



December 7, 2021

Garrett Thobe
Precision Construction & Roofing
7625 Davis Blvd
North Richland Hills, TX 76182

**RE: Forensic Engineering Report – Wind Damage
Newnan Presbyterian Church
38 Greenville St. S
Newnan, GA 30263**

Dear Mr. Thobe:

Per your request, Shields Engineering Group, Inc. performed a forensic engineering inspection at the Newnan Presbyterian Church at the address above. The Church purportedly sustained damage as a direct result from high winds from a tornado that passed through Newnan on March 26, 2021. This investigation was conducted on November 9th, 2021, by Martin Shields, P.E. and Ava Shields of SEG.

SCOPE

SEG was retained to assess the wind-related damages to the slate tiles, flat modified bitumen roofing assembly, water intrusion into the interiors, and the necessary scope of repair or replacement. MEP components were outside the scope of this investigation and were not inspected. All of the findings and opinions in the Report are made to reasonable degree of engineering certainty, unless stated otherwise.

PROPERTY DESCRIPTION

An aerial view of the property is provided as **Figure 1**. The Church is multi-story construction with brick veneer and several volumes with ridge and hip-style facets and valleys clad with Rockmart Slate tile. Stained glass windows are present around the elevations. A flat modified-bitumen roofing assembly is located above the main entrance on the west elevation. The Church was renovated in 1924 and the addition of the fellowship hall, offices and classrooms was done in 1983.

DAMAGE EVALUATION METHODOLOGY

The evaluation of the roofing assemblies and interiors in question included general observations as well as more detailed observations and record of specific areas. For this assignment, SEG was unable to access the steep-slope slate tile roofing assembly. SEG reviewed high-quality drone photos provided by Precision Construction and Roofing for close examination of the broken and displaced tiles.

WEATHER DATA

Weather data found on the NOAA weather data base, shows on March 25, 2021, an EF-4 tornado tracked 39 miles across Heard, Coweta and Fayette Counties in Georgia with **maximum windspeeds reaching 170 mph as it entered the western City limits of Newnan.**

Weather data is contained in **Appendix A.**

Wind Damage

Direct wind damage to roofs and exteriors can occur when high winds travel over the rooftops and impact the exteriors, creating negative pressures and positive outward forces within a roof assembly when openings or doors allow the air within in building, and can be identified by areas that have been uplifted or ballooned up, deformed, or blown away. Wind damage is commonly found at the roof level, especially the windward rakes, eaves, and corners, where the wind forces (i.e., inward and outward forces) are the greatest.

Critical locations on a building when impacted by high winds include:

1. Wind stagnates as it impacts the windward exterior and thus is forced to go around the building – this creates upward forces on the roof and pushes against the exterior and brick veneer. Windows can flex and break (generally wind speeds of 80+ mph are required), seals can be broken, and the frames displaced (often cracking the surrounding brick),
2. Tiles or shingles are displaced or removed on the windward slope, especially along the eaves and corners, and
3. Open areas, such as porches or carports catch wind and produce an uplift effect on the structure.

Wind damage to composition shingles also includes shingle tabs that are missing, torn, creased, or un-adhered from the force of the wind. Wind damage to the building envelope can also include punctures or impacts from wind-borne debris, torn or displaced siding and roofing framing.

Functional Damage and Physical Damage

- Functional damage for Roofing assemblies is defined as a loss of water shedding capabilities and/or loss of service life.
- Physical damage includes functional damage but also incorporates any distinct, demonstrable, and physical alteration of a property's structure or appearance (often referred to as Cosmetic Damage).

OBSERVED CONDITIONS

Observations of the exteriors and interiors were photographed to document distress and relevant conditions at the subject property on the date of the site visit. Please note that not all damage or distress that may be present was necessarily observed or photographed; however, the selected photographs provide an indication of their types, severity, and distribution. They may also document unusual or contributing conditions that may exist. Photographs were taken during the site visit and are included in **Appendix B**. Photos are captioned to indicate the observation and the location. The following observations were noted during the claim examination:

Exteriors

- A walk around of the Main Building was conducted. SEG noted a broken stained-glass window on the western elevation, above the main entrance due to the high winds and wind-borne debris. The stained-glass windows were found to have storm-protection plexiglass panels around them on the north and south elevations. The metal frames around these protection panels were observed to be displaced and uplifted due to the high winds. On the south elevation, a protective window was noted to have a crack. Other windows on the south elevation had displaced sealant strips (**Photographs 1—11**).
- A downspout on the south elevation was found to have a chalky substance on the wall due to discharge from an unknown supply line. It is unclear if the supply line was meant to connect to the downspout (**Photographs 12—15**).

- The north elevation was observed to have a displaced vinyl awning due to the high winds. SEG found the plexiglass storm windows over the stained glass to be bowed on the north elevation. One of the panels was noted to have been displaced from the metal window frame and pushed inward. Other windows on the north were observed to have missing window seals and displaced metal window frames (**Photographs 16—38**).
- SEG observed broken, displaced and chipped slate tiles on the northern slope from the ground (**Photographs 39—42**).

Modified Bitumen Roofing Assembly – Front Entrance

- The flat-lay modified bitumen roofing assembly was inspected for storm-related damages. SEG found several broken slate tiles on the roofing assembly that had fallen from the main roof above. Abrasions and scratches were noted throughout the roofing field due to the fallen tiles and wind-borne debris. Areas of the mod-bit lap seams were found to be unbonded and uplifted due to the high winds. Storm-related debris was noted underneath some of these lap seams, as well as throughout the roof (**Photographs 43—70**).
- Copper counter flashing was noted around the roofing assembly. A scratch was found on the copper from the adjacent broken slate tile that had fallen (**Photographs 71—73**).

Interiors

- SEG inspected the interiors for water intrusion and associated water-related damages. Significant water damage and mold was found on the upstairs walls and ceilings in the NE and SE multi-use rooms. Efflorescence was noted on the plaster walls throughout the upstairs - this is due to soluble salts dissolved by moisture that are drawn to the surface. The water stains were reported to be located near the chimneys where loose slate tiles were observed. Several cracks were noted on the walls and ceiling. Due to the age of the building, it is unknown how much displacement was present prior to the tornado (**Photographs 82—99**).
- The R.O. Jones Rooms was found to have moisture intrusion in the seagrass cloth wallpaper, with moisture bubbles. The wood flooring below the wallpaper had water damage along the edges. Again, efflorescence was noted around the

windows, with large cracks in the plaster. Water stains were seen on the ceiling, with minor displacement (**Photographs 100—113**).

- The Session Room had similar displacement around the window frames, and large cracks noted above the windows and walls. Efflorescence was found on the corners of the walls and around the windows, with water stains on the ceiling (**Photographs 114—130**).
- SEG inspected the interior areas of the towers on the NW and SW corners of the Church. The exposed wooden floor joists were noted to have water stains throughout (**Photographs 131—137, 144—148**).
- The mezzanine above the sanctuary was found to have displacement around the windows and in the walls. Efflorescence was seen on the wall above the window with chipping plaster. Water stains were also noted on the carpet (**Photographs 138—140, 149—151**).
- Cracks were observed in the stain-glass windows on the second floor (**Photographs 141—143**).
- Water damage (efflorescence) was noted on the walls and ceilings of the NW stairway behind the Sanctuary, with chipping plaster and water stains (**Photographs 156—168**).
- SEG inspected the Sanctuary and found water stains, peeling plaster, displacement, and moisture bubbles within the walls and ceiling. Cracks were noted around the windows, along with water damage to the wooden windowsills (**Photographs 169—195**).

REVIEW OF PRECISION CONSTRUCTION PHOTOGRAPHS

We reviewed the aerial drone photographs taken on 3/29/21 by Precision Construction and have included them in **Appendix B under Photographs by Precision Construction and Roofing (Photographs 1—55)**. The photographs show specific areas of damage, which have been enlarged by SEG in each photograph.

- Drone photographs revealed several broken, chipped, displaced and missing slate tiles on the north and south slopes.
- Old damage was pointed out to note the difference between the fresh cracks.

- Wind-borne debris impacted the tile roof resulting in several broken edges and chips in the slate.
- Several broken tiles were found to have fallen into the gutter of the roof resulting in damage to the metal gutters.
- Loose and displaced tiles were noted on both slopes, with some tiles missing completely.
- We estimate that 10 to 30% of the slopes were affected.

DISCUSSION

The high wind event, noted to be an EF-4 tornado with up to 170 mph winds, damaged and displaced the slate tiles and the low-slope modified bitumen roofing assembly on the Church.

As stated earlier, when high winds strike a building, it can cause either an increase in the pressure within a building (i.e., positive pressure), or it can cause a decrease in the pressure (i.e., negative pressure). Internal pressure can be caused by openings around the doors and window frames, or from storm-related openings. This pressurization resulted in the displacement, cracking of the building's envelope and subsequent water intrusion observed by SEG in the interiors.

Further, windborne debris is a major cause of structural damage during severe windstorms and hurricanes, owing to its direct impact on building envelopes as well as to the 'chain reaction' failure mechanism it induces by interacting with wind pressure damage.

It is our professional opinion that the high winds of the tornado on March 26, 2021, created storm-created openings, including the windows and doorways, and allowed moisture to enter the building envelope. Further, we believe the displaced and damaged roofing assemblies also allowed the intrusion of water within the building.

CONCLUSIONS

Based on the information stated in the body of this report including field observations, and to a reasonable degree of engineering certainty from my experience, my opinions related to the wind event at the Church include:

1. The slate tiles should be removed and replaced on both the north and south slopes. If economically feasible and if replacement tiles are available to match, the intact tiles can be removed and re-attached, after the replacement of the old/damaged roofing felt. Several items to note if the intact tiles are going to be re-used: 1) A breakage factor must be included as approximately 10 to 15% of the intact tiles will be broken, and 2) many of the intact tiles are currently chipped and have small cracks – these tiles cannot be re-used per IBC codes.
2. Remove and replace the damaged modified-bitumen flat roofing assembly on the west elevation.
3. Remove and repair the stained-glass window on the western elevation.
4. Remove and replace all plexiglass storm-protection windows on the north and south elevations.
5. Remove and replace all damaged gutters and downspouts.
6. According to *The Institute of Inspection Cleaning and Restoration Certification Standard for Professional Water Damage Restoration* (IICRC S500), interior plaster, drywall, insulation and flooring that was impacted by the roof leaks, should all be removed. Hard surfaces should be mitigated using the IICRC S500 Standards, which includes anti-microbial spray and HEPA vacuuming to disinfect affected.

CLOSING & SIGNATURE

Shields Engineering Group warrants that its services are performed, within the limits prescribed by its Clients, with that level of care and skill ordinarily exercised by members of the same professions currently practicing in the same locality under similar conditions; no expressed or implied warranties or guarantees of any kind are given.

I hereby certify that this Investigation/Report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Georgia.

Respectfully submitted,

SHIELDS ENGINEERING GROUP, INC

DocuSigned by:
Martin Shields
93172F70846D423...

Martin D. Shields, MCE, P.E., LEED^{AP-NC}
Principal



Martin Shields, P.E. electronically signed and sealed this Report on the date shown using a Digital Signature. Printed copies of this Report are not considered signed and sealed, and the signature must be verified on any

ATTACHMENTS

1. Figure 1 – Aerial View
2. Appendix A – Weather Data
3. Appendix B – SEG Photographs and Precision Construction's Photographs

RESOURCES

NOAA (National Oceanic and Atmospheric Administration) -
https://www.weather.gov/ffc/March25_26_2021_severe_EF4Tor

Coweta County Current Codes - <https://www.coweta.ga.us/government/departments-a-e/community-development/community-development/building-inspection-department/current-codes>

2018 IRC Building Codes - <https://codes.iccsafe.org/content/IRC2018/chapter-9-roof-Assemblies>

Precision Construction - First United Methodist Church Preliminary Report, dated 4/13/21.

