak. If not carefully noted before a project begins, there may be problems in replacing the surface. The standard reference for this phase of the work is *Recording Historic Buildings,* compiled by Harley J. McKee for the Historic American Buildings Survey, National Park Service, Washington, D.C., 1970.

Replacing the Historic Roofing Material

Professional advice will be needed to assess the various aspects of replacing a historic roof. With some exceptions, most historic roofing materials are available today. If not, an architect or preservation group who has previously worked with the same type material may be able to recommend suppliers. Special roofing materials, such as tile or embossed metal shingles, can be produced by manufacturers of related products that are commonly used elsewhere, either on the exterior or interior of a structure. With some creative thinking and research, the historic materials usually can be found.



Because of the roof's visibility, the slate detailing around the dormers is important to the character of this structure. Note how the slates swirl from a horizontal pattern on the main roof to a diamond pattern on the dormer roofs and side walls. (18th and Que Streets, NW, Washington, D.C.)

Craft Practices: Determining the craft practices used in the installation of a historic roof is another major concern in roof restoration. Early builders took great pride in their work, and experience has shown that the "rustic" or irregular designs commercially labled "Early American" are a 20th-century invention. For example, historically, wood shingles underwent several distinct operations in their manufacture including splitting by hand, and smoothing the surface with a draw knife. In modern nomenclature, the same item would be a "tapersplit" shingle which has been dressed. Unfortunately, the rustic appearance of today's commercially available "handsplit" and re-sawn shingle bears no resemblance to the hand-made roofing materials used on early American buildings.

Good design and quality materials for the roof surface, fastenings, and flashing minimize roofing failures. This is essential on roofs such as on the National Cathedral where a thorough maintenance inspection and minor repairs cannot be done easily without special scaffolding. However, the success of the roof on any structure depends on frequent cleaning and repair of the gutter system. (Washington, D.C., photo courtesy of John Burns, A.I.A.)

Early craftsmen worked with a great deal of common sense; they understood their materials. For example they knew that wood shingles should be relatively narrow; shingles much wider than about 6" would split when walked on, or they may curl or crack from varying temperature and moisture. It is important to understand these aspects of craftsmanship, remembering that people wanted their roofs to be weather-tight and to last a long time. The recent use of "mother-goose" shingles on historic structures is a gross underestimation of the early craftsman's skills.

Supervision: Finding a modern craftsman to reproduce historic details may take some effort. It may even involve some special instruction to raise his understanding of certain historic craft practices. At the same time, it may be pointless (and expensive) to follow historic craft practices in any construction that will not be visible on the finished product. But if the roofing details are readily visible, their appearance should be based on architectural evidence or on historic prototypes. For instance, the spacing of the seams on a standing-seam metal roof will affect the building's overall scale and should therefore match the original dimensions of the seams.

Many older roofing practices are no longer performed because of modern improvements. Research and review of specific detailing in the roof with the contractor before beginning the project is highly recommended. For example, one early craft practice was to finish the ridge of a wood shingle roof with a roof "comb"—that is, the top course of one slope of the roof was extended uniformly beyond the peak to shield the ridge, and to provide some weather protection for the raw horizontal edges of the shingles on the other slope. If the "comb" is known to have been the correct detail, it should be used. Though this method leaves the top course vulnerable to the weather, a disguised strip of flashing will strengthen this weak point.

Detail drawings or a sample mock-up will help ensure that the contractor or craftsman understands the scope and special requirements of the project. It should never be assumed that the modern carpenter, slater, sheet metal worker, or roofer will know all the historic details. Supervision is as important as any other stage of the process.

Special problems inherent in the design of an elaborate historic roof can be controlled through the use of good materials and regular maintenance. The shape and detailing are essential elements of the building's historic character, and should not be modified, despite the use of alternative surface materials. (Gamwell House, Bellingham, Washington)

Alternative Materials

The use of the historic roofing material on a structure may be restricted by building codes or by the availability of the materials, in which case an appropriate alternative will have to be found.

Some municipal building codes allow variances for roofing materials in historic districts. In other instances, individual variances may be obtained. Most modern heating and cooking is fueled by gas, electricity, or oil—none of which emit the hot embers that historically have been the cause of roof fires. Where wood burning fireplaces or stoves are used, spark arrestor screens at the top of the chimneys help to prevent flaming material from escaping, thus reducing the number of fires that start at the roof. In most states, insurance rates have been equalized to reflect revised considerations for the risks involved with various roofing materials.

In a rehabilitation project, there may be valid reasons for replacing the roof with a material other than the original. The historic roofing may no longer be available, or the cost of obtaining specially fabricated materials may be prohibitive. But the decision to use an alternative material should be weighed carefully against the primary concern to keep the historic character of the building. If the roof is flat and is not visible from any elevation of the building, and if there are advantages to substituting a modern built-up composition roof for what might have been a flat metal roof, then it may make better economic and construction sense to use a modern roofing method. But if the roof is readily visible, the alternative material should match as closely as possible the scale, texture, and coloration of the historic roofing material.

Asphalt shingles or ceramic tiles are common substitute materials intended to duplicate the appearance of wood shingles, slates, or tiles. Fire-retardant, treated wood shingles are currently available. The treated wood tends, however, to be brittle, and may require extra care (and expense) to install. In some instances, shingles laid with an interlay of fire-retardent building paper may be an acceptable alternative.

Lead-coated copper, terne-coated steel, and aluminum/zinc-coated steel can successfully replace tin, terne plate, zinc, or lead. Copper-coated steel is a less expensive (and less durable) substitute for sheet copper.

The search for alternative roofing materials is not new. As early as the 18th century, fear of fire cause many wood shingle or board roofs to be replaced by sheet metal or clay tile. Some historic roofs were failures from the start, based on overambitious and naive use of materials as they were first developed. Research on a structure may reveal that an inadequately designed or a highly combustible roof was replaced early in its history, and therefore restoration of a later roof material would have a valid precedent. In some cities, the substitution of sheet metal on early row houses occurred as soon as the rolled material became available.

Cost and ease of maintenance may dictate the substitution of a material wholly different in appearance from the original. The practical problems (wind, weather, and roof pitch) should be weighed against the historical consideration of scale, texture, and color. Sometimes the effect of the alternative material will be minimal. But on roofs with a high degree of visibility and patterning or texture, the substitution may seriously alter the architectural character of the building.

Temporary Stabilization

It may be necessary to carry out an immediate and temporary stabilization to prevent further deterioration until research can determine how the roof should be restored or rehabilitated, or until funding can be provided to do a proper job. A simple covering of exterior plywood or roll roofing might provide adequate protection, but any temporary covering should be applied with caution. One should be careful not to overload the roof structure, or to damage or destroy historic evidence or fabric that might be incorporated into a new roof at a later date. In this sense, repairs with caulking or bituminous patching compounds should be recognized as potentially harmful, since they are difficult to remove, and at their best, are very temporary.

Precautions

The architect or contractor should warn the owner of any precautions to be taken against the specific hazards in installing the roofing material. Soldering of sheet metals, for instance, can be a fire hazard, either from the open flame or from overheating and undected smoldering of the wooden substrate materials.

Thought should be given to the design and placement of any modern roof appurtenances such as plumbing stacks, air vents, or TV antennas. Consideration should begin with the placement of modern plumbing on the interior of the building, otherwise a series of vent stacks may pierce the roof membrane at various spots creating maintenance problems as well as aesthetic ones. Air handling units placed in the attic space will require vents which, in turn, require sensitive design. Incorporating these in unused chimneys has been very successful in the past.

Whenever gutters and downspouts are needed that were not on the building historically, the additions should be made as unobtrusively as possible, perhaps by painting them out with a color compatible with the nearby wall or trim.

Maintenance

Although a new roof can be an object of beauty, it will not be protective for long without proper maintenance. At least twice a year, the roof should be inspected against a checklist. All changes should be recorded and reported. Guidelines should be established for any foot traffic that may be required for the maintenance of the roof. Many roofing materials should not be walked on at all. For some—slate, asbestos, and clay tile—a self-supporting ladder might be hung over the ridge of the roof, or planks might be spanned across the roof surface. Such items should be specifically designed and kept in a storage space accessible to the roof. If exterior work ever requires hanging scaffolding, use caution to insure that the anchors do not penetrate, break, or wear the roofing surface, gutters, or flashing.

Any roofing system should be recognized as a membrane that is designed to be self-sustaining, but that can be easily damaged by intrusions such as pedestrian traffic or fallen tree branches. Certain items should be checked at specific times. For example, gutters tend to accumulate leaves and debris during the spring and fall and after heavy rain. Hidden gutter screening both at downspouts and over the full length of the gutter could help keep them clean. The surface material would require checking after a storm as well. Periodic checking of the underside of the roof from the attic after a storm or winter freezing may give early warning of any leaks. Generally, damage from water or ice is less likely on a roof that has good flashing on the outside and is well ventilated and insulated on the inside. Specific instructions for the maintenance of the different roof materials should be available from the architect or contractor.

Summary

The essential ingredients for replacing and maintaining a historic roof are:

- Understanding the historic character of the building and being sympathetic to it.
- Careful examination and recording of the existing roof and any evidence of earlier roofs.
- Consideration of the historic craftsmanship and detailing and implementing them in the renewal wherever visible.
- Supervision of the roofers or maintenance personnel to assure preservation of historic fabric and proper understanding of the scope and detailing of the project.
- Consideration of alternative materials where the original cannot be used.
- Cyclical maintenance program to assure that the staff understands how to take care of the roof and of the particular trouble spots to safeguard.

With these points in mind, it will be possible to preserve the architectural character and maintain the physical integrity of the roofing on a historic building.

This Preservation Brief was written by Sarah M. Sweetser, Architectural Historian, Technical Preservation Services Division. Much of the technical information was based upon an unpublished report prepared under contract for this office by John G. and Diana S. Waite. Some of the historical information was from Charles E. Peterson, FAIA, "American Notes," *Journal of the Society of Architectural Historians.*

The illustrations for this brief not specifically credited are from the files of the Technical Preservation Services Division.

This publication was prepared pursuant to Executive Order 11593, "Protection and Enhancement of the Cultural Environment," which directs the Secretary of the Interior to "develop and make available to Federal agencies and State and local governments information concerning professional methods and techniques for preserving, improving, restoring and maintaining historic properties." The Brief has been developed under the technical editorship of Lee H. Nelson, AIA, Chief, Preservation Assistance Division, National Park Service, U.S. Department of the Interior, Washington, D.C. 20240. Comments on the usefulness of this information are welcome and can be sent to Mr. Nelson at the above address. **February 1978.**

Decorative features such as cupolas require extra maintenance. The flashing is carefully detailed to promote run-off, and the wooden ribbing must be kept well-painted. This roof surface, which was originally tin plate, has been replaced with lead-coated copper for maintenance purposes. (Lyndhurst, Tarrytown, New York, photo courtesy of the National Trust for Historic Preservation)

Additional readings on the subject of roofing are listed below.

Boaz, Joseph N., ed. *Architectural Graphic Standards.* New York: John Wiley and Sons, Inc., 1970. (Modern roofing types and detailing)

Briggs, Martin S. *A Short History of the Building Crafts.* London: Oxford University Press, 1925. (Descriptions of historic roofing materials)

Bulletin of the Association for Preservation Technology. Vol. 2 (nos. 1-2) 1970. (Entirely on roofing)

Holstrom, Ingmar; and Sandstrom, Christina. *Maintenance of Old Buildings: Preservation from the Technical and Antiquarian Standpoint.* Stockholm: National Swedish Building Research, 1972. (Contains a section on roof maintenance problems)

Insall, Donald. *The Care of Old Buildings Today.* London: The Architectural Press, 1972. (Excellent guide to some problems and solutions for historic roofs)

Labine, R.A. Clem. "Repairing Slate Roofs." *The Old House Journal* 3 (no. 12, Dec. 1975): 6–7.

