STEWART

July 26, 2011

City of Hendersonville
145 Fifth Avenue
Hendersonville, NC 28792

Attn: Sue Anderson

RE: Grey Hosiery Mill Structural Assessment
Hendersonville, NC

Dear Ms. Anderson:

PROJECT BACKGROUND AND DESCRIPTION

Per the request of the City of Hendersonville and the Hendersonville Historic Preservation Commission, an evaluation of the existing conditions of the Grey Hosiery Mill Building was performed. The purpose of the evaluation is to determine the immediate and long term issues that need to be addressed to maintain the integrity of the structure. On Tuesday, June 14, 2011, Mr. Robert Macia, PE visited the site, and on Wednesday, June 15, 2011, Mr. Robert Macia, PE and Mr. Craig Fisher, PE visited the site. The purpose of these site visits was to assess the structural members that were visible and accessible. The **OBSERVATIONS** section of this report identifies all of the members with issues and provides recommendations for remediation in the **RECOMMENDATIONS** section of this report.

The Grey Hosiery Mill is located at 301 - 4th Avenue in downtown Hendersonville, NC. The building is primarily a one-story structure with some portions of the building two-story (with basement.) The building is approximately 30,701 sf and has had several additions throughout its history. The exterior skin consists of brick veneer, and the structural systems vary for each addition.

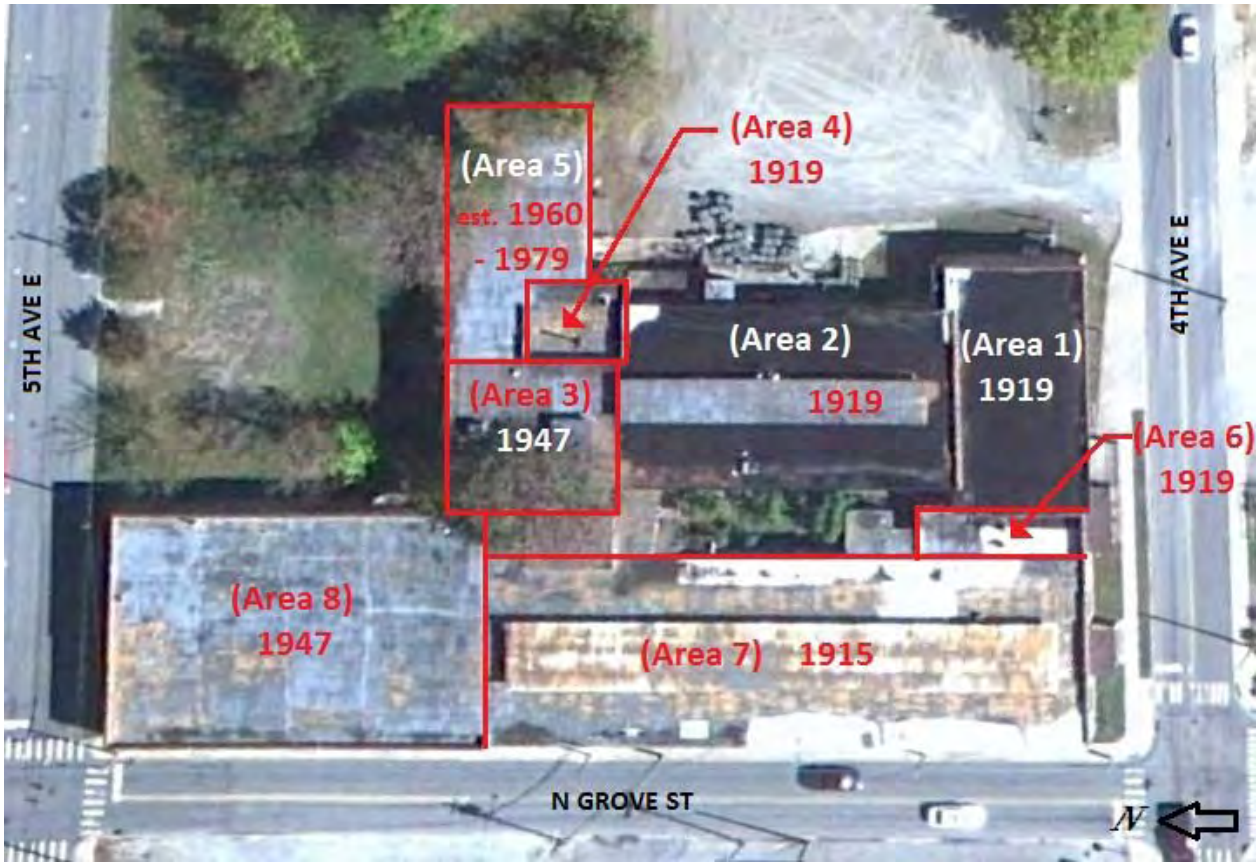
We understand the building was added to the National Register of Historic Places in 2000. From the National Register of Historic Places Registration Form 5.11.99, we understand the building was originally constructed in 1915 with additions in 1919 and 1947. Based on this document, we understand it is the only historic industrial building left in the city. The 1915 and 1947 portions of the building are oriented north-south along Grove Street. These two sections connect to a 1919 section. A parking lot extends to the east of the building. The original portion of the mill served as a knitting room. Since 1967, the building has had a number of different uses, including a craft store and library. The building is owned by the city and is currently unoccupied. The majority of the building exterior consists of solid brick walls and multi-pane steel windows. Roof construction consists of wood decking over heavy timbers or consists of wood decking over structural steel beams in later additions. Roof construction includes clerestories. Interior construction consists of wood decking over heavy timbers, wood decking over structural steel, or concrete slab on grade.

Issues were discovered during the site visits. Some issues will require immediate action to maintain the structural stability, while other issues tend to be more cosmetic and can be addressed at a later time. The **OBSERVATIONS** section of this report identifies each issue. The **RECOMMENDATIONS**

section of this report provides recommendations for the issues that require immediate action and recommendations for issues that can be performed with a longer term maintenance plan.

At the end of this report, a Photograph Appendix contains photographs of each issue noted in the report. For the purposes of this report, each addition is broken down as follows:

Area 1: 1919 Construction
Area 2: 1919 Construction
Area 3: 1947 Construction
Area 4: 1919 Construction
Area 5: Year unknown. Based on the site visit, this addition was likely constructed in the 1960s or 1970s.
Area 6: 1919 Construction
Area 7: 1915 Original Construction
Area 8: 1947 Construction.



Drawings containing floor framing plans, roof framing plans, and elevations are also included as follows:

S100 Partial First Floor Framing Plan (1/8"=1'-0")
S101 Partial First Floor Framing Plan (1/8"=1'-0")
S200 Partial Roof Framing Plan (1/8"=1'-0")
S201 Partial Roof Framing Plan (1/8"=1'-0")
S300 West Elevation (Grove Street) – No Scale
S301 East Elevation (Pine Street) – No Scale
S302 South Elevation (Fourth Avenue) – No Scale
S303 North Elevation (Fifth Avenue) – No Scale.

OBSERVATIONS

Exterior Assessment

Although the entire building was constructed in multiple phases throughout the early to mid 1900's, the exterior construction is relatively similar overall. The exterior construction consists of brick and stone masonry walls along with steel multi-paned window frames and precast concrete sills. In some of the most recent additions to the building, concrete basement walls were constructed inside of previous additions. All of the exterior door frames are wood construction. As stated above, most of the windows consist of steel multi-paned window frames; however some window frames are wood construction as noted in the elevation drawings. Given the overall uniformity of the construction materials, exterior faces of the building are experiencing similar issues. The next few paragraphs describe general issues and are followed by specific details of each building face.

Water and moisture damage are prevalent throughout the building and its severity varies. A large amount of the wood construction has deteriorated due to water exposure including significant areas of floor and roof framing. In several areas, concrete framing is spalling which leaves portions of the steel reinforcement exposed. Nearly all exterior steel lintels have exhibited signs of corrosion. Many of the exterior precast window sills are cracked. In many locations, the exterior brick has cracked or chipped. Many of the window panes are broken or missing. Some areas of the concrete are spalling. Also, efflorescence is possibley occurring in many locations.

As explained in Technical Note 23A of the Brick Industry Association (BIA) Technical Notes, "efflorescence occurs when water containing dissolved salts is brought to the surface of masonry, the water evaporates and the salts are left on the surface of the masonry." For recommendations of removal and further prevention of efflorescence, see the Recommendations portion of this report.

In general, along each face of the building, repointing of the brick or stone mortar joints is necessary. Repointing of masonry is the process of removing damaged or cracked mortar back to a uniform depth and then placing new mortar in the joint. Repointing is usually required when moisture has penetrated the mortar leaving it soft and deteriorated (as stated in Technical Note 46 of BIA's Technical Notes). In conjunction with correcting the water penetration issues, repointing the mortar will help keep water from entering the masonry. For the best results and in an attempt to keep the aesthetics of the brick or stone uniform, an effort should be made to duplicate the original mortar composition and proportions. At a minimum, the new mortar shall match the color, texture, and

tooling of the existing mortar. The best way to control this is to match the sand as close as possible to the sand in the existing mortar. The new mortar must have a greater vapor permeability and be softer than the existing mortar.

Due to the historic status of the Grey Hosiery Mill, the standards set forth in The Secretary of Interior's Standards for the Treatment of Historic Properties must be observed and followed throughout the restoration of the project. These standards specifically state that any measures taken to preserve, rehabilitate, restore, or reconstruct this historic building must be done so in a manner that will maintain the original intent of the structure in terms of design, color, texture, and materials. Therefore, any recommendations made in this report that advise the removal and replacement of any component of the building, architectural or structural, implies that the replacement component is to match that of the existing building in those terms stated in the standards. If this cannot be accomplished within reasonable efforts, the City of Hendersonville and the Hendersonville Historic Preservation Commission should be consulted for the final approval of an alternate component. For reference, The Secretary of Interior's Standards for the Treatment of Historic Properties is included in the Appendix of this report.

It is the intent of the standards set forth in The Secretary of Interior's Standards for the Treatment of Historic Properties that any portion or entity of the existing historical building, structural and architectural, be salvaged and remain in use whenever possible. To allow an existing structural element to remain as a part of the building, it must be fully intact and "structurally sound", meaning free of any flaws, imperfections, or other physical characteristics that contribute to a reduction in strength of material, reduction in section properties, or increased stress/strain of that structural element and could potentially have an adverse affect on the safety and integrity of the structure. These flaws or imperfections include, but are not limited to: rotting, rusting, termite damage, warping, prying, bowing, buckling, cracking, splitting, and spalling of any structural component. If any structural component is not structurally sound, based on the definition above, it will require replacement as per the stipulations set forth in the standards referenced in this report.

See below for specific issues noted at each elevation/Area:

North Elevation (5th Avenue viewpoint, Areas 3, 5, 8) – Also, see Sheet 1/S-303:

- Excessive growth of vegetation over the brick and concrete walls between grids Q and D. See **Photos 1.16 – 1.20**.
- A hole exists in the brick wall just above the stone masonry near grid I. See **Photos 1.17 & 1.19**.
- Significant concrete spalling has occurred at the concrete knee wall supporting the brick between grids D and C. See **Photos 1.12 & 1.13**.
- A section of brick has spalled at approximately fourteen brick courses above the door near grid C. See **Photo 1.14**.
- The steel lintels supporting the brick above the windows are rusted; this is typical for the five windows between grid D and the west end of the building. See **Photos 1.9, 1.10, & 1.15**.
- The wood door and wood door frame is starting to rot. Multiple glass panes are missing from the door frame. The steel lintel supporting the brick above the door is rusted. See **Photo 1.5**.

- Water staining was found in four locations between grid C and the west end of the building. See **Photos 1.8, & 1.11**.
- Repointing of the brick is required above the window near the west end of the building. See **Photo 1.7**.
- Significant concrete spalling has occurred at the concrete knee wall supporting the brick at the west end of the building. See **Photo 1.6**.

East Elevation (Pine Street viewpoint, Areas 1, 2, 4, 8) – Also, see Sheet 1/S-301:

- Several cracks exist in the mortar joints of the stone masonry wall south of grid 13.5. See **Photo 2.2**.
- Two openings in the brick wall near grid 13.5, which serve as openings for mechanical equipment, do not appear to be sealed sufficiently for preventing water infiltration. See **Photos 2.5 and 2.6**.
- Repointing of the stone masonry is required beside the smaller mechanical opening. See **Photo 2.4**.
- A crack exists in the mortar joints of the stone masonry wall between grids 13 and 12. See **Photos 2.9 & 2.10**.
- Repointing of the brick is required just above the stone wall near grid 12. See **Photos 2.11 & 2.12**.
- Repointing of the stone masonry is required near grid 12. See **Photos 2.5, 2.7, & 2.8**.
- A cracked window pane exists in the window frame on the front wall near grid 12. See **Photo 2.14**.
- A cracked window pane exists in the window frame on the back wall near grid 12. See **Photo 2.78**.
- Several holes exist in the brick in addition to a broken window pane and repointing of brick required at the north-facing bump-out wall between grid 12 and 11.5. See **Photos 2.78 - 2.81**.
- Two cracked window panes exist in the window frame between grids 11.5 and 10.8. See **Photo 2.16 & 2.22**.
- Repointing of stone wall at ramp between grids 11.5 and 10.8 is required. See **Photo 2.19**.
- The mouth of the drain pipe near the stone ramp has been damaged. See **Photo 2.20**.
- Plywood cover/infill has been installed in front of overhead door opening between grids 11.5 and 10.8. See **Photo 2.21**.
- The wooden deck that allows access to the double door entry between grids 10.3 and 9.5 is excessively worn and rotted, the handrails are loose, and several rusted nails are exposed. To be functional, the deck would need to be replaced in its entirety. See **Photos 2.31, 2.33, & 2.34**.
- Plywood cover/infill has been installed in front of the double door opening between grids 10.3 and 9.5. See **Photos 2.29 & 2.32**.
- A hole exists in the lower right corner of the overhead door between grids 9.5 and 8.3. See **Photos 2.35 & 2.36**.
- Wood facia at loading dock near grid 9.5 has pulled away from concrete slab creating a substantial gap. See **Photo 2.38 & 2.39**.

- Several bricks on each side of the overhead door at the loading dock have been broken. It appears a fix was conducted by way of concrete infill, but that has undergone damage as well. See **Photos 2.30 & 2.36**.
- Two window panes in the window frame near grid 7.5 have been infilled with ply wood. See **Photo 2.37**.
- The wood facia at the roof along the entire perimeter has rotted. See **Photos 2.23 & 2.24**.
- The steel pipe railing that borders the loading dock has rusted. See **Photo 2.40**.
- Repointing of brick is required just above the loading dock near the single door entry. See **Photo 2.47**.
- Several of the concrete steps leading to the single door entry have chipped. See **Photos 2.41 – 2.46 & 2.54**.
- The concrete steps leading to the single door entry have pulled away from the concrete slab. See **Photo 2.55**.
- The wood flashing for the louver opening above the single door entry has rotted. See **Photo 2.48**.
- A hole exists in the brick near the roof above the single door entry. See **Photos 2.51 & 2.52**.
- A hole exists in the brick to the right of the concrete steps leading to the single door entry. See **Photo 2.62**.
- The opening in the lower front wall between grids 6.4 and 5.9 has been covered/infilled with plywood. See **Photo 2.53**.
- A cracked window pane exists in the window frame between grids 6.4 and 5.9. See **Photo 2.27**.
- A crack exists in the mortar joints of the brick between the window frames near grid 5.9. See **Photo 2.58**.
- The downspout between the two window frames near grid 5.9 does not continue all the way to the ground. See **Photo 2.57**.
- Concrete spalling has occurred in several locations at the low roof between grids 6.4 and 5.5. See **Photos 2.55 & 2.56**.
- The wood door frame for the low door between grids 5.9 and 5.5 has rotted. See **Photos 2.73 – 2.76**.
- The foam roof membrane at the high roof near grid 5.5 has rotted or disintegrated. Repointing of the brick is also needed in this area. See **Photos 2.59 & 2.60**.
- The brick wall near grid 5.5 is bowed out and is missing mortar due to a sizeable tree that has grown in behind the brick. The tree has forced its way between the brick and adjacent window frame. See **Photos 2.63 – 2.72**.

South Elevation (4th Avenue viewpoint, Areas 1, 5, 6, 7)) – Also, see Sheet 1/S-302:

- Four cracked window panes exist in the steel window frame west of grid B. See **Photo 3.4**.
- At the window openings on each side of grid B, the steel lintels have rusted. See **Photo 3.3**.
- The wood canopy at the first entry from the left has rotted. See **Photo 3.7**.
- A chipped stair tread exists at the top of the concrete steps leading to the first entry. See **Photo 3.5**.

- Four (4) cracked window panes exist in the steel window frame just east of grid B. See **Photo 3.8**.
- A hole exists in the brick between grids B and C. See **Photo 3.7**.
- The wood window frame and the wood door near grid C have rotted. See **Photo 3.9**.
- The window above the door near grid C has been covered/infilled with plywood. See **Photo 3.9**.
- Cracking/chipping has occurred in the precast door sill at the left side of the main entry. See **Photo 3.13**.
- At the window located between the two single doors of the main entry, a cracked window pane exists in the window frame, the wood window frame has rotted, and the right corner of the precast window sill is chipped. See **Photo 3.9**.
- The lower wall opening between grid C and D has been covered/infilled with plywood. See **Photo 3.10**.
- Several of the concrete steps leading to the main entry have chipped. See **Photos 3.12 – 3.18**.
- Several cracks exist in the precast door sill at the right side of the main entry. See **Photo 3.20**.
- The wood handrail and roof fascia of the main entry canopy have rotted. See **Photo 3.9, 3.21, & 3.22**.
- Chipping has occurred at the vertical faces and underside of the loading dock concrete slab. See **Photos 3.29 & 3.32**.
- Significant spalling and cracking has occurred at several loading dock concrete columns. See **Photos 3.26, 3.27, 3.29, & 3.34**.
- The loading dock slab is supported by (3) W8 steel beams. Where the W8 located in the center of the slab meets the stone wall, the beam bearing position is directly over top of the opening (see **Photo 3.31**) rather than the jamb of the opening (see **Photo 3.32**).
- The W8 beams supporting the loading dock slab are rusted. See **Photo 3.24, 3.28, & 3.30**.
- The wood door and door frame at the loading dock entry is rotted. See **Photo 3.35**.
- The downspout to the right of the loading dock is disconnected before it reaches the ground. See **Photo 3.38**.
- The opening above each high window frame from the loading dock to grid H has been infilled with brick. See **Photo 3.37**.
- The steel lintels at each high window opening from the loading dock to grid H have rusted. See **Photos 3.42-3.44, & 3.47**.
- Nine window panes are missing from the low window frame nearest the loading dock. The opening has been covered/infilled with plywood. See **Photo 3.37**.
- Four window panes are missing from the low window frame nearest grid D. Two holes have been cut in another window pane to allow for PVC pipe penetrations. See **Photo 3.37**.
- One window pane in the window frame between grids F and H has been replaced with a dryer vent. See **Photo 3.37**.
- Several cracks exist in the precast sills of each high window frame from the loading dock to grid H. See **Photos 3.39 – 3.41, 3.45, & 3.46**.
- Mortar is missing in the stone wall between grids D and E. See **Photo 3.49**.
- Mortar is missing in the stone wall between grids E and F. See **Photo 3.51**.

- Mortar is missing in the stone wall nearest grid H. See **Photo 3.52**.
- The wood facia along the roof between the main entry and grid H is rotten. See **Photo 3.48**.
- A crack exists in the concrete ramp leading to the overhead door between grid H and I. See **Photo 3.55**.
- The wood fascia around the overhead door between grid H and I has rotted. See **Photos 3.55 – 3.57**.
- A hole exists in the aluminum siding between grids H and I. See **Photo 3.58**.
- A hole has been cut in the aluminum siding between grids H and I to allow for PVC pipe penetration. See **Photo 3.53**.
- The wood stairs and deck at the entry near grid I are rotten and worn, and the handrails have become loose. See **Photos 3.59 – 3.61**.
- The aluminum siding has been significantly damaged in two locations between grids I and J. See **Photos 3.54, 3.58, 3.64, & 3.65**.
- A hole exists in the aluminum siding between grids I and J. See **Photos 3.66 & 3.68**.
- Brick infill is missing between the concrete piers that are located between grids J and K. See **Photo 3.54**.
- Chipping of the concrete slab has occurred between grids J and K. See **Photos 3.54, 3.71 – 3.73**.
- A crack exists in the concrete beam between grids J and K. See **Photo 3.54**.
- The aluminum siding has been significantly damaged in two locations between grids J and K. See **Photo 3.54**.
- Aluminum panel soffit is missing from grid H to just past grid J. See **Photos 3.54, 3.62, 3.63, 3.67, & 3.68**.
- Several anchor bolts have projected past the edge of the concrete slab from grid J to the end of the building. See **Photos 3.54, 3.71 – 3.73**.
- An opening exists in aluminum siding for mechanical louver. See **Photo 3.69**.

West Elevation (Grove Street viewpoint, Areas 7, 8) – Also, see Sheet 1/S-300:

- The louver opening nearest grid 1 has been infilled with brick. See **Photo 4.61**.
- The first louver opening between grids 1 and 2 has been infilled with plywood. The second louver opening between grids 1 and 2 has been infilled with brick. See **Photo 4.62 & 4.63**.
- The first louver opening between grids 2 and 3 has been infilled with plywood. The second louver opening between grids 2 and 3 has been infilled with brick. See **Photo 4.60**.
- The first louver opening between grids3 and 4 has been infilled with plywood. The second louver opening between grids 3 and 4 has been infilled with brick. See **Photo 4.59**.
- The downspouts near grids 1, 2, 3, & 4 terminate directly at the sidewalk. Efflorescence exists on the brick wall at each location of the downspouts. See **Photos 4.59 – 4.64**.
- Repointing of the brick is required between grids 1 and 2. See **Photo 4.62 & 4.63**.
- A sizeable crack and delamination exists in the brick near grid 4. See **Photos 4.54 – 4.58**.
- Six cracked window panes exist in the window frame near grid 4. See **Photo 4.49 & 4.54**.

- Repointing of the brick is required above and below the window nearest grid 4. See **Photo 4.49 & 4.50**.
- The wood soffit above the window nearest grid 4 is missing. See **Photo 4.50**.
- Missing bricks and severe cracks exist on each side of the main entry opening between grids 4 and 5. See **Photos 4.45 – 4.53**.
- The main entry opening has been infilled with plywood. See **Photos 4.45 – 4.53**.
- The structural wood lintel above the main entry opening is not sufficiently bearing on the brick walls. See **Photos 4.45, 4.47 & 4.50**.
- The concrete ramp leading to the main entry opening is beginning to spall. See **Photo 4.51**.
- At the opening nearest grid 5, cracking exists in one of the glass masonry units and a crack exists in the precast concrete sill below. See **Photo 4.15**.
- Repointing of the brick is required above the opening near grid 5. See **Photo 4.15**.
- A hole exists in the brick above the opening near grid 5 for an existing pipe. See **Photo 4.15**.
- A louver opening exists in the brick between grids 5 and 6. See **Photo 4.14**.
- A hole exists in the brick to the left of the louver between grids 5 and 6 for an existing pipe. See **Photo 4.14**.
- A hole exists in the brick to the right of the louver between grids 5 and 6. See **Photo 4.14**.
- Repointing of the brick is required to the right of the louver between grids 5 and 6. See **Photo 4.14**.
- Cracking exists in seven glass masonry units in the second opening between grids 5 and 6. See **Photo 4.13**.
- Repointing of the brick is required above and below the second opening between grids 5 and 6. See **Photos 4.13 & 4.42**.
- Repointing of the brick is required in the brick infill near grid 6. See **Photo 4.12, 4.37, & 4.38**.
- The wood soffit above the brick infill near grid 6 is missing. See **Photo 4.12**.
- Chipping of concrete has occurred at the small concrete areaway near grids 6, 8, and 9. See **Photo 4.44, 4.27, & 4.36** respectively.
- Cracking exists in one of the glass masonry units in the opening between grids 6 and 7. See **Photo 4.11**.
- A louver opening exists above the window between grids 6 and 7 and has been infilled with plywood. See **Photo 4.43**.
- A brick at the lower right corner of the window between grids 6 and 7 is significantly chipped. See **Photo 4.20**.
- A crack exists in the precast concrete sill below the window between grids 6 and 7. See **Photo 4.28**.
- Repointing of the brick is required at the top and bottom of the wall between grid 7 and 8. See **Photos 4.10, 4.18, 4.19, & 4.24**.
- The downspout between grids 7 and 8 is situated on the ground in a way that permits water to flow back towards the building. See **Photo 4.17**.
- Repointing of the brick is required above the opening near grid 8. See **Photo 4.9**.
- A louver opening exists at the top of the brick infill between grids 8 and 9. See **Photo 4.8**.
- A hole in the brick wall exists near grid 9 for a pipe penetration. See **Photo 4.34**.