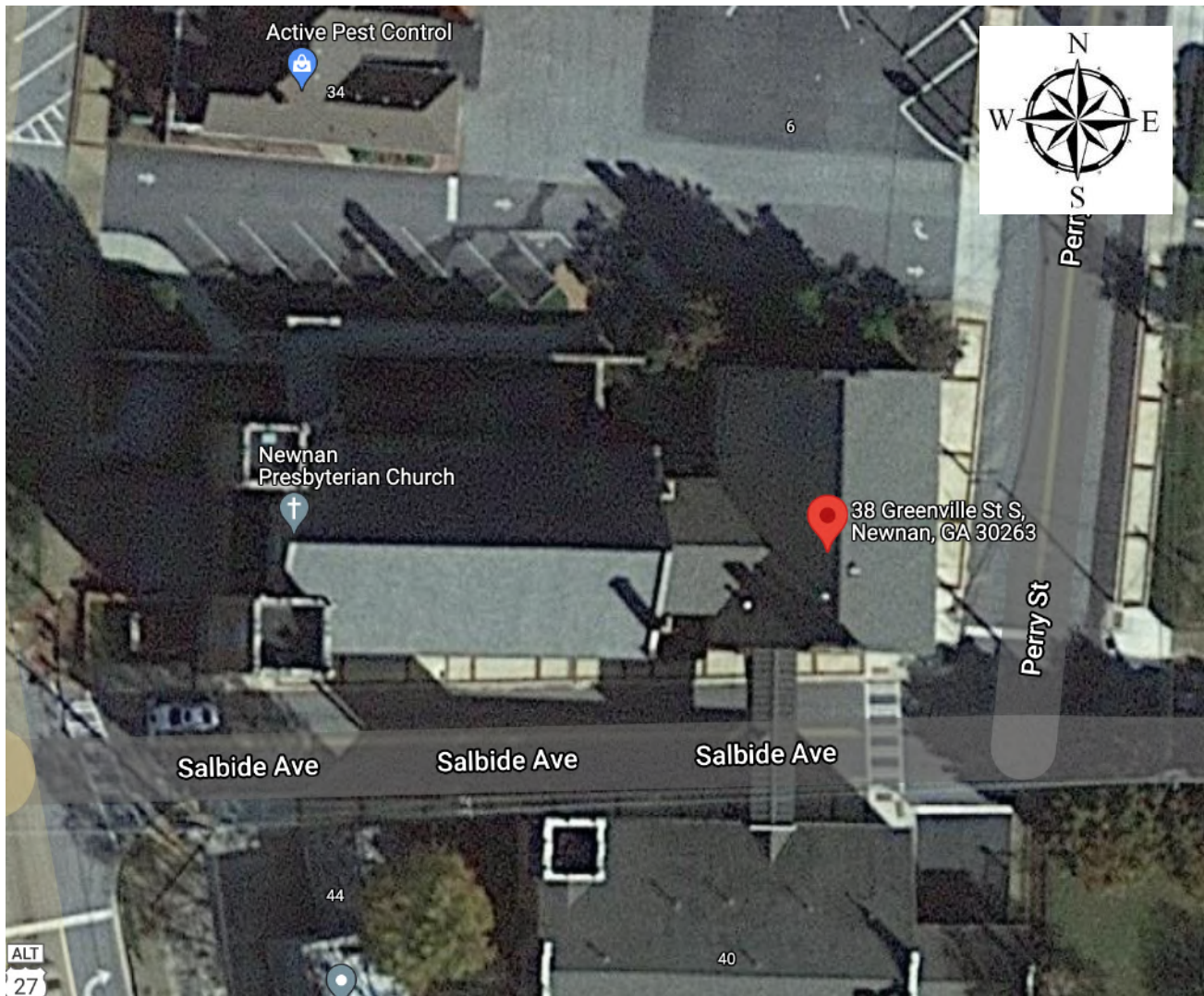
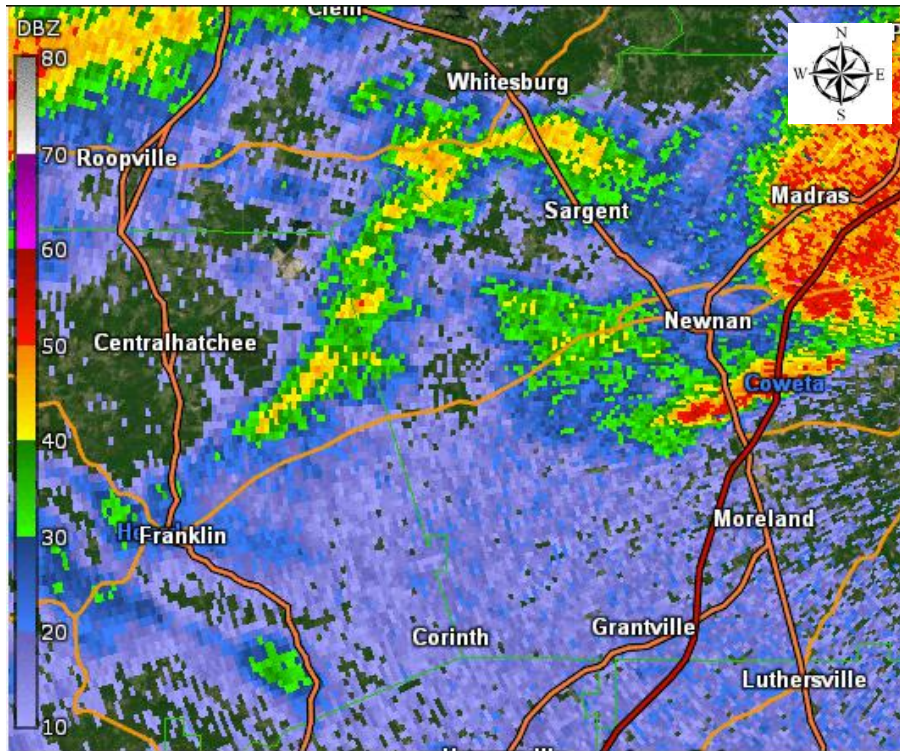


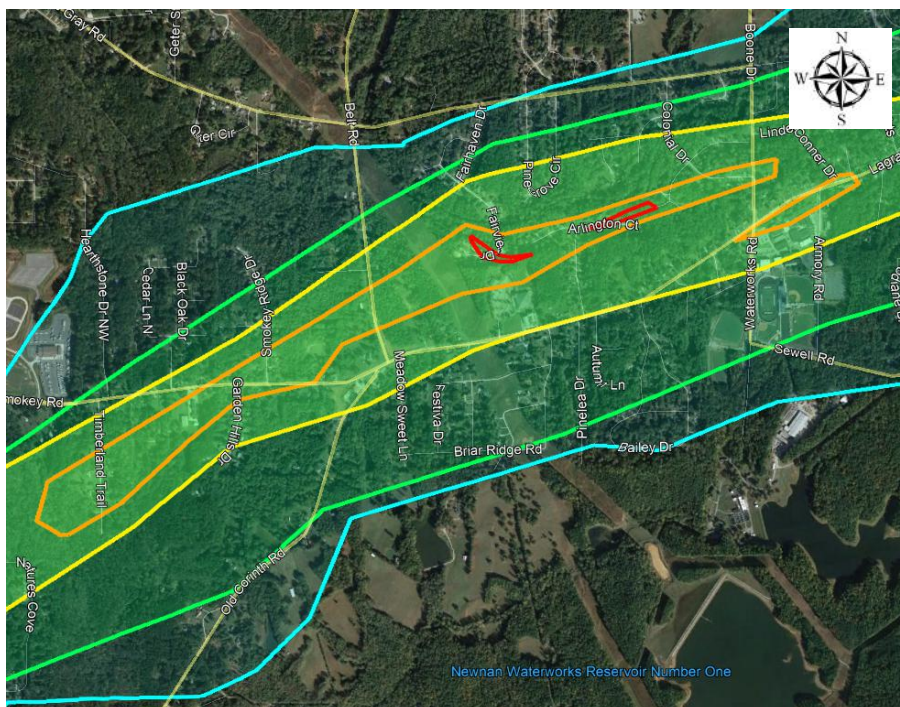
Figure 1. Aerial view of 38 Greenville St. S, Newnan, GA 30263. (Source: Google Earth - not to scale)

APPENDIX A

WEATHER DATA



NOAA KFFC radar reflectivity – Supercell thunderstorm and associated tornado



NOAA Damage Path – March 25th, 2021 Newnan GA

APPENDIX B

PHOTOGRAPHS

Shields Engineering Group, Inc.

12/6/2021 | 250 Photos

Newnan Presbyterian Church

38 Greenville St. S, Newnan, GA 30263



SEG Photos

- Exterior Photos: 1 - 42
- Flat Mod-bit Roofing Assembly Photos: 43 - 73
- Interior Photos: 82 - 195