Lefer, Henry. "A Birds-eye View." *Progressive Architecture.* (Mar. 1977), pp. 88–92. (Article on contemporary sheet metal)

National Slate Association. *Slate Roofs.* Reprint of 1926 edition, now available from the Vermont Structural Slate Co., Inc., Fairhaven, VT 05743. (An excellent reference for the many designs and details of slate roofs)

Peterson, Charles E. "Iron in Early American Roofs." *The Smithsonian Journal of History* 3 (no. 3). Edited by Peter C. Welsh. Washington, D.C.: Smithsonian Institution, 1968, pp. 41–76.

Waite, Diana S. *Nineteenth Century Tin Roofing and its Use at Hyde Hall.* Albany: New York State Historic Trust, 1971.

———. "Roofing for Early America." *Building Early America.* Edited by Charles E. Peterson. Radnor, Penn.: Chilton Book Co., 1976.

U.S. Department of the Interior
National Park Service
Cultural Resources
Heritage Preservation Services

Preservation Briefs: 9

The Repair of Historic Wooden Windows

John H. Myers

The windows on many historic buildings are an important aspect of the architectural character of those buildings. Their design, craftsmanship, or other qualities may make them worthy of preservation. This is self-evident for ornamental windows, but it can be equally true for warehouses or factories where the windows may be the most dominant visual element of an otherwise plain building (see figure 1). Evaluating the significance of these windows and planning for their repair or replacement can be a complex process involving both objective and subjective considerations. The *Secretary of the Interior's Standards for Rehabilitation*, and the accompanying guidelines, call for respecting the significance of original materials and features, repairing and retaining them wherever possible, and when necessary, replacing them in kind. This **Brief** is based on the issues of significance and repair which are implicit in the standards, but the primary emphasis is on the technical issues of planning for the repair of windows including evaluation of their physical condition, techniques of repair, and design considerations when replacement is necessary.

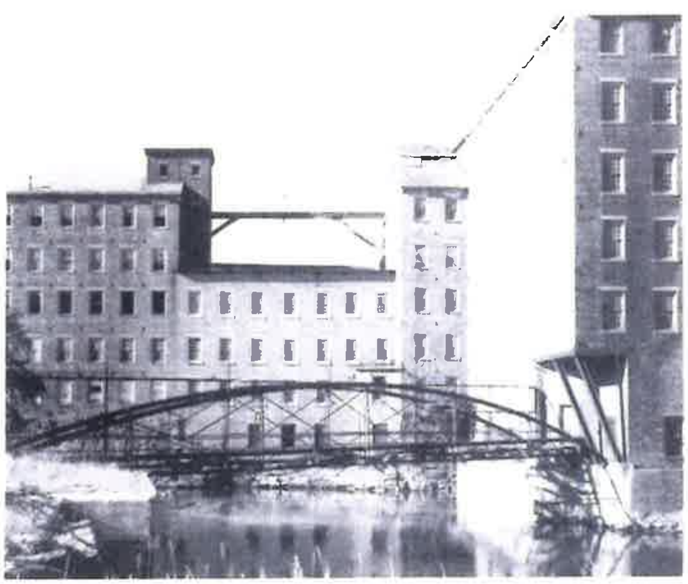


Figure 1. *Windows are frequently important visual focal points, especially on simple facades such as this mill building. Replacement of the multi-pane windows here with larger panes could dramatically change the appearance of the building. The areas of missing windows convey the impression of such a change. Photo: John T. Lowe*

Much of the technical section presents repair techniques as an instructional guide for the do-it-yourselfer. The information will be useful, however, for the architect, contractor, or developer on large-scale projects. It presents a methodology for approaching the evaluation and repair of existing windows, and considerations for replacement, from which the professional can develop alternatives and specify appropriate materials and procedures.

Architectural or Historical Significance

Evaluating the architectural or historical significance of windows is the first step in planning for window treatments, and a general understanding of the function and history of windows is vital to making a proper evaluation. As a part of this evaluation, one must consider four basic window functions: admitting light to the interior spaces, providing fresh air and ventilation to the interior, providing a visual link to the outside world, and enhancing the appearance of a building. No single factor can be disregarded when planning window treatments; for example, attempting to conserve energy by closing up or reducing the size of window openings may result in the use of *more* energy by increasing electric lighting loads and decreasing passive solar heat gains.

Historically, the first windows in early American houses were casement windows; that is, they were hinged at the side and opened outward. In the beginning of the eighteenth century single- and double-hung windows were introduced. Subsequently many styles of these vertical sliding sash windows have come to be associated with specific building periods or architectural styles, and this is an important consideration in determining the significance of windows, especially on a local or regional basis. Site-specific, regionally oriented architectural comparisons should be made to determine the significance of windows in question. Although such comparisons may focus on specific window types and their details, the ultimate determination of significance should be made within the context of the whole building, wherein the windows are one architectural element (see figure 2).

After all of the factors have been evaluated, *windows should be considered significant to a building if they:* 1) are original, 2) reflect the original design intent for the building, 3) reflect period or regional styles or building practices, 4) reflect changes to the building resulting from major periods or events, or 5) are examples of exceptional craftsmanship or design. Once this evaluation of significance has been completed, it is possible to pro-

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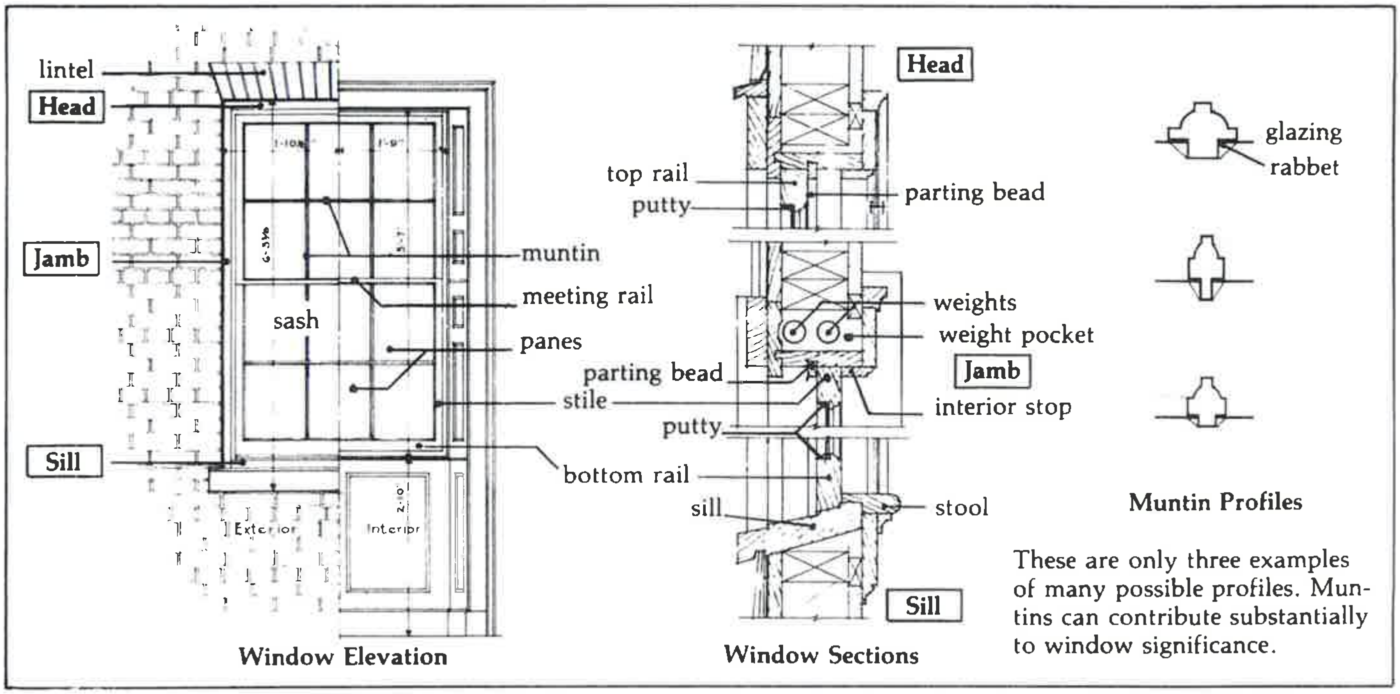

Figure 2. *These drawings of window details identify major components, terminology, and installation details for a wooden double-hung window.*

ceed with planning appropriate treatments, beginning with an investigation of the physical condition of the windows.

Physical Evaluation

The key to successful planning for window treatments is a careful evaluation of existing physical conditions on a unit-by-unit basis. A graphic or photographic system may be devised to record existing conditions and illustrate the scope of any necessary repairs. Another effective tool is a window schedule which lists all of the parts of each window unit. Spaces by each part allow notes on existing conditions and repair instructions. When such a schedule is completed, it indicates the precise tasks to be performed in the repair of each unit and becomes a part of the specifications. In any evaluation, one should note at a minimum, 1) window location, 2) condition of the paint, 3) condition of the frame and sill, 4) condition of the sash (rails, stiles and muntins), 5) glazing problems, 6) hardware, and 7) the overall condition of the window (excellent, fair, poor, and so forth).

Many factors such as poor design, moisture, vandalism, insect attack, and lack of maintenance can contribute to window deterioration, but moisture is the primary contributing factor in wooden window decay. All window units should be inspected to see if water is entering around the edges of the frame and, if so, the joints or seams should be caulked to eliminate this danger. The glazing putty should be checked for cracked, loose, or missing sections which allow water to saturate the wood, especially at the joints. The back putty on the interior side of the pane should also be inspected, because it creates a seal which prevents condensation from running down into the joinery. The sill should be examined to insure that it slopes downward away from the building and allows water to drain off. In addition, it may be advisable to cut a dripline along the underside of the sill. This almost invisible treatment will insure proper water run-off, particularly if the bottom of the sill is flat. Any conditions, including poor original design, which permit water to come in contact with the wood or to puddle on the sill must be corrected as they contribute to deterioration of the window.

One clue to the location of areas of excessive moisture is the condition of the paint; therefore, each window should be examined for areas of paint failure. Since excessive moisture is detrimental to the paint bond, areas of paint blistering, cracking, flaking, and peeling usually identify points of water penetration, moisture saturation, and potential deterioration. Failure of the paint should not, however, be mistakenly interpreted as a sign that the wood is in poor condition and hence, irreparable. Wood is frequently in sound physical condition beneath unsightly paint. After noting areas of paint failure, the next step is to inspect the condition of the wood, particularly at the points identified during the paint examination.

Each window should be examined for operational soundness beginning with the lower portions of the frame and sash. Exterior rainwater and interior condensation can flow downward along the window, entering and collecting at points where the flow is blocked. The sill, joints between the sill and jamb, corners of the bottom rails and muntin joints are typical points where water collects and deterioration begins (see figure 3). The operation of the window (continuous opening and closing over the years and seasonal temperature changes) weakens the joints, causing movement and slight separation. This process makes the joints more vulnerable to water which is readily absorbed into the end-grain of the wood. If severe deterioration exists in these areas, it will usually be apparent on visual inspection, but other less severely deteriorated areas of the wood may be tested by two traditional methods using a small ice pick.

An ice pick or an awl may be used to test wood for soundness. The technique is simply to jab the pick into a wetted wood surface at an angle and pry up a small sec-

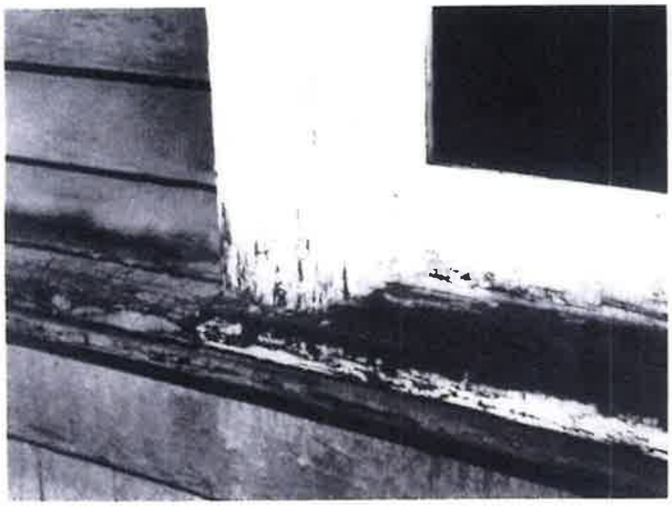

Figure 3. *Deterioration of poorly maintained windows usually begins on horizontal surfaces and at joints where water can collect and saturate the wood. The problem areas are clearly indicated by paint failure due to moisture. Photo: Baird M. Smith, AIA*

tion of the wood. Sound wood will separate in long fibrous splinters, but decayed wood will lift up in short irregular pieces due to the breakdown of fiber strength.