- Five cracked window panes exist in the window frame between grids 9 and 10. See **Photo 4.30**.
- Two holes exist in the brick wall near grid 10 for lighting conduit. See **Photo 4.16**.
- A crack exists in the precast concrete sill below the window between grids 9 and 10. See **Photo 4.35**.
- A cracked window pane exists in the window frame between grids 10 and 11. See **Photo 4.32**.
- The plywood flooring at the entry between grids 10 and 11 has rotted, the wooden steps and handrails lack stability, and a crack exists in the top concrete step leading to the entry. See **Photos 4.83 – 4.85**.
- The downspout near grid 11 feeds directly onto the sidewalk. See **Photo 4.6**.
- A cracked window pane exists in the window frame. See **Photo 4.6**.
- A crack exists in the precast concrete sill nearest grid 11. See **Photo 4.29**.
- The window opening between grids 11 and 12 has been covered/infilled with plywood. See **Photo 4.5**.
- A crack exists in the precast concrete sill. See **Photo 4.81**.
- The steel lintels above all steel window frames have rusted. See **Photos 4.26, 4.37, 4.38, & 4.42**.
- Repointing of the brick is required in the wall near grid 12. See **Photo 4.4**.
- A cracked window pane exists in the window frame between grids 12 and 13. See **Photo 4.4**.
- A crack exists in the precast concrete sill between grids 12 and 13. See **Photo 4.77**.
- The window opening near grid 13 has been covered/infilled with plywood. See **Photo 4.3**.
- A crack exists in the precast concrete sill near grid 13. See **Photo 4.80**.
- Repointing of the brick is required below the window near grid 13. See **Photo 4.3**.
- Four (4) cracked window panes exist in the window frame between grids 13 and 14. See **Photo 4.2**.
- A crack exists in the precast concrete sill between grids 13 and 14. See **Photo 4.73**.
- Repointing of the brick is required below the window between grids 13 and 14. See **Photo 4.2**.
- The wood soffit is missing above the window between grids 13 and 14. See **Photo 4.78**.
- Two (2) cracked window panes exist in the window frame near grid 14. See **Photo 4.1**.
- A crack exists in the precast concrete sill near grid 14. See **Photo 4.72**.
- Significant chipping has occurred at the brick below the window near grid 14. See **Photo 4.71**.

Roofing Assessment

The roofing has water damage. Two different types of roofing systems are used throughout the eight areas of the building. The first type is a membrane roof. It could not be verified that insulation board was installed between the decking and the membrane. This system is installed at Areas 1 and 2. The second roofing system is a spray polyurethane foam (SPF). It could not be verified if it was installed directly over the existing roof or not(It was most likely applied directly over the existing roofing.) This

system is installed at Areas 3, 4, 5, 6, 7, and 8. This system was also applied to all parapets of the building.

The SPF system was typically known to be the most economical roofing system in the mid 1980s to early 1990s. This system requires an overall recoating every 10 to 15 years. The spray polyurethane foam is coated with a sealant to protect it from moisture. Over time, the sealant cracks due to ultraviolet light and any foot traffic. After it cracks, water infiltrates the foam. Once water gets inside the foam, the foam acts like a sponge, and the water does not evaporate easily. As temperatures rise, heat can also get trapped in the foam roofing causing it to form bubbles or pockets along the surface.

The roof drainage system consists of interior roof drains and scuppers. Due to the water ponding on the roof, it appears an insufficient amount of interior roof drains and scuppers are present. Specific issues at each area are noted below.

Area 1

Roofing

- Roofing/drainage system – membrane roofing, insulation board not verified; scuppers and interior roof drains
- New roofing is required over the entire extents of Area 1. See **Photos 6.42, 6.43, & 6.45**.
- Ponding is prevalent in several locations on the roof of Area 1. See **Photos 6.44 & 6.46**.
- The roof drain at Area 1 appears to be clogged. Considerable ponding has resulted. See **Photo 6.47**.

Area 2

Roofing

- Roofing/drainage system – membrane roofing, insulation board not verified; scuppers and interior roof drains
- New roofing is required over the entire extents of Area 2. See **Photos 6.25–6.29, 6.36, 6.38-6.41**.
- Ponding is prevalent at nearly all edges of the roof at Area 2. See **Photos 6.25-6.29, 6.40–6.41**

Area 3

Roofing

- Roofing/drainage system – spray polyurethane foam (SPF); scuppers and interior roof drains
- The roof of Area 3 carries an excessive amount of vegetation that needs to be removed. See **Photos 6.4, 6.6, & 6.7**.

Area 4

Roofing

- Roofing/drainage system – spray polyurethane foam (SPF); scuppers and interior roof drains
- Ponding is prevalent around the perimeter of Area 4 roof. See **Photos 6.33 & 6.34**.
- New roofing is required over the entire extents of Area 4. See **Photos 6.33, 6.34 & 6.37**.

Area 5

Roofing

- Roofing/drainage system – spray polyurethane foam (SPF); scuppers and interior roof drains
- New roofing is required over the entire extents of Area 5. See **Photos 6.31 & 6.35**.
- The roof of Area 5 carries an excessive amount of vegetation that needs to be removed. See **Photos 6.30 & 6.32**.

Area 6

Roofing

- Roofing/drainage system – spray polyurethane foam (SPF); scuppers and interior roof drains
- New roofing is required over the entire extents of Area 6. See **Photo 6.1**.

Area 7

Roofing

- Roofing/drainage system – spray polyurethane foam (SPF); scuppers and interior roof drains
- New roofing is required over the entire extents of Area 7. See **Photos 6.3, 6.11-6.15, & 6.17**.
- The roof drain appears to be clogged. See **Photo 6.14**.
- The soffit around the entire perimeter of the Area 7 clerestory has rotted and will need to be replaced. See **Photos 6.16, 6.19-6.24**.
- Cracks exist in several window panes at the clerestory windows. See **Photo 6.18**.

Area 8

Roofing

- Roofing/drainage system – spray polyurethane foam (SPF); scuppers and interior roof drains
- New roofing is required over the entire extents of Area 8. See **Photos 6.5, 6.8-6.10**.

Structural Floor Framing and Roof Framing Assessment

Different framing systems and materials were used in the construction of this building. Regardless of the type of the construction, every area of this building has some issues. Water infiltration is the primary cause of the structural issues. The water infiltration has caused rotting of the wood roof framing and wood floor framing.

Other minor issues not related to water damage include the damage of steel column flanges, cracking of wood beams, missing brick(as previously noted in Exterior Assessment), and an insufficient wood beam to steel beam connection. Each of these specific structural issues is documented in more detail below.

The structural system of each Area is described below. Also, see Sheets S100 and S101 for Floor Framing, and Sheets S200 and S201 for Roof Framing.

Building Construction

Area 1 (1919)

- Basement – concrete slab on grade
- 1st floor framing – concrete exterior foundation walls, 10x10(9 ½" x 9 ½") wood columns @ ~10'-0" oc, 10"x14" wood beams @ ~10'-0" oc, 3"x8" T&G wood decking

- Roof framing – multi-wythe brick exterior walls, 8”x8” nominal (7 1/4” x 7 1/4”) 10x10(9 ½” x 9 ½”) wood columns @ ~10’-0” oc, 8”x12” wood beams @ 10’-0” oc, 3”x8” T&G wood decking

Area 2 (1919)

- Partial basement – concrete slab on grade
- 1st floor framing – partial slab on grade, concrete exterior foundation walls, 10”x10” wood columns @ ~10’-0” oc, 10”x16” wood beams @ ~10’-0” oc, 3”x8” T&G wood decking
- Roof framing – multi-wythe brick exterior walls, 8”x8” nominal (7 ½” x 7 ½”) wood columns @ ~10’-0” oc, 10”x16” wood beams @ ~10’-0” oc, piggyback wood trusses @ clerestory, 3”x8” T&G wood decking

Area 3 (1947)

- 1st floor framing – concrete slab on grade
- Roof framing – multi-wythe brick exterior walls, 8”x8” wood columns along with W6 and W8 steel columns, 8”x12” wood beams along with W8 and W12 steel beams, 3”x8” T&G wood decking (two types)

Area 4 (1919)

- 1st floor framing – concrete slab on grade
- Roof framing – multi-wythe brick exterior walls

Area 5 (Year unknown)

- Crawlspace – 4’-0” height; unfinished
- 1st floor framing – concrete exterior foundation walls, 16”x16” concrete piers, 16”x16” concrete beams, elevated concrete slab
- Roof framing – multi-wythe brick exterior walls, 24” deep open-web steel joists @ 48” oc (24” deep, 2 ½” x 2 ½” top and bottom chords, 1” diameter webs), plywood sheathing, W8 columns(d = 8”, bf = 8”, tf = ¼”); W21 structural steel perimeter beams

Area 6 (1919)

- Partial basement – concrete slab on grade
- 1st floor framing – concrete exterior foundation walls, 8”x8” brick piers, 10”x10” wood beam, 3”x8” T&G wood decking
- Roof framing – multi-wythe brick exterior walls, 8”x12” wood beams, 3”x8” T&G wood decking

***All framing needs to be replaced due to severe rot and water damage.

Area 7 (1915)

- Partial crawlspace – shallow; unfinished
- 1st floor framing – partial slab on grade, stone foundation wall; multi-wythe brick exterior walls, 24”x24” stone piers, 8”x8” brick piers, (2)2x10 nominal (2x9 ½”) wood beams framing between piers, 2x10 wood joists @ 16” oc, 3”x8” T&G wood decking; 12”x12” concrete piers, 12” concrete beams, elevated concrete slabs (two small areas in courtyard)
- Roof framing – multi-wythe brick exterior walls, 10”x10”nominal(9 ¼” x 9 ¼”) wood columns along with W6 steel columns, W12(d=11 3/4”, bf = 6 ½”, tf =3/8”) and W18 steel girders(d=18 1/8”, bf = 7 ½”, tf = ½”), 16”x10” wood beams, piggyback wood trusses @ clerestory, 3”x8” T&G wood decking
- Clerestory framing – wood truss element consisting of 6x6 members

Area 8 (1947)

- 1st floor framing – concrete slab on grade, partial 2" topping slab
- Roof framing – multi-wythe brick exterior walls, W6 steel columns, W18 steel girders(d=18 1/8", bf = 7 ½", tf = ½") W12 steel beams(d=11 3/4", bf = 6 ½", tf =3/8") @ ~8'-0" oc, 3"x8" T&G wood decking
- Top of W18 is 14'-6" at grid A. Top of W18 is 14'-9" at grid C.

The following paragraphs detail the specific issues at each area.

Area 1 – See drawings

Basement/1st Floor Framing

- Significant water infiltration in the northeast corner of Area 1 has resulted in ponding at the basement slab on grade and severe rotting of the 1st floor wood framing. See **Photos 5.13-5.19**.
- A sump hole exists in the southeast corner of Area 1. See **Photo 5.20**.
- A vertical crack exists in the south concrete basement wall. See **Photo 5.21**.
- A crack exists in a wood beam. See **Photo 5.22**.
- A crack exists in the foundation wall at the bearing location of the steel lintel. See **Photos 5.23 & 5.24**.
- (2)3x8 wood decking boards were used as the structural headers at each end of the stair. See **Photos 5.25 & 5.26**.
- A large portion of existing brick infill has been knocked out. See **Photo 5.27**.

1st Floor Framing Finish/Roof Framing

- Cracks exist in several wood beams. See **Photos 5.30 & 5.31** as typical.
- Water damage has occurred in northeast corner of Area 1 and has caused the wood roof framing and the 1st floor finish to rot. See **Photos 5.32 – 5.38**.
- Water damage has occurred in the northeast vestibule of Area 1 and has caused the wood to warp and separate from the bearing walls. See **Photos 5.39 & 5.40**.

Area 2 – See drawings

Basement/1st Floor Framing

- A crack exists in a wood beam. See **Photos 5.4 & 5.5**.
- Repointing of the stone masonry is required in the southwest corner of the partial basement. See **Photo 5.6**.
- Repointing of the brick is required at the northwest corner of the partial basement. Also, the steel lintel in this location is rusted. See **Photo 5.7**.
- A wood beam on grid 10.3 has suffered significant termite damage. See **Photo 5.8**.
- Water infiltration in the northwest corner of the partial basement has resulted in ponding at the basement slab on grade. See **Photos 5.9 & 5.10**.
- Chipping has occurred at a wood beam along grid 10.8. See **Photo 5.11**.
- A crack exists in the foundation wall at the east side of Area 2. See **Photo 5.12**.

1st Floor Framing Finish/Roof Framing

- A cracked wood beam along grid 11.5 has been reinforced with (2)C10 channels. See **Photos 5.45 – 5.47**.
- Wood double door leading to courtyard has become warped and is in need of replacement. See **Photo 5.48**.

- Water damage has occurred in the southeast corner of Area 2 and has caused the wood decking to rot. See **Photo 5.49**.
- Cracks exist in the slab on grade near grid 8.3. See **Photo 5.50**.
- Water damage has occurred in the northwest corner of Area 2 and has caused the wood beam and roof decking to rot. See **Photos 5.109 & 5.110**.

Area 3 – See drawings

1st Floor Framing Finish/Roof Framing

- The 8"x8" wood column on grid 5.2 has twisted. See **Photo 5.108**.
- Water damage has occurred near grid 5.4 and has caused the wood decking to rot. See **Photo 5.113**.
- The flanges of the steel W6 column on grids G-6 are dented or slightly buckled most likely from forklift traffic. See **Photo 5.114**.
- Water damage has occurred at the louver between grids 4.1 and 5.4. The louver has rusted as a result. See **Photo 5.115**.

Area 4 – See drawings

1st Floor Framing Finish/Roof Framing

- No structural concerns

Area 5 – See drawings

Crawlspace/1st Floor Framing

- No structural concerns

1st Floor Framing Finish/Roof Framing

- Existing joist bearing on brick condition will need to be replaced. See **Photo 5.117**.
- The plywood roof sheathing is spanning 48" between the steel joists, which exceeds the allowable span for plywood sheathing under this loading. See **Photo 5.118**.
- Water damage has occurred in the southwest corner of Area 5 and has caused the plywood roof sheathing to rot and the brick bearing wall to deteriorate. See **Photo 5.120**.

Area 6 – See drawings

Basement/1st Floor Framing

- No structural concerns

1st Floor Framing Finish/Roof Framing

- Severe water damage has occurred at the north end of Area 6 and has caused the complete decay and failure of the structural roof framing. See **Photo 5.51 & 5.58-5.60**.
- Severe water damage has occurred at the north end of Area 6 and has caused several areas of wood framing to rot. See **Photos 5.52-5.57**.
- Water damage has occurred near grid 13.5. See **Photos 5.75 & 5.76**.

Area 7 – See drawings

Crawlspace/1st Floor Framing

- No structural concerns

1st Floor Framing Finish/Roof Framing

- Water damage has occurred at the north end of the courtyard and has caused the wood roof framing to rot, deterioration of the brick mortar joints, and cracks in the concrete wall. See **Photos 5.61 & 5.62**.
- Water damage has occurred at the east wall of the courtyard. The wood double door frame and the four (4) window frames north of the double door have all rotted. See **Photos 5.63 – 5.67**.
- Water damage has occurred at the north wall of the courtyard and has caused the brick mortar to deteriorate. See **Photos 5.68 & 5.69**.
- A crack exists in the concrete slab on grade located in the corridor that connects Area 2 and Area 7. See **Photo 5.111**.
- A brick has been knocked out of the wall above the door opening in the corridor that connects Area 2 and Area 7. See **Photo 5.112**.
- A crack exists in the brick wall at the south west corner of Area 7. See **Photo 5.70**.
- Water infiltration has occurred behind the in the southwest corner of Area 7 where the wood decking has deteriorated. See **Photo 5.71**.
- Water damage has occurred in the southwest corner of Area 7 and has caused the wood floor framing to rot. See **Photo 5.72**.
- Water damage has occurred at the east wall of Area 7 between grids 10 and 11 and has caused the wood roof decking to rot. See **Photo 5.78**.
- Water damage has occurred at the west wall of Area 7 between grids 11 and 12 and has caused the wood roof decking and wood beam to rot. See **Photo 5.79**.
- Water damage has occurred at the west wall of Area 7 between grids 11 and 12 and has caused the wood flooring to rot. See **Photo 5.80**.
- Standing water is present on the 1st floor between grids 7 and 8. See **Photo 5.81**.
- Standing water is present on the 1st floor between grids 6 and 7. See **Photo 5.87**.
- Water damage has occurred at the west wall of Area 7 and has caused the wood roof decking to rot. See **Photos 5.88 & 5.89**.
- Water damage has occurred at the west wall of Area 7 between grids 4 and 5 and has caused the wood roof decking to rot. See **Photos 5.90 – 5.92**.
- Water damage has occurred at the east wall of Area 7 between grids 6 and 7 and has caused the wood roof decking to rot. See **Photo 5.93**.
- The connection of the wood beam to steel beam between grids 4 and 5 needs additional support. See **Photo 5.94**.
- Water damage has occurred at the east wall of Area 7 between grids 4 and 5 and has caused the wood roof decking to rot. See **Photos 5.96**.

Area 8 – See drawings

1st Floor Framing Finish/Roof Framing

- Water damage has occurred at the west wall of Area 8 between grids 2 and 3 and has caused the wood roof decking to rot. See **Photos 5.97-5.99**.
- Water damage has occurred at the west wall of Area 8 near grid 2 and has caused the wood roof decking to rot. See **Photo 5.100**.
- The flanges of the steel W6 column on grids C-4 are dented or slightly buckled. See **Photo 5.95**.
- Water damage has occurred near column A-1 and has caused the wood roof decking to rot. See **Photo 5.101**.

STEWART

STRUCTURAL FRAMING ALLOWABLE LOAD CAPACITIES

The maximum allowable uniform load capacity of each structural member is indicated in the tables below. The capacities were determined by using conventional structural engineering analysis techniques. Allowable load capacities are based on the National Design for Wood Construction Manual (NDS-05). The beams and joists are assumed to be Beech Wood No. 1 grade with allowable stresses of Fb = 1,400 psi and Fv = 180 psi. Wood decking allowable stresses are assumed to be Fb = 1,050 psi and Fv = 195 psi. Structural Steel allowable load capacities are based on the AISC Manual of Steel Construction, Ninth Edition. Structural steel yield strength is assumed to be 36 ksi.

Area 1 (1919)

The roof is capable of supporting a maximum allowable uniform load of 34 psf which is greater than the code minimum of 20 psf. The floor is capable of supporting a maximum allowable uniform load of 68 psf which is comparable to office loading.

Structural Member Area 1	Maximum Allowable Uniform Load	Span
10x10(9 ½ x 9 ½)wood columns @ 10'-0" oc	128 psf	Approximately 14'-0"
3"x8" Wood Roof Decking	134 psf	Approximately 10'-0"
8"x12" Wood Roof Beams @ 10'-0" oc	34 psf	Approximately 28'-0"
3"x8" Wood Floor Decking	134 psf	Approximately 10'-0"
10"x14" Wood Floor Beams @ 10'-0" oc	68 psf	Approximately 18'-0"

Area 2 (1919)

The roof is capable of supporting a maximum allowable uniform load of 50 psf which is greater than the code minimum of 20 psf. The floor is capable of supporting a maximum allowable uniform load of 50 psf which is comparable to office loading.

Structural Member Area 2	Maximum Allowable Uniform Load	Span
8x8(7 ½ x 7 ½)wood columns @ 10'-0" oc	50 psf	Approximately 14'-0"
3"x8" Wood Roof Decking	134 psf	Approximately 10'-0"
10"x16" Wood Roof Beams @ 10'-0" oc	50 psf	Approximately 25'-0"
3"x8" Wood Floor Decking	134 psf	Approximately 10'-0"
10"x16" Wood Floor Beams @ 10'-0" oc	50 psf	Approximately 25'-0"

Area 3 (1947)

The roof is capable of supporting a maximum allowable uniform load of 20 psf which meets the code minimum of 20 psf.

Structural Member Area 3	Maximum Allowable Uniform Load	Span

8x8(7 ½ x 7 ½)wood columns	68 psf	Approximately 14’-0”
W6 Structural Steel Columns (W6x20)	273 psf	Approximately 14’-0”
3”x8” Wood Roof Decking	50 psf	Approximately 11’-8”
W12 Structural Steel Roof Beams (W12x26)	64 psf	Approximately 25’-0”
8x12 Wood Roof Beams	20 psf	Approximately 25’-0”

Area 4 (1919)

The roof is capable of supporting a maximum allowable uniform load of 25 psf which is greater than the code minimum of 20 psf.

Structural Member Area 4	Maximum Allowable Uniform Load	Span
¾” Plywood Roof Sheathing	25 psf	Approximately 4’-0”
24” Deep Roof Structural Steel Joists@48” oc	85 psf	Approximately 28’-0”

Area 5 (Estimated 1960s to 1970s)

The roof is capable of supporting a maximum allowable uniform load of 30 psf which is greater than the code minimum of 20 psf. The floor allowable load capacities are not known because the reinforcing steel in the concrete is not known; however, it will likely support office loading.

Structural Member Area 5	Maximum Allowable Uniform Load	Span
¾” Plywood Roof Sheathing	30 psf	Approximately 4’-0”
24” Deep Roof Structural Steel Joists@48” oc	40 psf	Approximately 40’-0”
W8 Structural Steel Columns	250 psf	Approximately 14’-0”
W21Structural Steel Roof Beams	126 psf	Approximately 27’-0”
16”x16” Concrete Beams	Reinforcing Steel not known	Approximately 14’-0”
Concrete Floor Slab between Beams	Reinforcing Steel not known	Approximately 14’-0”

Area 6 (1919)

All framing needs to be replaced due to severe water damage.

Area 7 (1915)

The roof is capable of supporting a maximum allowable uniform load of 45 psf which is greater than the code minimum of 20 psf. The floor is capable of supporting a maximum allowable uniform load of 90 psf which exceeds typical office loading.

Structural Member Area 7	Maximum Allowable Uniform Load	Span
10x10(9 ½ x 9 ½)wood columns	54 psf	Approximately 14'-0"
W6 Structural Steel Columns (W6x20)	85 psf	Approximately 12'-0"
3"x8" Wood Roof Decking	45 psf	Approximately 12'-0"
3"x8" Wood Floor Decking	2,500 psf	Approximately 1'-4"
2x9 ½" Wood Floor Joists at 16" oc	100 psf	Approximately 11'-6"
8"x12" Wood Floor Girders	90 psf	Approximately 10'-0"

Area 8 (1947)

Structural Member Area 8	Maximum Allowable Uniform Load	Span
W6 Structural Steel Columns (W6x20)	86 psf	Approximately 14'-0"
3"x8" Wood Roof Decking	154 psf	Approximately 8'-0"
W12 Structural Steel Beams @ 8'-0" o/c	70 psf	Approximately 29'-0"
W18 Structural Steel Girders	55 psf	Approximately 29'-0"

The roof is capable of supporting a maximum allowable uniform load of 55 psf which is greater than the code minimum of 20 psf.

RECOMMENDATIONS

The recommendations are prioritized into three categories as follows:

- Category 1 is for issues that need to be addressed within two to five years to maintain the building's integrity.
- Category 3 is for issues that can be addressed with a long term maintenance plan.

The repairs are also prioritized by building area as follows:

- Area 7 -1915
- Areas 1, 2, 4 -1919
- Areas 3, 6, 8 - 1947
- Area 5 – Estimated 1960s to 1970s

ROOF RECOMMENDATIONS

Roof: Area 7 – 1915

Category 1

- At locations noted that have leaks, roofing to be repaired immediately. Rotten wood framing members at leaks to be removed and replaced to match existing conditions.
- Roofing system to be replaced within five years.
- All roof drains to be checked for clogs
- All downspouts to be connected and to discharge at grade away from the building
- Additional roof drains and downspouts to be added
- At location of Photo 5.94, install (2)5/8" diameter A36 thru bolts into existing steel clip angles and wood beam
- All existing roofing to be removed and replaced with a new roofing system
- Remove and replace locations of rotten wood fascia and soffit.
- Remove and replace locations of rotten wood fascia and soffit at clerestory conditions.