Front



Front - west



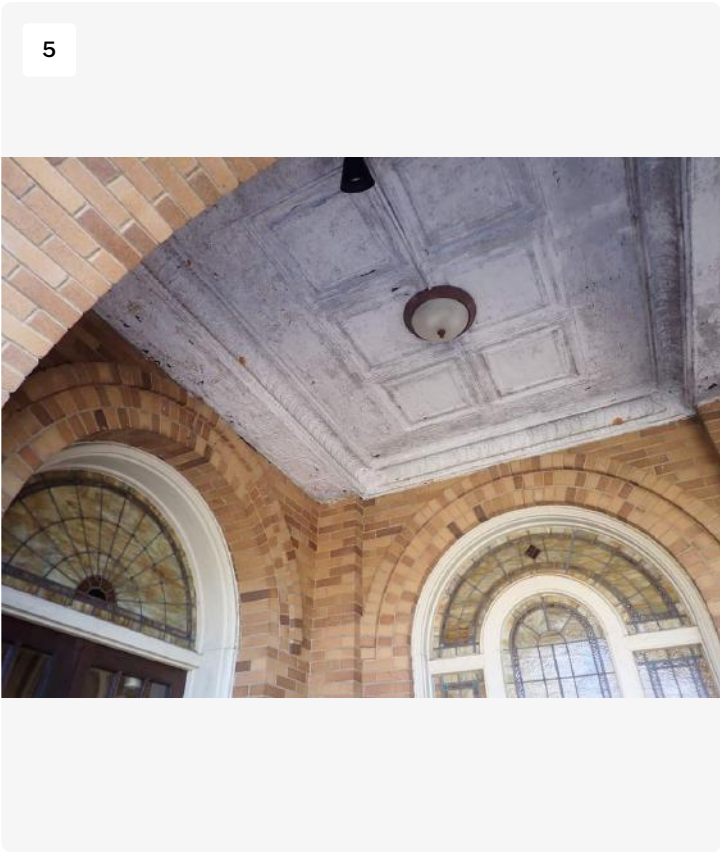
Broken window

Project: Newnan Presbyterian Church
Date: 11/9/2021, 10:09am



Same

Project: Newnan Presbyterian Church
Date: 11/9/2021, 10:09am



Ceiling under flat mod-bit roofing

Project: Newnan Presbyterian Church
Date: 11/9/2021, 10:09am



Displaced brick

Project: Newnan Presbyterian Church
Date: 11/9/2021, 10:09am



South elevation



Same



Displaced metal window frame



Broken window

11



Displaced window seal

Project: Newnan Presbyterian Church

Date: 11/9/2021, 10:16am

12



Unknown water line discharge

Project: Newnan Presbyterian Church

Date: 11/9/2021, 10:18am



Downspout



Displaced downspout



Unknown water line discharge

Project: Newnan Presbyterian Church
Date: 11/9/2021, 10:19am



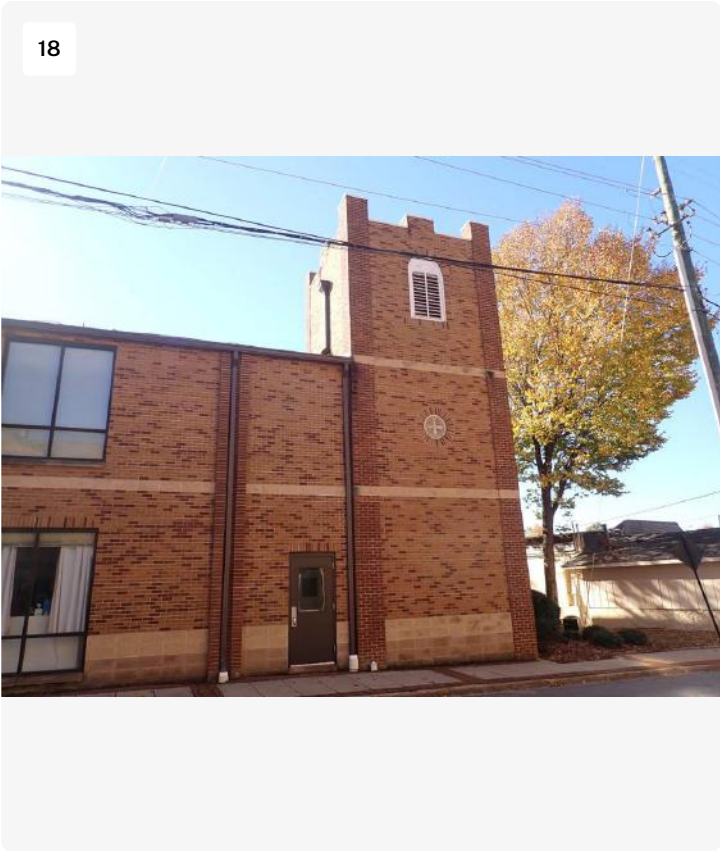
South bridge

Project: Newnan Presbyterian Church
Date: 11/9/2021, 10:20am



Building to the south of church

Project: Newnan Presbyterian Church
Date: 11/9/2021, 10:20am



Same

Project: Newnan Presbyterian Church
Date: 11/9/2021, 10:20am

19

North-displaced awning



Project: Newnan Presbyterian Church
Date: 11/9/2021, 10:21am

20

North elevation



Project: Newnan Presbyterian Church
Date: 11/9/2021, 9:06am

21

North elevation



Project: Newnan Presbyterian Church
Date: 11/9/2021, 9:05am

22

Bowed windows



Project: Newnan Presbyterian Church
Date: 11/9/2021, 10:22am



North windows



Same

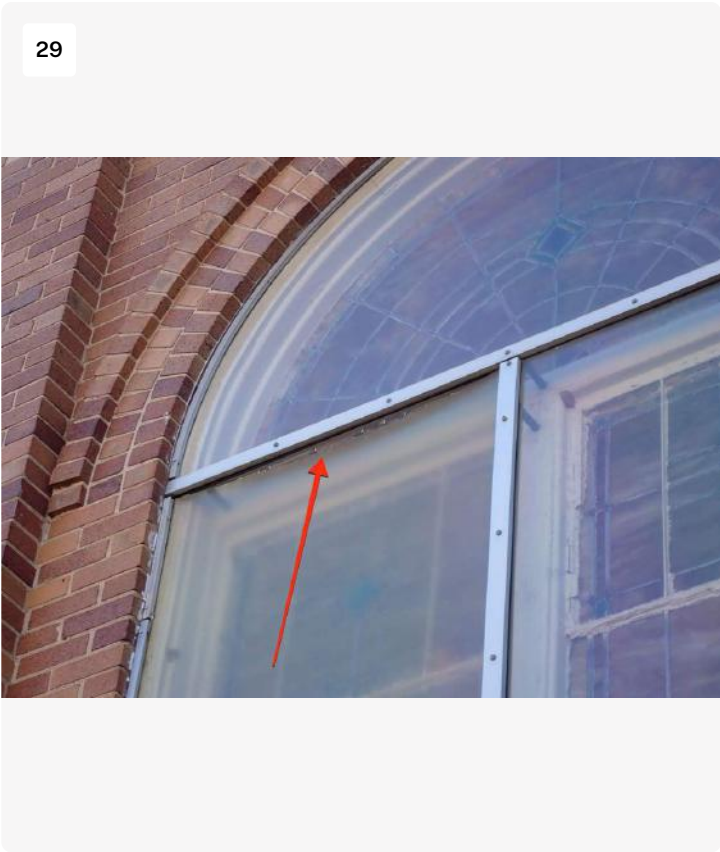


Same



Bowed windows





Same



Displaced window



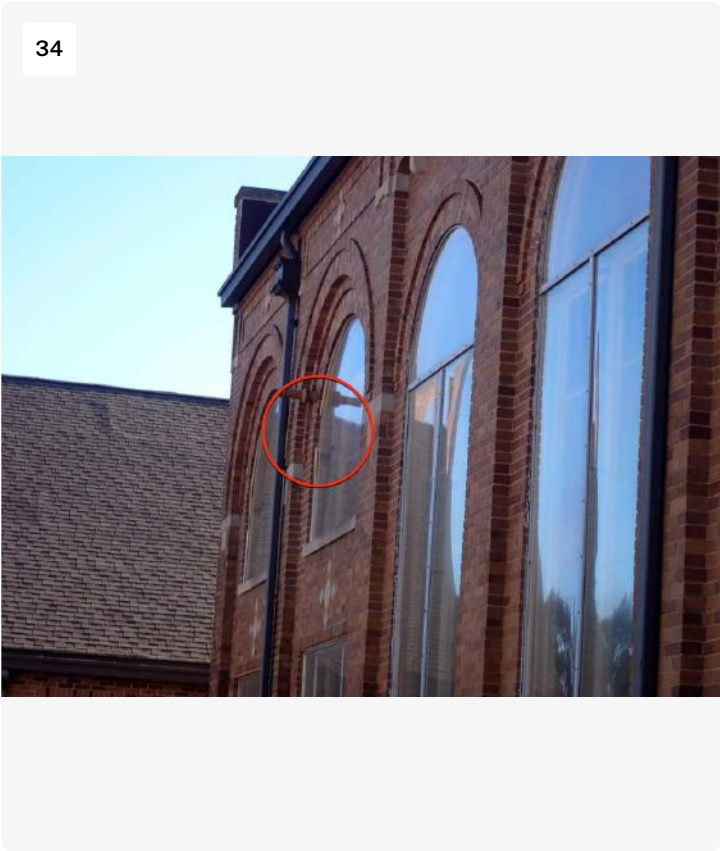
Bowed window



Displaced frame



Bowed window



Broken window seal



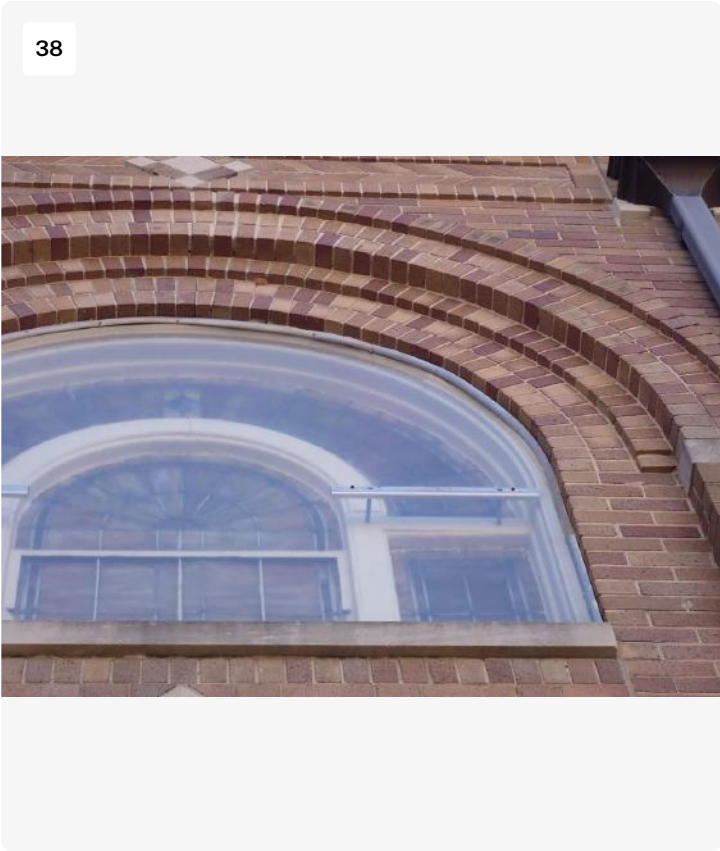
Displaced window frame



Damaged, missing window seal



Same

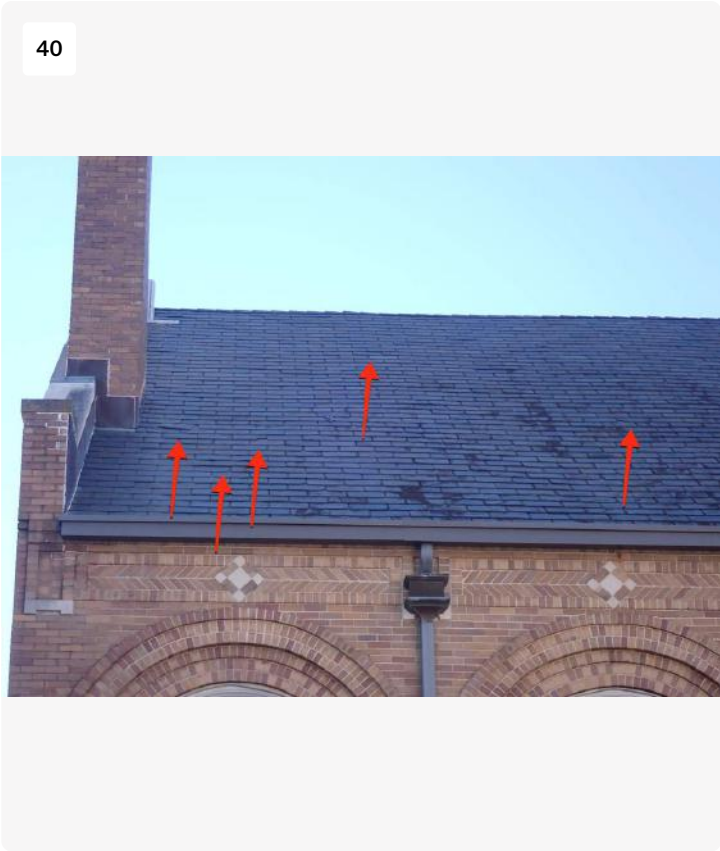


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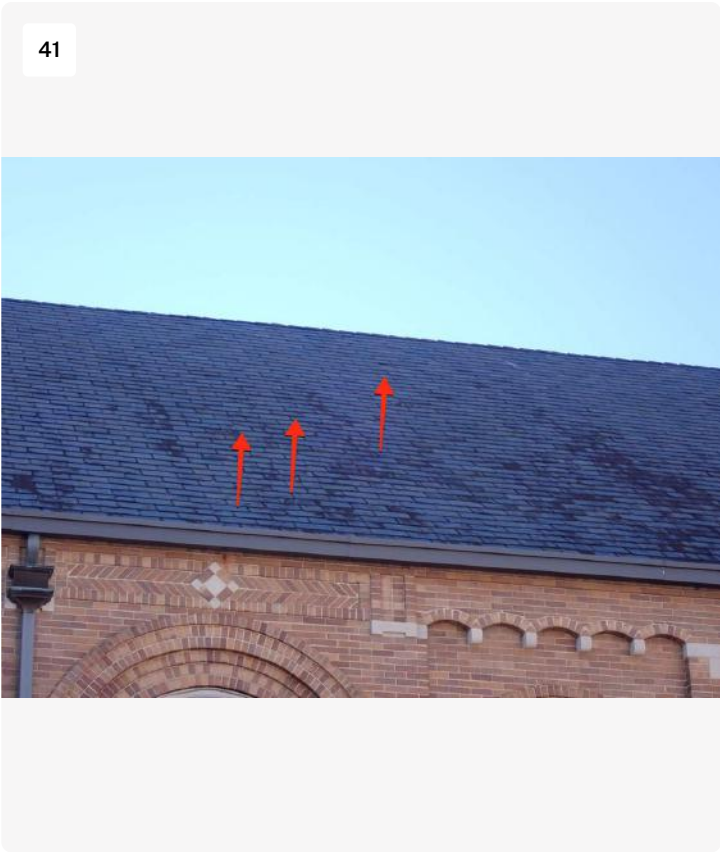
Displaced/missing tiles