Another method of testing for soundness consists of pushing a sharp object into the wood, perpendicular to the surface. If deterioration has begun from the hidden side of a member and the core is badly decayed, the visible surface may appear to be sound wood. Pressure on the probe can force it through an apparently sound skin to penetrate deeply into decayed wood. This technique is especially useful for checking sills where visual access to the underside is restricted.

Following the inspection and analysis of the results, the scope of the necessary repairs will be evident and a plan for the rehabilitation can be formulated. Generally the actions necessary to return a window to "like new" condition will fall into three broad categories: 1) routine maintenance procedures, 2) structural stabilization, and 3) parts replacement. These categories will be discussed in the following sections and will be referred to respectively as Repair Class I, Repair Class II, and Repair Class III. Each successive repair class represents an increasing level of difficulty, expense, and work time. Note that most of the points mentioned in Repair Class I are routine maintenance items and should be provided in a regular maintenance program for any building. The neglect of these routine items can contribute to many common window problems.

Before undertaking any of the repairs mentioned in the following sections all sources of moisture penetration should be identified and eliminated, and all existing decay fungi destroyed in order to arrest the deterioration process. Many commercially available fungicides and wood preservatives are toxic, so it is extremely important to follow the manufacturer's recommendations for application, and store all chemical materials away from children and animals. After fungicidal and preservative treatment the windows may be stabilized, retained, and restored with every expectation for a long service life.

Repair Class I: Routine Maintenance

Repairs to wooden windows are usually labor intensive and relatively uncomplicated. On small scale projects this allows the do-it-yourselfer to save money by repairing all or part of the windows. On larger projects it presents the opportunity for time and money which might otherwise be spent on the removal and replacement of existing windows, to be spent on repairs, subsequently saving all or part of the material cost of new window units. Regardless of the actual costs, or who performs the work, the evaluation process described earlier will provide the knowledge from which to specify an appropriate work program, establish the work element priorities, and identify the level of skill needed by the labor force.

The routine maintenance required to upgrade a window to "like new" condition normally includes the following steps: 1) some degree of interior and exterior paint removal, 2) removal and repair of sash (including reglazing where necessary), 3) repairs to the frame, 4) weatherstripping and reinstallation of the sash, and 5) repainting. These operations are illustrated for a typical double-hung wooden window (see figures 4a-f), but they may be adapted to other window types and styles as applicable.

Historic windows have usually acquired many layers of paint over time. Removal of excess layers or peeling and flaking paint will facilitate operation of the window and restore the clarity of the original detailing. Some degree of paint removal is also necessary as a first step in the proper surface preparation for subsequent refinishing (if paint color analysis is desired, it should be conducted prior to the onset of the paint removal). There are several safe and effective techniques for removing paint from wood, depending on the amount of paint to be removed. Several techniques such as scraping, chemical stripping, and the use of a hot air gun are discussed in "Preservation Briefs: 10 Paint Removal from Historic Woodwork" (see Additional Reading section at end).

Paint removal should begin on the interior frames, being careful to remove the paint from the interior stop and the parting bead, particularly along the seam where these stops meet the jamb. This can be accomplished by running a utility knife along the length of the seam, breaking the paint bond. It will then be much easier to remove the stop, the parting bead and the sash. The interior stop may be initially loosened from the sash side to avoid visible scarring of the wood and then gradually pried loose using a pair of putty knives, working up and down the stop in small increments (see figure 4b). With the stop removed, the lower or interior sash may be withdrawn. The sash cords should be detached from the sides of the sash and their ends may be pinned with a nail or tied in a knot to prevent them from falling into the weight pocket.

Removal of the upper sash on double-hung units is similar but the parting bead which holds it in place is set into a groove in the center of the stile and is thinner and more delicate than the interior stop. After removing any paint along the seam, the parting bead should be carefully pried out and worked free in the same manner as the interior stop. The upper sash can be removed in the same manner as the lower one and both sash taken to a convenient work area (in order to remove the sash the interior stop and parting bead need only be removed from one side of the window). Window openings can be covered with polyethylene sheets or plywood sheathing while the sash are out for repair.

The sash can be stripped of paint using appropriate techniques, but if any heat treatment is used (see figure 4c), the glass should be removed or protected from the sudden temperature change which can cause breakage. An

Figure 4a. *The following series of photographs of the repair of a historic double-hung window use a unit which is structurally sound but has many layers of paint, some cracked and missing putty, slight separation at the joints, broken sash cords, and one cracked pane. Photo: John H. Myers*

Figure 4b. *After removing paint from the seam between the interior stop and the jamb, the stop can be pried out and gradually worked loose using a pair of putty knives as shown. To avoid visible scarring of the wood, the sash can be raised and the stop pried loose initially from the outer side. Photo: John H. Myers*

Figure 4c. *Sash can be removed and repaired in a convenient work area. Paint is being removed from this sash with a hot air gun while an asbestos sheet protects the glass from sudden temperature change. Photo: John H. Myers*

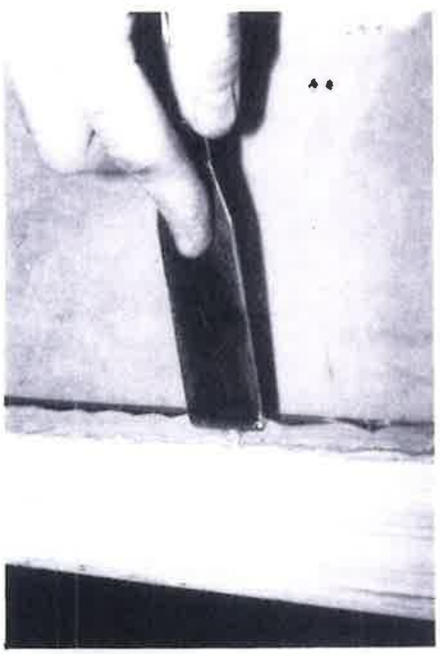

Figure 4d. *Reglazing or replacement of the putty requires that the existing putty be removed manually, the glazing points be extracted, the glass removed, and the back putty scraped out. To reglaze, a bed of putty is laid around the perimeter of the rabbet, the pane is pressed into place, glazing points are inserted to hold the pane (shown), and a final seal of putty is beveled around the edge of the glass. Photo: John H. Myers*

Figure 4e. *A common repair is the replacement of broken sash cords with new cords (shown) or with chains. The weight pocket is often accessible through a removable plate in the jamb, or by removing the interior trim. Photo: John H. Myers*

Figure 4f. *Following the relatively simple repairs, the window is weathertight, like new in appearance, and serviceable for many years to come. Both the historic material and the detailing and craftsmanship of this original window have been preserved. Photo: John H. Myers*

overlay of aluminum foil on gypsum board or asbestos can protect the glass from such rapid temperature change. It is important to protect the glass because it may be historic and often adds character to the window. Deteriorated putty should be removed manually, taking care not to damage the wood along the rabbet. If the glass is to be removed, the glazing points which hold the glass in place can be extracted and the panes numbered and removed for cleaning and reuse in the same openings. With the glass panes out, the remaining putty can be removed and the sash can be sanded, patched, and primed with a preservative primer. Hardened putty in the rabbets may be softened by heating with a soldering iron at the point of removal. Putty remaining on the glass may be softened by soaking the panes in linseed oil, and then removed with less risk of breaking the glass. Before reinstalling the glass, a bead of glazing compound or linseed oil putty should be laid around the rabbet to cushion and seal the glass. Glazing compound should only be used on wood which has been brushed with linseed oil and primed with an oil based primer or paint. The pane is then pressed into place and the glazing points are pushed into the wood around the perimeter of the pane (see figure 4d). The final glazing compound or putty is applied and beveled to complete the seal. The sash can be refinished as desired on the inside and painted on the outside as soon as a "skin" has formed on the putty, usually in 2 or 3 days. Exterior paint should cover the beveled glazing compound or putty and lap over onto the glass slightly to complete a weathertight seal. After the proper curing times have elapsed for paint and putty, the sash will be ready for reinstallation.

While the sash are out of the frame, the condition of the wood in the jamb and sill can be evaluated. Repair and refinishing of the frame may proceed concurrently with repairs to the sash, taking advantage of the curing times for the paints and putty used on the sash. One of the most common work items is the replacement of the sash cords with new rope cords or with chains (see figure 4e). The weight pocket is frequently accessible through a door on the face of the frame near the sill, but if no door exists, the trim on the interior face may be removed for access. Sash weights may be increased for easier window operation by elderly or handicapped persons. Additional repairs to the frame and sash may include consolidation or replacement of deteriorated wood. Techniques for these repairs are discussed in the following sections.

The operations just discussed summarize the efforts necessary to restore a window with minor deterioration to "like new" condition (see figure 4f). The techniques can be applied by an unskilled person with minimal training and experience. To demonstrate the practicality of this approach, and photograph it, a Technical Preservation Services staff member repaired a wooden double-hung, two over two window which had been in service over ninety years. The wood was structurally sound but the window had one broken pane, many layers of paint, broken sash cords and inadequate, worn-out weatherstripping. The staff member found that the frame could be stripped of paint and the sash removed quite easily. Paint, putty and glass removal required about one hour for each sash, and the reglazing of both sash was accomplished in about one hour. Weatherstripping of the sash and frame, replacement of the sash cords and reinstallation of the sash, parting bead, and stop required an hour and a half. These times refer only to individual operations; the entire process took several days due to the drying and curing times for putty, primer, and paint, however, work on other window units could have been in progress during these lag times.

Repair Class II: Stabilization

The preceding description of a window repair job focused on a unit which was operationally sound. Many windows will show some additional degree of physical deterioration, especially in the vulnerable areas mentioned earlier, but even badly damaged windows can be repaired using simple processes. Partially decayed wood can be waterproofed, patched, built-up, or consolidated and then painted to achieve a sound condition, good appearance, and greatly extended life. Three techniques for repairing partially decayed or weathered wood are discussed in this section, and all three can be accomplished using products available at most hardware stores.

One established technique for repairing wood which is split, checked or shows signs of rot, is to: 1) dry the wood, 2) treat decayed areas with a fungicide, 3) waterproof with two or three applications of boiled linseed oil (applications every 24 hours), 4) fill cracks and holes with putty, and 5) after a "skin" forms on the putty, paint the surface. Care should be taken with the use of fungicide which is toxic. Follow the manufacturers' directions and use only on areas which will be painted. When using any technique of building up or patching a flat surface, the finished surface should be sloped slightly to carry water away from the window and not allow it to puddle. Caulking of the joints between the sill and the jamb will help reduce further water penetration.

When sills or other members exhibit surface weathering they may also be built-up using wood putties or homemade mixtures such as sawdust and resorcinol glue, or whiting and varnish. These mixtures can be built up in successive layers, then sanded, primed, and painted. The same caution about proper slope for flat surfaces applies to this technique.