Roof: Area 1, 2, 4 – 1919

Category 1

- At locations noted that have leaks, roofing to be repaired immediately. Rotten wood framing members at leaks to be removed and replaced to match existing conditions.
- Roofing system to be replaced within five years.
- All roof drains to be checked for clogs
- All downspouts to be connected and to discharge at grade away from the building
- Additional roof drains and downspouts to be added
- All existing roofing to be removed and replaced with a new roofing system
- Remove and replace locations of rotten wood fascia and soffit
- At Area 2 clerestory condition, remove and replace rotten wood fascia and soffit

Roof: Area 3, 6, 8 – 1947

Category 1

- At north end of Area 6, remove and replace all existing roof framing to match existing conditions. This area is completely deteriorated.
- At locations noted that have leaks, roofing to be repaired immediately. Rotten wood framing members at leaks to be removed and replaced to match existing conditions.
- Roofing system to be replaced within five years.
- At Area 3, remove all vegetation on roof
- All roof drains to be checked for clogs
- All downspouts to be connected and to discharge at grade away from the building
- Additional roof drains and downspouts to be added
- At clerestory condition, remove and replace locations of rotten wood fascia and soffit
- All existing roofing to be removed and replaced with a new roofing system
- Remove and replace locations of rotten wood fascia and soffit
- Additional roof drains and downspouts to be added

Roof: Area 5 – Estimate d 1960s to 1970s

Category 1

- At locations noted that have leaks, roofing to be repaired immediately. Rotten wood framing members at leaks to be removed and replaced to match existing conditions.
- Roofing system to be replaced within five years.
- Remove all vegetation on roof
- All roof drains to be checked for clogs
- All downspouts to be connected and to discharge at grade away from the building
- Additional roof drains and downspouts to be added
- At location of Photo 5.94, install (2)5/8" diameter A36 thru bolts into existing steel clip angles and wood beam
- All existing roofing to be removed and replaced with a new roofing system
- Remove and replace locations of rotten wood fascia and soffit.
- Remove plywood roof decking and replace with 1½" – 22 gage metal roof deck. Install new roofing system over metal roof deck.

ELEVATION RECOMMENDATIONS

Elevation: Area 7 – 1915

Category 1

- Replace all broken window panes or cover windows with plywood
- At all locations noted with holes in brick, infill with brick to match existing conditions
- Remove and replace all rotten wood windows and doors to match existing conditions
- Remove and replace any rotten wood members to match existing conditions at the south canopy. See **Photo 3.1**
- Infill jambs of west entry with brick to match existing. See **Photos 4.45 – 4.53**. The infill brick must extend to the underside of roof beam to provide beam bearing support.
- See **Photo 4.82 – 4.85**
    - Remove and replace rotten plywood
    - Repair cracked concrete as follows:
        - Repair with SikaGrout 328, apply per the manufacturer's instructions

Category 2

- At all rusted lintels noted, remove rust with hand-tool cleaning methods and apply primer and paint
- Repoint all brick at locations noted
- Repair cracks in precast window and door sills as follows:
    - Repair with SikaGrout 328, apply per the manufacturer's instructions.
- At all locations where efflorescence was noted and the source of water penetration is stopped, remove efflorescence by dry brushing or brushing with water and a stiff fiber brush. In highly saturated areas, cleaning agents may be used as directed by the manufacturer's application instructions (in accordance with Technical Note 20 of BIA).
- At all existing louver locations, install waterproofing around opening
- Repoint all stone at locations noted
- Repair cracked and chipped steps and landings as follows:
    - All areas are to be chipped back to sound material. All steel reinforcement

exposed in this process is to have a minimum of ¾" clearance in all directions.
    - Apply a coat of Sika Armatec 110 EpoCem bonding agent to all surfaces with repairs greater than 4" in depth per the manufacturer's instructions.
    - For voids up to 4" repair with SikaGrout 328, apply per the manufacturer's instructions.
    - For voids 4" or greater repair with Sikacrete 211 utilizing form boards. Material may be poured or pumped per the manufacturer's instructions.
- Replace damaged stone to match existing at all areaways.
- At all existing openings that have been infilled/covered with plywood, as required by The Secretary of Interior's Standards for the Treatment of Historic Properties, the opening is to be restored to its originally intended use. Corrective waterproofing measures shall be taken during this restoration.

Elevation: Area 1, 2, 4 – 1919

Category 1

- See **Photos 2.63 – 2.72** at Area 4
    - Remove entire tree from inside brick wall down to foundations
    - Remove and replace brick wall to match existing conditions
- Replace all broken window panes or cover windows with plywood
- At all locations noted with holes in brick, infill with brick to match existing conditions
- Remove and replace all rotted wood windows and doors to match existing conditions
- Remove and replace any rotten wood members to match existing conditions at the south canopy
- At Area 2, all wood steps, handrails, and landings to be replaced. See **Photos 2.31, 2.33, & 2.34**.
- See **Photos 2.38 and 2.39**
    - Remove and replace rotten wood
- See **Photo 2.55**
    - Grout void between concrete steps and landing

Category 2

- At all rusted lintels noted, remove rust with hand-tool cleaning methods and apply primer and paint
- Repoint all brick at locations noted
- Repair cracks in precast window and door sills as follows:
    - Repair with SikaGrout 328, apply per the manufacturer's instructions.
- At all existing louver locations, install waterproofing around opening
- At all locations where efflorescence was noted and the source of water penetration is stopped, remove efflorescence by dry brushing or brushing with water and a stiff fiber brush. In highly saturated areas, cleaning agents may be used as directed by the manufacturer's application instructions (in accordance with Technical Note 20 of BIA).
- At Areas 1 and 2, repoint all stone at locations noted
- Repair cracked and chipped concrete at Area 1 loading dock and Area 2 loading dock as follows:
    - All areas are to be chipped back to sound material. All steel reinforcement exposed in this process is to have a minimum of ¾" clearance in all directions.

    - Apply a coat of Sika Armatec 110 EpoCem bonding agent to all surfaces with repairs greater than 4" in depth per the manufacturer's instructions.
    - For voids up to 4" repair with SikaGrout 328, apply per the manufacturer's instructions.
    - For voids 4" or greater repair with Sikacrete 211 utilizing form boards. Material may be poured or pumped per the manufacturer's instructions.
    - At Area 2, new roofing needs to be installed
- At Areas 1 and 2, replace damaged stone to match existing at all areaways.
- For rusted steel beams at the loading dock, remove rust with hand-tool cleaning methods and apply primer and paint
- Repoint stone at Area 2 ramp
- At Area 2 loading dock steel pipe railing, remove rust with hand-tool cleaning methods and apply primer and paint
- Repair cracked and chipped steps at Area 2 as follows:
    - All areas are to be chipped back to sound material. All steel reinforcement exposed in this process is to have a minimum of ¾" clearance in all directions.
    - Apply a coat of Sika Armatec 110 EpoCem bonding agent to all surfaces with repairs greater than 4" in depth per the manufacturer's instructions.
    - For voids up to 4" repair with SikaGrout 328, apply per the manufacturer's instructions.
    - For voids 4" or greater repair with Sikacrete 211 utilizing form boards. Material may be poured or pumped per the manufacturer's instructions.
- Ensure that catch basin at Area 2 is draining properly. See **Photo 2.17**.
- Remove and replace drain pipe at Area 2 to match existing conditions. See **Photo 2.20**.
- At all existing openings that have been infilled/covered with plywood, as required by The Secretary of Interior's Standards for the Treatment of Historic Properties, the opening is to be restored to its originally intended use. Corrective waterproofing measures shall be taken during this restoration.

Elevation Area 3, 6, 8 – 1947

Category 1

- Replace all broken window panes or cover windows with plywood
- At all locations noted with holes in brick, infill with brick to match existing conditions
- Remove and replace all rotted wood windows and doors to match existing conditions
- Remove and replace any rotten wood members to match existing conditions at the Area 6 south canopy

Category 2

- At all rusted lintels noted, remove rust with hand-tool cleaning methods and apply primer and paint
- Repoint all brick at locations noted
- Repoint large delamination crack in the brick wall at the southwest corner of Area 8
- Repair cracks in precast window and door sills as follows:
    - Repair with SikaGrout 328, apply per the manufacturer's instructions.
- At all existing louver locations, install waterproofing around opening

- At all locations where efflorescence was noted and the source of water penetration is stopped, remove efflorescence by dry brushing or brushing with water and a stiff fiber brush. In highly saturated areas, cleaning agents may be used as directed by the manufacturer's application instructions (in accordance with Technical Note 20 of BIA).
- At Area 6, repoint all stone at locations noted
- Repair cracked and chipped concrete at northwest and northeast corners of Area 8 as follows:
    - All areas are to be chipped back to sound material. All steel reinforcement exposed in this process is to have a minimum of ¾" clearance in all directions.
    - Apply a coat of Sika Armatec 110 EpoCem bonding agent to all surfaces with repairs greater than 4" in depth per the manufacturer's instructions.
    - For voids up to 4" repair with SikaGrout 328, apply per the manufacturer's instructions.
    - For voids 4" or greater repair with Sikacrete 211 utilizing form boards. Material may be poured or pumped per the manufacturer's instructions.
- Repair cracked and chipped steps at Area 6 as follows:
    - All areas are to be chipped back to sound material. All steel reinforcement exposed in this process is to have a minimum of ¾" clearance in all directions.
    - Apply a coat of Sika Armatec 110 EpoCem bonding agent to all surfaces with repairs greater than 4" in depth per the manufacturer's instructions.
    - For voids up to 4" repair with SikaGrout 328, apply per the manufacturer's instructions.
    - For voids 4" or greater repair with Sikacrete 211 utilizing form boards. Material may be poured or pumped per the manufacturer's instructions.
- Remove all vegetation from north wall of Area 3
- At all rusted angle framing on east wall of Area 8, remove rust with hand-tool cleaning methods and apply primer and paint
- At all existing openings that have been infilled/covered with plywood, as required by The Secretary of Interior's Standards for the Treatment of Historic Properties, the opening is to be restored to its originally intended use. Corrective waterproofing measures shall be taken during this restoration.

Area 5 – Estimated 1960s to 1970s

Category 1

- Replace all broken window panes or cover windows with plywood
- At all locations noted with holes in brick, infill with brick to match existing conditions
- Remove and replace all rotted wood windows and doors to match existing conditions
- At Area 5, all wood steps, handrails, and landings to be replaced
- Patch all holes in metal siding to match existing
- Replace damaged or missing soffit to match existing
- Replace damage plywood. See **Photo 5.120.**

Category 2

- At all rusted lintels noted, remove rust with hand-tool cleaning methods and apply primer and paint
- Repoint all brick at locations noted

- Repair cracks in precast window and door sills as follows:
    - Repair with SikaGrout 328, apply per the manufacturer's instructions.
- At all existing louver locations, install waterproofing around opening
- At all locations where efflorescence was noted and the source of water penetration is stopped, remove efflorescence by dry brushing or brushing with water and a stiff fiber brush. In highly saturated areas, cleaning agents may be used as directed by the manufacturer's application instructions (in accordance with Technical Note 20 of BIA).
- Repair cracked and chipped concrete piers and beams at the south wall of Area 5 as follows:
    - All areas are to be chipped back to sound material. All steel reinforcement exposed in this process is to have a minimum of ¾" clearance in all directions.
    - Apply a coat of Sika Armatec 110 EpoCem bonding agent to all surfaces with repairs greater than 4" in depth per the manufacturer's instructions.
    - For voids up to 4" repair with SikaGrout 328, apply per the manufacturer's instructions.
    - For voids 4" or greater repair with Sikacrete 211 utilizing form boards. Material may be poured or pumped per the manufacturer's instructions.
- Repair cracked and chipped concrete ramp at the southwest corner of Area 5 as follows:
    - All areas are to be chipped back to sound material. All steel reinforcement exposed in this process is to have a minimum of ¾" clearance in all directions.
    - Apply a coat of Sika Armatec 110 EpoCem bonding agent to all surfaces with repairs greater than 4" in depth per the manufacturer's instructions.
    - For voids up to 4" repair with SikaGrout 328, apply per the manufacturer's instructions.
    - For voids 4" or greater repair with Sikacrete 211 utilizing form boards. Material may be poured or pumped per the manufacturer's instructions.
- Remove all vegetation from north wall of Area 5
- Remove and replace metal siding and wood stud backup system entirely with new exterior brick and CMU block backup system
- At all existing openings that have been infilled/covered with plywood, as required by The Secretary of Interior's Standards for the Treatment of Historic Properties, the opening is to be restored to its originally intended use. Corrective waterproofing measures shall be taken during this restoration.

RECOMMENDATIONS: STRUCTURAL FLOOR FRAMING AND ROOF FRAMING

Area 7 – 1915

Category 1

- Remove and replace wood decking and framing to match existing at areas noted in the Observations section above.
- See **Photos 5.51 – 5.62** at courtyard vestibule
    - Remove and replace all wood framing to match existing conditions.

Category 2

- Repoint cracks in brick walls as noted in Elevation Recommendations.

- If Area is to receive forklift traffic, add column cover as follows to protect columns from damage like in **Photo 5.114:**
    - Cover plate columns with steel plates or
    - Add bollards or
    - Add concrete cover.

Area 1, 2, 4 – 1919

Category 1

- Remove and replace wood decking and framing to match existing at areas noted in the Observations section above.

Category 2

- Repoint cracks in brick walls as noted in Elevation Recommendations.
- Repair cracks in concrete wall as follows:
    - Repair with SikaGrout 328, apply per the manufacturer's instructions.
- Repair cracks in concrete slab at Area 2 (see **Photo 5.50**) as follows:
    - Repair with SikaGrout 328, apply per the manufacturer's instructions.
- See **Photo 5.27** at Area 1
    - Replace brick infill to match existing
- See **Photos 5.25 and 5.26**
- Ensure that all floor drains are not clogged and are draining properly. Also, see **Photo 5.20** for specific location that needs testing.

Area 3, 6, 8 – 1947

Category 1

- Remove and replace wood decking and framing to match existing at areas noted in the Observations section above.

Category 2

- Repoint cracks in brick walls as noted in Elevation Recommendations.
- If Area is to receive forklift traffic, add column cover as follows to protect columns from damage like in **Photo 5.114 and Photo 5.95:**
    - Cover plate columns with steel plates or
    - Add bollards or
    - Add concrete cover.

Area 5 – Estimate 1960s to 1970s

Category 1

- Remove and replace wood decking and framing to match existing at areas noted in the Observations section above.

Category 2

- Repoint cracks in brick walls as noted in Elevation Recommendations.
- Repair cracks in concrete slab at Area 5 (see **Photo 5.119**) as follows:
    - Repair with SikaGrout 328, apply per the manufacturer's instructions.

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EXECUTIVE SUMMARY

In general, the roof and floor framing structural members are in good condition except for specific areas of water damage noted in the report. These areas must be repaired as soon as possible. The roof framing members are capable of supporting the Code minimum roof live load requirement. The floor framing members are capable of supporting loads for an Office use.

The roofing system needs to be replaced within the next two to five years. Numerous leaks are present as noted in the report, and these areas need to be repaired immediately to prevent further deterioration. In addition, all vegetation needs to be removed from the roof and walls. Also, all downspouts need to be connected and diverted away from the building. Roof drains need to be checked for any clogs. Until the roof is completely replaced, new leaks are likely. Maintenance personnel will need to monitor the building for additional leaks on a monthly basis and repair them immediately.

In general, the exterior brick walls are in good condition. All holes need to be repaired immediately as noted in the report. Repointing of the walls can be done with a long term maintenance plan. The soffit in many locations has deteriorated as noted in the report; however, it does not have to be replaced until the roofing system is replaced. Until the roof and soffit are replaced, the soffit will likely continue to deteriorate.

The majority of windows have broken window panes. The window panes should be replaced or infilled with plywood. In general, the steel windows are in good condition but the rust needs to be removed with a long term maintenance plan. In general, the wood windows are in fair condition; however, they will need to be repainted and reglazed. Steel lintels are in good condition but the rust needs to be removed with a long term maintenance plan.

Some of the concrete steps, ramps, and walls had some concrete spalling and cracking. These areas can be repaired with a long term maintenance plan.

Per the recommendations for Mothballing Historic Buildings, the building should be treated for pests. In addition, the building should be secured against break-ins with locks on doors and windows should be boarded up as noted in the report. This report assumes that proper amounts of ventilation will be maintained to prevent damages associated with humidity and freeze-thaw cycles. Maintenance personnel should have a plan to check on the building as outlined in Mothballing Historic Buildings.

Stewart Engineering, Inc. appreciates the opportunity to assist you in this investigation. If you have any questions about the recommendations contained in this report, please contact us.

Sincerely,
Stewart Engineering, Inc.

Craig Fisher, P.E.

STEWART

Report References

Brick Industry Association (BIA) Technical Notes
National Register of Historic Places Registration Form 5.11.99
The Secretary of Interior's Standards for the Treatment of Historic Properties
Mothballing Historic Buildings, National Park Service, US Department of the Interior

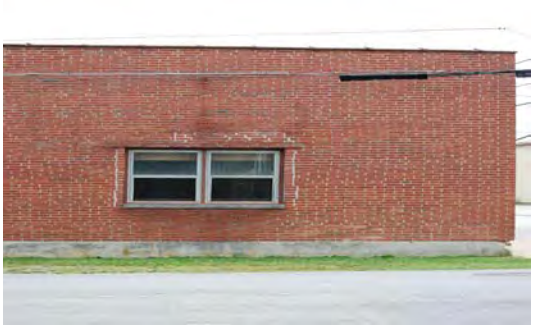


Photo 1.1

Photo 1.2

Photo 1.3

Photo 1.4

Photo 1.5

Photos – North Elevation (5th Avenue)
(Area 8)

Photo 1.6

Photo 1.7

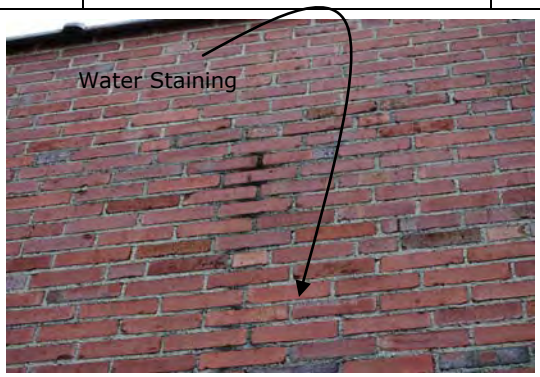
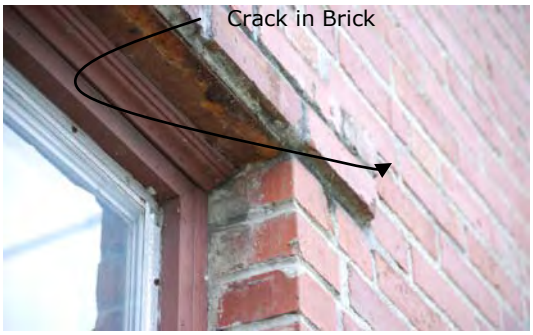


Photo 1.8

Photo 1.9



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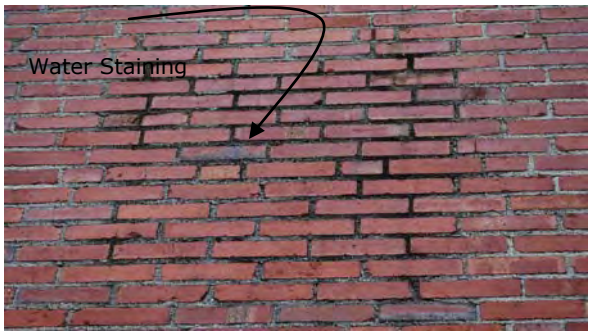


Photo 1.11

Photo 1.12

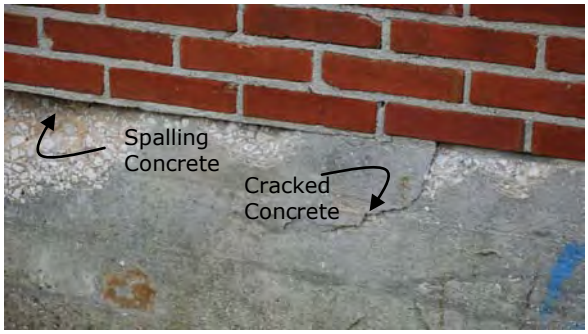


Photo 1.13

Photos – North Elevation (5th Avenue) (Area 8)

Photo 1.14

Photo 1.15

Photos – North Elevation (5th Avenue)
(Area 8)

Photo 1.16

Photo 1.17

Photo 1.18

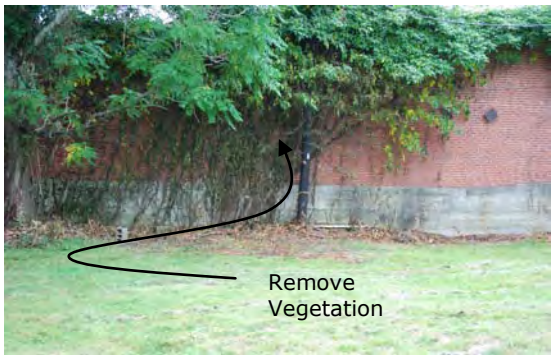


Photo 1.19

Photo 1.20

Photos – North Elevation (5th Avenue)
(Area 3 & 5)

Photo 2.1

Photo 2.2

Photo 2.3

Photo 2.4

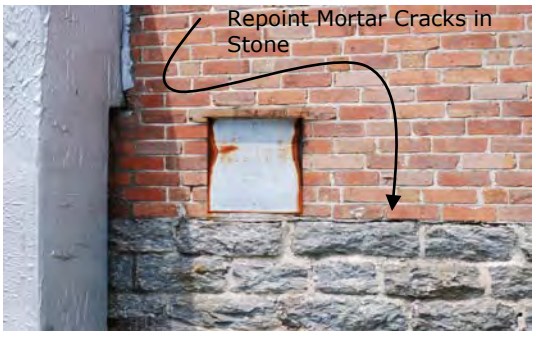


Photo 2.5

Photo 2.6

Photo 2.7

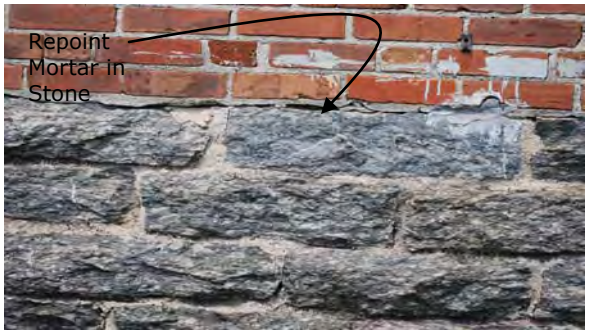


Photo 2.8

Photos – East Elevation (Pine Street)
(Area 1)

Photo 2.9

Photo 2.10

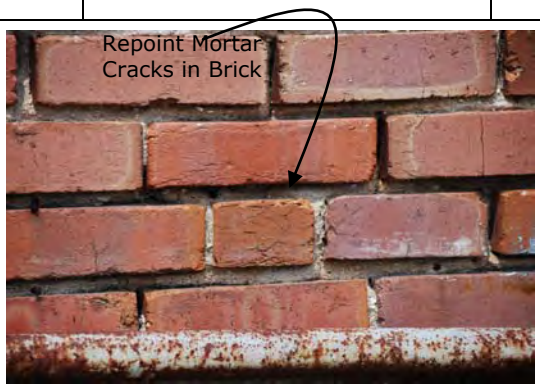


Photo 2.11

Photo 2.12

Photo 2.13

Photo 2.14

Photos – East Elevation (Pine Street)
(Area 1 & 2)

Photo 2.15

Photo 2.16

Photo 2.17

Photo 2.18

Photo 2.19

Photo 2.20

Photo 2.21

Photo 2.22

Photos – East Elevation (Pine Street)
(Area 2)