Project: Newnan Presbyterian Church
Date: 11/9/2021, 10:24am

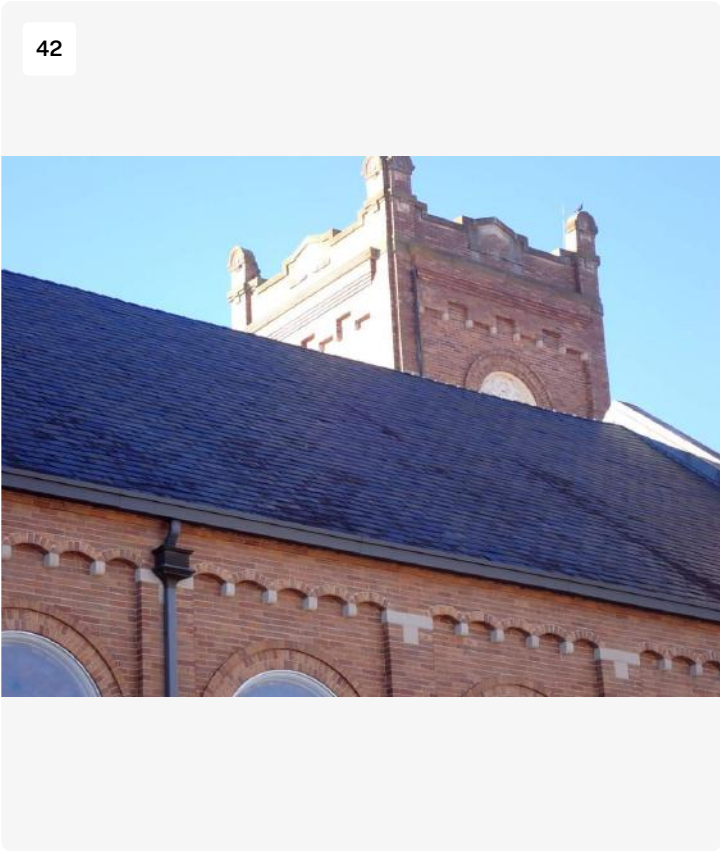


Displaced/broken tiles

Project: Newnan Presbyterian Church
Date: 11/9/2021, 9:07am



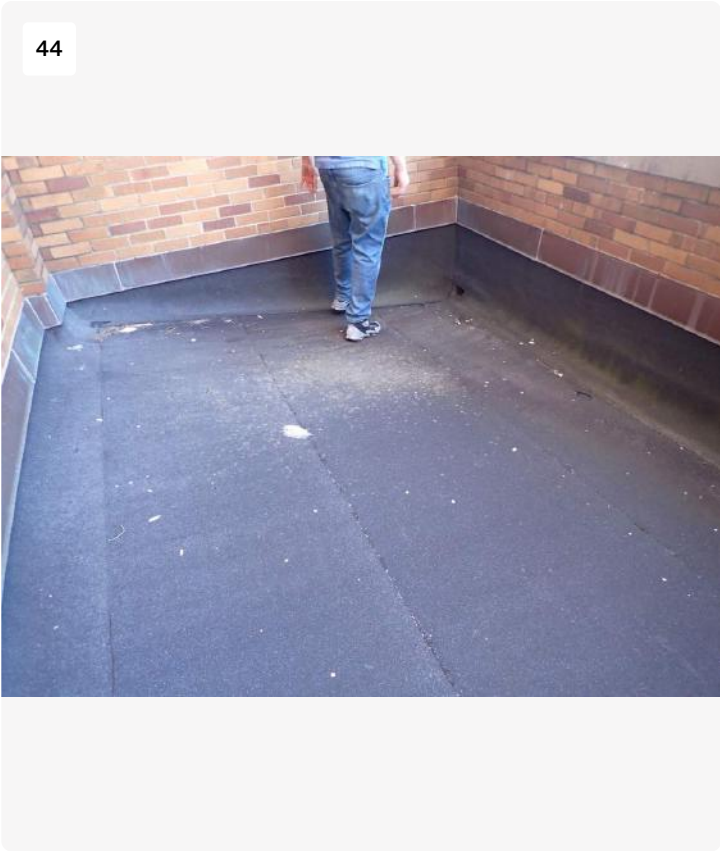
Same



Same



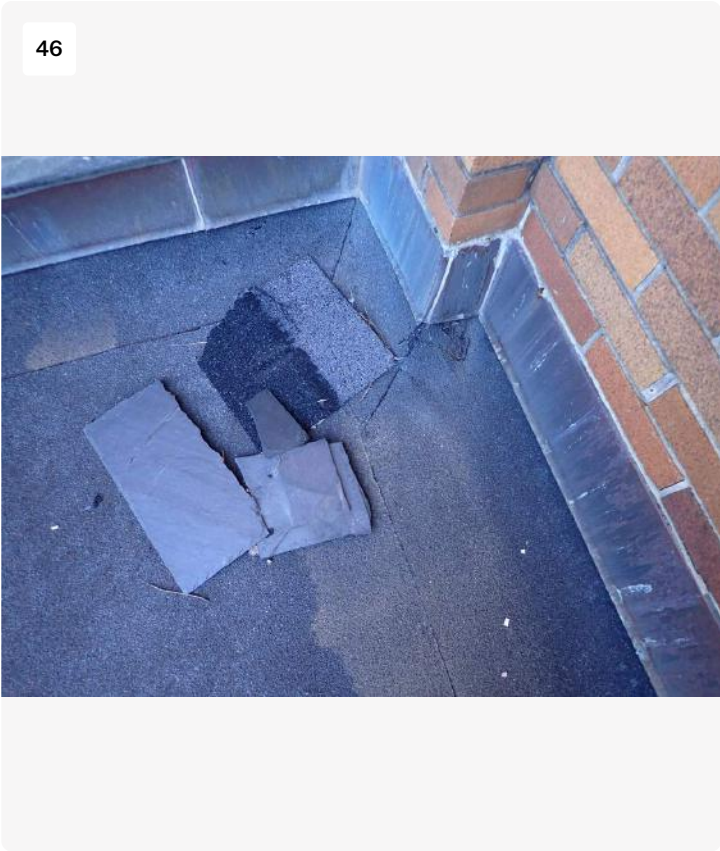
Modified Bitumen Flat Roofing Assembly
Over front entrance - west elevation



Same



Same



Broken tiles and shingles that fell from the above roofing assembly



Same



Minor uplift on lap seam



Minor uplift on lap seam



Uplifted lap seam and wind-borne debris



Uplifted lap seam



Wind-borne debris



Wind-borne debris



Wind-borne debris

55

Fallen tile



Project: Newnan Presbyterian Church

Date: 11/9/2021, 10:30am

56

Damage to mod-bit from fallen slate tile



Project: Newnan Presbyterian Church

Date: 11/9/2021, 10:30am



Abrasions in mod-bit from fallen tiles



Same



Same



Same



Same



Same



Same



Same



Same



Same



Same



Same



Same

Project: Newnan Presbyterian Church
Date: 11/9/2021, 10:35am



Damages to mod-bit from fallen tiles

Project: Newnan Presbyterian Church
Date: 11/9/2021, 10:40am



Copper counter flashing



Damage to copper flashing from fallen tile



Same

Project: Newnan Presbyterian Church
Date: 11/9/2021, 10:37am



Roof drain

Project: Newnan Presbyterian Church
Date: 11/9/2021, 10:33am



Damages to painted window frames due to high winds



Broken mosaic window



Paint ripped off due to high winds

Project: Newnan Presbyterian Church
Date: 11/9/2021, 10:41am

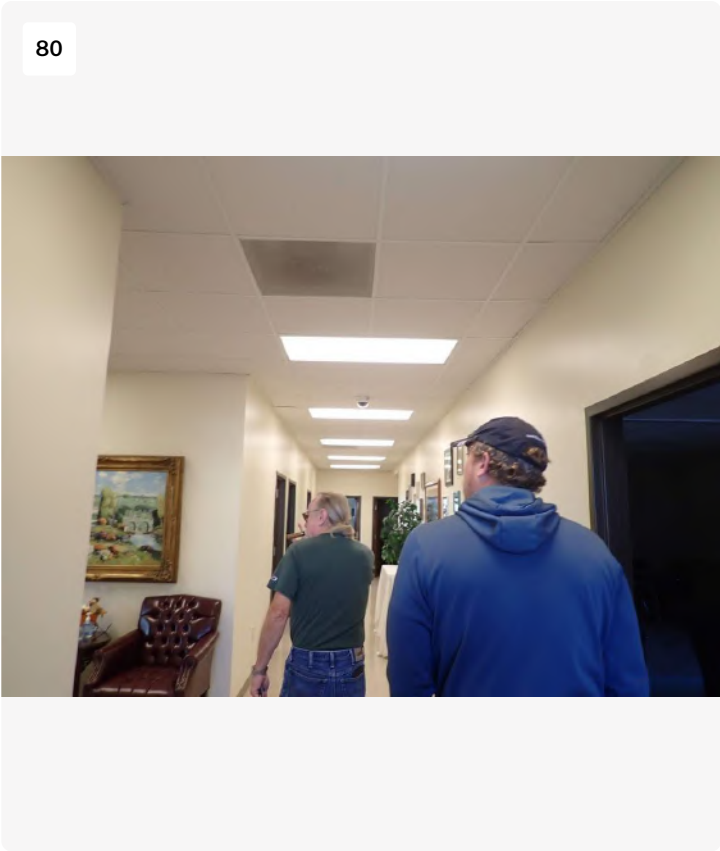


Displaced mortar

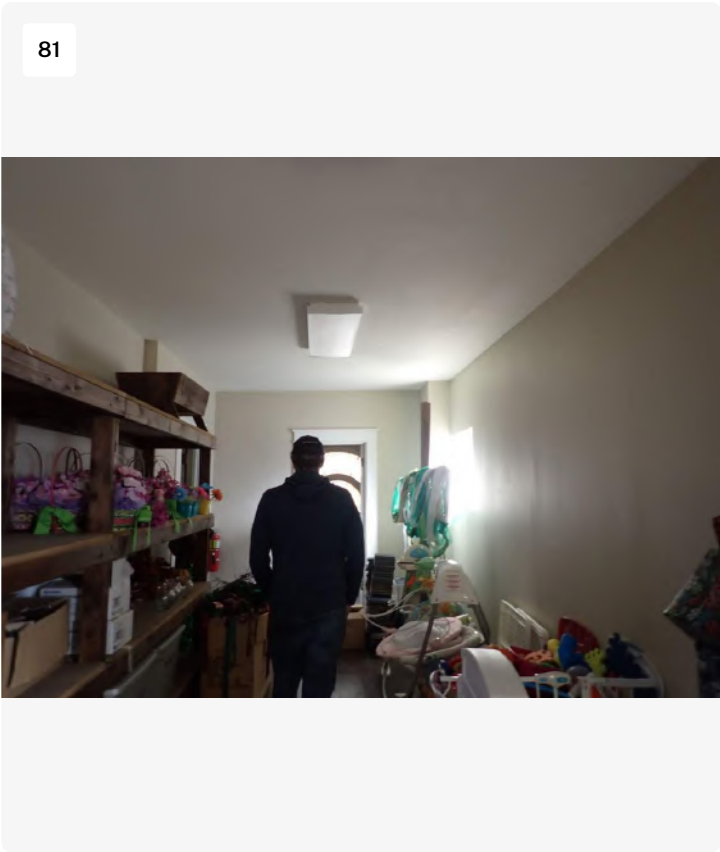
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Date: 11/9/2021, 10:41am