Wood may also be strengthened and stabilized by consolidation, using semi-rigid epoxies which saturate the porous decayed wood and then harden. The surface of the consolidated wood can then be filled with a semi-rigid epoxy patching compound, sanded and painted (see figure 5). Epoxy patching compounds can be used to build up

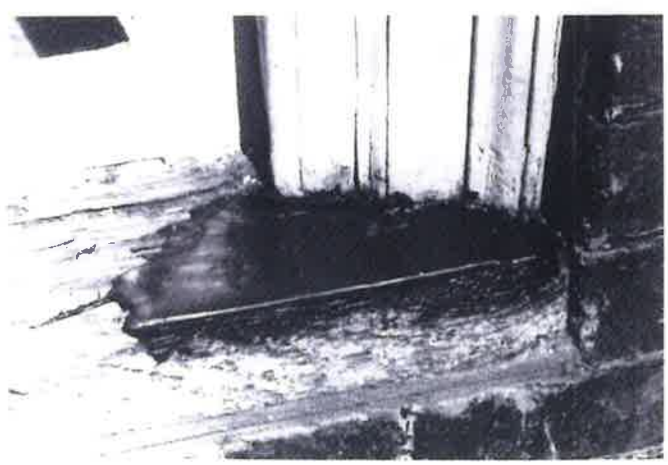

Figure 5. *This illustrates a two-part epoxy patching compound used to fill the surface of a weathered sill and rebuild the missing edge. When the epoxy cures, it can be sanded smooth and painted to achieve a durable and waterproof repair. Photo: John H. Myers*

missing sections or decayed ends of members. Profiles can be duplicated using hand molds, which are created by pressing a ball of patching compound over a sound section of the profile which has been rubbed with butcher's wax. This can be a very efficient technique where there are many typical repairs to be done. Technical Preservation Services has published *Epoxies for Wood Repairs in Historic Buildings* (see Additional Reading section at end), which discusses the theory and techniques of epoxy repairs. The process has been widely used and proven in marine applications; and proprietary products are available at hardware and marine supply stores. Although epoxy materials may be comparatively expensive, they hold the promise of being among the most durable and long lasting materials available for wood repair.

Any of the three techniques discussed can stabilize and restore the appearance of the window unit. There are times, however, when the degree of deterioration is so advanced that stabilization is impractical, and the only way to retain some of the original fabric is to replace damaged parts.

Repair Class III: Splices and Parts Replacement

When parts of the frame or sash are so badly deteriorated that they cannot be stabilized there are methods which permit the retention of some of the existing or original fabric. These methods involve replacing the deteriorated parts with new matching pieces, or splicing new wood into existing members. The techniques require more skill and are more expensive than any of the previously discussed alternatives. It is necessary to remove the sash and/or the affected parts of the frame and have a carpenter or woodworking mill reproduce the damaged or missing parts. Most millwork firms can duplicate parts, such as muntins, bottom rails, or sills, which can then be incorporated into the existing window, but it may be necessary to shop around because there are several factors controlling the practicality of this approach. Some woodworking mills do not like to repair old sash because nails or other foreign objects in the sash can damage expensive knives (which cost far more than their profits on small repair jobs); others do not have cutting knives to duplicate muntin profiles. Some firms prefer to concentrate on larger jobs with more profit potential, and some may not have a craftsman who can duplicate the parts. A little searching should locate a firm which will do the job, and at a reasonable price. If such a firm does not exist locally, there are firms which undertake this kind of repair and ship nationwide. It is possible, however, for the advanced do-it-yourselfer or craftsman with a table saw to duplicate moulding profiles using techniques discussed by Gordie Whittington in "Simplified Methods for Reproducing Wood Mouldings," *Bulletin* of the Association for Preservation Technology, Vol. III, No. 4, 1971, or illustrated more recently in *The Old House*, Time-Life Books, Alexandria, Virginia, 1979.

The repairs discussed in this section involve window frames which may be in very deteriorated condition, possibly requiring removal; therefore, caution is in order. The actual construction of wooden window frames and sash is not complicated. Pegged mortise and tenon units can be disassembled easily, *if* the units are out of the building. The installation or connection of some frames to the surrounding structure, especially masonry walls, can complicate the work immeasurably, and may even require dismantling of the wall. It may be useful, therefore, to take the following approach to frame repair: 1) conduct regular maintenance of sound frames to achieve the longest life possible, 2) make necessary repairs in place wherever possible, using stabilization and splicing techniques, and 3) if removal is necessary, thoroughly investigate the structural detailing and seek appropriate professional consultation.

Another alternative may be considered if parts replacement is required, and that is sash replacement. If extensive replacement of parts is necessary and the job becomes prohibitively expensive it may be more practical to purchase new sash which can be installed into the existing frames. Such sash are available as exact custom reproductions, reasonable facsimiles (custom windows with similar profiles), and contemporary wooden sash which are similar in appearance. There are companies which still manufacture high quality wooden sash which would duplicate most historic sash. A few calls to local building suppliers may provide a source of appropriate replacement sash, but if not, check with local historical associations, the state historic preservation office, or preservation related magazines and supply catalogs for information.

If a rehabilitation project has a large number of windows such as a commercial building or an industrial complex, there may be less of a problem arriving at a solution. Once the evaluation of the windows is completed and the scope of the work is known, there may be a potential economy of scale. Woodworking mills may be interested in the work from a large project; new sash in volume may be considerably less expensive per unit; crews can be assembled and trained on site to perform all of the window repairs; and a few extensive repairs can be absorbed (without undue burden) into the total budget for a large number of sound windows. While it may be expensive for the average historic home owner to pay seventy dollars or more for a mill to grind a custom knife to duplicate four or five bad muntins, that cost becomes negligible on large commercial projects which may have several hundred windows.

Most windows should not require the extensive repairs discussed in this section. The ones which do are usually in buildings which have been abandoned for long periods or have totally lacked maintenance for years. It is necessary to thoroughly investigate the alternatives for windows which do require extensive repairs to arrive at a solution which retains historic significance and is also economically feasible. Even for projects requiring repairs identified in this section, if the percentage of parts replacement per window is low, or the number of windows requiring repair is small, repair can still be a cost effective solution.

Weatherization

A window which is repaired should be made as energy efficient as possible by the use of appropriate weatherstripping to reduce air infiltration. A wide variety of products are available to assist in this task. Felt may be fastened to the top, bottom, and meeting rails, but may have the disadvantage of absorbing and holding moisture, particularly at the bottom rail. Rolled vinyl strips may also be tacked into place in appropriate locations to reduce infiltration. Metal strips or new plastic spring strips may be used on the rails and, if space permits, in the channels between the sash and jamb. Weatherstripping is a historic treatment, but old weatherstripping (felt) is not likely to perform very satisfactorily. Appropriate contemporary weatherstripping should be considered an integral part of the repair process for windows. The use of sash locks installed on the meeting rail will insure that the sash are kept tightly closed so that the weatherstripping will function more effectively to reduce infiltration. Although such locks will not always be historically accurate, they will usually be viewed as an acceptable contemporary modification in the interest of improved thermal performance.

Many styles of storm windows are available to improve the thermal performance of existing windows. The use of exterior storm windows should be investigated whenever feasible because they are thermally efficient, cost-effective, reversible, and allow the retention of original windows (see "Preservation Briefs: 3"). Storm window frames may be made of wood, aluminum, vinyl, or plastic; however, the use of unfinished aluminum storms should be avoided. The visual impact of storms may be minimized by selecting colors which match existing trim color. Arched top storms are available for windows with special shapes. Although interior storm windows appear to offer an attractive option for achieving double glazing with minimal visual impact, the potential for damaging condensation problems must be addressed. Moisture which becomes trapped between the layers of glazing can condense on the colder, outer prime window, potentially leading to deterioration. The correct approach to using interior storms is to create a seal on the interior storm while allowing some ventilation around the prime window. In actual practice, the creation of such a durable, airtight seal is difficult.

Window Replacement

Although the retention of original or existing windows is always desirable and this Brief is intended to encourage that goal, there is a point when the condition of a window may clearly indicate replacement. The decision process for selecting replacement windows should *not* begin with a survey of contemporary window products which are available as replacements, but should begin with a look at the windows which are being replaced. Attempt to understand the contribution of the window(s) to the appearance of the facade including: 1) the pattern of the openings and their size; 2) proportions of the frame and sash; 3) configuration of window panes; 4) muntin profiles; 5) type of wood; 6) paint color; 7) characteristics of the glass; and 8) associated details such as arched tops, hoods, or other decorative elements. Develop an understanding of how the window reflects the period, style, or regional characteristics of the building, or represents technological development.

Armed with an awareness of the significance of the existing window, begin to search for a replacement which retains as much of the character of the historic window as possible. There are many sources of suitable new windows. Continue looking until an acceptable replacement can be found. Check building supply firms, local woodworking mills, carpenters, preservation oriented magazines, or catalogs or suppliers of old building materials, for product information. Local historical associations and state historic preservation offices may be good sources of information on products which have been used successfully in preservation projects.

Consider energy efficiency as one of the factors for replacements, but do not let it dominate the issue. Energy conservation is no excuse for the wholesale destruction of historic windows which can be made thermally efficient by historically and aesthetically acceptable means. In fact, a historic wooden window with a high quality storm window added should thermally outperform a new double-glazed metal window which does not have thermal breaks (insulation between the inner and outer frames intended to break the path of heat flow). This occurs because the wood has far better insulating value than the metal, and in addition many historic windows have high ratios of wood to glass, thus reducing the area of highest heat transfer. One measure of heat transfer is the U-value, the number of Btu's per hour transferred through a square foot of material. When comparing thermal performance, the lower the U-value the better the performance. According to *ASHRAE 1977 Fundamentals*, the U-values for single glazed wooden windows range from 0.88 to 0.99. The addition of a storm window should reduce these figures to a range of 0.44 to 0.49. A non-thermal break, double-glazed metal window has a U-value of about 0.6.

Conclusion

Technical Preservation Services recommends the retention and repair of original windows whenever possible. We believe that the repair and weatherization of existing wooden windows is more practical than most people realize, and that many windows are unfortunately replaced because of a lack of awareness of techniques for evaluation, repair, and weatherization. Wooden windows which are repaired and properly maintained will have greatly extended service lives while contributing to the historic character of the building. Thus, an important element of a building's significance will have been preserved for the future.

Additional Reading

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1981

CITY OF FERNANDINA BEACH
Code Enforcement Department

Michelle D. Forstrom
Code Enforcement Manager

CODE ENFORCEMENT & APPEALS BOARD
NOTICE OF VIOLATION/NOTICE OF HEARING

March 21, 2018

Case Number: 18-00044

Cert. #:7012 1640 0001 5937 9623

IN THE MATTER OF:

Front Street Property LLC
2970 New Paces Ferry Road
Atlanta, GA 30339

PREMISES: 101 North 2nd Street, Fernandina Beach, FL 32034

The brief legal description of the real property upon which this violation occurred is: **BLOCK 2 LOTS 1 THRU 34 PT OR 1916/391 CITY OF FDNA BEACH, Fernandina Beach, FL 32034.**

The Code Enforcement office of the City of Fernandina Beach has previously notified you of alleged violation(s) of the City of Fernandina Beach Code of Ordinances and contends that the following violation(s) exist: **42-116 (a & b) Cleaning of lots; Maintenance of Structures; and 8.03.07 Demolition by Neglect** of the City of Fernandina Beach Land Development Code (These can be found on the City's website: www.fbfl.us/code). This letter specifically addresses the overgrown grounds, and the disrepair of the structure, which includes: graffiti; failing paint; missing window sashes; broken window panes; deterioration of window frames; biological growth on the walls; vegetation against the building and in paved areas; missing downspouts (which is shedding water directly onto masonry walls/foundation); damaged scuppers; and roof failure.

Therefore, you are hereby directed to remedy and discontinue the problems by: cutting the grounds; repairing the structure by removing the graffiti; painting the structure; replace the missing window sashes, the window panes, and window frames; remove the biological growth on the walls; remove the vegetation against the building and in the paved areas; replace the missing downspouts and damage scuppers; and replace the roof (please be sure to apply for a certificate of approval from the Historic District Council, and apply for all required building permits), by April 20th, 2017 thirty (30) days from the date of this notice, and if this office is not notified of compliance by you, this department will refer this matter to the Code Enforcement & Appeals Board for legal action at the date and time listed below.

DATE: May 2, 2018
TIME: 5:30 p.m.
LOCATION: City Commission Chambers, 204 Ash Street
Fernandina Beach, Florida 32034

YOU HAVE THE RIGHT to appear before the Board at that time to answer and defend the allegations that you have violated the above cited provision(s) of the Code of Ordinances.

If the Board finds that you are in violation, they will consider all appropriate actions required to bring the property into compliance, which may include, but is not limited to demolition; the recovery of fees, and fines which may be imposed for the duration of the non-compliance (NOT TO EXCEED $250.00 per day, per violation).

Please be advised that the Rules of the Code Enforcement & Appeals Board and the Code of Ordinances of the City of Fernandina Beach govern the procedures of the Board.

PLEASE GOVERN YOUR SELF ACCORDINGLY.