Photo 2.23

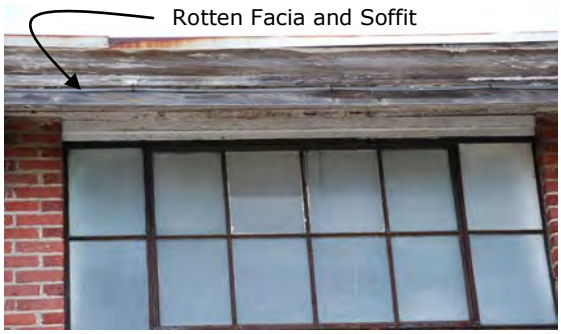


Photo 2.24

Photos – East Elevation (Pine Street)
(Area 2)

Photo 2.25

Photo 2.26

Photo 2.27

Photo 2.28

Photo 2.29

Photo 2.30

Photo 2.31

Photo 2.32

Photos – East Elevation (Pine Street)
(Area 2 & 4)

Photo 2.33

Photo 2.34

Photo 2.35

Photo 2.36

Photo 2.37

Photo 2.38

Photo 2.39

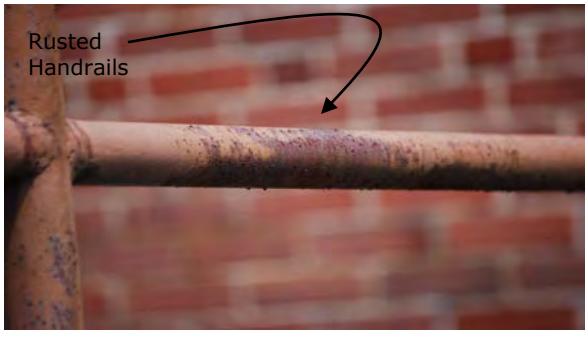
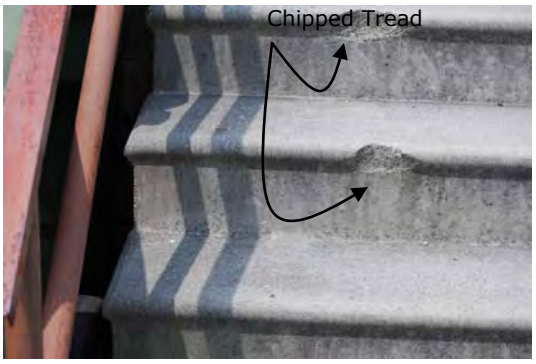


Photo 2.40

Photos – East Elevation (Pine Street) (Area 2)

Photo 2.41

Photo 2.42



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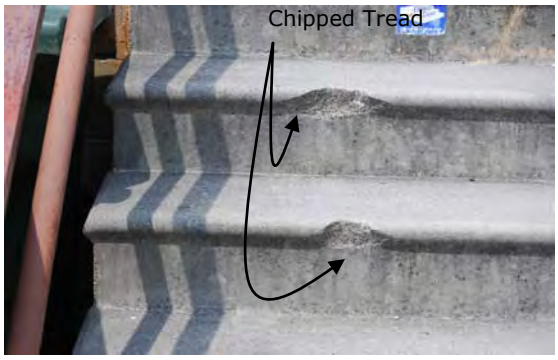

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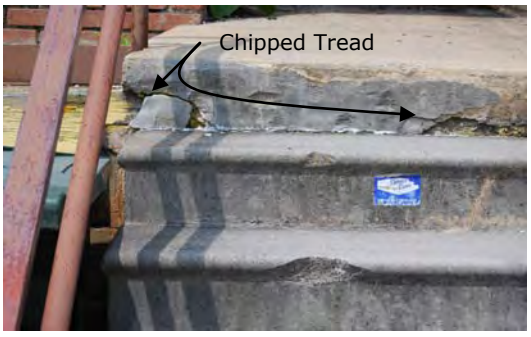


Photo 2.45

Photo 2.46

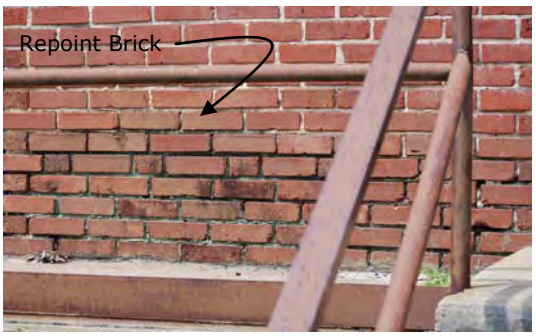


Photo 2.47

Photo 2.48

Photos – East Elevation (Pine Street)
(Area 2)

Photo 2.49

Photo 2.50

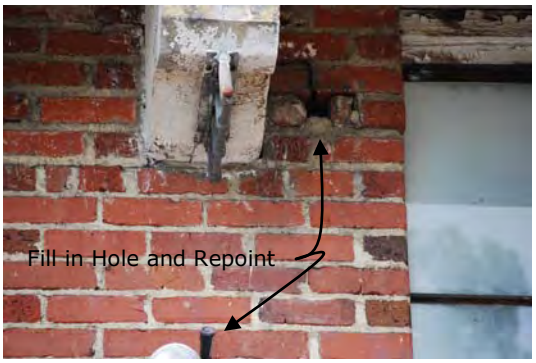


Photo 2.51

Photo 2.52

Photo 2.53

Photo 2.54

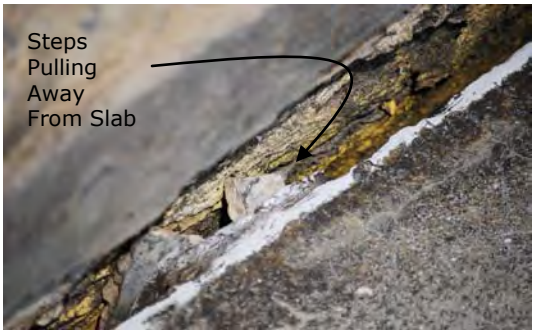


Photo 2.55

Photo 2.56

Photos – East Elevation (Pine Street)
(Area 2)

Photo 2.57

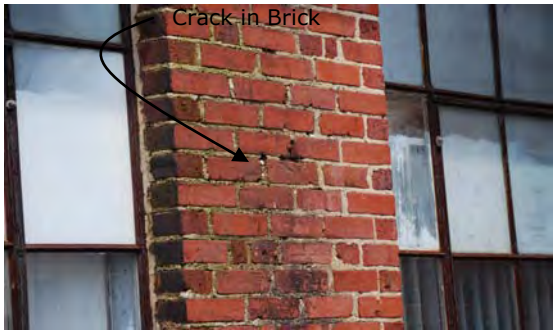


Photo 2.58

Photo 2.59

Photo 2.60

Photo 2.61

Photo 2.62

Photo 2.63

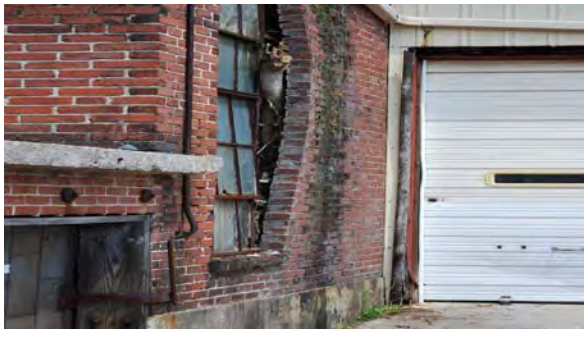


Photo 2.64

Photos – East Elevation (Pine Street)
(Area 2 & 4)

Photo 2.65

Photo 2.66

Photo 2.67

Photo 2.68

Photo 2.69

Photo 2.70

Photo 2.71

Photo 2.72

Photos – East Elevation (Pine Street)
(Area 4)

Photo 2.73

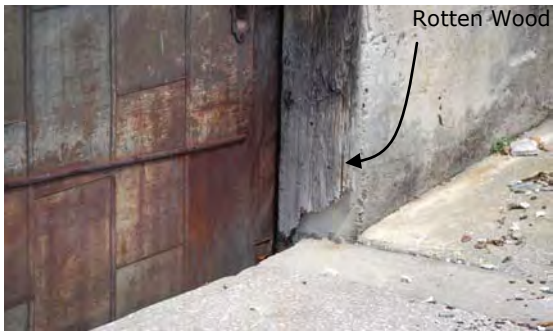


Photo 2.74

Photo 2.75

Photo 2.76

Photo 2.77

Photos – East Elevation (Pine Street)
(Area 2)

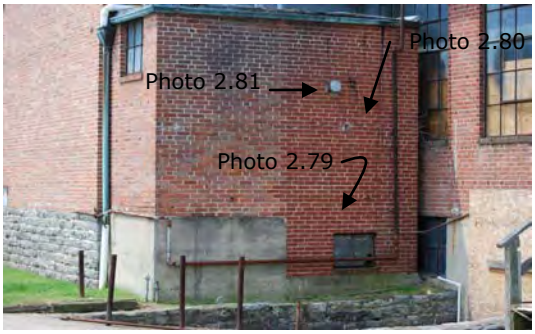


Photo 2.78

Photo 2.79

Photo 2.80

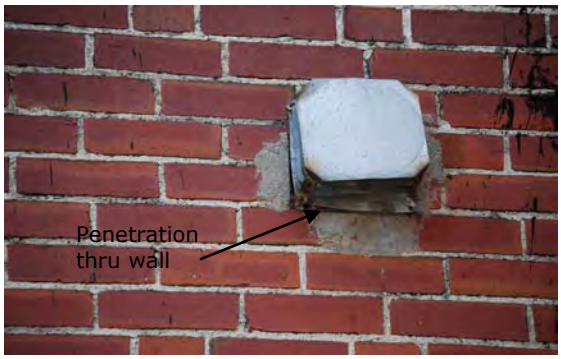
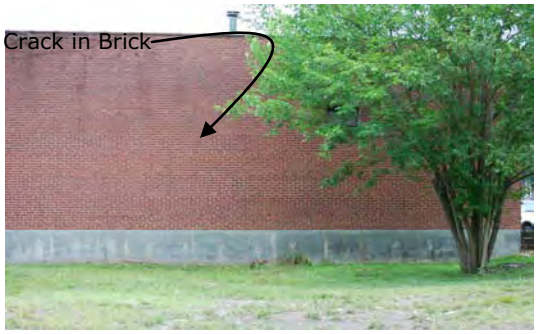


Photo 2.81

Photos – East Elevation (Pine Street)
(Area 2)



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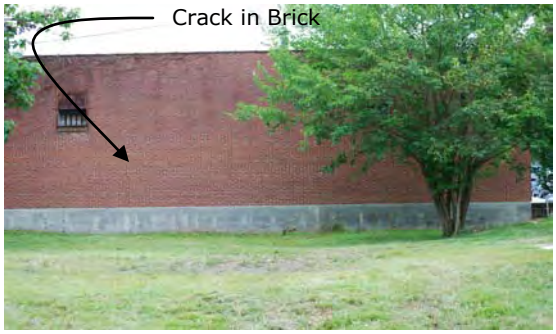

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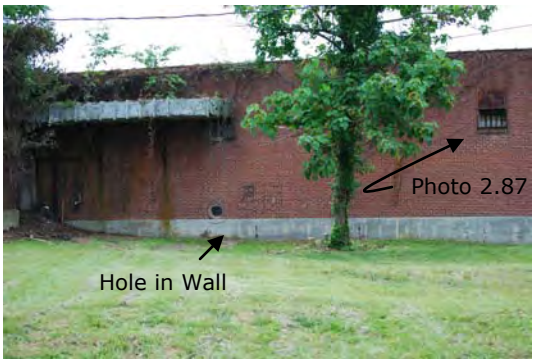

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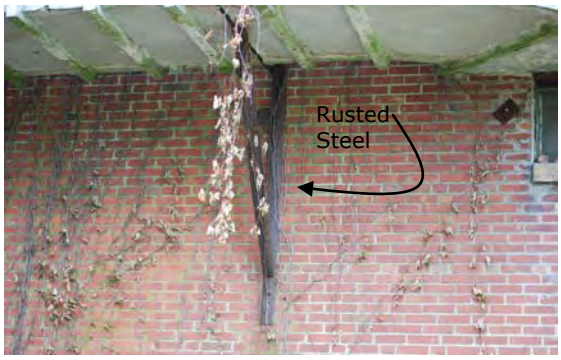

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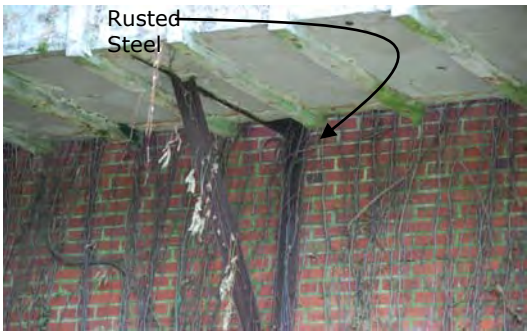


Photo 2.86

Photo 2.87

Photo 2.88

Photo 2.89

Photos – East Elevation
(Area 8)

Photo 2.90

Photo 2.91

Photo 2.92

Photo 2.93

Photos –East Elevation
(Area 5)

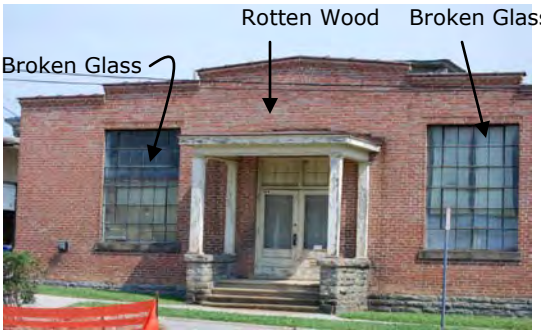


Photo 3.1

Photo 3.2

Photo 3.3

Photo 3.4

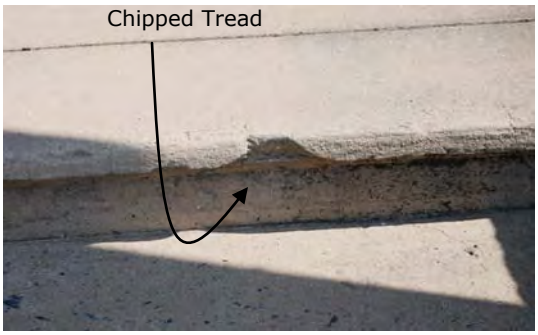


Photo 3.5

South Elevation- Fourth Avenue
Photos – Left Side Entry (Area 7)

Photo 3.7

Photo 3.8

South Elevation- Fourth Avenue
Photos – Between Left Side Entry and Main Entry (Area 7)

Photo 3.9

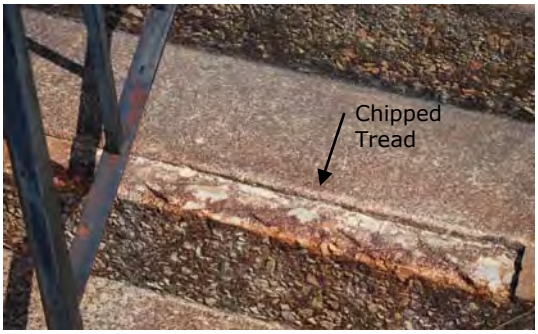
Photo 3.10

Photo 3.11

Photo 3.12

Photo 3.13

Photo 3.14



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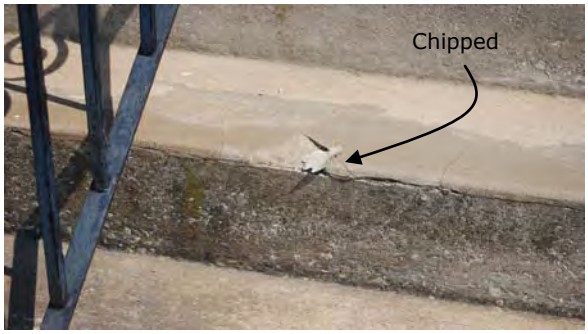
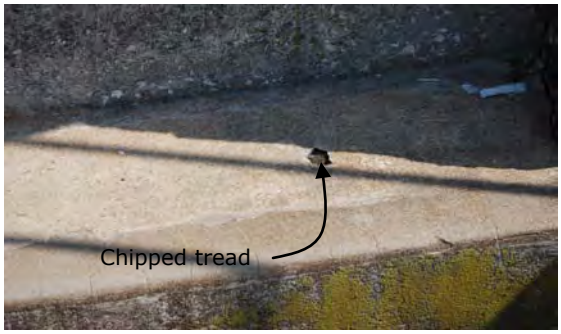


Photo 3.16

South Elevation- Fourth Avenue
Photos – Main Entry (Area 6)

Photo 3.17



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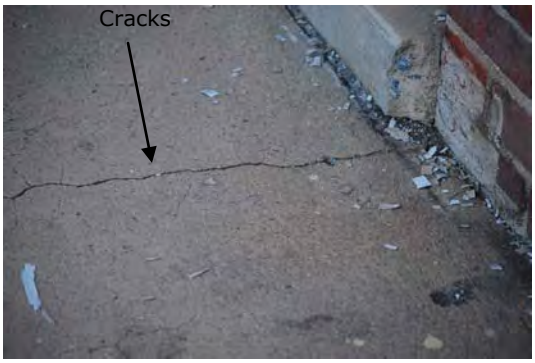


Photo 3.19

Photo 3.20

Photo 3.21

Photo 3.22

South Elevation-Fourth Avenue
Photos – Main Entry (Area 6)

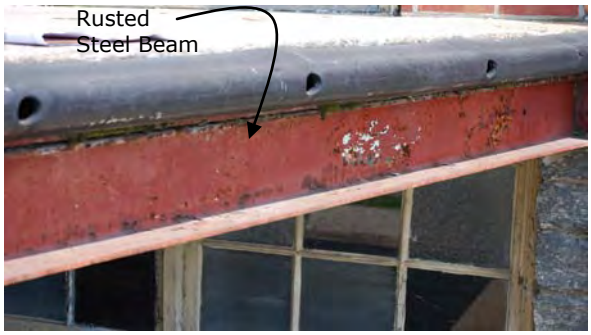
Photo 3.23

Photo 3.24

Photo 3.25

Photo 3.26

Photo 3.27



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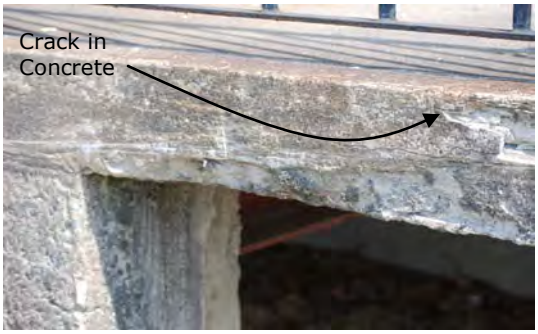

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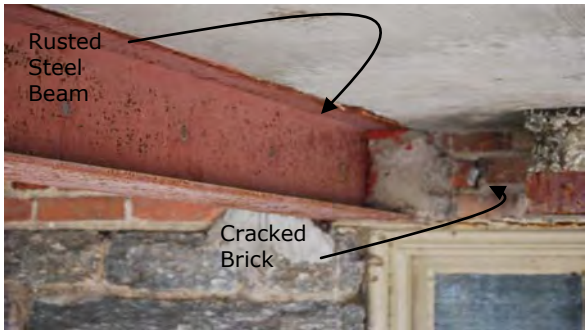


Photo 3.30

South Elevation-Fourth Avenue
Photos – Loading Dock (Area 1)

Photo 3.31

Photo 3.32

Photo 3.34

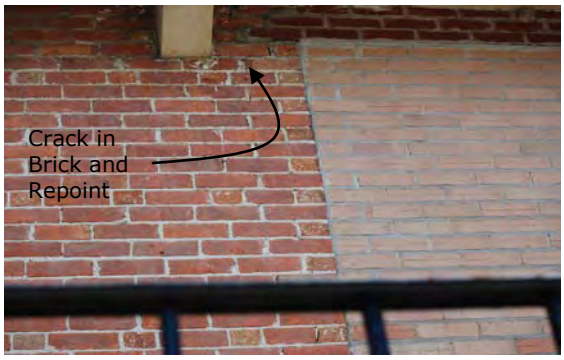


Photo 3.35

Photo 3.36

South Elevation-Fourth Avenue
Photos – Loading Dock (Area 1)

Photo 3.37

Photo 3.38

Photo 3.39

Photo 3.40

Photo 3.41

Photo 3.42

Photo 3.43

Photo 3.44

South Elevation-Fourth Avenue
Photos – Right of Main Entry (Area 1)

Photo 3.45

Photo 3.46

Photo 3.47

Photo 3.48

Photo 3.49

Photo 3.50

Photo 3.51

Photo 3.52

South Elevation-Fourth Avenue
Photos – Right of Main Entry (Area 1)

Photo 3.53

Photo 3.54

Photo 3.55

Photo 3.56

Photo 3.57

Photo 3.58

Photo 3.59

Photo 3.60

South Elevation-Fourth Avenue
Photos –(Area 5)

Photo 3.61

Photo 3.62

Photo 3.63

Photo 3.64

Photo 3.65

Photo 3.66

Photo 3.67

Photo 3.68

South Elevation-Fourth Avenue
Photos – (Area 5)

Photo 3.69

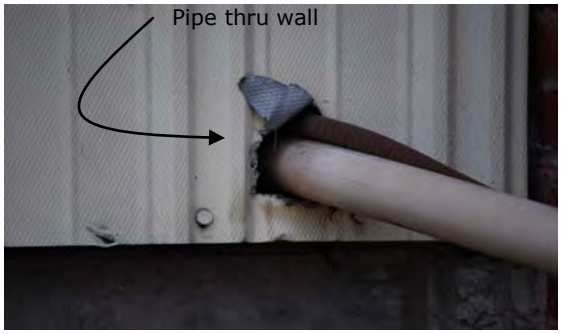


Photo 3.70

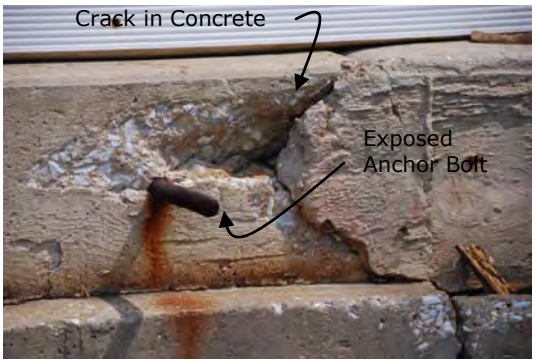


Photo 3.71

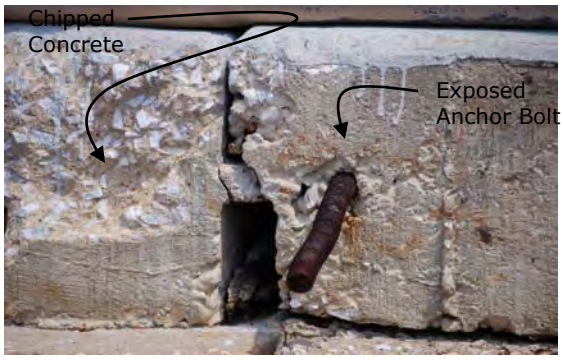


Photo 3.72

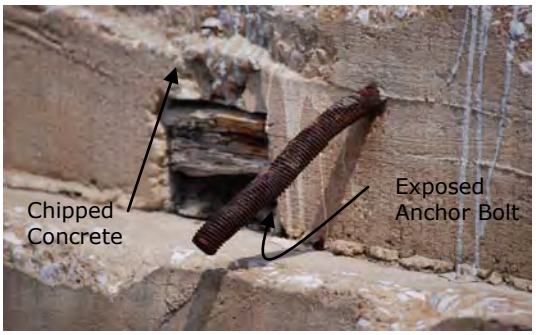


Photo 3.73

South Elevation-Fourth Avenue
Photos – (Area 5)

Photo 4.1

Photo 4.2

Photo 4.3

Photo 4.4

Photos – West Elevation (Grove Street) (Area 7)

Photo 4.5

Photo 4.6

Photo 4.7

Photo 4.8

Photos – West Elevation (Grove Street) (Area 7)