Interiors

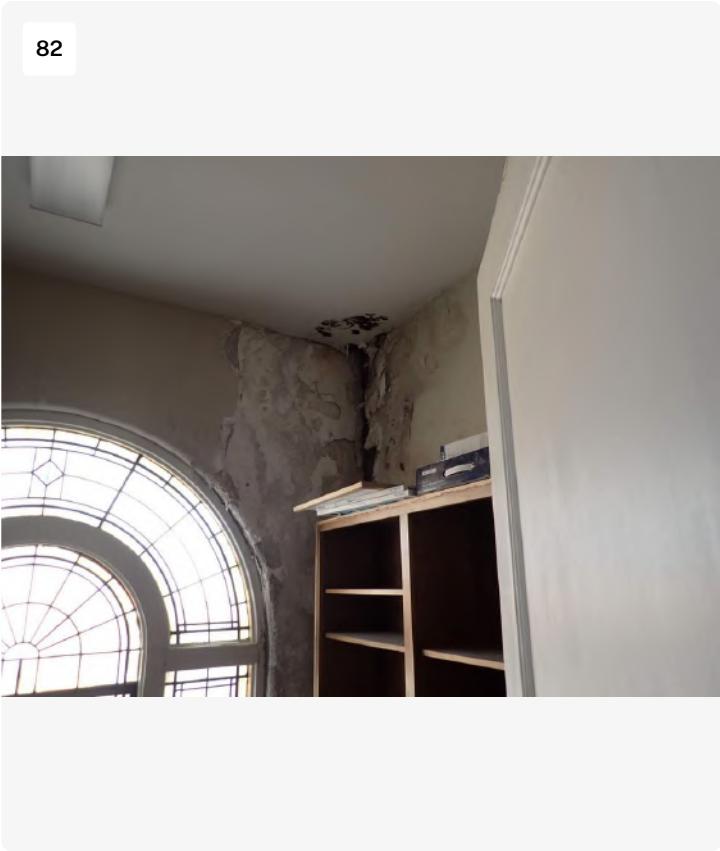


Interiors



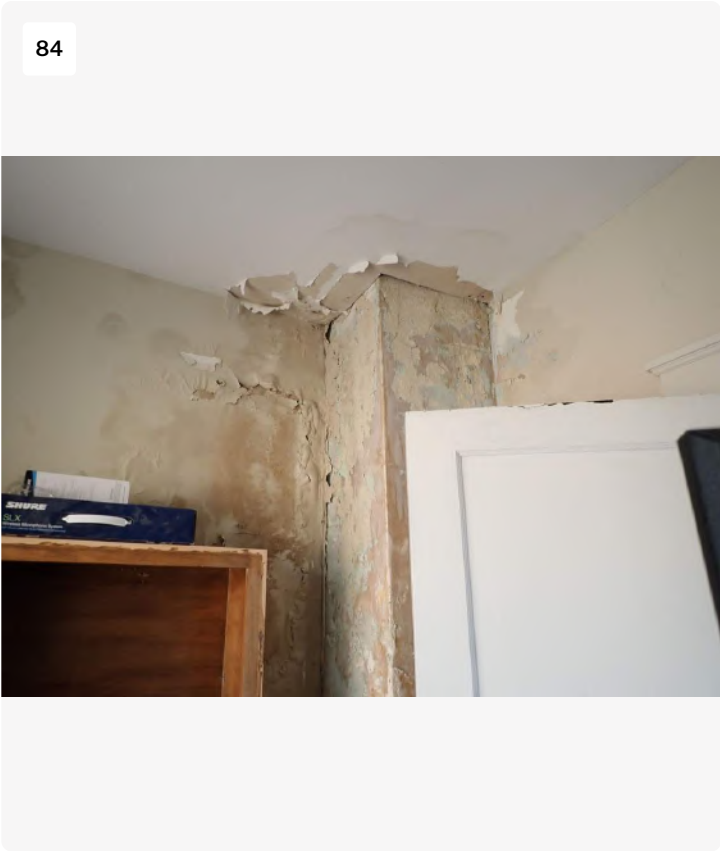
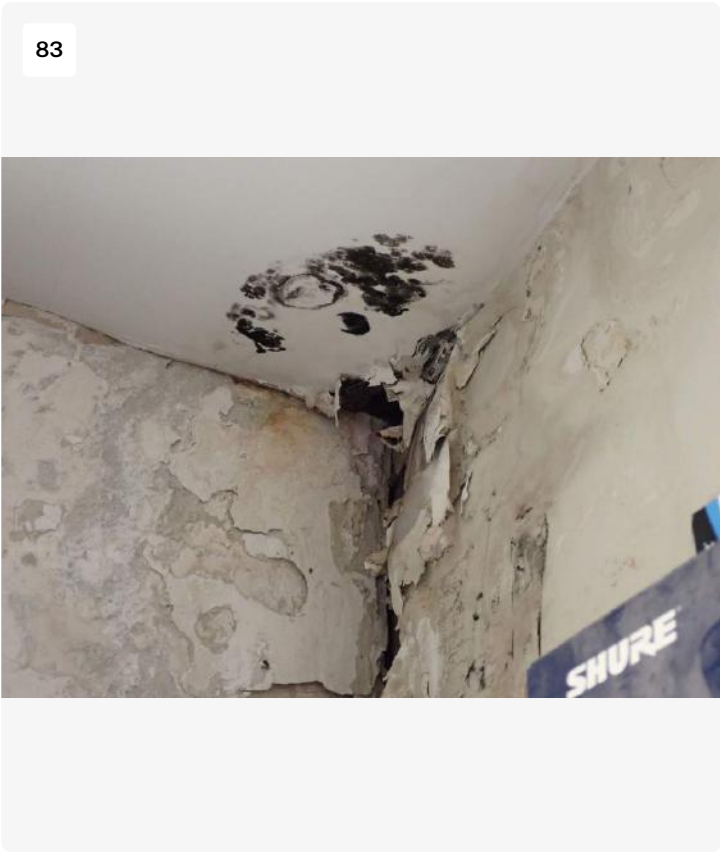
Upstairs

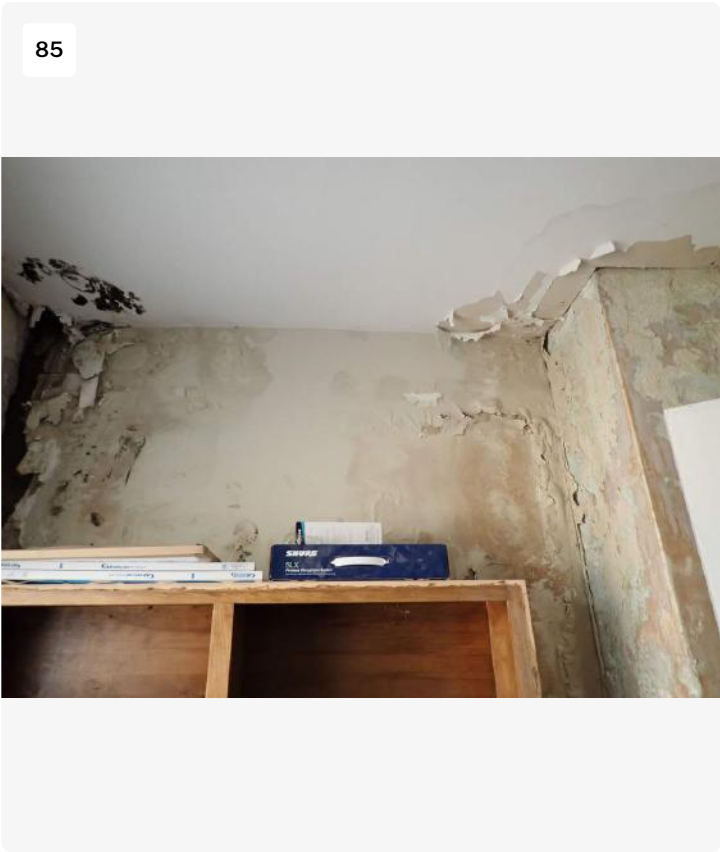
Project: Newnan Presbyterian Church
Date: 11/9/2021, 9:12am



Water damage/mold
Efflorescence

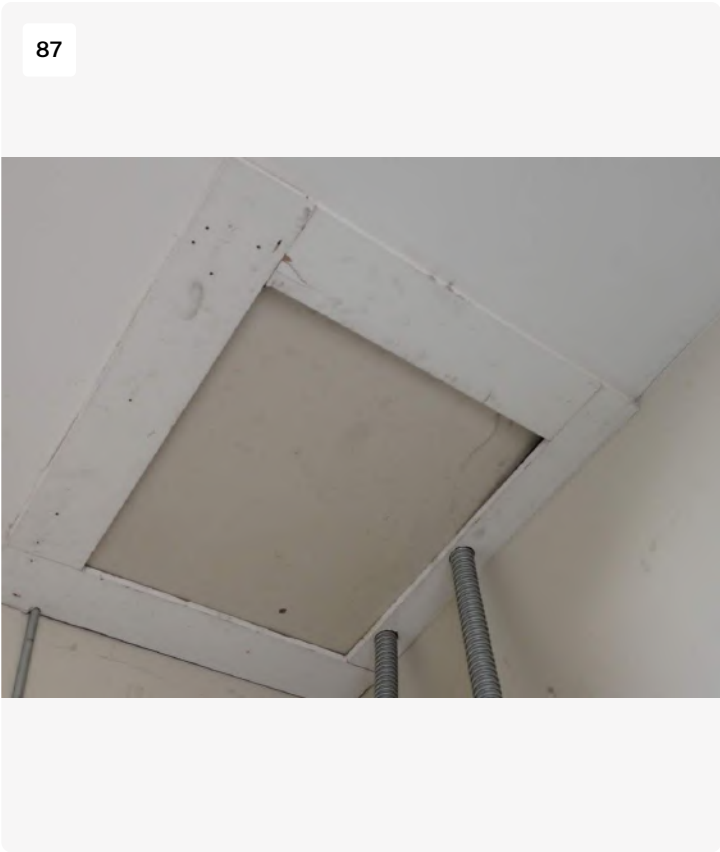
Project: Newnan Presbyterian Church
Date: 11/9/2021, 9:12am



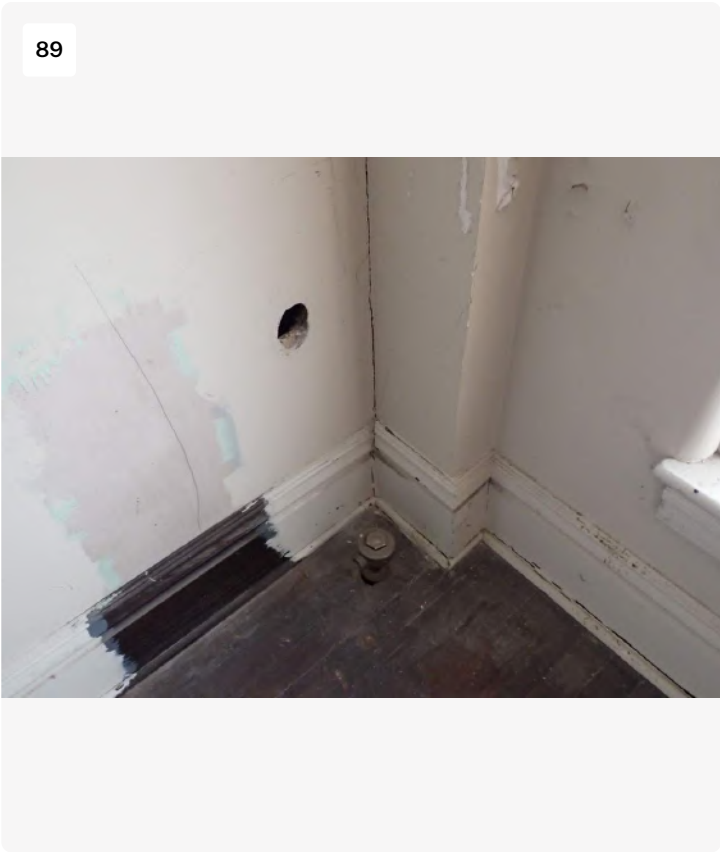


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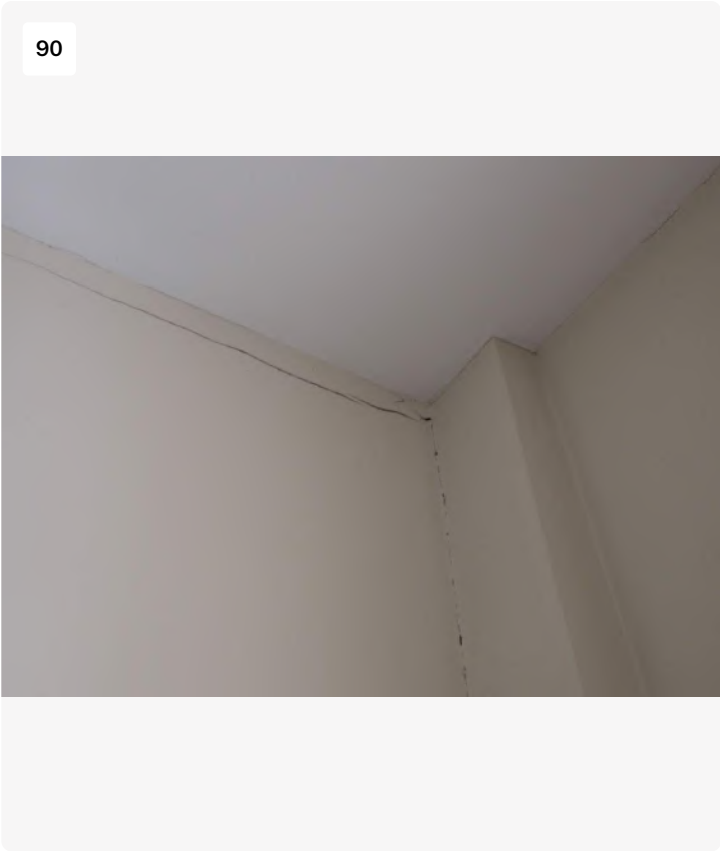