If you have any questions, please feel free to contact me (please see my attached business card for contact information).

MDForstrom

Michelle D. Forstrom
Code Enforcement Manager

Hearing impaired or non-English speaking individuals may request a language or sign interpreter at least (10) ten working days prior to this hearing. Please contact the City Clerk's office at (904) 310-3115.

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FERNANDINA BCH FL MAR 21 2018 USPS 32034

101 N 2nd St.

Sent To FRONT STREET PROPERTY LLC
Street, Apt. No., or PO Box No. 2970 NEW PACES FERRY ROAD
City, State, ZIP+4 ATLANTA, GA 30339

PS Form ... Instructions

7012 1640 0001 5937 9623

SENDER: *COMPLETE THIS SECTION*

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- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

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2970 NEW PACES FERRY ROAD
ATLANTA, GA 30339

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2. Article Number *(Transfer from service label)*
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COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☒ Addressee

B. Received by *(Printed Name)*

C. Date of Delivery
3-26-18

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

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- ☐ Registered Mail™
- ☐ Registered Mail Restricted Delivery
- ☐ Return Receipt for Merchandise
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

PS Form 3811, July 2015 PSN 7530-02-000-9053 Domestic Return Receipt

Preservation & Restoration of the Standard Marine Building
Amounts spent to date

Engineering Evaluation

Construction Solutions, Inc. 12/12/16	$ 2,500

Interior cleanup, restoration, roof repair & Securing the building

Chism Development Company	$ 4,531
Starfish Design	$ 1,415
Starfish Design	$ 1,300
Chism Development Co.	$ 250
Bruce Porter (interior cleanup)	$10,260
Cliff Brock (exterior securing & cleanup)	$ 3,229
Advance Disposal (4 dumpsters)	$ 1,425

Fencing & ground maintenance

Armstrong Fence	$ 610
Armstrong Fence	$ 610
Cliff Brock	$ 1,826
Grass & Grass (mowing 6 invoices)	$ 1,000
Shawn Deluca (bush hogging)	$ 200
Total (work)	$29,156

Management & Supervision (of the above 7/16-7/17) — $12,000

Total including management & supervision **$41,156**

CONSTRUCTION SOLUTIONS, INC
ENGINEERING • TESTING • PROJECT MANAGEMENT
www.constructionsolutions.cc

December 12, 2016

Mr. Anthony S. Quattrochi, Broker Manager
JDM Real Estate Services, LLC
1866 Carnation Street
Fernandina Beach, Florida 32034

via electronic mail: tquattrochi@comcast.net

Engineering Evaluation Report
Standard Marine Building
101 North 2nd Street
Fernandina Beach, Florida 32034

Construction Solutions, Inc. ("CSI") was recently requested to provide an opinion of the condition of one of the existing buildings at the address noted above. There are three buildings on the site; a two-story building, a one-story block building, and a one-story metal framed building. This report only covers the two-story building. The following is a summary of our findings as well as our recommendations.

Observations:

Jeff Sellers and Al Henderson, of CSI, visited the site on December 7, 2016 to collect information about the building and observe the present conditions. The building in question was constructed about 1882. The exterior walls are brick with direct applied stucco on the outside. The roof and second floor are constructed using wood framing. It currently has a concrete slab on the first floor, but most likely had a wood framed floor originally.

There is a row of columns with beams running down the center of the building supporting the second floor framing. The roof framing spans completely across the building. It is our understanding that the second floor and roof framing will be removed and replaced, so we will not comment on the existing framing.

The exterior wall is a triple wythe solid brick wall that is approximately 13 inches thick. No excavations were performed around the perimeter of the building, but it is normal to find a brick foundation at least twice as wide as the width of the wall in a building of this age.

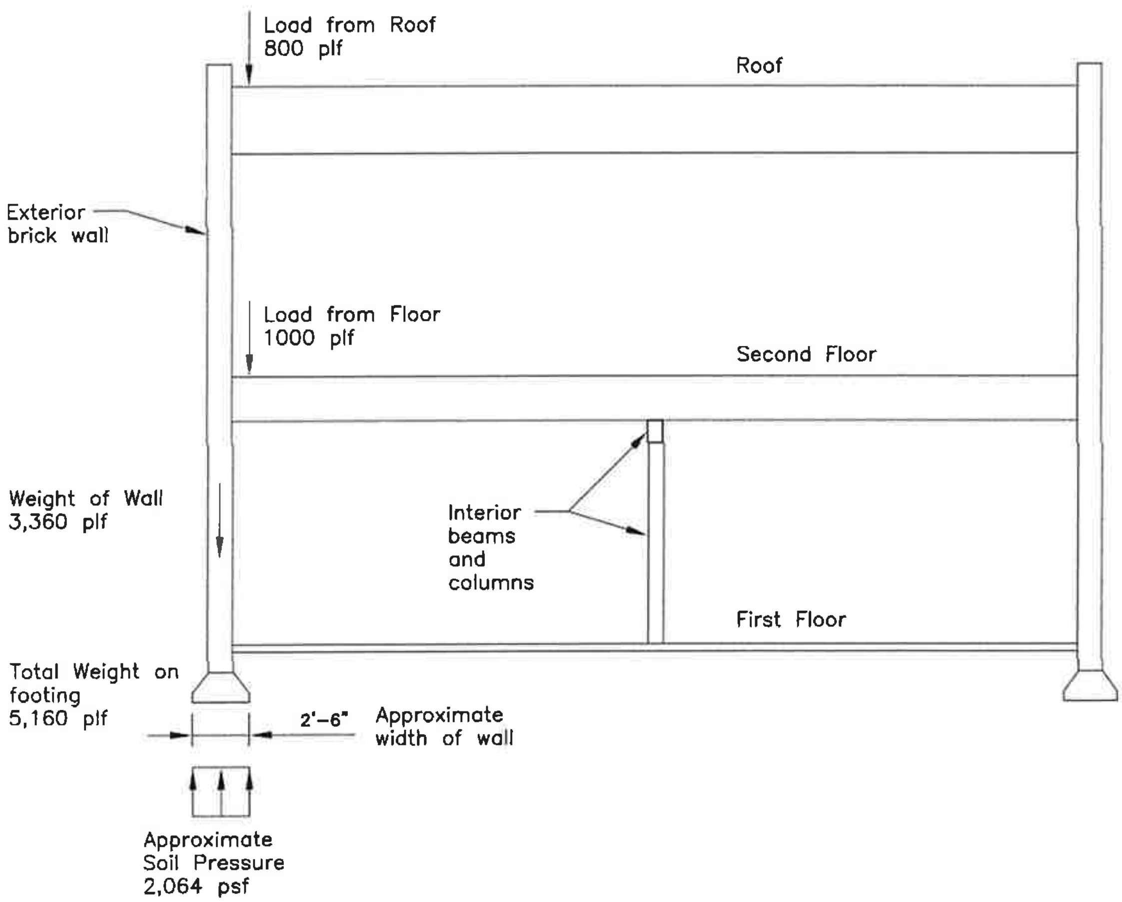
The outside of the exterior walls is visible on all sides. Some cracking was noted in the exterior stucco. This cracking likely goes through into the brick. Some of the brick was visible on the interior. Erosion of the mortar between the bricks was evident at some locations on the interior walls in these exposed areas.

Findings:

Calculations were performed to determine the loads on the walls and foundations. We used the following parameters.

We considered:

- 20 psf dead load (DL) for the roof and floor each
- 20 psf live load (LL) on the roof
- 80 psf live load (LL) on the floor
- The exterior wall will weigh approximately 120 psf



From the results, one can see that just the weight of the wall greatly exceeds the floor and roof loads.

No digging was performed around the existing footings, but we can assume that it is approximately 2'-6" wide. Considering this, the soil pressure under the footing is: 5,160 plf / 2.5 ft = 2,064 pounds per square foot. This soil pressure of approximately 2000 pounds per square foot bearing pressure is reasonable for this area and the type of building construction.

A preliminary geotechnical investigation was performed on this site by Universal Engineering Sciences of Jacksonville, Florida. Their report is dated February 22, 2006. Boring B-6 is directly adjacent to the west wall of the two-story building. In the boring, dense sand is found down to a depth of approximately 12 feet below the grade, underlain with soft clay. While no specifics were given for allowable soil pressures, the report did indicate that some areas of the site could support lightly loaded structures on shallow foundations. Boring B-6 is included in this suggestion. The underlying soft clay can be the reason that the building has experienced some settling over the years.

Conclusions:

- The existing walls appear to be performing adequately for their age. They have supported loads for many years and will continue to do so as long as there are no catastrophic events and as long as the loads do not change perceptibly.
- Some cracking is visible in the exterior walls. These cracks can be injected with epoxy to help with the strength of the wall and for weather tightness.
- Soft mortar and/or loss of mortar between the bricks was noted on the interior of the building. This can be remedied by digging out the soft mortar and replacing it with new mortar.

Recommendations:

We recommend that when the floor and roof get rebuilt, the same configuration as exists be used for the new framing. In other words, the second-floor framing should be broken into two equal halves with beams and columns running down the center of the building. We do not recommend spanning the floor all the way across and connecting to the exterior walls. The load would be too much for the old brick and connections would be very hard to make. We also recommend that the building continue to be used in as a similar purpose with the same types of floor loads noted previously.

Should the owner want more open space near the center of the floor plan, or want to support special or extra heavy loads on the second floor we recommend that new framing be designed to support these loads while keeping the reactions from this new framing approximately the same or less than the existing loads on the existing walls. Any new columns added need to be far enough inside the existing walls so that the new footings do not interfere with the existing wall footings or exert soil bearing pressure on the existing footings.

We appreciate the opportunity to provide our professional services. If you have any questions concerning this report, please do not hesitate to contact us.

Sincerely,

Richard M. Renstrom, PE
Florida P. E. 37061
Construction Solutions, Inc.

Preservation & Restoration of the Standard Marine Building
Amounts spent to date

Engineering Evaluation

Construction Solutions, Inc. 12/12/16	$ 2,500

Interior cleanup, restoration, roof repair & Securing the building

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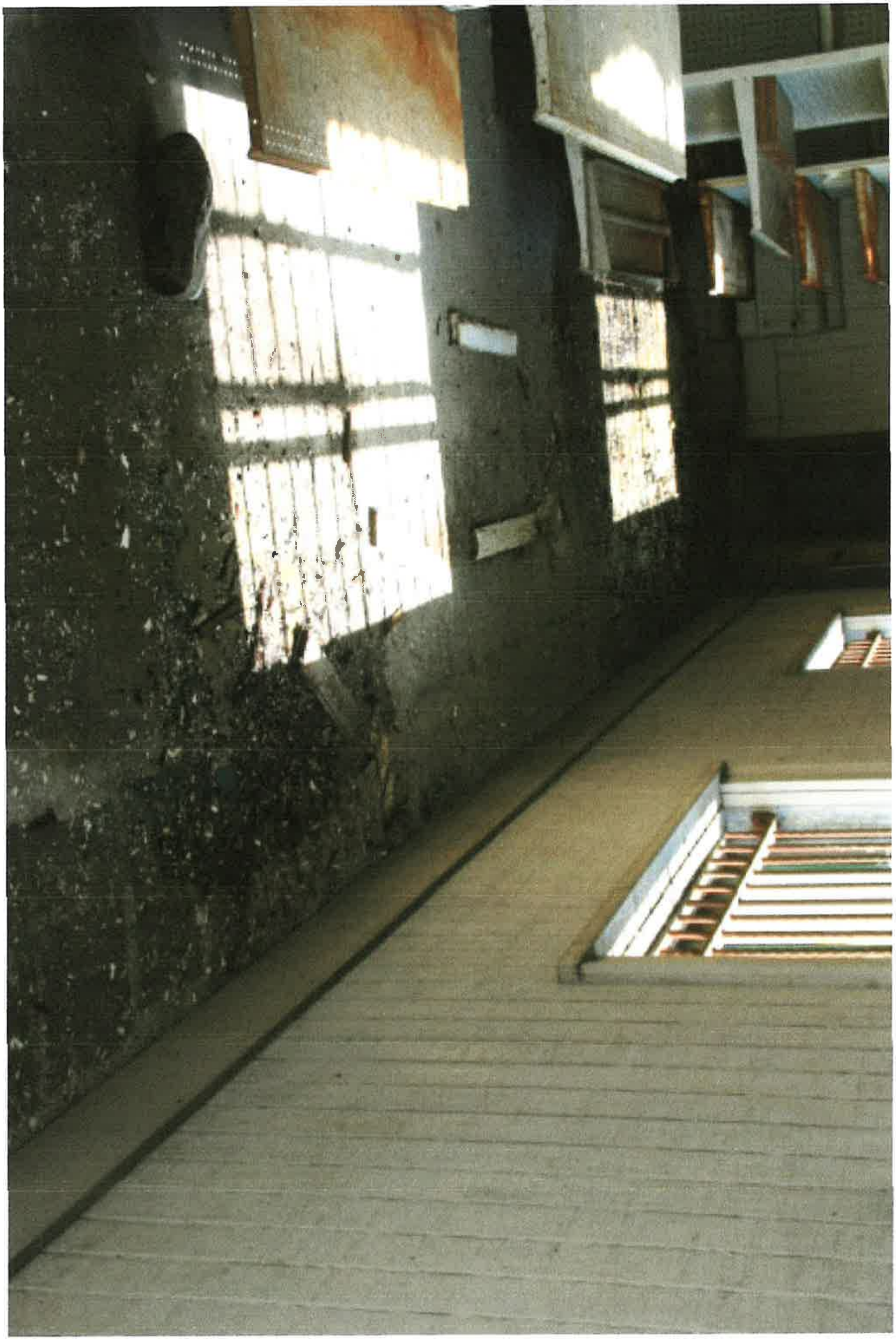
Total (work)	$29,156