Photo 4.9

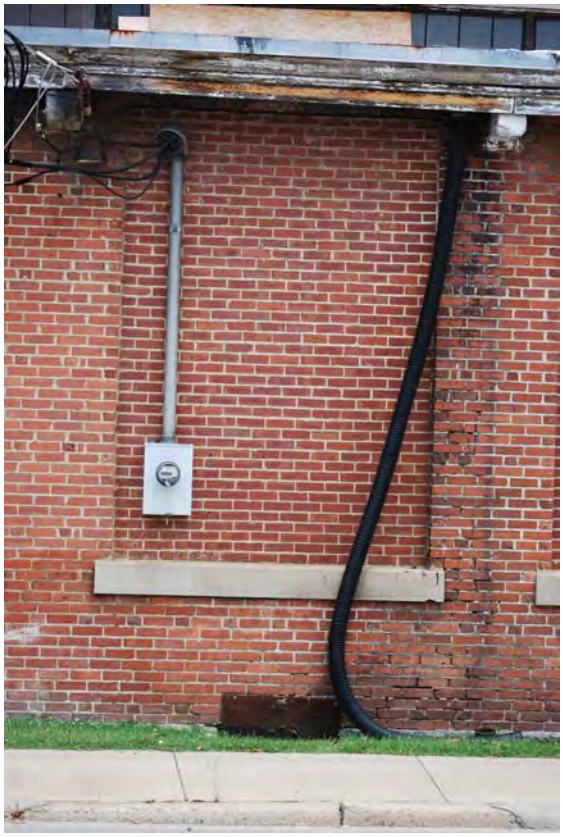


Photo 4.10

Photo 4.11

Photo 4.12

Photos – West Elevation (Grove Street) (Area 7)

Photo 4.13

Photo 4.14

Photo 4.15

Photo 4.16

Photos – West Elevation (Grove Street) (Area 7)

Photo 4.17

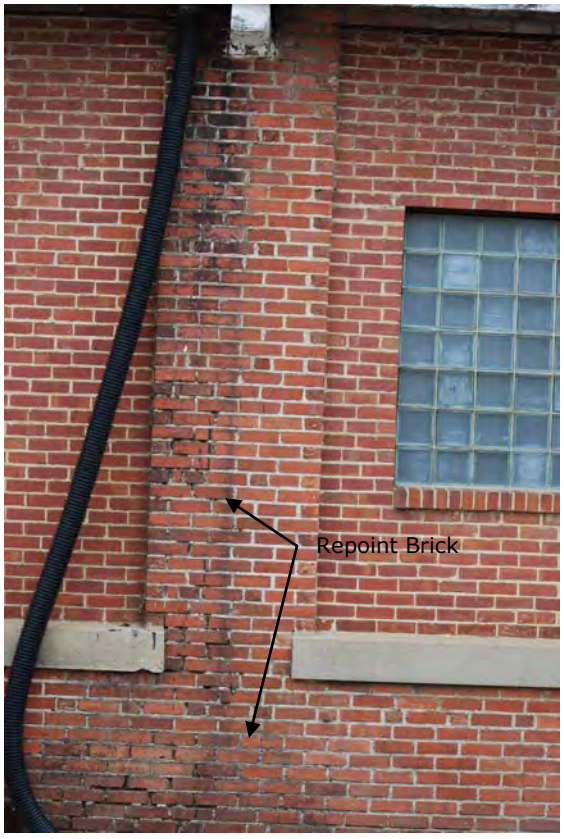


Photo 4.18

Photo 4.19

Photo 4.20

Photos – West Elevation (Grove Street) (Area 7)

Photo 4.21

Photo 4.22

Photo 4.23

Photo 4.24

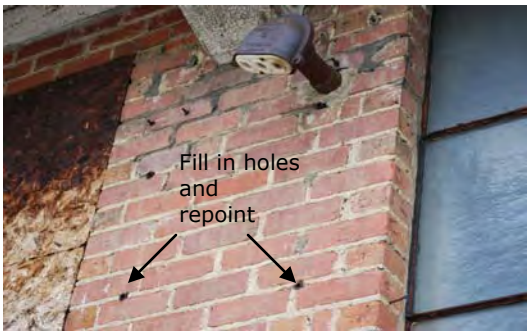


Photo 4.25

Photo 4.26

Photo 4.27

Photo 4.28

Photos – West Elevation (Grove Street) (Area 7)

Photo 4.29

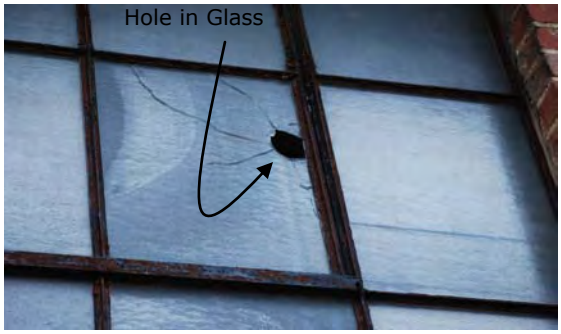


Photo 4.30

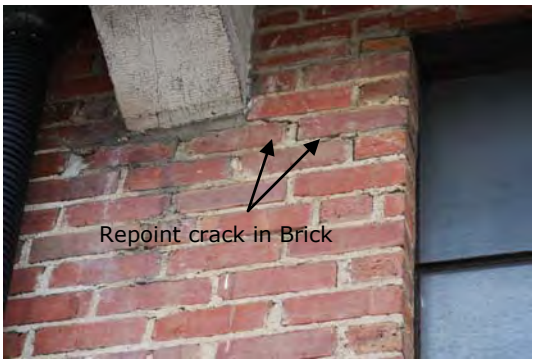


Photo 4.31

Photo 4.32

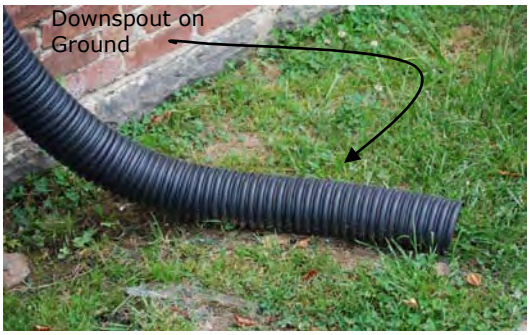


Photo 4.33

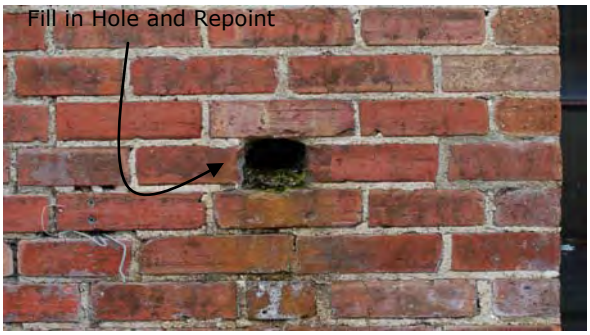


Photo 4.34

Photo 4.35

Photo 4.36

Photos – West Elevation (Grove Street) (Area 7)

Photo 4.37

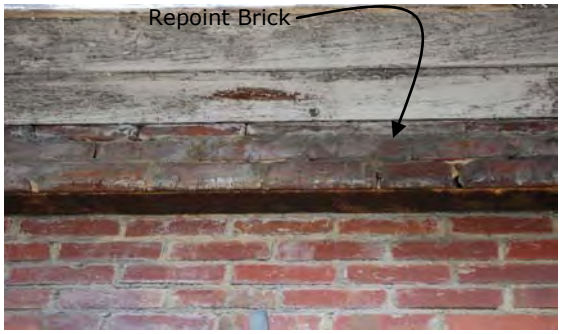


Photo 4.38

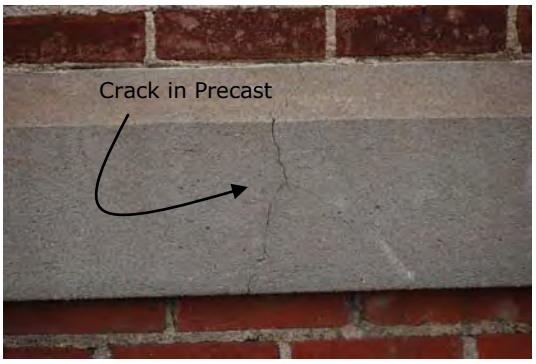


Photo x4.39

Photo 4.40

Photo 4.41

Photo 4.42

Photo 4.43

Photo 4.44

Photos – West Elevation (Grove Street) (Area 7)

Photo 4.45

Photo 4.46

Photo 4.47

Photo 4.48

Photo 4.49

Photo 4.50

Photo 4.51

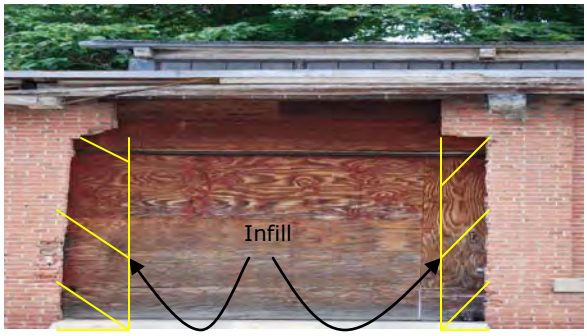


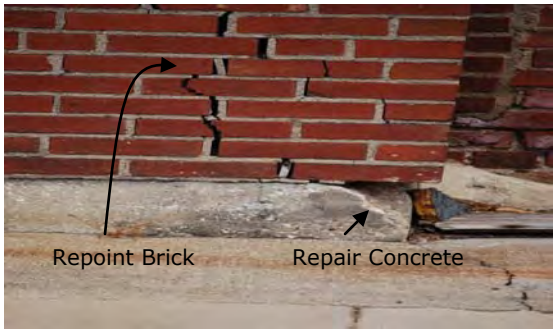
Photo 4.52

Photos – West Elevation (Grove Street) (Area 7)

Photo 4.53

Photos – West Elevation (Grove Street) (Area 7)

Photo 4.54



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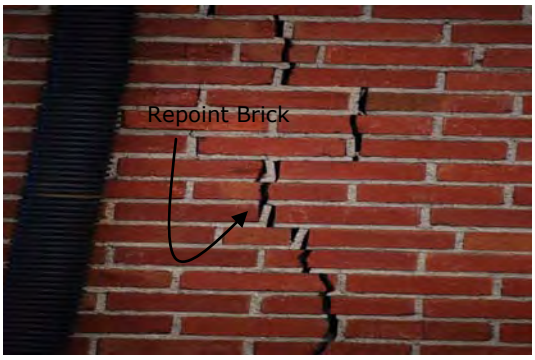

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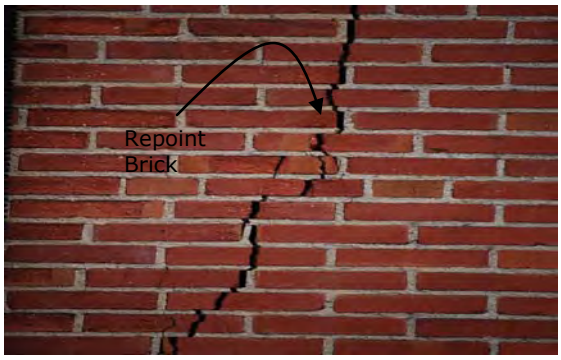

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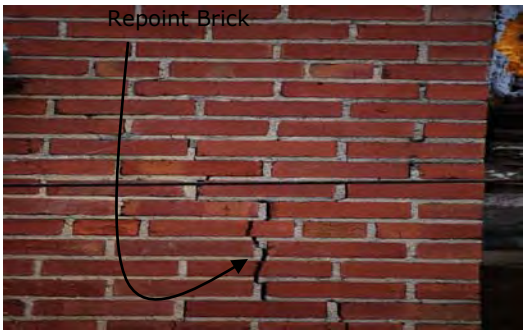


Photo 4.58

Photo 4.59

Photo 4.60

Photo 4.61

Photos – west Elevation (Grove Street) (Area 8)

Photo 4.62

Photo 4.63

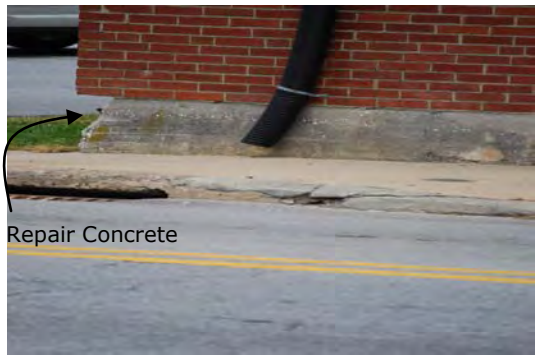


Photo 4.64

Photos – West Elevation (Grove Street) (Area 8)

Photo 4.65

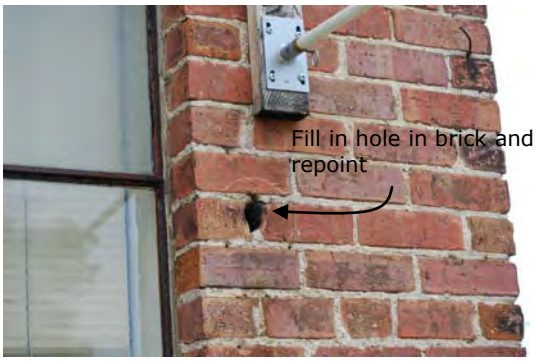
Photo 4.66

Photo 4.67

Photos – West Elevation (Grove Street) (Area 7)

Photo 4.68

Photo 4.69



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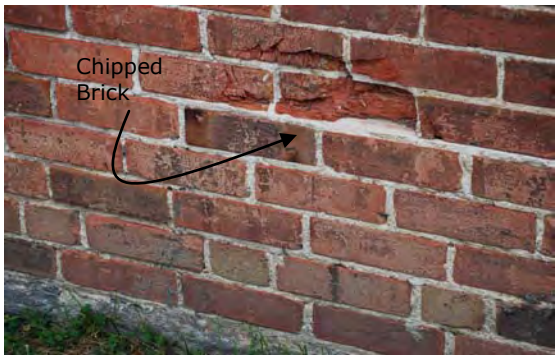


Photo 4.71

Photo 4.72

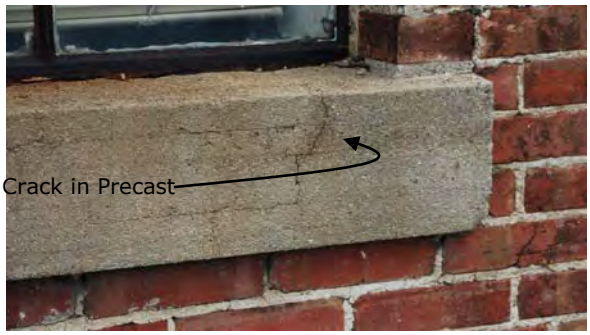


Photo 4.73

Photo 4.74

Photos – West Elevation (Grove Street) (Area 7)

Photo 4.75

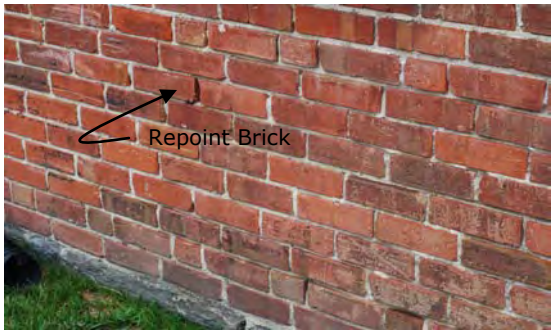


Photo 4.76

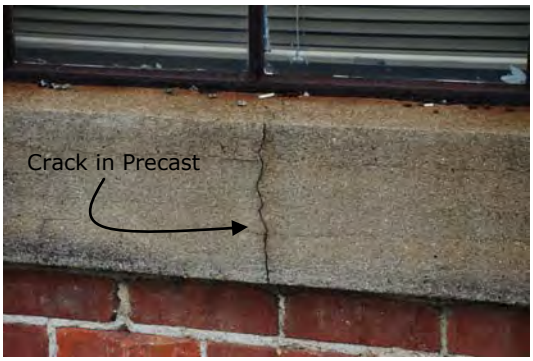


Photo 4.77

Photo 4.78

Photo 4.79

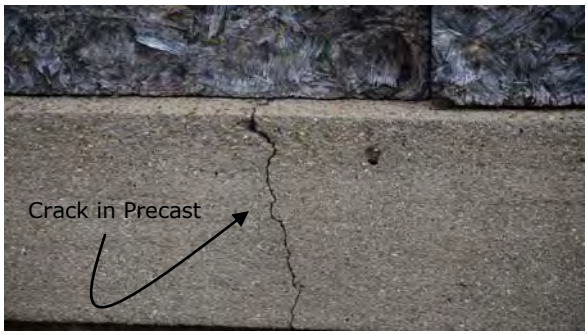


Photo 4.80

Photo 4.81

Photos – West Elevation (Grove Street) (Area 7)

Photo 4.82

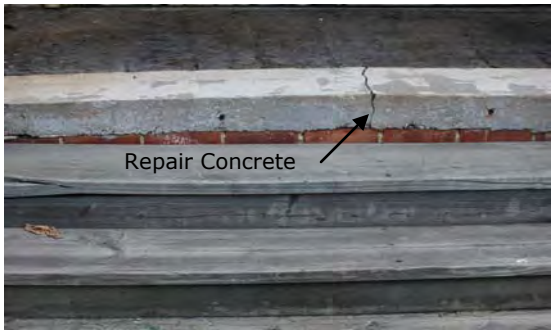


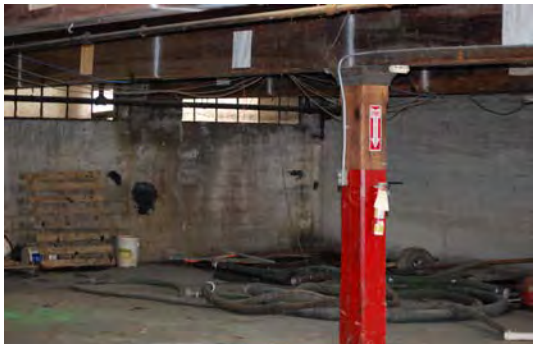
Photo 4.83

Photo 4.84

Photo 4.85

Photos – West Elevation (Grove Street) (Area 7)

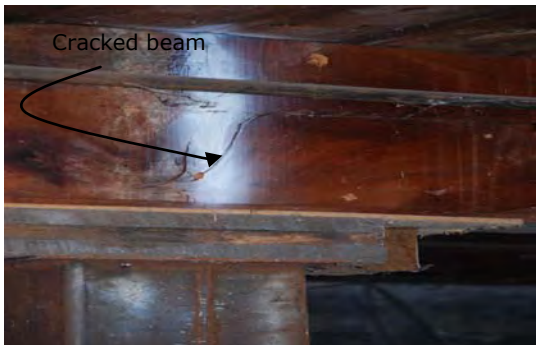
Area NO.2 (1919) First Floor
Framing Photo 5.1



Area NO.2 (1919) First Floor
Framing Photo 5.2

Area NO.2 (1919) First Floor
Framing Photo 5.3

Area NO.2 (1919) First Floor
Framing Photo 5.4



Area NO.2 (1919) First Floor
Framing Photo 5.5

Area NO.2 (1919) First Floor
Framing Photo 5.6

Area NO.2 (1919)First Floor
Framing Photo 5.7

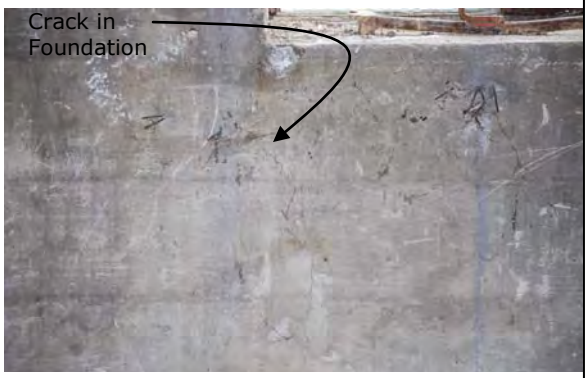
Area NO.2 (1919) First Floor
Framing Photo 5.8

Photos – Interior
Area 2-First Floor Framing

Area NO.2 (1919) First Floor
Framing Photo 5.9

Area NO.2 (1919) First Floor
Framing Photo 5.10

Area NO.2 (1919) First Floor
Framing Photo 5.11



Area NO.2 (1919) First Floor
Framing Photo 5.12

Area NO.1 (1919) First Floor
Framing Photo 5.13

Area NO.1 (1919) First Floor
Framing Photo 5.14

Area NO.1 (1919) First Floor
Framing Photo 5.15

Area NO.1 (1919) First Floor
Framing Photo 5.16

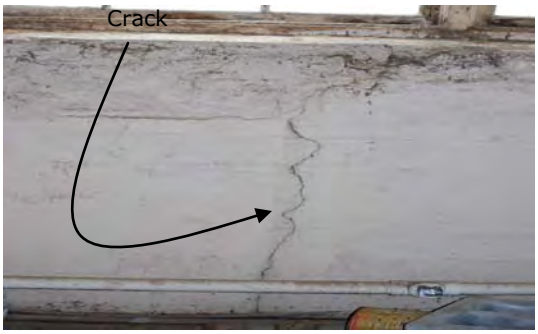
Photos – Interior
Area 1 and 2- First Floor Framing

Area NO.1 (1919) First Floor
Framing Photo 5.17

Area NO.1 (1919) First Floor
Framing Photo 5.18

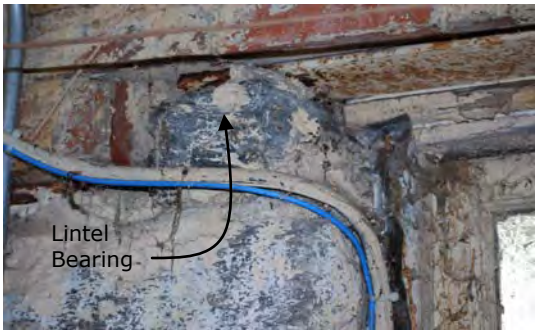
Area NO.1 (1919) First floor
Framing Photo 5.19

Area NO.1 (1919) First floor
Framing Photo 5.20



Area NO.1 (1919) First Floor
Framing Photo 5.21

Area NO.1 (1919) First Floor
Framing Photo 5.22



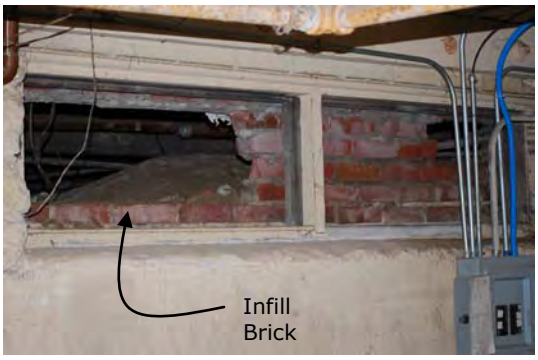
Area NO.1 (1919) First Floor
Framing Photo 5.23

Area NO.1 (1919) First Floor
Framing Photo 5.24

Photos – Interior
Area No. 1-First Floor Framing

Area NO.1 (1919) First Floor Framing Photo 5.25

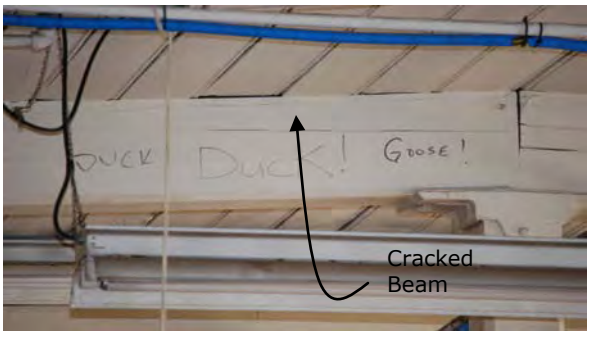
Area NO.1 (1919) First Floor Framing Photo 5.26



Area NO.1 (1919) First Floor Framing Photo 5.27

Area NO.1 (1919) Roof Framing Photo 5.28

Area NO.1 (1919) Roof Framing Photo 5.29



Area NO.1 (1919) Roof Framing Photo 5.30

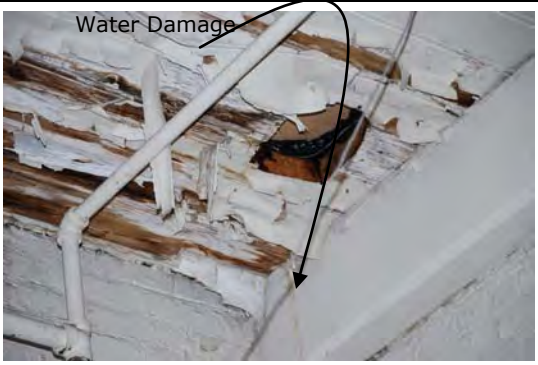
Area NO.1 (1919) Roof Framing Photo 5.31