Displacement



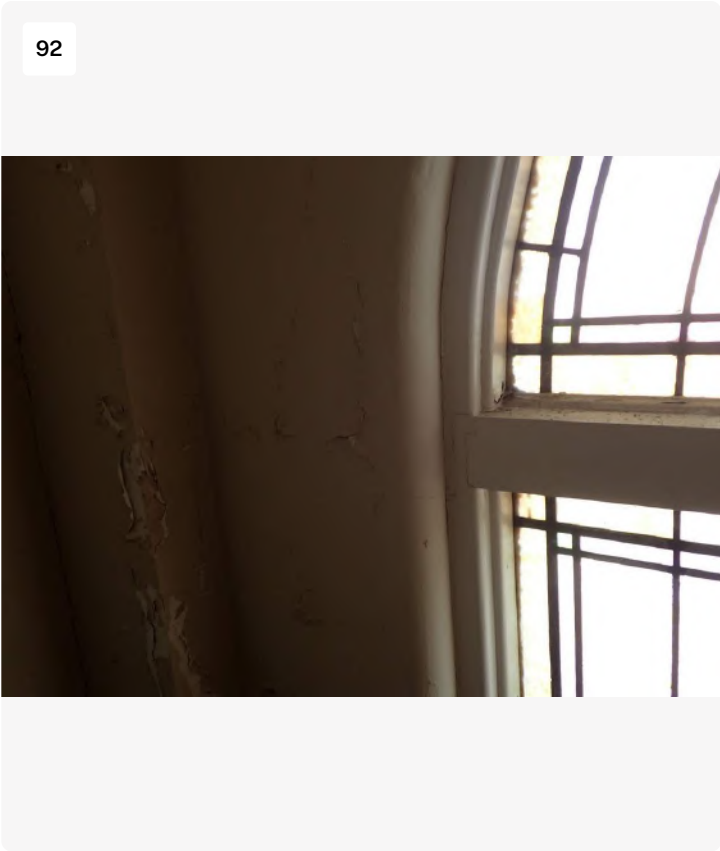
Same



Same



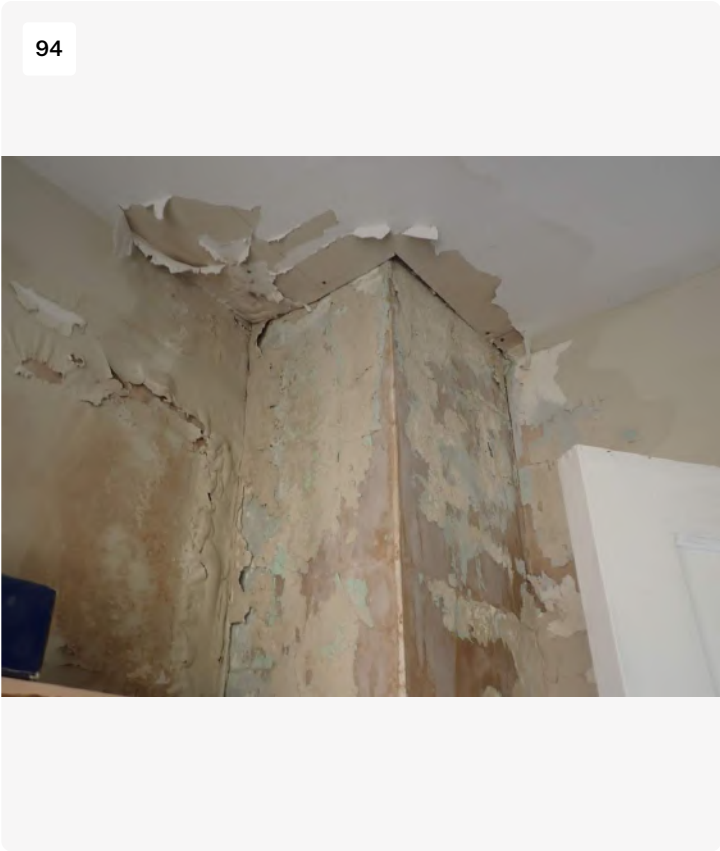
Same



Same



Water damage

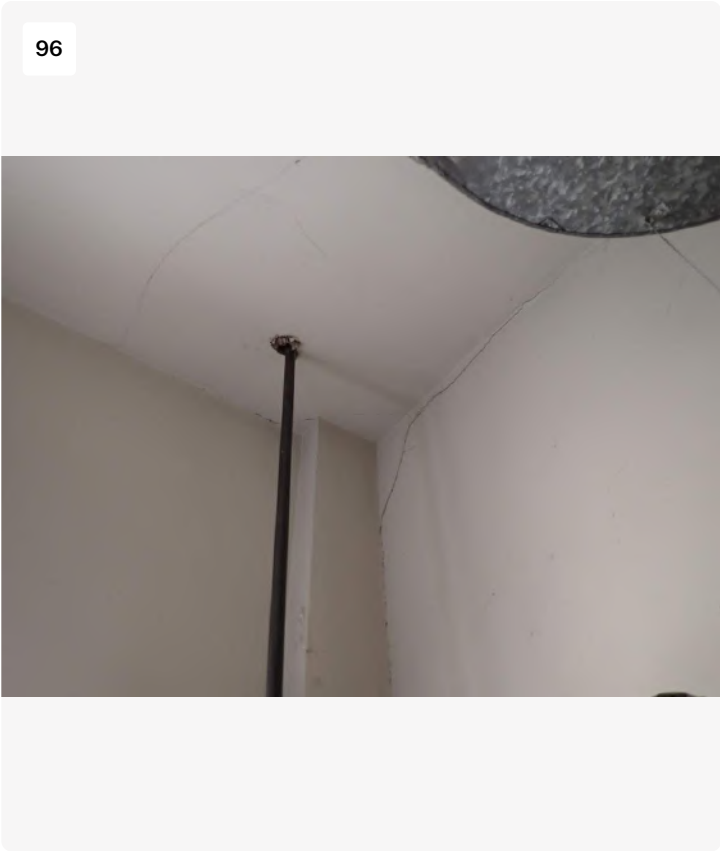


Same



Displacement

Project: Newnan Presbyterian Church
Date: 11/9/2021, 9:15am

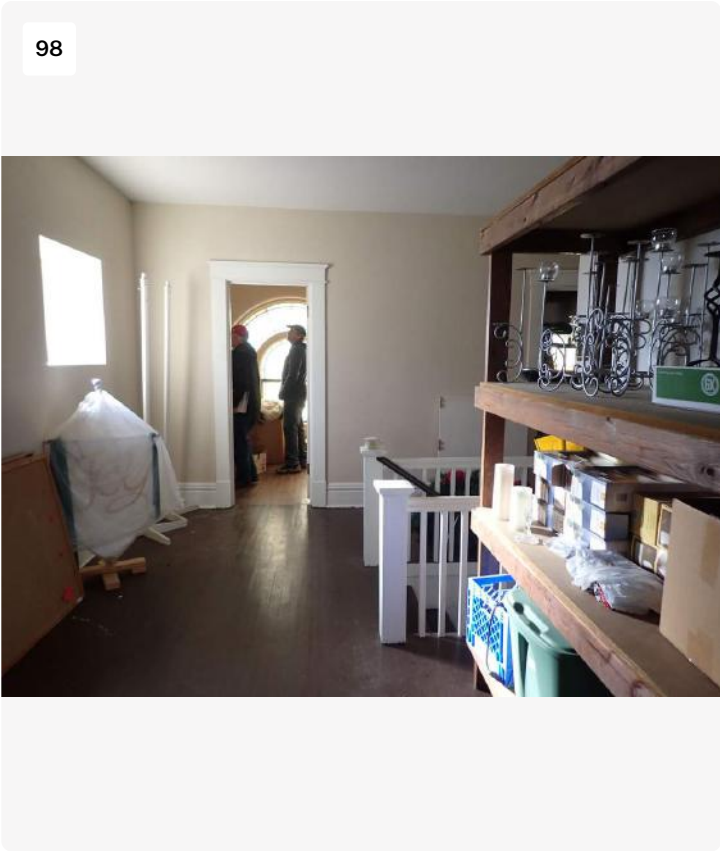


Same

Project: Newnan Presbyterian Church
Date: 11/9/2021, 9:15am



Same



99



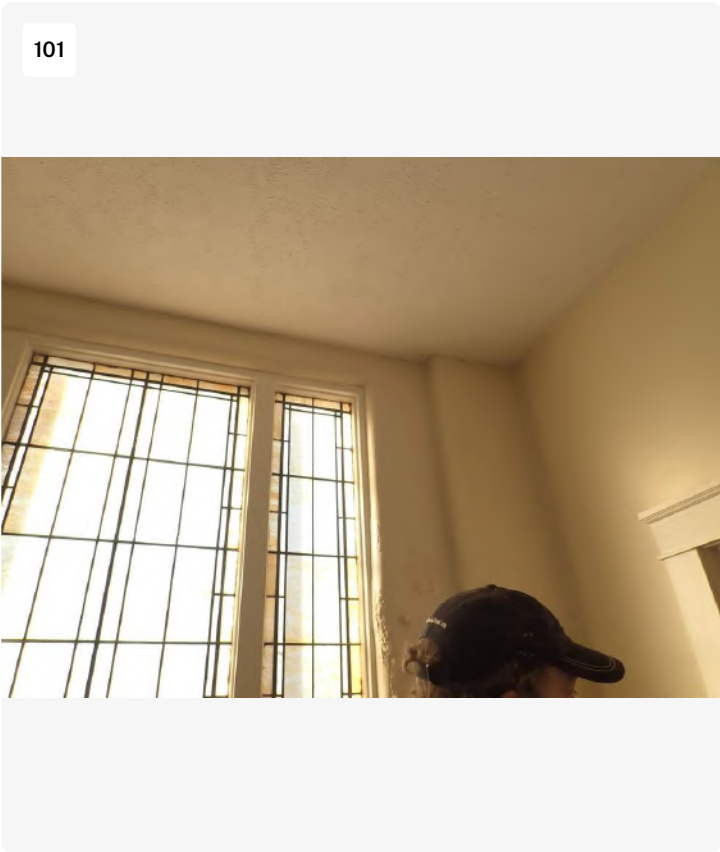
Project: Newnan Presbyterian Church
Date: 11/9/2021, 9:15am