Management & Supervision (of the above 7/16-7/17)	$12,000
Total including management & supervision	**$41,156**

Before Cleanup


Stan Mar
MARINE SUPPLIES
ENTRANCE



Tony Quattrochi

To: Richard (Dick) Goodsell

Dry as a bone!!

February 6, 2017 at 2:33 PM

Inbox - Gmail

TQ

After Cleanup

From: **Tquattrochi** tquattrochi@comcast.net
Subject: Dry as a bone!!
Date: February 6, 2017 at 2:33 PM
To: Goodsell Dick dickgoodsell5@gmail.com

CONSTRUCTION SOLUTIONS, INC
ENGINEERING • TESTING • PROJECT MANAGEMENT
www.constructionsolutions.cc

April 18, 2018

Mr. Richard Goodsell
2970 New Paces Ferry Road
Atlanta, Georgia 30339

via electronic mail: dickgoodsell5@gmail.com

Engineering Evaluation Report
Standard Marine Building
101 North 2nd Street
Fernandina Beach, Florida 32034

Construction Solutions, Inc. ("CSI") was recently requested to provide a follow up report with our opinion of the current condition of one of the existing buildings at the address noted above. Our original report is from December of 2016 and that report concerns this same building.

There are three buildings on the site; a two-story building, a one-story block building, and a one-story metal framed building. This report only covers the two-story building. The following is a summary of our findings as well as our recommendations.

Observations:

Myself and Nathan Cutajar, of CSI, visited the site on April 18, 2018 to observe the present conditions. The building in question was constructed about 1882 and has plan dimensions of approximately 100' by 40'.

The exterior walls are solid brick approximately 13" thick, with direct applied stucco on the outside. The roof and second floor are constructed using wood framing. It currently has a concrete slab on the first floor, but most likely it originally had a wood framed floor. There is a row of columns with beams running down the center of the building supporting the second floor framing. The roof framing spans completely across the building.

The cracking seen in the exterior stucco during our previous visit does not appear to have gotten worse since our last visit to the site.

Several places were visible where the roofing has failed and water has leaked through the roof and floor framing down to the first floor. At the locations of water intrusion, the water has caused the deck and ceiling members to become decayed, but none of the floor or roof joists have fallen into the space.

A few spots on the first floor had missing ceiling boards that allowed us to see the floor joists. There were extremely rotted floor joists visible in these few locations. Because of the damage visible from the first floor, we did not walk around on the second floor. However, we would expect to see rotted joists in select locations on the roof framing also.

Currently, the floor and roof joists have not rotted to the point of falling. We did not see any joists that had come completely loose from the brick wall and fallen or sagged.

Building Stability:

A building relies on the combined effect of walls, floors and roofs, vertical and horizontal elements, to be stable. These elements need to remain connected to each other to provide a stable building. If you lose the connections between elements, the building becomes unstable.

In buildings of this era, the floor and roof joists were often built into the brick walls as the building was being constructed. The joists being placed tightly into these pockets in the brick formed the connection between the brick and joist. Since most of the joists are still intact, this connection between wall and floor is still mostly intact.

Conclusions:

The building did survive Hurricane Irma last year which indicates more than any observations or calculations can tell us, that the overall building is still fairly solid. Currently, we feel that the building is stable and not on the verge of collapse. Although, with the holes in the roof and the constant wetting of the wood members, it is unknown how long the floor or roof framing will remain intact. Loss of a large section of either the floor or the roof framing could allow the building to become unstable if left unattended. We recommend that the owner continue to monitor this condition to ensure the building does not become unstable.

Recommendations:

While the building is in need of repair and/or renovation, is still in a fairly solid structural condition and there is no immediate risk of collapse. We recommend that the owner formulate a long term plan to preserve this historic building. We would not recommend walking on the second floor or the roof without first shoring up the framing.

We suggest that the repairs and renovations of the exterior of the building be incorporated into the long-term plans for the building. At present, we have not noted any deterioration in the exterior walls of the building since our last site visit in December of 2016, which, considering an intervening Hurricane, indicates that the exterior walls remain structurally sound.

We appreciate the opportunity to provide our professional services. If you have any questions concerning this report, please do not hesitate to contact us.

Sincerely,

Richard M Renstrom
4-18-18

RICHARD MICHAEL RENSTROM
LICENSE
No. 37061
★ STATE OF ★
FLORIDA
PROFESSIONAL ENGINEER

Richard M. Renstrom, PE
Florida P. E. 37061
Construction Solutions, Inc.

Photo 1 – Southeast corner of building.

Photo 2 – First floor showing ceiling damage and where water has pooled.

Photo 3 – Wood beam above first floor still in good condition.

Photo 4 – Wider view of first floor with ceiling damage.

Photo 5 – Second floor damage due to water intrusion.

Photo 6 – Wider view of second floor.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4 26.2018 07:27


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4.26.2018 07:26


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STAFF REPORT
Case 18-00037
City of Fernandina Beach Code Enforcement & Appeals Board
May 2, 2018

Violation Information

Owner	Walter L Champion Estate, 221 South 5th Street, Fernandina Beach, FL 32034
Violation	City of Fernandina Beach Code of Ordinances, Section 22-26 (12), Adoption of codes by reference, International Maintenance Code 2012 edition, Chapter 5, Section 505 Water System; and 506 Sanitary Drainage System.
Location:	221 South 5th Street, Fernandina Beach FL 32034

Summary and Background Information

April 6, 2018, Dennis Champion vacated the property.

The locks have been changed, the yard has been cleaned up and cut.

Conclusion

This property is in compliance.

Recommendation

Staff recommends that the respondent pay administrative fees incurred.

Submitted by:

Michelle D. Forstrom
Code Enforcement Manager

STAFF REPORT
Case 18-00037
City of Fernandina Beach Code Enforcement & Appeals Board
April 5, 2018

Violation Information

Owner	Walter L Champion Estate, 221 South 5th Street, Fernandina Beach, FL 32034
Violation	City of Fernandina Beach Code of Ordinances, Section 22-26 (12), Adoption of codes by reference, International Maintenance Code 2012 edition, Chapter 5, Section 505 Water System; and 506 Sanitary Drainage System.
Location:	221 South 5th Street, Fernandina Beach FL 32034

Summary and Background Information

January 23, 2018, I received a complaint that Dennis Champion was living at this address without running water. I talked to Susan McCarthy, the executor of the estate. She confirmed that Dennis was living there and that the water was not turned on, because Dennis had ran up the bill so much that they had to have it turned off. I told her that it had to be turned on by the end of the next day, for him to live there.

January 26, 2018, I checked Utilities Billing, water had not been turned on.

February 5, 2018, I stopped by and talked to Dennis. He told me that he had been in & out of the hospital and was not living there. He said that he was only there during the day and stayed in the county, off the island at night. I told him that he needed to get the yard cleaned up and cut. He said that he would.

February 15, 2018, I ran into Dennis at the Fernandina Beach Police Station. I asked him when he was going to clean up the yard, and asked him again if he was living at the house. He told me that he wasn't living at the house and that he would get his friends to help him with the yard.

February 26, 2017, After receiving an email from the City Manager requesting the status of the case. Officer Wells went by the property and talked to Dennis. Nothing had changed in the yard. Dennis told Officer Wells that the water had been turned on and that he hardly ever stayed there, just every once in a while. I checked the Utilities Billing again, the water had still not been turned on.

February 27, 2017, I sent the Notice of Violation/Notice of Hearing certified to the property, which came back "NOT DELIVERABLE AS ADDRESSED", and hand delivered the letter to Susan McCarthy and Margie Hatton.

February 26, 2017, Susan McCarthy and Captain Bishop of FBPD served Dennis an eviction notice to vacate the premises by March 21, 2018.

March 21, 2018, I called to Susan McCarthy and asked if Dennis had vacated the property. She told me that he had not, that he had until the end of the day. She told me that if he did not vacate by the end of the day, that she would have go back to the judge. She would have to fill out some more paperwork to get him escorted off the property if he was still there after the allotted time given by the judge. I asked her to keep me updated, but I haven't heard back from her.

March 27, 2018, I drove by the house and Dennis was sitting on the porch.

Conclusion

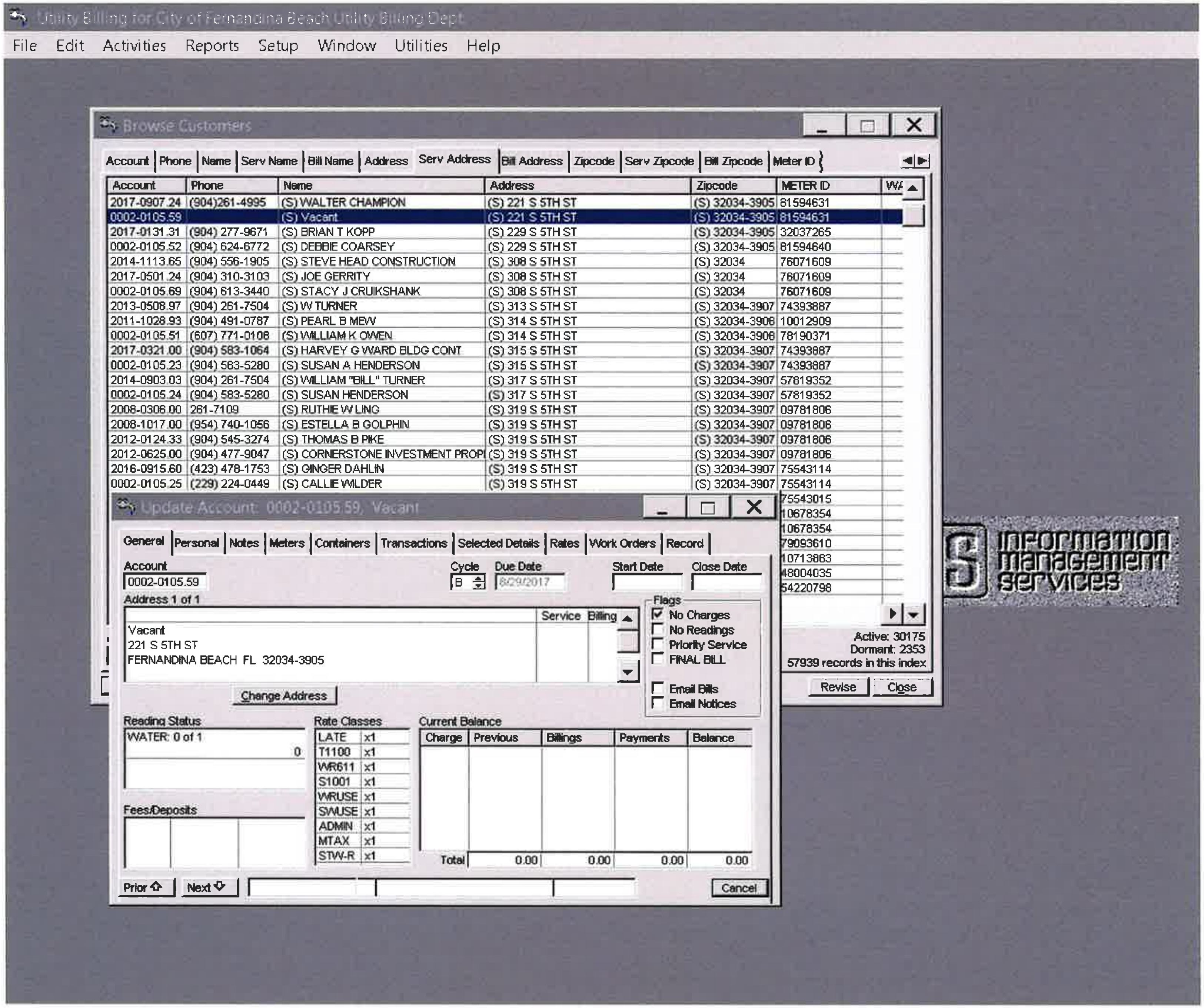
This property is still in violation.