Area NO.1 (1919) Roof Framing Photo 5.32

Photos – Interior
Area 1 First Floor Framing and Roof Framing

Area NO.1 (1919) Roof Framing
Photo 5.33

Area NO.1 (1919) Roof Framing
Photo 5.34



Area NO.1 (1919) Roof Framing
Photo 5.35

Area NO.1 (1919) Roof Framing
Photo 5.36

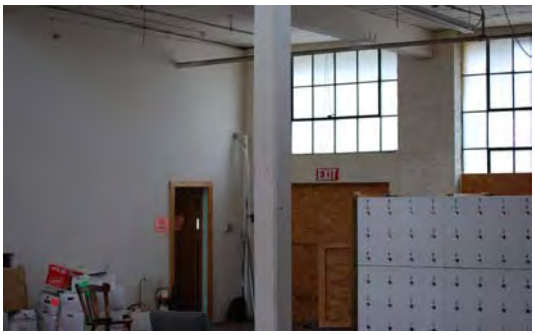
Area NO.1 (1919) First Floor
Framing Photo 5.37

Area NO.1 (1919) First floor
Framing Photo 5.38

Area NO.1 (1919) Roof Framing
Photo 5.39

Area NO.1 (1919) Roof Framing
Photo 5.40

Photos – Interior
Area 1 First Floor Framing and Roof Framing

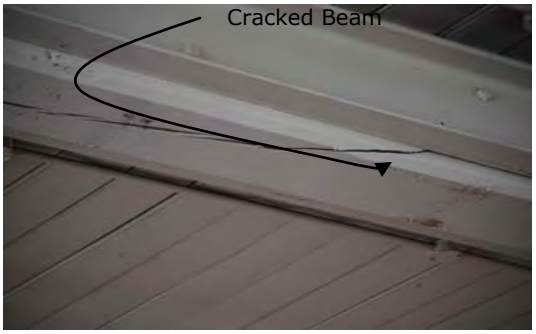


Area NO.2 (1919) Roof Framing
Photo 5.41

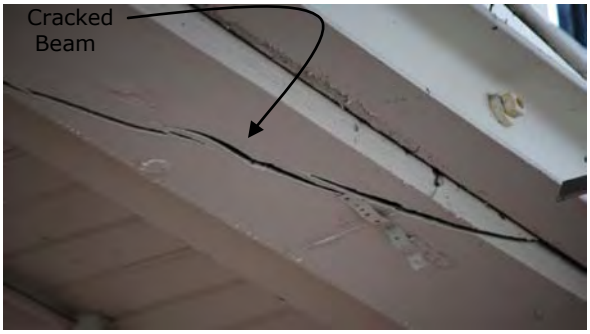
Area NO.2 (1919) Roof Framing
Photo 5.42

Area NO.2 (1919) Roof Framing
Photo 5.43

Area NO.2 (1919)Roof Framing
Photo 5.44



Area NO.2 (1919) Roof Framing
Photo 5.45



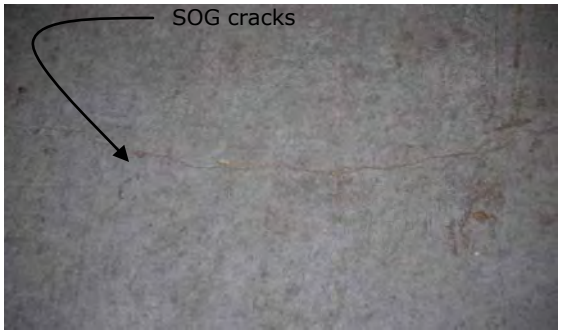
Area NO.2 (1919) Roof Framing
Photo 5.46

Area NO.2 (1919) Roof Framing
Photo 5.47

Area NO.2 (1919) Roof Framing
Photo 5.48

Photos – Interior
Area 2 Roof Framing

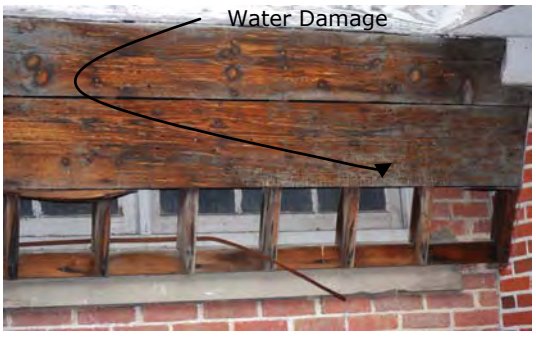
Area NO.2 (1919) Roof Framing
Photo 5.49



Area NO.2 (1919) First Floor
Framing Photo 5.50

Area NO.6 (1915) Roof Framing
Photo 5.51

Area NO.6 (1915) First Floor
Framing Photo 5.52



Area NO.6 (1915) First Floor
Framing Photo 5.53

Area NO.6 (1915) Photo 5.54

Area NO.6 (1915) First Floor
Framing Photo 5.55

Area NO.6 (1915) First Floor
Framing Photo 5.56

Photos – Interior
Area 2, Area 6- First Floor and Roof
Framing

Area NO.6 (1915) First Floor Framing Photo 5.57

Area No.6 (1915) First Floor Framing Photo 5.58

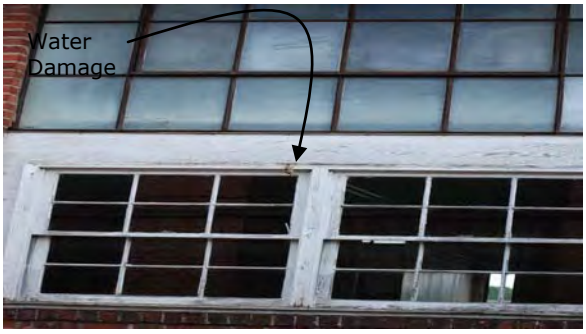
Area NO.6 (1915) First floor Framing Photo 5.59

Area NO.6 (1915) First Floor Framing Photo 5.60

Area NO.7 (1915) Photo 5.61

Area NO.7 (1915) Photo 5.62

Area NO.7 (1915) Taken From Courtyard Photo 5.63



Area NO.7 (1915) Taken From Courtyard Photo 5.64

Photos – Interior
Area 6 First Floor and Roof Framing

Area NO.7 (1915) Taken From Courtyard Photo 5.65

Area NO.7 (1915) Taken From Courtyard Photo 5.66

Area NO.7 (1915) Taken From Courtyard Photo 5.67

Area NO.7 (1915) Taken From Courtyard Photo 5.68

Area NO.7 (1915)Taken From Courtyard Photo 5.69

Area No.7 (1915) First Floor Framing Photo 5.70

Area NO.7 (1915) Roof Framing Photo 5.71

Area NO.7 (1915) First Floor Framing Photo 5.72

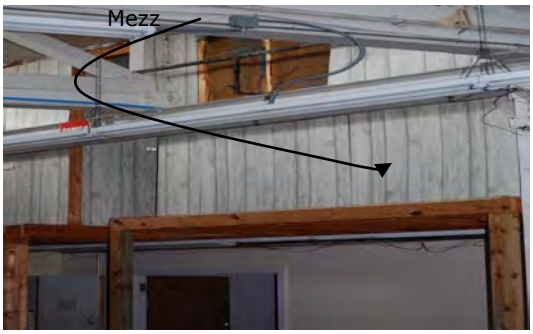
Photos – Interior
Area 7 First Floor and Roof Framing

Area NO.7 (1915) Roof Framing
Photo 5.73

Area NO.7 (1915) Roof Framing
Photo 5.74

Area NO.6 (1915) Roof Framing
Photo 5.75

Area NO.6 (1915) Roof Framing
Photo 5.76



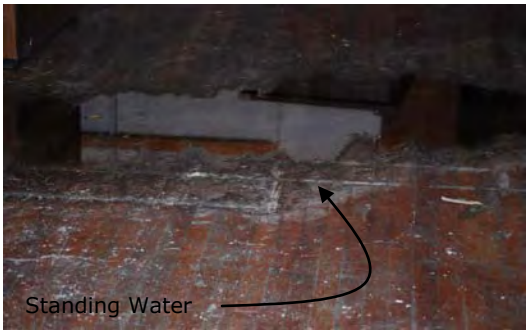
Area NO.7 (1915) Roof Framing
Photo 5.77

Area NO.7 (1915) Roof Framing
Photo 5.78

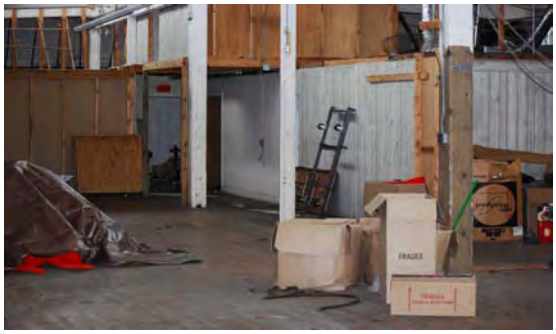
Area NO.7 (1915) Roof Framing
Photo 5.79

Area NO.7 (1915) First Floor
Framing Photo 5.80

Photos – Interior



Area NO.7 (1915) First Floor Framing Photo 5.81



Area NO.7 (1915) Roof Framing Photo 5.82

Area NO.7 (1915) Roof Framing Photo 5.83

Area NO.7 (1915) Roof Framing Photo 5.84

Area NO.7 (1915) Roof Framing Photo 5.85

Area NO.7 (1915) Roof Framing Photo 5.86

Area NO.7 (1915) Roof Framing Photo 5.87

Area NO.7 (1915) Roof Framing Photo 5.88

Photos – Interior
Area 7 First Floor and Roof Framing

Area NO.7 (1915) Roof Framing
Photo 5.89

Area NO.7 (1915) Roof Framing
Photo 5.90

Area NO.7 (1915) Roof Framing
Photo 5.91

Area NO.7 (1915) Roof Framing
Photo 5.92

Area NO.7 (1915) Roof Framing
Photo 5.93

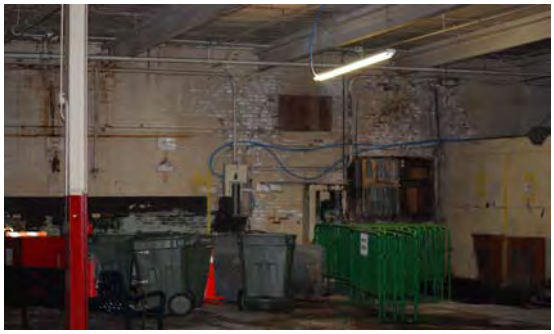
Area NO.7 (1915) Roof Framing
Photo 5.94

Area NO.8 (1947) Roof Framing
Photo 5.95

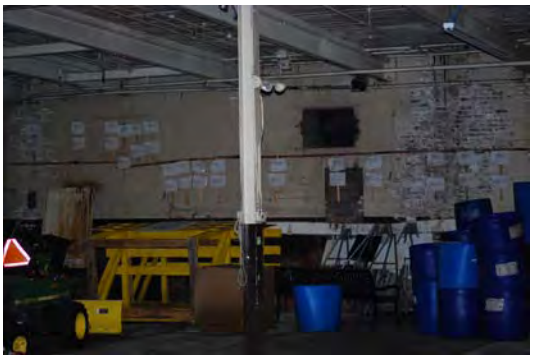
Area NO.8 (1947) Roof Framing
Photo 5.96

Photos – Interior
Area 7, 8 Roof Framing

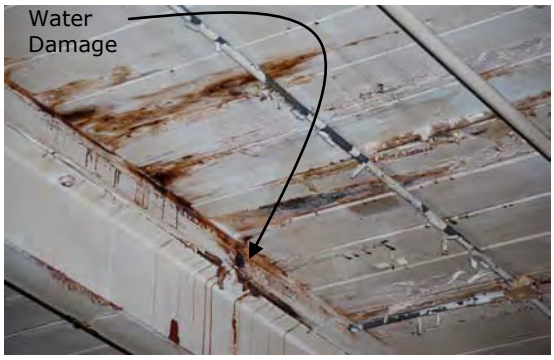
Area NO.8 (1947) Roof Framing
Photo 5.97



Area NO.8 (1947) Roof Framing
Photo 5.98



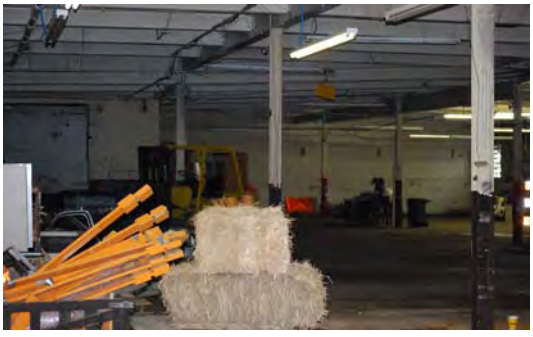
Area NO.8 (1947) Roof Framing
Photo 5.99



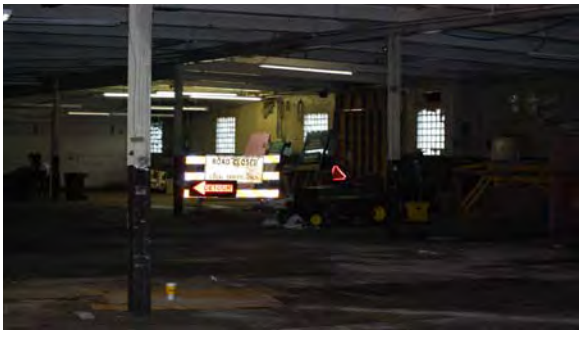
Area NO.8 (1947) Roof Framing
Photo 5.100

Area NO.8 (1947) Roof Framing
Photo 5.101

Area NO.8 (1947) Roof Framing
Photo 5.102



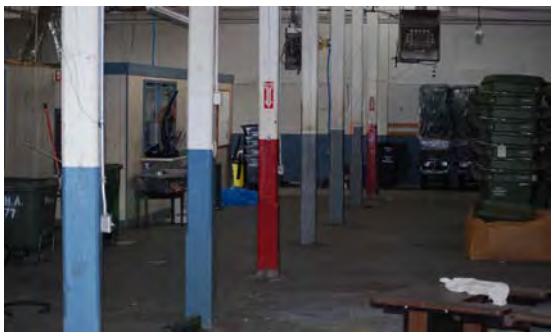
Area NO.8 (1947) Roof Framing
Photo 5.103



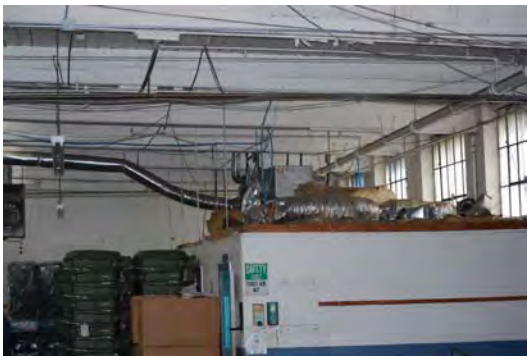
Area NO.8 (1947) Roof Framing
Photo 5.104

Photos – Interior
Area 8 Roof Framing

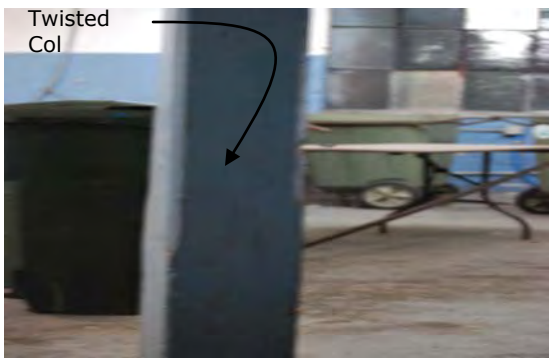
Area NO.2 (1919) Roof Framing
Photo 5.105



Area NO.2 (1919) Roof Framing
Photo 5.106



Area NO.2 (1919) Roof Framing
Photo 5.107



Area NO.3 (1947) First Floor
Framing Photo 5.108

Area NO.2 (1919) Roof Framing
Photo 5.109

Area NO.2 (1919) Roof Framing
Photo 5.110

Area NO.7 (1915) Roof Framing
Photo 5.111

Area No.7 (1915) Roof Framing
Photo 5.112

Photos – Interior
Area 2, 3, 7 Roof Framing

Area NO.3 (1947) Roof Framing Photo 5.113

Area NO.3 (1947) First Floor Framing Photo 5.114

Area NO.3 (1947)Roof Framing Photo 5.115

Area NO.5 Roof Framing Photo 5.116

Area NO.5 Roof Framing Photo 5.117

Area NO.5 Roof Framing Photo 5.118

Area NO.5 Photo First Floor Framing 5.119

Area NO.5 First Floor Framing Photo 5.120

Photos – Interior
Area 3, 5 First Floor and Roof Framing

Photo 6.1-Area 6

Photo 6.2-Area 2

Photo 6.3-Area 7

Photo 6.4-Area 3

Photo 6.5-Area 8

Photo 6.6-Area 3

Photo 6.7-Area 3

Photo 6.8-Area 8

Photo 6.9-Area 8

Photo 6.10-Area 8

Photo 6.11-Area 7

Photo 6.12-Area 7

Photo 6.13-Area 7

Photo 6.14-Area 7

Photo 6.15-Area 7

Photo 6.16-Clerestory Area 7

Photos – Roofing Photos

Photo 6.17-area 7

Photo 6.18-Clerestory Area 7

Photo 6.19-Clerestory Area 7

Photo 6.20-Cleverstory Area 7

Photo 6.21-Clerestory area 7

Photo 6.22-Clerestory area 7

Photo 6.23-Clerestory Area 7

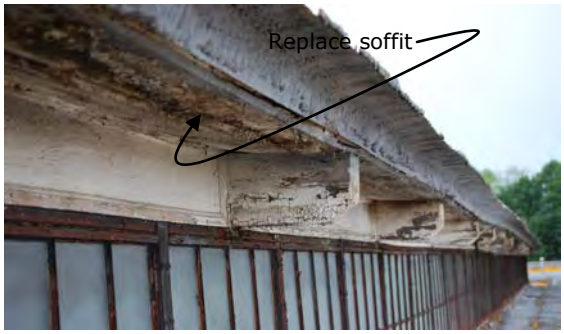


Photo 6.24-Clerestory Area 7

Photos – Roofing Photos

Photo 6.25-Area 2

Photo 6.26-Area 2

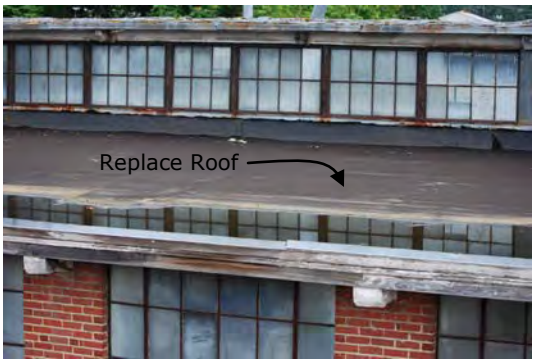


Photo 2.27-Area 2

Photo 6.28-Area 2

Photo 6.29-Area 2

Photo 6.30-Area 5

Photo 6.31-Area 5

Photo 6.32-Area 5

Photos – Roofing Photos

Photo 6.33-Area 4

Photo 6.34-Area 4

Photo 6.35-Area 5

Photo 6.36-Area 1,2

Photo 6.37-Area4

Photo 6.38-Area 2

Photo 6.39-Area 2

Photo 6.40-Area 2

Photos – Roofing Photos

Photo 6.41-Area 2

Photo 6.42-Area 1

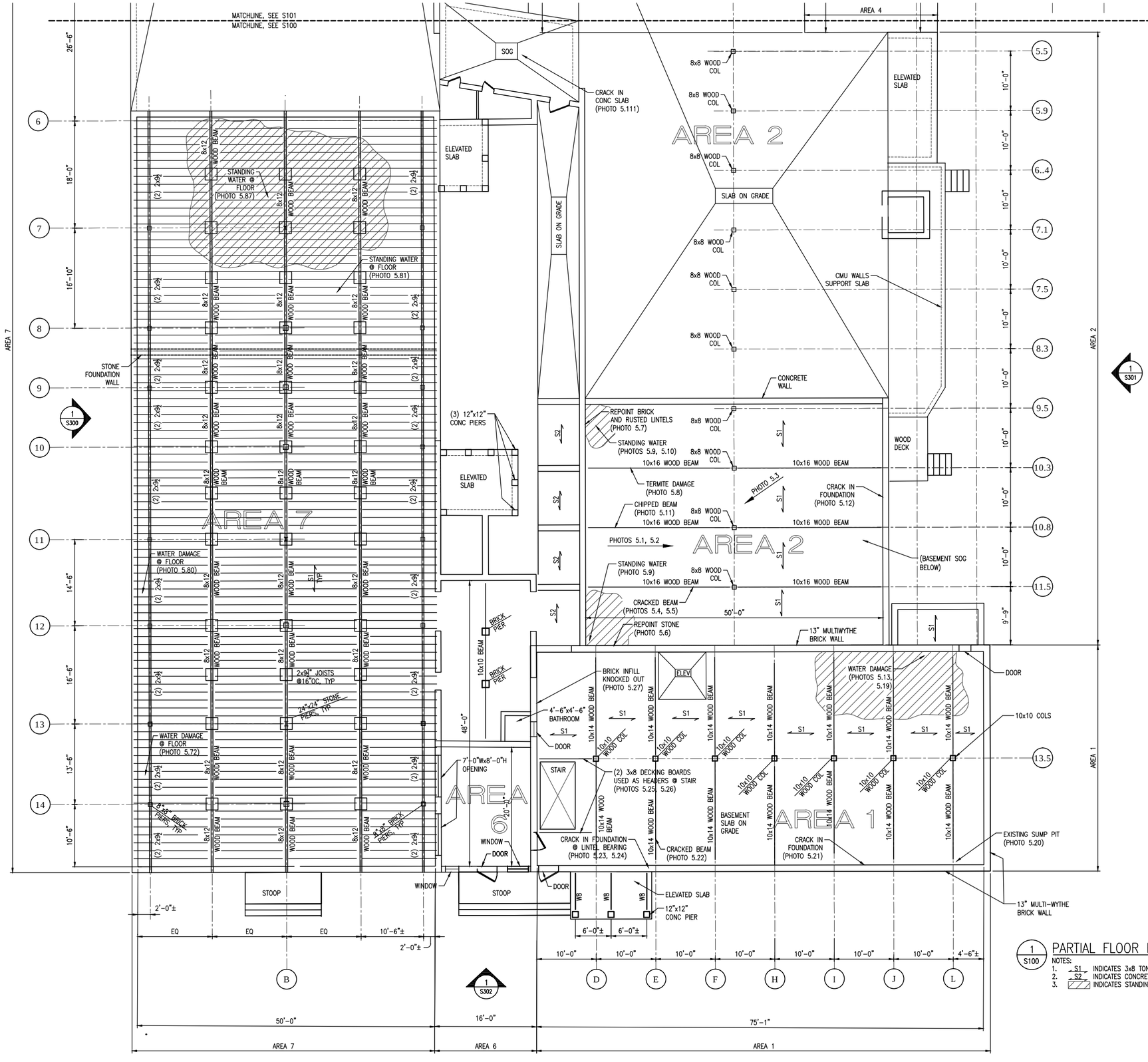
Photo 6.43-Area 1

Photo 6.44

Photo 6.45-Area 1

Photo 6.46-Area 1

Photo 6.47-Area 1



1 S100 PARTIAL FLOOR FRAMING AND BASEMENT SLAB PLAN 8"=1'-0"

NOTES:
1. S1 INDICATES 3x8 TONGUE AND GROOVE WOOD DECKING.
2. S2 INDICATES CONCRETE SLAB.
3. INDICATES STANDING WATER.