100



R.O. Jones Room

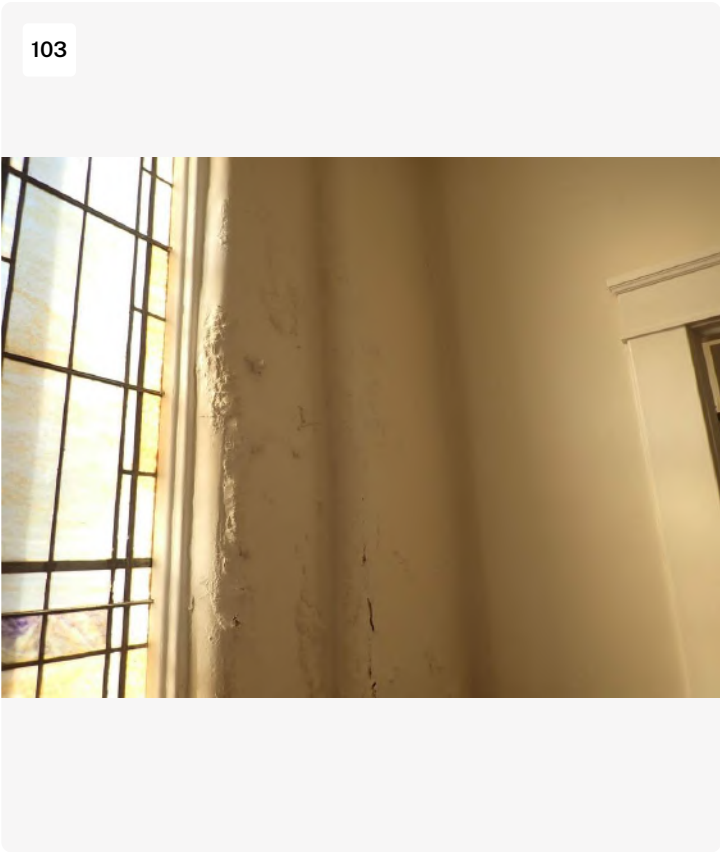
Project: Newnan Presbyterian Church
Date: 11/9/2021, 9:20am



Water damage



Same



Efflorescence



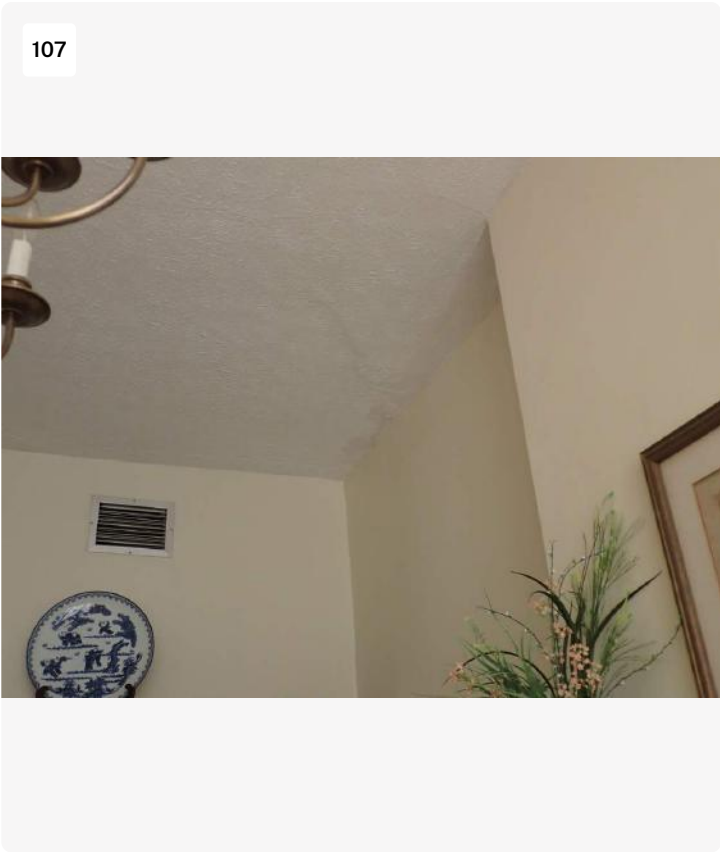
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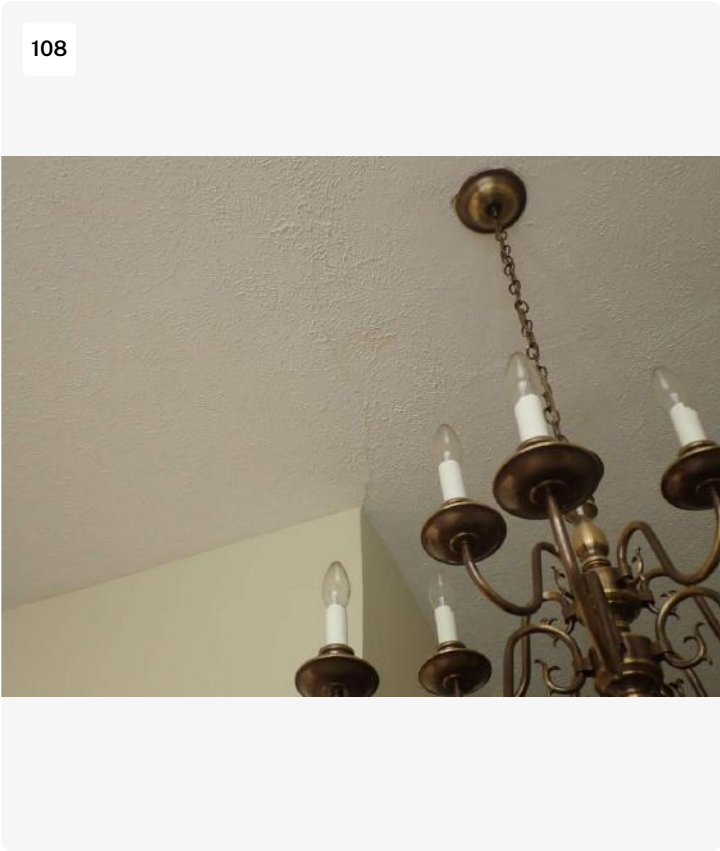
Efflorescence