Recommendation

Staff recommends assessing a $100.00 fine per day, and administrative fees incurred until compliance is achieved by either vacating the property or turning on the water.

Submitted by:

Michelle D. Forstrom
Code Enforcement Manager


Utility Billing for City of Fernandina Beach Utility Billing Dept
File Edit Activities Reports Setup Window Utilities Help
Browse Customers
Account Phone Name Serv Name Bill Name Address Serv Address Bill Address Zipcode Serv Zipcode Bill Zipcode Meter ID
Account Phone Name Address Zipcode METER ID
2017-0907.24 (904)261-4995 (S) WALTER CHAMPION (S) 221 S 5TH ST (S) 32034-3905 81594631
0002-0105.59 (S) Vacant (S) 221 S 5TH ST (S) 32034-3905 81594631
2017-0131.31 (904) 277-9671 (S) BRIAN T KOPP (S) 229 S 5TH ST (S) 32034-3905 32037265
0002-0105.52 (904) 624-6772 (S) DEBBIE COARSEY (S) 229 S 5TH ST (S) 32034-3905 81594640
2014-1113.65 (904) 556-1905 (S) STEVE HEAD CONSTRUCTION (S) 308 S 5TH ST (S) 32034 76071609
2017-0501.24 (904) 310-3103 (S) JOE GERRITY (S) 308 S 5TH ST (S) 32034 76071609
0002-0105.69 (904) 613-3440 (S) STACY J CRUIKSHANK (S) 308 S 5TH ST (S) 32034 76071609
2013-0508.97 (904) 261-7504 (S) W TURNER (S) 313 S 5TH ST (S) 32034-3907 74393887
2011-1028.93 (904) 491-0787 (S) PEARL B MEW (S) 314 S 5TH ST (S) 32034-3906 10012909
0002-0105.51 (607) 771-0106 (S) WILLIAM K OWEN (S) 314 S 5TH ST (S) 32034-3906 78190371
2017-0321.00 (904) 583-1064 (S) HARVEY G WARD BLDG CONT (S) 315 S 5TH ST (S) 32034-3907 74393887
0002-0105.23 (904) 583-5280 (S) SUSAN A HENDERSON (S) 315 S 5TH ST (S) 32034-3907 74393887
2014-0903.03 (904) 261-7504 (S) WILLIAM "BILL" TURNER (S) 317 S 5TH ST (S) 32034-3907 57819352
0002-0105.24 (904) 583-5280 (S) SUSAN HENDERSON (S) 317 S 5TH ST (S) 32034-3907 57819352
2008-0306.00 261-7109 (S) RUTHIE W LING (S) 319 S 5TH ST (S) 32034-3907 09781806
2008-1017.00 (954) 740-1056 (S) ESTELLA B GOLPHIN (S) 319 S 5TH ST (S) 32034-3907 09781806
2012-0124.33 (904) 545-3274 (S) THOMAS B PIKE (S) 319 S 5TH ST (S) 32034-3907 09781806
2012-0625.00 (904) 477-9047 (S) CORNERSTONE INVESTMENT PROP (S) 319 S 5TH ST (S) 32034-3907 09781806
2016-0915.60 (423) 478-1753 (S) GINGER DAHLIN (S) 319 S 5TH ST (S) 32034-3907 75543114
0002-0105.25 (229) 224-0449 (S) CALLIE WILDER (S) 319 S 5TH ST (S) 32034-3907 75543114
75543015
10678354
10678354
79093610
10713863
48004035
54220798
Active: 30175
Dormant: 2353
57939 records in this index
Revise
Close
Update Account: 0002-0105.59, Vacant
General Personal Notes Meters Containers Transactions Selected Details Rates Work Orders Record
Account
0002-0105.59
Cycle B
Due Date 8/29/2017
Start Date
Close Date
Address 1 of 1
Service Billing
Vacant
221 S 5TH ST
FERNANDINA BEACH FL 32034-3905
Flags
No Charges
No Readings
Priority Service
FINAL BILL
Email Bills
Email Notices
Change Address
Reading Status
WATER: 0 of 1
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Rate Classes
LATE x1
T1100 x1
WR611 x1
S1001 x1
WRUSE x1
SWUSE x1
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MTAX x1
STW-R x1
Current Balance
Charge Previous Billings Payments Balance
Total 0.00 0.00 0.00 0.00
Fees/Deposits
Prior
Next
Cancel
information management services

CITY OF FERNANDINA BEACH
Code Enforcement Department

Michelle D. Forstrom
Code Enforcement Manager

CODE ENFORCEMENT & APPEALS BOARD
NOTICE OF VIOLATION/NOTICE OF HEARING

February 27, 2018

Case Number: 18-00037

Cert. #:7012 1640 0001 5937 9616

IN THE MATTER OF:

Walter L Champion
221 S. 5th Street
Fernandina Beach, FL 32034

PREMISES: 221 S. 5th Street, Fernandina Beach, FL 32034

The brief legal description of the real property upon which this violation occurred is: **BLOCK 26 LOTS 10 N 25 FT OF 9 & 11 IN OR 1752/818, Fernandina Beach, FL 32034.**

The Code Enforcement office of the City of Fernandina Beach has previously notified you of alleged violation(s) of the City of Fernandina Beach Code of Ordinances and contends that the following violation(s) exist: **Section 22-26 (12) Adoption of codes by reference, International Property Maintenance Code 2012 edition, Chapter 5, Section 505 Water System; and 506 Sanitary Drainage System** (This can be found on the City's website: www.fbfl.us/code). This letter specifically addresses no running water or sewer, while living at this residence.

Therefore, you are hereby directed to remedy and discontinue the problems by: get the water and sewer turned on or permanently vacate the premises, by March 9, 2018 ten (10) days from the date of this notice, and if this office is not notified of compliance by you, this department will refer this matter to the Code Enforcement & Appeals Board for legal action at the date and time listed below.

DATE:	April 5, 2018
TIME:	5:30 p.m.
LOCATION:	City Commission Chambers, 204 Ash Street Fernandina Beach, Florida 32034

YOU HAVE THE RIGHT to appear before the Board at that time to answer and defend the allegations that you have violated the above cited provision(s) of the Code of Ordinances.

If the Board finds that you are in violation, they will consider all appropriate actions required to bring the property into compliance, which may include, but is not limited to recovery of fees, and fines which may be imposed for the duration of the non-compliance (NOT TO EXCEED $250.00 per day, per violation).

Please be advised that the Rules of the Code Enforcement & Appeals Board and the Code of Ordinances of the City of Fernandina Beach govern the procedures of the Board.

PLEASE GOVERN YOUR SELF ACCORDINGLY.

If you have any questions, please feel free to contact me (please see my attached business card for contact information).

MForstrom

Michelle D. Forstrom
Code Enforcement Manager

Hearing impaired or non-English speaking individuals may request a language or sign interpreter at least (10) ten working days prior to this hearing. Please contact the City Clerk's office at (904) 310-3115.

Cc: Susan McCarthy
Margie Hatten

AFFIDAVIT OF SERVICE

State of Florida
County of Nassau

Code Enforcement Case Number: 18-00037

I, Michelle D. Forstrom, being first duly sworn, depose and state as follows:

1. That I am an employee of the City of Fernandina Beach, Code Enforcement Department;

2. That part of my duties include hand delivering Notice of Violation/Notice of Hearing letters, and other correspondence; and

3. That on the 27th day of February, 2018, at 2:35 P.M., I delivered the Notice of Violation/Notice of Hearing letter for **Case 18-00037, Walter L Champion Est, 221 South 5th Street, Fernandina Beach, FL 32034** to Susan McCarthy while she was working at 202 South 8th Street, Fernandina Beach, FL 32034, and on the same date, at 1:20 P.M. I delivered the same letter for the same case to Margie Hatton while she was working at 1525 Lime Street, Fernandina Beach, FL 32034.

FURTHER AFFIANT SAYETH NAUGHT.

Signature: M Forstrom

Michelle D. Forstrom
(Printed name of Code Compliance Manager)

Subscribed and sworn to before me, a notary public in and for the State of Florida, this 5th day of July, 2017.

(SEAL)

NOTARY PUBLIC STATE OF FLORIDA
SYLVIE MCCANN
MY COMMISSION # GG38352
EXPIRES: November 12, 2020

Signature: Sylvie McCann
Exp 11/12/20

Sylvie McCann
(Printed name of Notary)

CHAPTER 5

PLUMBING FACILITIES AND FIXTURE REQUIREMENTS

SECTION 501 GENERAL

501.1 Scope. The provisions of this chapter shall govern the minimum plumbing systems, facilities and plumbing fixtures to be provided.

501.2 Responsibility. The *owner* of the structure shall provide and maintain such plumbing facilities and plumbing fixtures in compliance with these requirements. A person shall not occupy as *owner-occupant* or permit another person to occupy any structure or *premises* which does not comply with the requirements of this chapter.

SECTION 502 REQUIRED FACILITIES

[P] 502.1 Dwelling units. Every *dwelling unit* shall contain its own bathtub or shower, lavatory, water closet and kitchen sink which shall be maintained in a sanitary, safe working condition. The lavatory shall be placed in the same room as the water closet or located in close proximity to the door leading directly into the room in which such water closet is located. A kitchen sink shall not be used as a substitute for the required lavatory.

[P] 502.2 Rooming houses. At least one water closet, lavatory and bathtub or shower shall be supplied for each four *rooming units*.

[P] 502.3 Hotels. Where private water closets, lavatories and baths are not provided, one water closet, one lavatory and one bathtub or shower having access from a public hallway shall be provided for each ten *occupants*.

[P] 502.4 Employees' facilities. A minimum of one water closet, one lavatory and one drinking facility shall be available to employees.

> **[P] 502.4.1 Drinking facilities.** Drinking facilities shall be a drinking fountain, water cooler, bottled water cooler or disposable cups next to a sink or water dispenser. Drinking facilities shall not be located in *toilet rooms* or *bathrooms*.

[P] 502.5 Public toilet facilities. Public toilet facilities shall be maintained in a safe sanitary and working condition in accordance with the *International Plumbing Code*. Except for periodic maintenance or cleaning, public access and use shall be provided to the toilet facilities at all times during *occupancy* of the *premises*.

SECTION 503 TOILET ROOMS

[P] 503.1 Privacy. *Toilet rooms* and *bathrooms* shall provide privacy and shall not constitute the only passageway to a hall or other space, or to the exterior. A door and interior locking device shall be provided for all common or shared *bathrooms* and *toilet rooms* in a multiple dwelling.

[P] 503.2 Location. *Toilet rooms* and *bathrooms* serving hotel units, *rooming units* or dormitory units or *housekeeping units*, shall have access by traversing a maximum of one flight of stairs and shall have access from a common hall or passageway.