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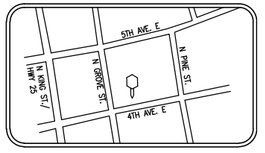

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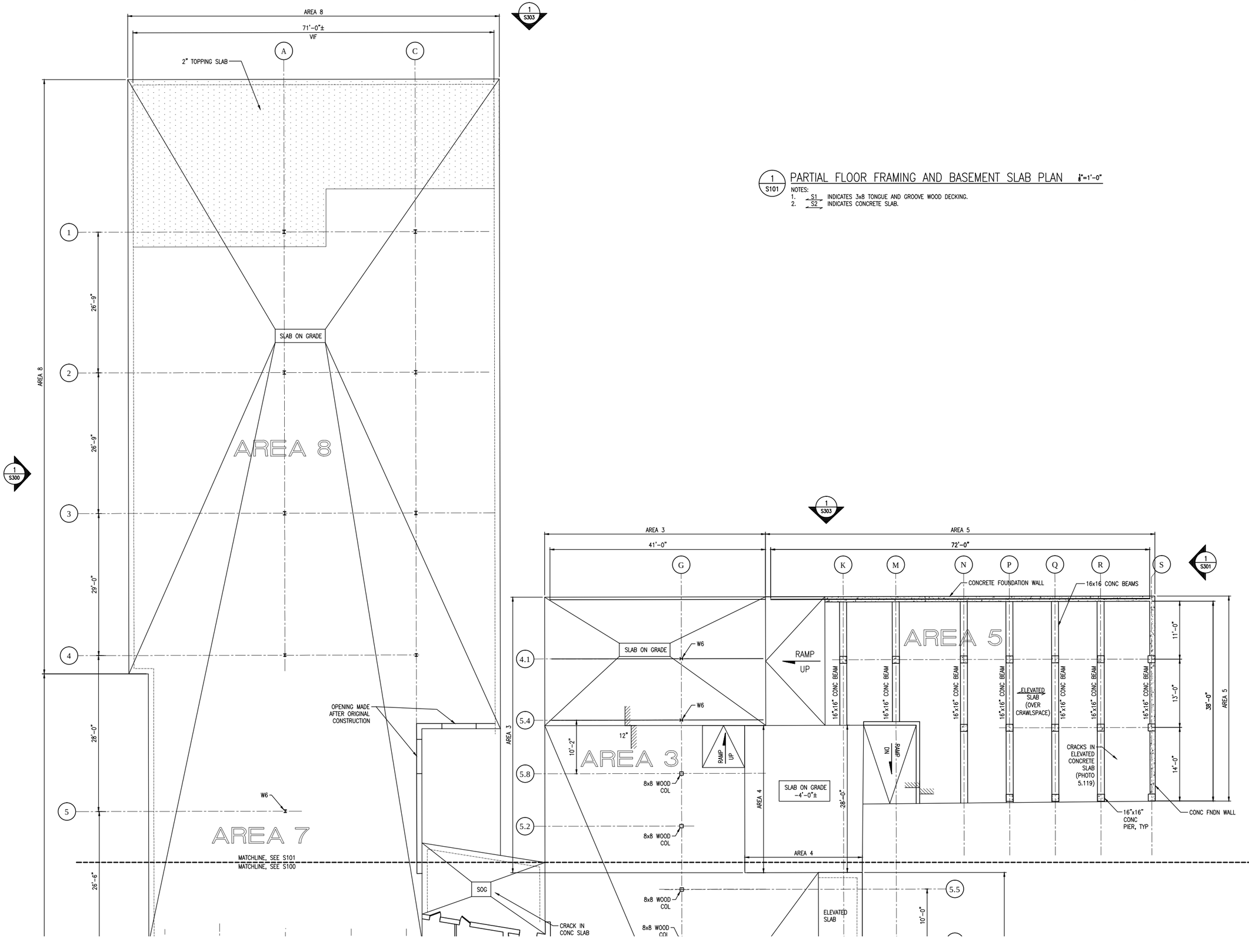
Project No.	S11038.00
Drawn By	MAM
Checked By	JCF
Issue Date:	00.00.00

HENDERSONVILLE GREY HOSIERY MILL
HENDERSONVILLE, NC

PARTIAL FLOOR FRAMING AND BASEMENT SLAB PLAN

S100



1 S101 PARTIAL FLOOR FRAMING AND BASEMENT SLAB PLAN 1"=1'-0"

NOTES:
1. S1 INDICATES 3x8 TONGUE AND GROOVE WOOD DECKING.
2. S2 INDICATES CONCRETE SLAB.

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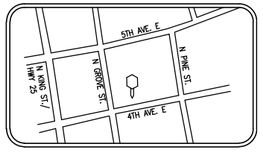

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HENDERSONVILLE GREY HOSIERY MILL
HENDERSONVILLE, NC

PARTIAL FLOOR FRAMING AND BASEMENT SLAB PLAN

S101

1 PARTIAL ROOF FRAMING PLAN S200 — 1/8"=1'-0"

NOTES:
1. S1 INDICATES SPAN DIRECTION OF 3x8 TONGUE AND GROOVE WOOD DECKING.
2. S2 INDICATES SPAN DIRECTION OF PLYWOOD.
3. INDICATES COMMENT ON ROOFING.
4. INDICATES STANDING WATER.

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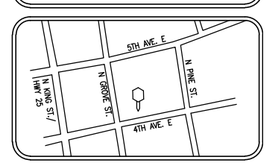

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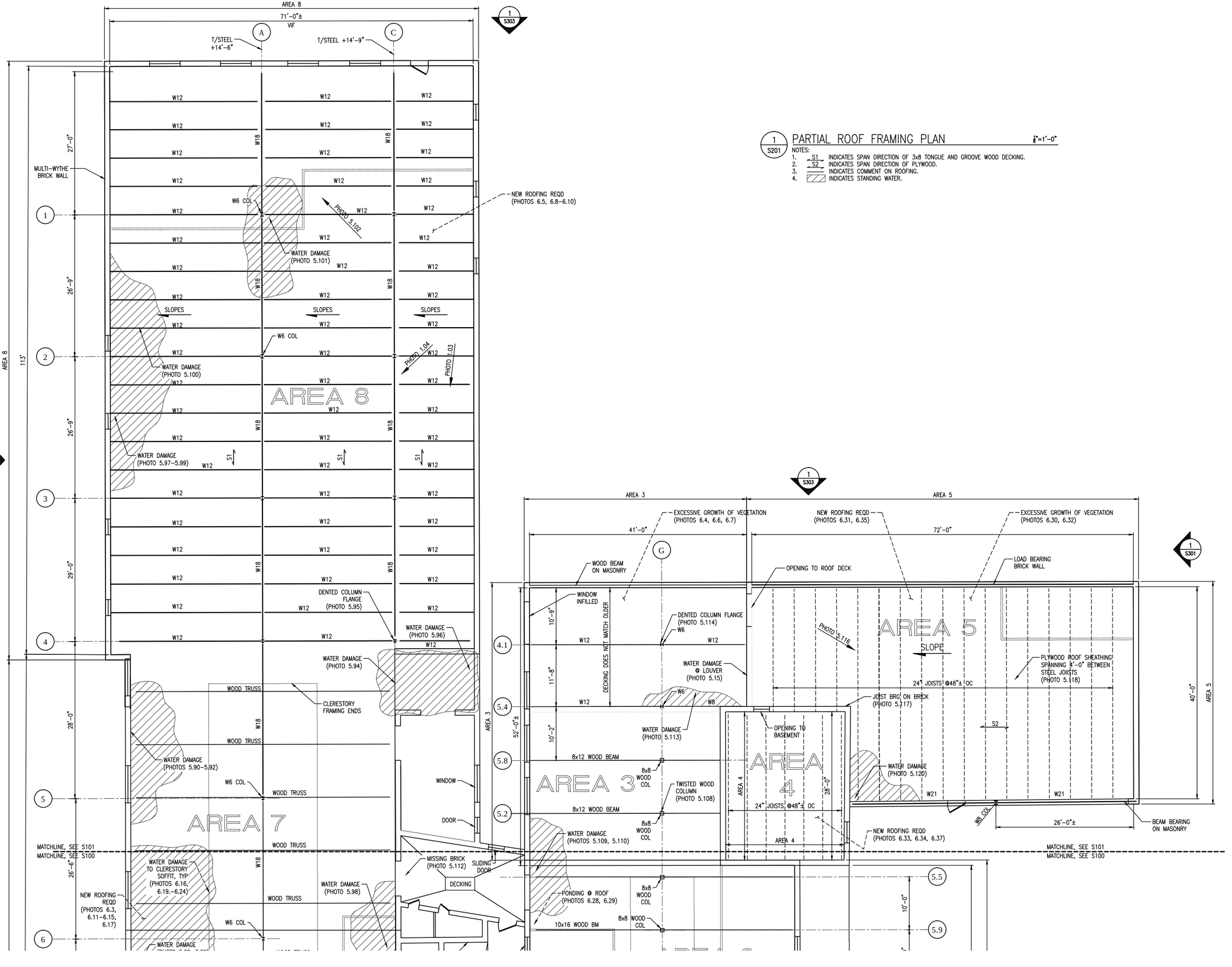
HENDERSONVILLE GREY HOSIERY MILL
HENDERSONVILLE, NC

PARTIAL ROOF FRAMING PLAN

S200



1 S201 PARTIAL ROOF FRAMING PLAN 1/8"=1'-0"

NOTES:
1. S1 INDICATES SPAN DIRECTION OF 3x8 TONGUE AND GROOVE WOOD DECKING.
2. S2 INDICATES SPAN DIRECTION OF PLYWOOD.
3. INDICATES COMMENT ON ROOFING.
4. INDICATES STANDING WATER.

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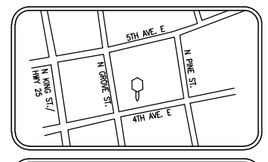

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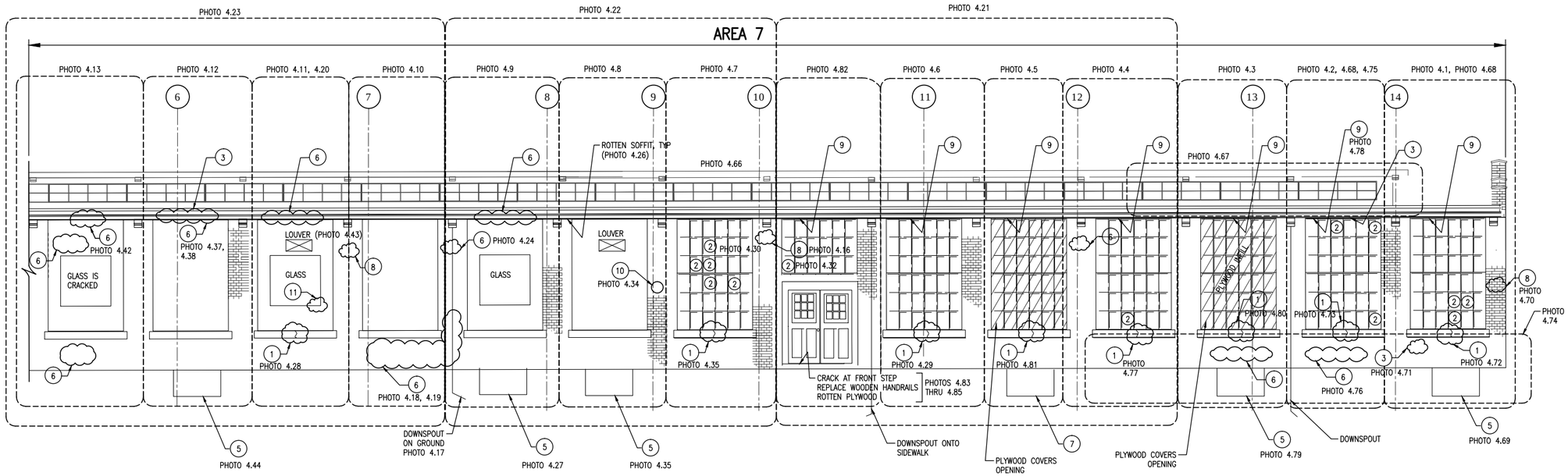
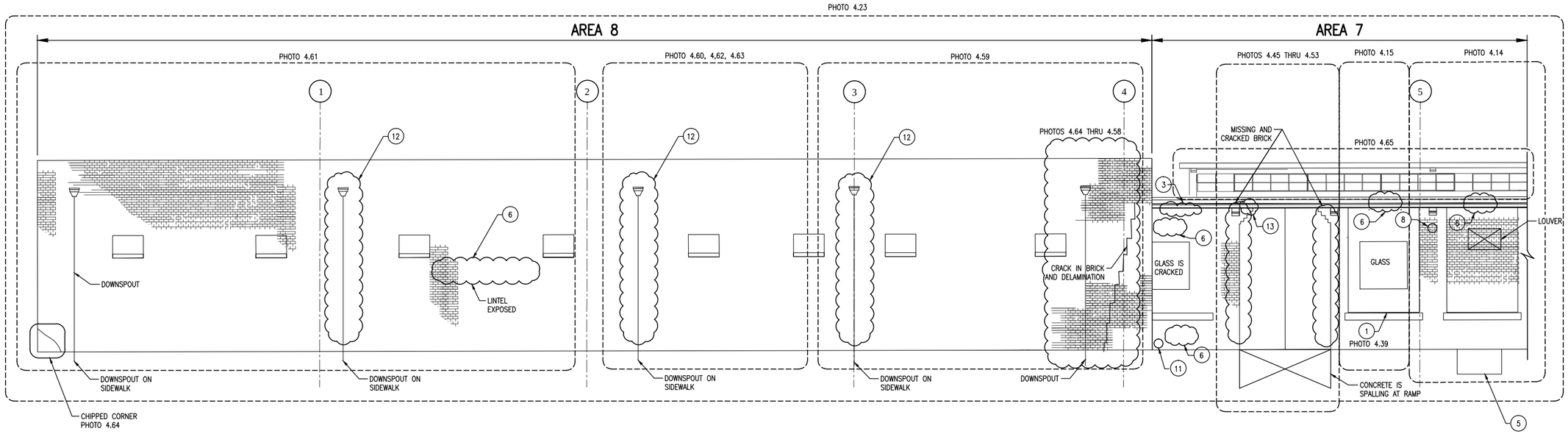
HENDERSONVILLE GREY HOSIERY MILL
HENDERSONVILLE, NC

PARTIAL ROOF FRAMING PLAN

S201





1 S300 WEST ELEVATION NO SCALE
GROVE STREET

NOTE:
1. "(#)" THUS REFERS TO KEYNOTE LEGEND.

KEYNOTES LEGEND

1. CRACK IN PRECAST
2. BROKEN WINDOW PANE
3. SOFFIT IS COMPLETELY DETERIORATED
4. CRACK IN BRICK
5. AREAWAY DAMAGED
6. REPOINT BRICK
7. AREAWAY NEEDS REPLACEMENT
8. FILL HOLES WITH BRICK AND REPOINT
9. LINTEL RUSTING, TYP
10. HOLE FOR PIPE
11. MISSING BRICK
12. EFFLORESENCE
13. LINTEL NOT BEARING
14. REPOINT MORTAR CRACKS IN STONE.
15. BROKEN BRICK
16. DAMAGED SIDING
17. HOLE IN DOOR AND DAMAGED BRICK
18. RUSTED HANDRAIL

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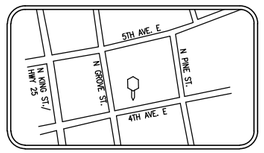

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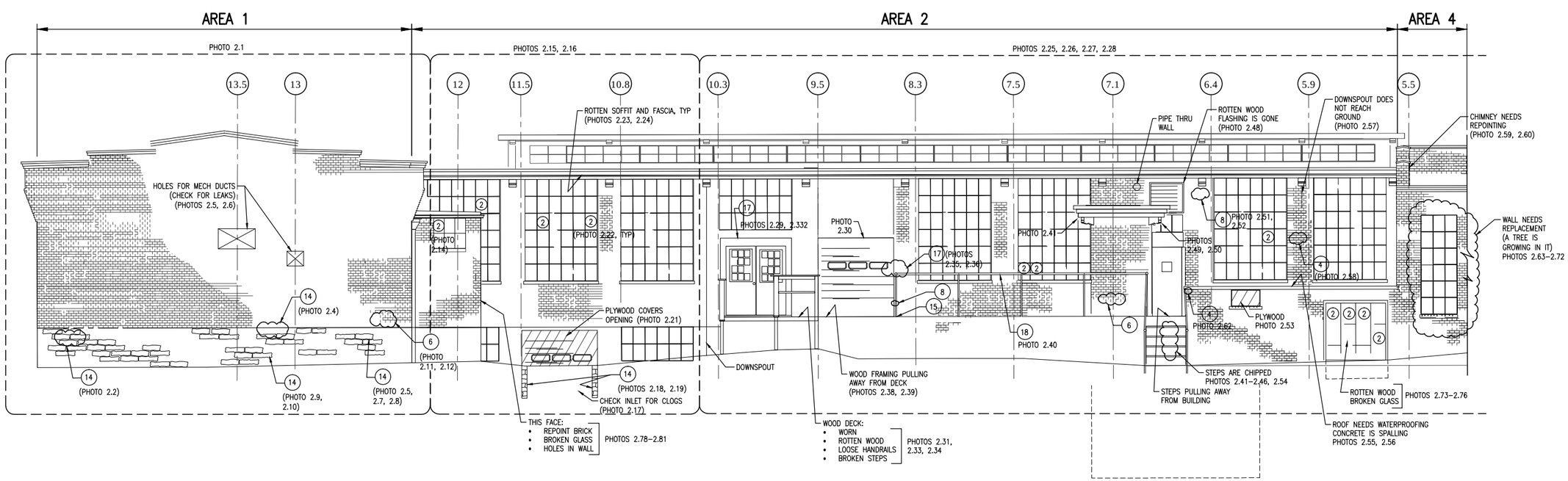
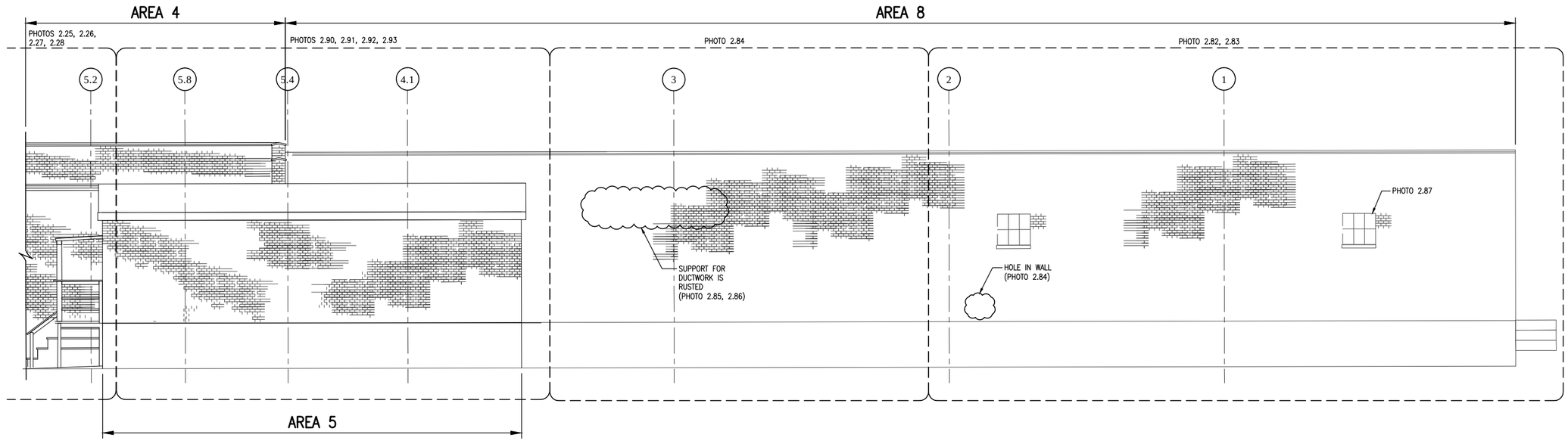
HENDERSONVILLE GREY HOSIERY MILL
HENDERSONVILLE, NC

WEST ELEVATION (GROVE STREET)

S300





1 / S301 EAST ELEVATION — NO SCALE

PINE STREET

NOTE:
1. "(#)" THUS REFERS TO KEYNOTE LEGEND.

KEYNOTES LEGEND

1. CRACK IN PRECAST
2. BROKEN WINDOW PANE
3. SOFFIT IS COMPLETELY DETERIORATED
4. CRACK IN BRICK
5. AREAWAY DAMAGED
6. REPOINT BRICK
7. AREAWAY NEEDS REPLACEMENT
8. FILL HOLES WITH BRICK AND REPOINT
9. LINTEL RUSTING, TYP
10. HOLE FOR PIPE
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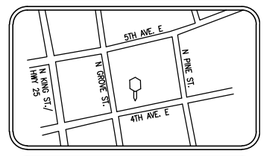

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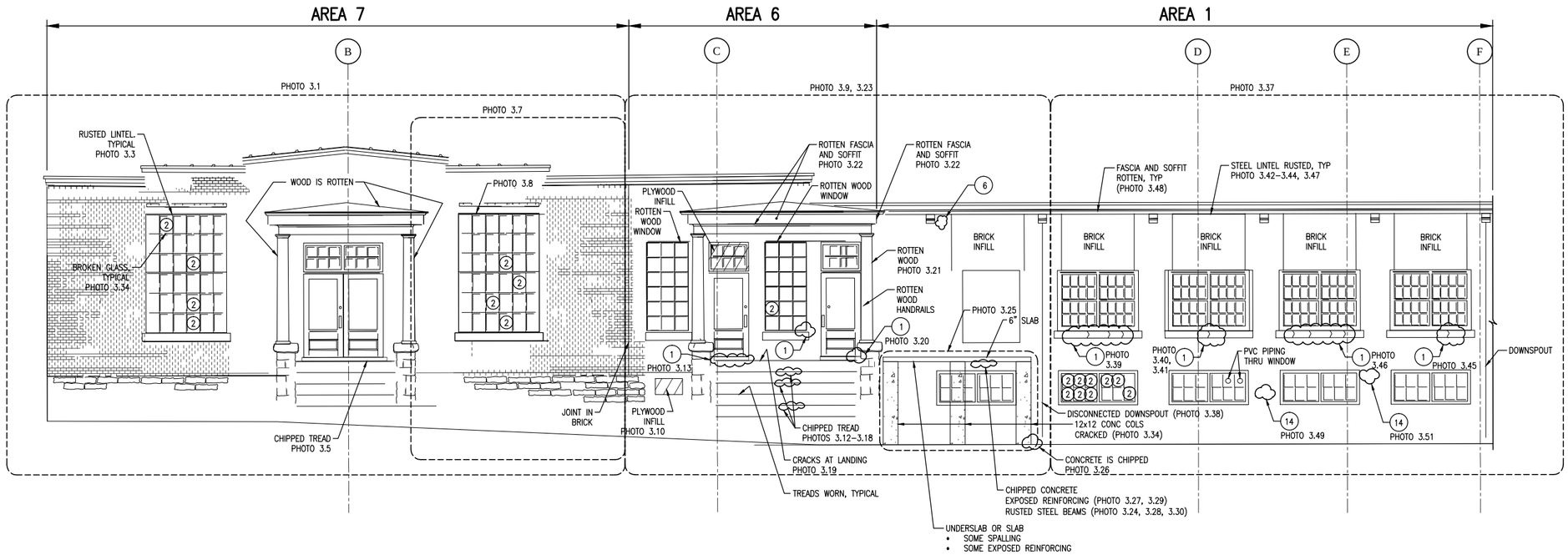
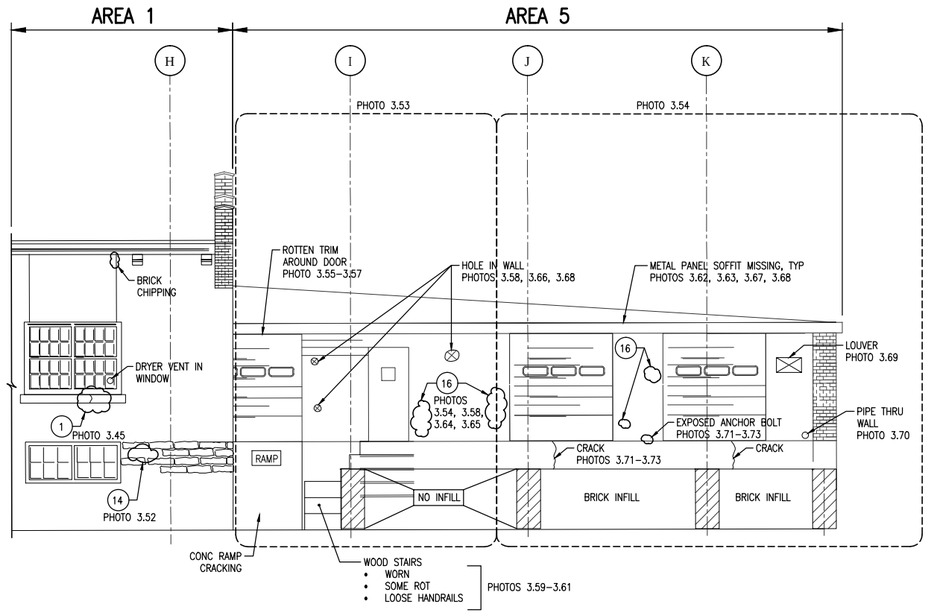
HENDERSONVILLE GREY HOSIERY MILL
HENDERSONVILLE, NC

EAST ELEVATION (PINE STREET)

S301





1 S302 SOUTH ELEVATION NO SCALE

FOURTH AVENUE

NOTE:
1. "(#)" THUS REFERS TO KEYNOTE LEGEND.