[P] 503.3 Location of employee toilet facilities. Toilet facilities shall have access from within the employees' working area. The required toilet facilities shall be located a maximum of one story above or below the employees' working area and the path of travel to such facilities shall not exceed a distance of 500 feet (152 m). Employee facilities shall either be separate facilities or combined employee and public facilities.

> **Exception:** Facilities that are required for employees in storage structures or kiosks, which are located in adjacent structures under the same ownership, lease or control, shall not exceed a travel distance of 500 feet (152 m) from the employees' regular working area to the facilities.

[P] 503.4 Floor surface. In other than *dwelling units*, every *toilet room* floor shall be maintained to be a smooth, hard, nonabsorbent surface to permit such floor to be easily kept in a clean and sanitary condition.

SECTION 504 PLUMBING SYSTEMS AND FIXTURES

[P] 504.1 General. All plumbing fixtures shall be properly installed and maintained in working order, and shall be kept free from obstructions, leaks and defects and be capable of performing the function for which such plumbing fixtures are designed. All plumbing fixtures shall be maintained in a safe, sanitary and functional condition.

[P] 504.2 Fixture clearances. Plumbing fixtures shall have adequate clearances for usage and cleaning.

[P] 504.3 Plumbing system hazards. Where it is found that a plumbing system in a structure constitutes a hazard to the *occupants* or the structure by reason of inadequate service, inadequate venting, cross connection, backsiphonage, improper installation, *deterioration* or damage or for similar reasons, the *code official* shall require the defects to be corrected to eliminate the hazard.

SECTION 505 WATER SYSTEM

505.1 General. Every sink, lavatory, bathtub or shower, drinking fountain, water closet or other plumbing fixture shall be properly connected to either a public water system or to an *approved* private water system. All kitchen sinks, lavatories, laundry facilities, bathtubs and showers shall be supplied with hot or tempered and cold running water in accordance with the *International Plumbing Code.*

[P] 505.2 Contamination. The water supply shall be maintained free from contamination, and all water inlets for plumbing fixtures shall be located above the flood-level rim of the fixture. Shampoo basin faucets, janitor sink faucets and other hose bibs or faucets to which hoses are attached and left in place, shall be protected by an approved atmospheric-type vacuum breaker or an approved permanently attached hose connection vacuum breaker.

505.3 Supply. The water supply system shall be installed and maintained to provide a supply of water to plumbing fixtures, devices and appurtenances in sufficient volume and at pressures adequate to enable the fixtures to function properly, safely, and free from defects and leaks.

505.4 Water heating facilities. Water heating facilities shall be properly installed, maintained and capable of providing an adequate amount of water to be drawn at every required sink, lavatory, bathtub, shower and laundry facility at a minimum temperature of 110°F (43°C). A gas-burning water heater shall not be located in any *bathroom, toilet room, bedroom* or other occupied room normally kept closed, unless adequate combustion air is provided. An *approved* combination temperature and pressure-relief valve and relief valve discharge pipe shall be properly installed and maintained on water heaters.

SECTION 506
SANITARY DRAINAGE SYSTEM

[P] 506.1 General. All plumbing fixtures shall be properly connected to either a public sewer system or to an *approved* private sewage disposal system.

[P] 506.2 Maintenance. Every plumbing stack, vent, waste and sewer line shall function properly and be kept free from obstructions, leaks and defects.

[P] 506.3 Grease interceptors. Grease interceptors and automatic grease removal devices shall be maintained in accordance with this code and the manufacturer's installation instructions. Grease interceptors and automatic grease removal devices shall be regularly serviced and cleaned to prevent the discharge of oil, grease, and other substances harmful or hazardous to the building drainage system, the public sewer, the private sewage disposal system or the sewage treatment plant or processes. All records of maintenance, cleaning and repairs shall be available for inspection by the code official.

SECTION 507
STORM DRAINAGE

[P] 507.1 General. Drainage of roofs and paved areas, *yards* and courts, and other open areas on the *premises* shall not be discharged in a manner that creates a public nuisance.

7012 1640 0001 5937 9616

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27 2018
USPS - 32034

20

Sent To
Street or PO
City, S

WALTER L CHAMPION EST
221 S. 5TH STREET
FERNANDINA BEACH, FL
32034

PS Fo... ...tructions

PLACE STICKER AT TOP OF ENVELOPE TO THE RIGHT OF THE RETURN ADDRESS, FOLD AT DOTTED LINE

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

WALTER L CHAMPION EST
221 S. 5TH STREET
FERNANDINA BEACH, FL
32034

9590 9402 3035 7124 0450 28

2. Article Number *(Transfer from service label)*

7012 1640 0001 5937 9616

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X
☐ Agent
☐ Addressee

B. Received by *(Printed Name)*

C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☐ Adult Signature
☐ Adult Signature Restricted Delivery
☑ Certified Mail®
☐ Certified Mail Restricted Delivery
☐ Collect on Delivery
☐ Collect on Delivery Restricted Delivery
...stricted Delivery
☐ Priority Mail Express®
☐ Registered Mail™
☐ Registered Mail Restricted Delivery
☐ Return Receipt for Merchandise
☐ Signature Confirmation™
☐ Signature Confirmation Restricted Delivery

PS Form 3811, July 2015 PSN 7530-02-000-9053

Domestic Return Receipt

City of Fernandina Beach
204 Ash Street
Fernandina Beach, FL 32034

CERTIFIED MAIL™

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Hasler
02/27/2018
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WALTER L CHAMPION EST
221 S. 5TH STREET
FERNANDINA BEACH, FL
32034

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RETURN TO SENDER
NOT DELIVERABLE AS ADDRESSED
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UTI BC: 32034423004 *1435-07745-27-41

MAR 5 AM 9:32

NOTICE FROM LANDLORD TO TENANT
TERMINATION OF TENANCY
(7 DAY OR 15 DAY)

To: Dennis Champion
221 S. 5th St,
Fdna Bch FL 32034

YOU ARE HERBY NOTIFIED TO QUIT AND VACATE THE PREMISES DESCRIBED AS: Family home Walter Champion estate so home can be sold

On or before the 21 **day of** March**, 20**18
This notice is given under and by authority of Section 83.57 Florida Statutes. The tenancy under which you have been occupying and using the said described premises as of the date shown above.

DATED at 1:22 pm**, Florida, on this** 28 **day of** Feb**, 20**18

[signature]
OWNER/AGENT (Signature)
702 Centre St,
Address
Fdna Bch Fl 32034
904 583-3838
Telephone

This NOTICE Served on the tenant on the 28 **day of** Feb**, 20**18
at 315 **AM/PM (circle one).**

By: ☒ **Personal delivery**

☐ **Posting a copy at resident in absence of tenant**

With police officer Bishop

Katie Newton

From: Caroline Best <cbest@fbfl.org>
Sent: Wednesday, April 11, 2018 11:10 AM
To: Michelle Forstrom
Cc: Katie Newton; Kim Briley
Subject: FW: Online Form Submittal: Advisory Board/Committee Application

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Michele,

Please see the below Advisory Board/Committee Application from Ms. Christine Harmon to be placed on 5/02 Code Enforcement & Appeals Board agenda for recommendation to the City Commission.

Thank you and let me know if there are any questions.

Sincerely,

Caroline Best, CMC
City Clerk
204 Ash Street
Fernandina Beach, Florida 32034
Office (904) 310-3115
If this email is related to the Board, Committee or Commission that you serve on, please DO NOT REPLY TO ALL.

Please Go Green: Please don't print this unless its really necessary

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From: noreply@civicplus.com [mailto:noreply@civicplus.com]
Sent: Tuesday, April 10, 2018 8:54 PM
To: Caroline Best; Kim Briley
Subject: Online Form Submittal: Advisory Board/Committee Application

Advisory Board/Committee Application

This application is intended to provide information that will enable the City Commission to select the most qualified Board/Committee members. Please complete all applicable sections and return the form along with your current résumé to the City Clerk's Office.

City of Fernandina Beach
City Clerk's Office
204 Ash Street
Fernandina Beach, FL 32034
(904) 310-3115

Name	Christine A. Harmon
Home Mailing Street Address	482 Crosswind Drive
City	Fernandina Beach
Zip Code	32034
Primary Phone	614-306-5940
Secondary Phone	904-432-8077

Please note that board materials are distributed electronically.

Email to receive board materials	charmon1846@gmail.com
Employer	Retired - Columbus (OH) City Schools
Position Title	Former Counselor and Community Liaison
Business Address	NA
City	NA
Zip	00000
Select the board you are applying for:	Code Enforcement & Appeals Board
Additional board that you are applying for:	None
Why are you interested in serving on this Board? Please explain.	My husband and I moved to Fernandina Beach due largely to it's historic character and charm. In Ohio, we restored two homes - the first dated to the 1890's, the last was built in1846. I believe in civic involvement, and would like to contribute by working to insure our community is well maintained and zoning guidelines are followed. By serving on the Code Enforcement and Appeals Board, I hope I will have an opportunity to

	preserve and protect the citizens and the beauty of Fernandina Beach.

Eligibility

Are you a resident of the City?	Yes
Length of time:	4 years
Do you hold a public office?	No
Office name:	*Field not completed.*
Are you employed by the City?	No
Position:	*Field not completed.*
Are you currently serving on a Board?	No
Board Name:	*Field not completed.*

Potential Conflict of Interest:

Have you ever been engaged in the management/ownership of any business enterprise that has a financial interest with the City of Fernandina Beach?	No
If yes, please provide details:	*Field not completed.*

Major Affiliations:

List community, professional, or other applicable policy-making Boards on which you have served. Note the length of service and office held (if any):	Rivers Unlimited (Ohio) - Trustee, Sierra Club (Ohio Chapter) Executive Committee, The Darby Creek Association (Ohio) - Vice President, The Ohio Family Farm Coalition, Vice-Chair I did not keep a record of length of service. I estimate 4 to 5 years. While serving on the boards of these organizations, I was working 20 to 30 hours/week and had a flexible schedule. I stepped down when I returned to work full-time. My position necessitated I devote hours in excess of the traditional 40 hour work week. Since moving to Fernandina Beach, I have joined

	the boards of Keep Nassau Beautiful, the local Sierra Club chapter, and Communities-In-Schools. In addition, I am co-founder of the Amelia Island Beach and Marine Life Protection Task Force.
Qualifications:	
Please list any specific qualifications, education or experience that would directly relate to the Board for which you are being recommended:	I have no specific certifications in city planning and zoning. However, my work experience and civic engagement demonstrates an ability to analyze information, and to communicate with diverse groups. I like exploring new areas of study, and am willing to learn all information required to function in this position.
Organization or Commissioner sponsoring nomination (if applicable):	*Field not completed.*
Educational Background: (Check all that apply)	MS/A
Other:	*Field not completed.*
Major areas of study:	Undergraduate: Education Focus: Political science Master of Arts: Guidance and Counseling

Florida's Public Records Law, Chapter 119, Florida Statutes, states:

"It is the policy of this state that all state, county, and municipal records shall at all times be open for a personal inspection by any person." Your application when filed will become a public record and subject to the above statute. In addition, any appointed member of a board of any political subdivision (except members of solely advisory bodies) and all members of bodies exercising planning or zoning, are required to file a financial disclosure form (Form1) within 30 days after appointment and annually thereafter, for the duration of the appointment as required by Chapter 112, Florida Statutes

I understand that if I am appointed to one of the City's boards, I will be required to file a financial disclosure form - Form 1, as described above, and I am willing to comply with this requirement.

I understand that any false, incomplete or misleading information given by me on the application is sufficient cause for rejection of this application. I understand and agree that any such false, incomplete or misleading information discovered on this application at any time after appointment to a Board may result in my removal.

I also understand that all board appointments are for voluntary, uncompensated services. Additionally, if appointed, I am able to attend meetings and otherwise fulfill the duties of the office.

Applications are submitted to the City Commission when vacancies occur and are effective for two years from date of completion.

Do you understand the duties and responsibilities of the Board/Committee that you are applying for?	Yes

By submitting this form, I declare the foregoing facts to be true, correct, and complete.

Date	4/10/2018
Applicant's Signature	Christine A. Harmon