KEYNOTES LEGEND

1. CRACK IN PRECAST
2. BROKEN WINDOW PANE
3. SOFFIT IS COMPLETELY DETERIORATED
4. CRACK IN BRICK
5. AREAWAY DAMAGED
6. REPOINT BRICK
7. AREAWAY NEEDS REPLACEMENT
8. FILL HOLES WITH BRICK AND REPOINT
9. LINTEL RUSTING, TYP
10. HOLE FOR PIPE
11. MISSING BRICK
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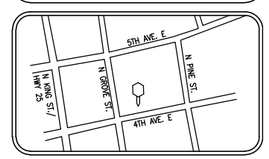

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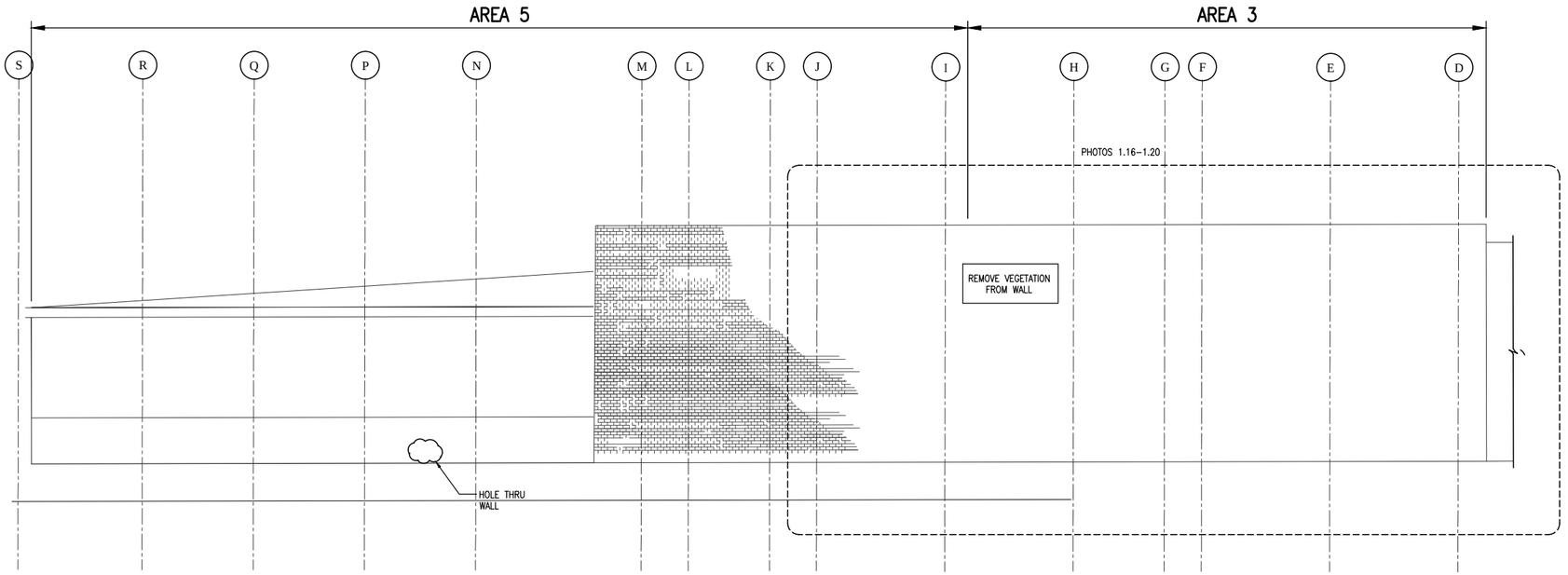
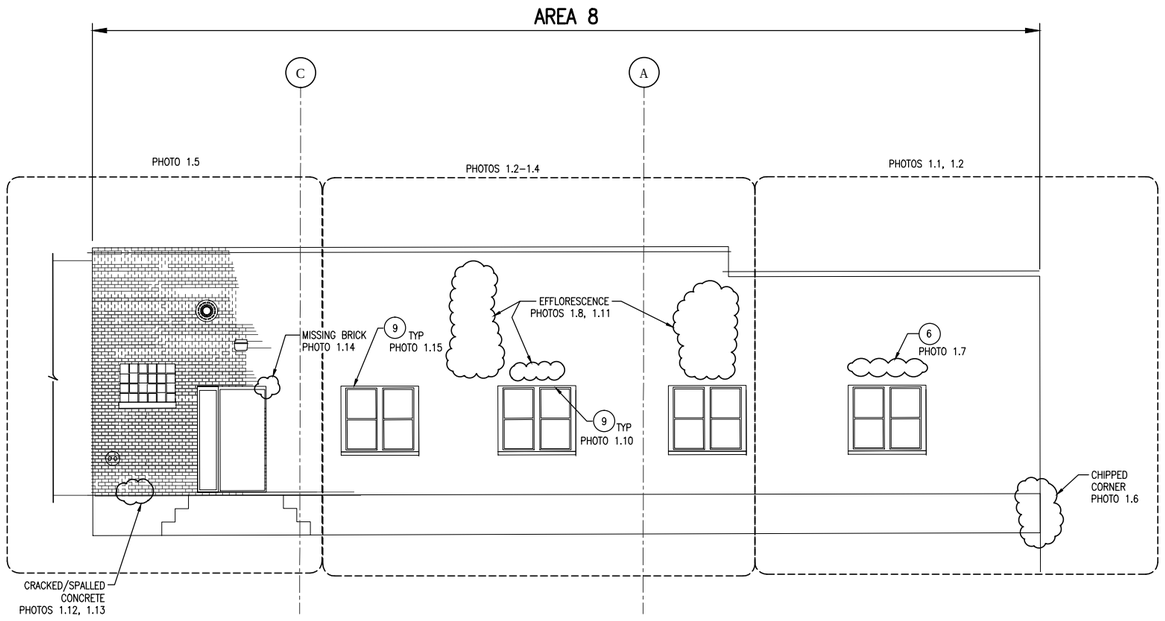
Checked By	JCF
Issue Date:	00.00.00

HENDERSONVILLE GREY HOSIERY MILL
HENDERSONVILLE, NC

SOUTH ELEVATION (FOURTH AVENUE)

S302





1 / S303 NORTH ELEVATION — NO SCALE

FIFTH AVENUE

NOTE:
1. "(#)" THUS REFERS TO KEYNOTE LEGEND.

KEYNOTES LEGEND

1. CRACK IN PRECAST
2. BROKEN WINDOW PANE
3. SOFFIT IS COMPLETELY DETERIORATED
4. CRACK IN BRICK
5. AREAWAY DAMAGED
6. REPOINT BRICK
7. AREAWAY NEEDS REPLACEMENT
8. FILL HOLES WITH BRICK AND REPOINT
9. LINTEL RUSTING, TYP
10. HOLE FOR PIPE
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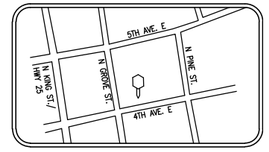

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HENDERSONVILLE GREY HOSIERY MILL
HENDERSONVILLE, NC

NORTH ELEVATION (FIFTH AVENUE)

S303

The Secretary of the Interior's Standards for the Treatment of Historic Properties, 1995

Standards for Preservation

1. A property will be used as it was historically, or be given a new use that maximizes the retention of distinctive materials, features, spaces, and spatial relationships. Where a treatment and use have not been identified, a property will be protected and, if necessary, stabilized until additional work may be undertaken.

2. The historic character of a property will be retained and preserved. The replacement of intact or repairable historic materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.

3. Each property will be recognized as a physical record of its time, place, and use. Work needed to stabilize, consolidate, and conserve existing historic materials and features will be physically and visually compatible, identifiable upon close inspection, and properly documented for future research.

4. Changes to a property that have acquired historic significance in their own right will be retained and preserved.

5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.

6. The existing condition of historic features will be evaluated to determine the appropriate level of intervention needed. Where the severity of deterioration requires repair or limited replacement of a distinctive feature, the new material will match the old in composition, design, color, and texture.

7. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.

8. Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.

Standards for Rehabilitation

1. A property will be used as it was historically or be given a new use that requires minimal change to its distinctive materials, features, spaces, and spatial relationships.

2. The historic character of a property will be retained and preserved. The removal of distinctive materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.

3. Each property will be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or elements from other historic properties, will not be undertaken.

4. Changes to a property that have acquired historic significance in their own right will be retained and preserved.

5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.

6. Deteriorated historic features will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature will match the old in design, color, texture, and, where possible, materials. Replacement of missing features will be substantiated by documentary and physical evidence.

7. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.

8. Archeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.

9. New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work will be differentiated from the old and will be compatible with the historic materials, features, size, scale and proportion, and massing to protect the integrity of the property and its environment.

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

Standards for Restoration

1. A property will be used as it was historically or be given a new use which reflects the property's restoration period.

2. Materials and features from the restoration period will be retained and preserved. The removal of materials or alteration of features, spaces, and spatial relationships that characterize the period will not be undertaken.

3. Each property will be recognized as a physical record of its time, place, and use. Work needed to stabilize, consolidate and conserve materials and features from the restoration period will be physically and visually compatible, identifiable upon close inspection, and properly documented for future research.

4. Materials, features, spaces, and finishes that characterize other historical periods will be documented prior to their alteration or removal.

5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize the restoration period will be preserved.

6. Deteriorated features from the restoration period will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature will match the old in design, color, texture, and, where possible, materials.

7. Replacement of missing features from the restoration period will be substantiated by documentary and physical evidence. A false sense of history will not be created by adding conjectural features, features from other properties, or by combining features that never existed together historically.

8. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.

9. Archeological resources affected by a project will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.

10. Designs that were never executed historically will not be constructed.

Standards for Reconstruction

1. Reconstruction will be used to depict vanished or non-surviving portions of a property when documentary and physical evidence is available to permit accurate reconstruction with minimal conjecture, and such reconstruction is essential to the public understanding of the property.

2. Reconstruction of a landscape, building, structure, or object in its historic location will be preceded by a thorough archeological investigation to identify and evaluate those features and artifacts which are essential to an accurate reconstruction. If such resources must be disturbed, mitigation measures will be undertaken.

3. Reconstruction will include measures to preserve any remaining historic materials, features, and spatial relationships.

4. Reconstruction will be based on the accurate duplication of historic features and elements substantiated by documentary or physical evidence rather than on conjectural designs or the availability of different features from other historic properties. A reconstructed property will re-create the appearance of the non-surviving historic property in materials, design, color, and texture.

5. A reconstruction will be clearly identified as a contemporary re-creation.

6. Designs that were never executed historically will not be constructed.

31 Preservation Briefs
Technical Preservation Services
National Park Service
U.S. Department of the Interior

Mothballing Historic Buildings

Sharon C. Park, AIA

A NOTE TO OUR USERS: The web versions of the **Preservation Briefs** differ somewhat from the printed versions. Many illustrations are new, captions are simplified, illustrations are typically in color rather than black and white, and some complex charts have been omitted.

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 building has been successfully mothballed for 10 years because the roof and walls were repaired and structurally stabilized, ventilation louvers added, and the property maintained. Photo: NPS files.

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.

Boarding up without adequate ventilation and maintenance has accelerated deterioration of this property. Photo: NPS files.

But if long-term mothballing is the only remaining option, it must be done properly. 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:

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. 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.

Documenting a building's history and assessing its condition provide information to set priorities for stabilization and repair, prior to mothballing. Photo: NPS files.

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, inventoried, and safely stored, preferably in the building, for later retrieval.

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. Recording actions taken on the building and identifying where elements that have been removed are stored 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.

Buildings seriously damaged by storms or deterioration may need to be braced before architectural evaluations can be made. Photo: John Milner Architects. Photo: NPS files

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

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

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.

Interior bracing which will last the duration of the mothballing will protect weakened structural members. Photo: John Milner Architects.

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. Any major vertical post added during the stabilization should be properly supported and, if necessary, taken to the ground and underpinned.

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

Regrading has protected this masonry foundation wall from excessive damp during its 10-year mothballing. Note the attic and basement vents, temporary stairs, and interpretive sign. Photo: NPS files.

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 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. 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.

Urban buildings often need additional protection from unwanted entry and graffiti. This commercial building uses painted plywood panels to cover its glass storefronts. The upper windows on the street sides have been painted to resemble 19th century sash. Photo: NPS files.

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.

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. 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.

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. 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.

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 recommended 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.

The first floor openings of this historic building have been filled with cinder blocks and the doors, window sash, and frames removed for safe keeping. The security metal door features heavy duty locks. Photo: NPS files.

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. Infill materials for closing door and window openings include plywood, corrugated panels, metal grates, chain fencing, metal grills, and cinder or cement blocks. 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.

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. Alternatively, security gates in an 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

This painted trompe l'eoil scene on plywood panels is a neighborhood-friendly device. Photo: NPS files.

windows openings to avoid damage to frame and sash. 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. With extra attention to detail, the plywood panels can be 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 community.

If the building has shutters simply close the shutters and secure them from the interior. 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.

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.

A view showing the exterior of the Brearley House, New Jersey, in its mothballed condition Photo: Michael Mills, Ford Farewell Mills Gatsch, Architects.

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 use. 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. Generally a telephone 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. 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 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.

This exhaust fan has tamper-proof housing. Photo: Michael Mills, Ford Farewell Mills Gatsch, Architects.

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).

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

Portable monitors are used to record temperature and humidity conditions in historic buildings during mothballing. Photo: NPS files.

mothballed buildings consists of one to four air exchanges every hour; one or two air exchanges per hour in winter and 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 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 hot 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 will 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. 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.

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. 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. 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. 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 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.

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.

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. 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. 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.

Sidebar

Mothballing Checklist

In reviewing mothballing plans, the following checklist may help to ensure that work items are not inadvertently omitted.

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, rodents, etc.?
- 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?

Maintenance Chart

1-3 months; 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

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. The three highest priorities for a mothballed building 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.

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 is needed for careful planning and repair, sensitively designed protection measures, follow-up security surveillance, and cyclical maintenance.

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.

Further Reading

Cotton, J. Randall. "Mothballing Buildings." The Old-House Journal. July/August, 1993.

Fisher, Charles E. and Thomas A. Vitanza. "Temporary Window Vents in Unoccupied Historic Buildings." Preservation Tech Note (Windows, No. 10). Washington, DC: National Park Service, 1985.

Frazier Associates. "Mothballing Historic Buildings." Preserving Prince William, 2. County of Prince William, VA, 1990.

Michell, Eleanor. Emergency Repairs for Historic Buildings. London: Butterworth Architecture, 1988.

"Mothballing Vacant Buildings," An Anti-Arson Kit for Preservation and Neighborhood Action. Washington, DC: Federal Emergency Management Agency, 1982.

Solon, Thomas E. "Security Panels for the Foster-Armstrong House." Association for Preservation Technology Bulletin. Vol XVI no. 3 & 4, 1984. (note the design of the panels, but be aware that additional louvering may be needed on other projects).

Acknowledgements

The author, Sharon C. Park, Senior Historical Architect, Heritage Preservation Services Division, National Park Service, would like to acknowledge the assistance of the following individuals in the preparation and review of this publication. H. Ward Jandl served as the technical editor and assisted with producing this Preservation Brief. In addition the following persons have provided invaluable information and illustrations: Ernest A. Conrad, PE; Doug Hicks, NPS Williamsport Preservation Training Center; Thomas C. Taylor, Colonial Williamsburg; Karen Gordon, Seattle Urban Conservation Office; Kevin B. Stoops, Seattle Department of Parks and Recreation; Michael Mills, AIA; Christina Henry, architect, Mary Beth Hirsch, Ohio Historical Society. Thanks also to Heritage Preservation Services Division staff members Michael J. Auer, Anne E. Grimmer, Kay D. Weeks, Tim Buehner, and Jean Travers, and to the numerous staff members of the NPS Regional offices who submitted comments. All photographs and drawings are by the author unless otherwise noted.

Washington, D.C. September, 1993

Home page logo: Appropriately mothballed historic building. Photo: NPS files.

This publication has been prepared pursuant to the National Historic Preservation Act of 1966, as amended, which directs the Secretary of the Interior to develop and make available information concerning historic properties. Technical Preservation Services (TPS), Heritage Preservation Services Division, National Park Service prepares standards, guidelines, and other educational materials on responsible historic preservation treatments to a broad public.

Preservation Briefs | Questions

KDW

STEWART

Design Comments
NC Department of Cultural Resources

Project Name: Grey Hosiery Mill Engineered Structural Analysis
Discipline: Structural
Reviewed by: Jennifer Cathey, Restoration Specialist, NC Department of Cultural Resources
Date of comments: 07/19/2011
Date of response:

COMMENT	RESPONSE
Include a concise description of the existing roof and drainage system. Jennifer Cathey e-mail 7-19-2011	See pages 10 through 12 of the Final Report.
Include a complete and concise description of the overall structure and different construction periods – this information is contained in the National Register nomination. Jennifer Cathey e-mail 7-19-2011	See pages 1 through 4 and 12 through 15 of the Final Report.
Grey Hosiery Mill was listed in the National Register of Historic Places in 2000. As such, it is a certified historic building according to North Carolina building code. Jennifer Cathey e-mail 7-19-2011	See page 1 of the Final Report.
Key Maps do not appear to identify Areas indicated in report text. Jennifer Cathey e-mail 7-19-2011	See page 2 of the Final Report for the key map.
Comments indicate that water infiltration is not the sole contributor to interior deterioration. Please identify and discuss other contributing issues. Are they addressed in the recommendations? Jennifer Cathey e-mail 7-19-2011	The comment(s) has been re-worded. It was intended to explain that water is the primary cause of issues. A comment on "other contributing issues" has been added to the Final Report. See page 12.
As stated in the Scope of Work, recommendations contained within the report must be consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties. Recommendations contained in the draft report are not entirely consistent with the Standards, and in some instances, are worded in such a way to be in conflict with the Standards. I think that these conflicts may be relatively easily addressed by referencing the Standards within the report, by some rewording of the text, and by including some additional specifications for work items. Jennifer Cathey e-mail 7-19-2011	Re-wording to address this comment has been implemented in the Final Report and the Standards have been referenced. See page 4.

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The report must actually reference the Standards. Standards for Preservation may be included as an appendix. Given that stabilization followed by rehabilitation and reuse is the desired outcome for the building, Standards for Rehabilitation may also be appended to the document. They may be found online: http://www.nps.gov/history/hps/tps/standards_guidelines.htm. Jennifer Cathey e-mail 7-19-2011	The Standards have been referenced on page 4 of the Final Report and will be added as an appendix to this report.
Wood elements such as soffit, fascia, eave brackets, and components of the south porches are part of the historic fabric of the building and contribute to its overall historic character. Sound original materials are part of the history of the building and should be left in place, and only severely deteriorated elements should be replaced. Although water damage and rot is apparent in many locations and will certainly warrant some replacement, standards require detailed and specific evaluation of individual components before full replacement is justified. Generally speaking, this specificity is present in notes on the exterior elevation drawings, but is not always clearly stated within the report text. Jennifer Cathey e-mail 7-19-2011	Content has been included in the Final Report on page 4 that addresses intent of the Standards regarding the reuse of any existing sound building components.
Notes for the south porches seem to indicate widespread and extensive rot that would lead to demolition, and thus require rewording in order to avoid wholesale replacement. The viability of filling, patching, and dutchman repair should be examined before any components of the south porches are replaced. Throughout the text, the need to leave sound components in place, rather than replacing features in entirety, should be stated. Jennifer Cathey e-mail 7-19-2011	Content has been included in the Final Report on page 4 that addresses intent of the Standards regarding the reuse of any existing sound building components.
Greater clarity regarding treatment of individual doors and windows is required within notes and recommendations. Certainly not all are important, historic, of interest, etc. – there's quite a mix of new and old. Existing steel casement windows in the 1915 and 1919 wings are significant features of the historic building, and pending regulatory oversight and further consultation regarding rehabilitation and preservation requirements, may need to be repaired rather than replaced. Some windows are boarded, but it is unclear if any sash of casement survives underneath. (Existing wood windows on the south facing façade appear to be modern replacements, and thus may warrant replacement when building rehabilitation occurs.) Jennifer Cathey e-mail 7-19-2011	Content has been included in the Final Report on page 4 that addresses intent of the Standards regarding the reuse of any existing sound building components.
As stated in my comments about soffit and fascia, the elevation notes are relatively clear on this topic, but the recommendations text seems to indicate wholesale replacement of entire window units and some doors. For example, on page 14, under Area 7, the first recommendation states "replace all broken windows." Should this read "replace all broken window glass"? Glass panes may be replaced with appropriate glazing. Or the windows may be boarded pending future rehabilitation. Jennifer Cathey e-mail 7-19-2011	Re-wording to address this comment has been implemented on page 4 in the Final Report

Recommendations to repoint brick and stone require greater specificity in materials and methods. (There are specifications for the repair of concrete steps on page 16 of the draft report, but similar specifications are not included for masonry work.) Stone and brick repointing mortar must match the color, texture, strength, joint width and joint profile of the existing historic masonry. Jennifer Cathey e-mail 7-19-2011	Information regarding repointing of brick and stone has been included in the Final Report on pages 3 and 4.
Preservation Brief 31: Mothballing Historic Buildings, provides general recommendations for preventing water infiltration and securing historic buildings in accordance with preservation standards: http://www.nps.gov/history/hps/tps/briefs/brief31.htm. Other publications address masonry, cast stone, wood window, and other standards: http://www.nps.gov/history/hps/tps/briefs/presbhom.htm. Jennifer Cathey e-mail 7-19-2011	Stewart has reviewed these documents and incorporated items for repointing the masonry in the Final Report.

STEWART

Design Comments
City of Hendersonville

Project Name: Grey Hosiery Mill Engineered Structural Analysis
Discipline: Structural
Reviewed by: Sue Anderson, Planning Director, City of Hendersonville
Date of comments: 07/21/2011
Date of response:

COMMENT	RESPONSE
Provide sheet with footprint of all structures on the site with the specific areas referenced as 1-8. Susan Anderson e-mail 7-21-11	See page 2 of the report. Areas 1 - 8 have now been identified in the drawings.
From your evaluation it appears that the foundation, piers, posts, beams, joists and other floor structural members are in good shape. You do identify termite damage on one beam in the partial basement. It appears that someone has scraped away the damaged wood. I take it that given the size of that beam, it is still structurally sound and able to support the above floor loads – is that correct? Of course that is with the understanding that floor loads vary depending on occupancy. Susan Anderson e-mail 7-21-11	Beam is still ok. See pages 12 through 15 for uniform load capacities of members.
Also, will you be providing information on overstressed structural members – specifically roof and floor framing excluding piers and perimeter foundations since we do not know their size and depth without excavation which was not part of the evaluation. For instance, is the roof design structurally sound for the live and dead loads? For the floors joists, can you provide info on maximum load for the post and beam and joist size and spacing? Susan Anderson e-mail 7-21-11	See pages 12 through 15 for uniform load capacities of members.