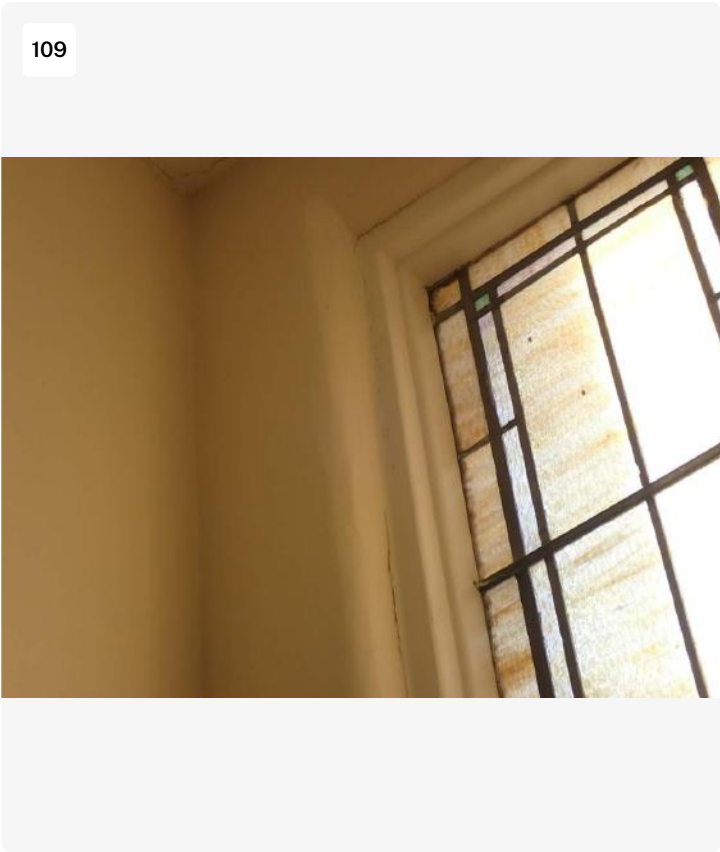
Efflorescence



Water stains



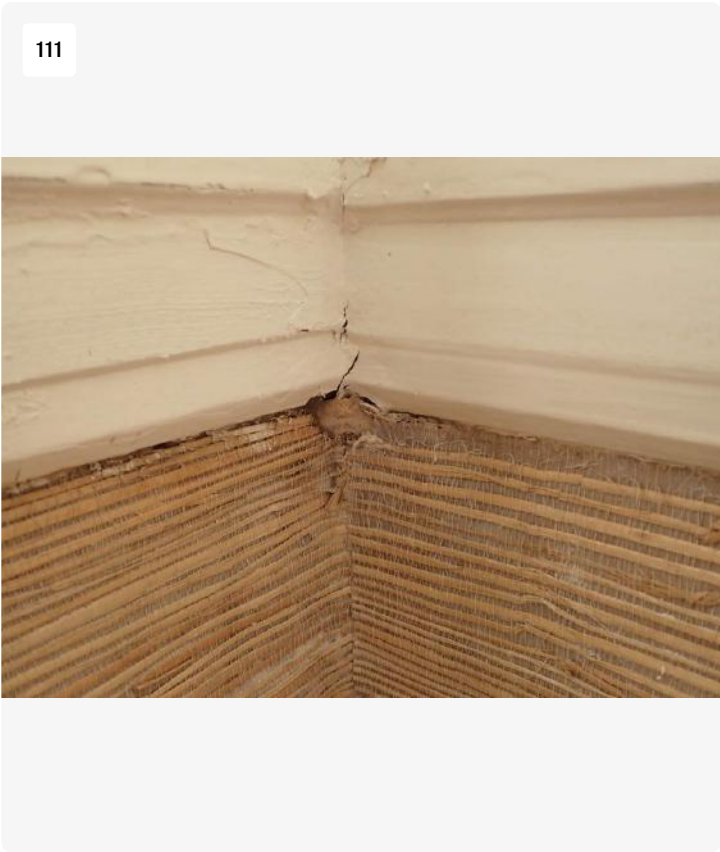
Displacement



Same



Water intrusion behind wallpaper



Same



Water intrusion



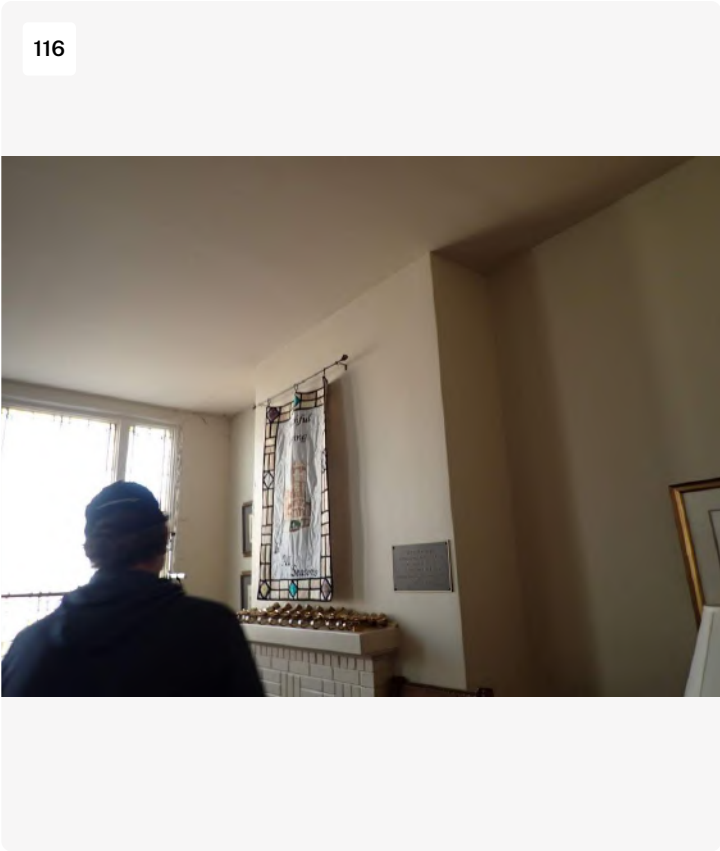
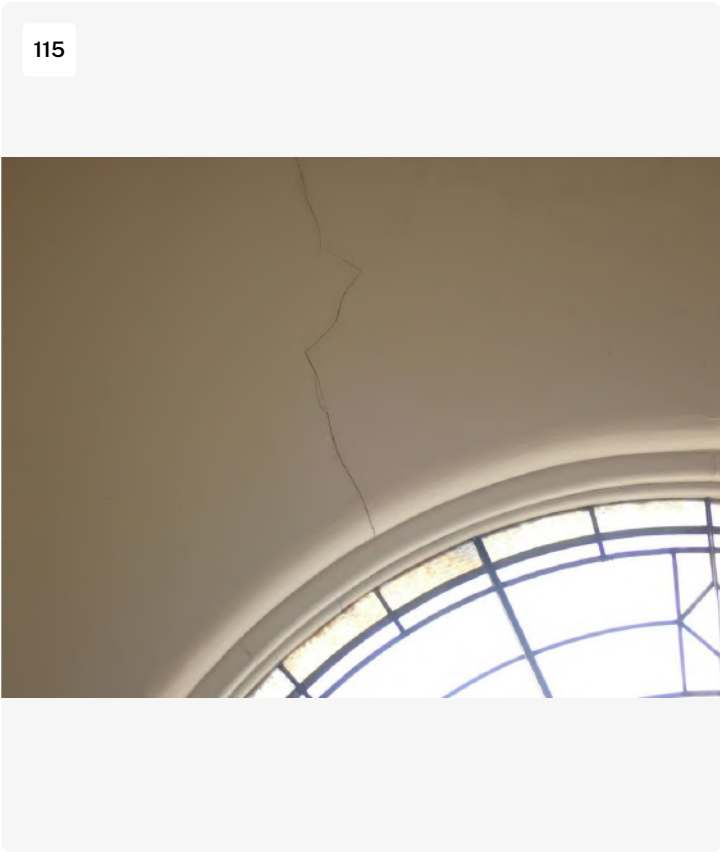
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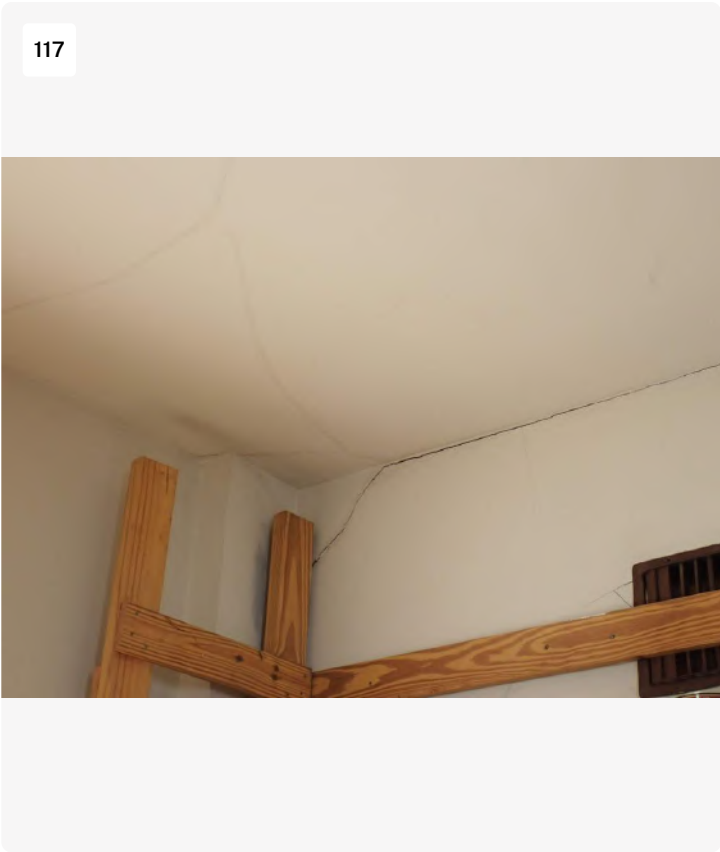
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Date: 11/9/2021, 9:23am



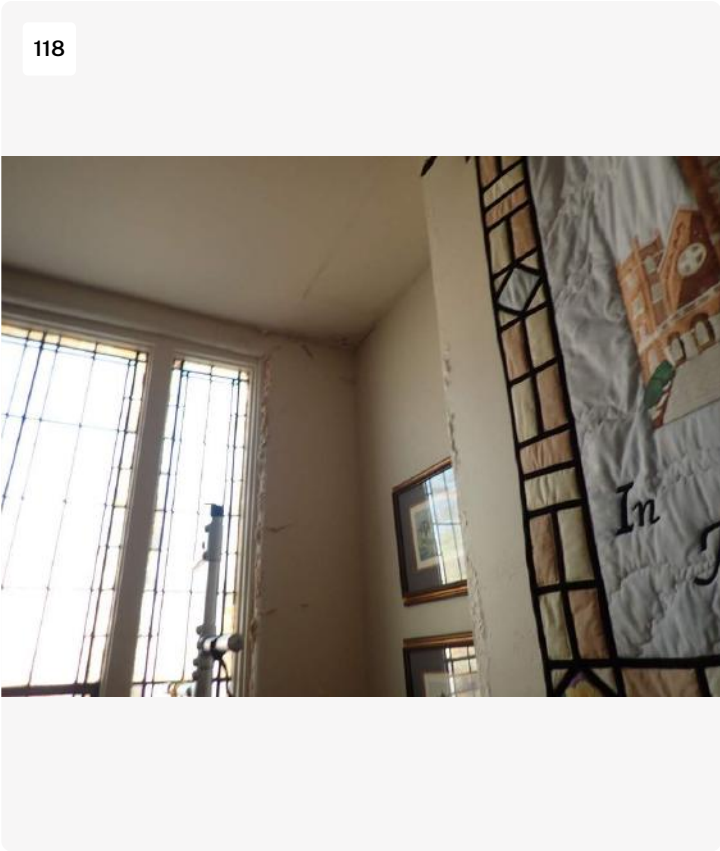
Session Room

Project: Newnan Presbyterian Church
Date: 11/9/2021, 9:23am



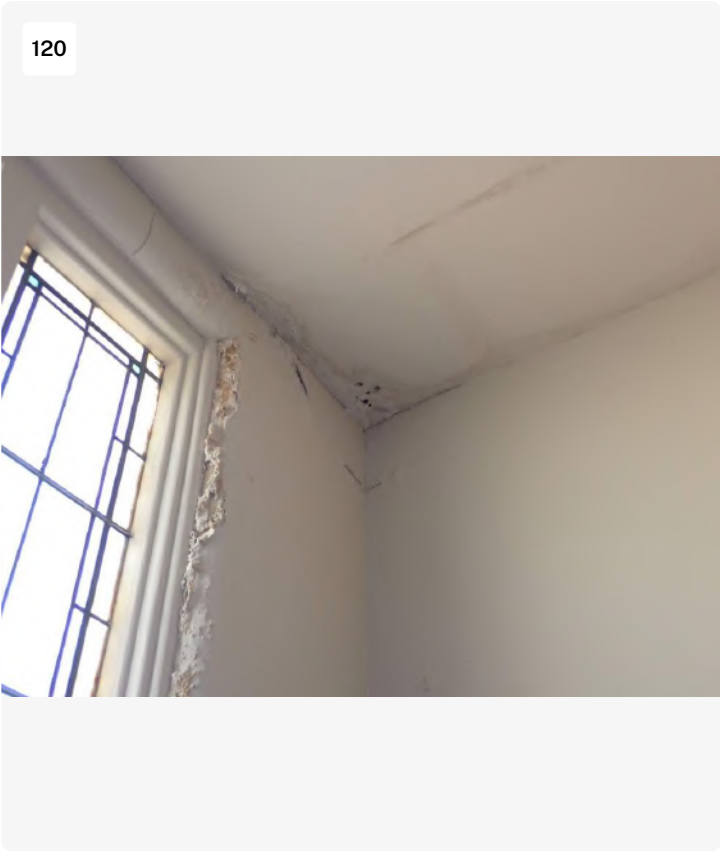


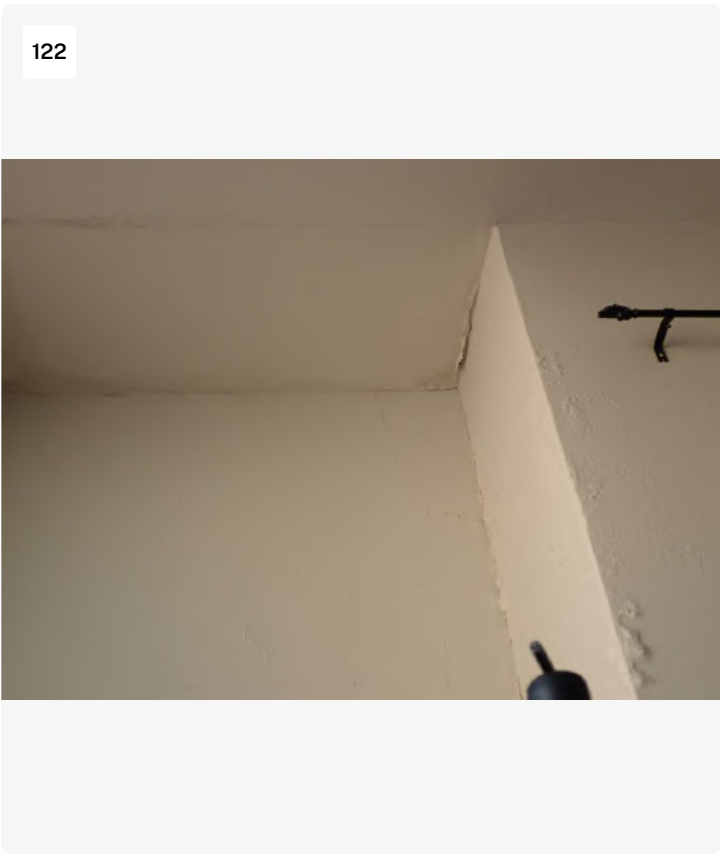
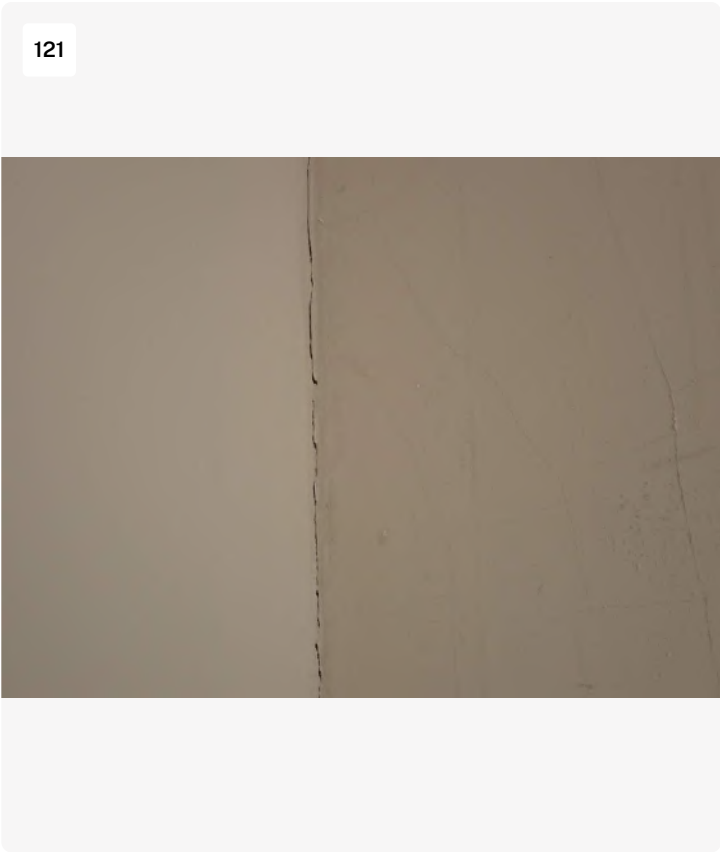
Water damage





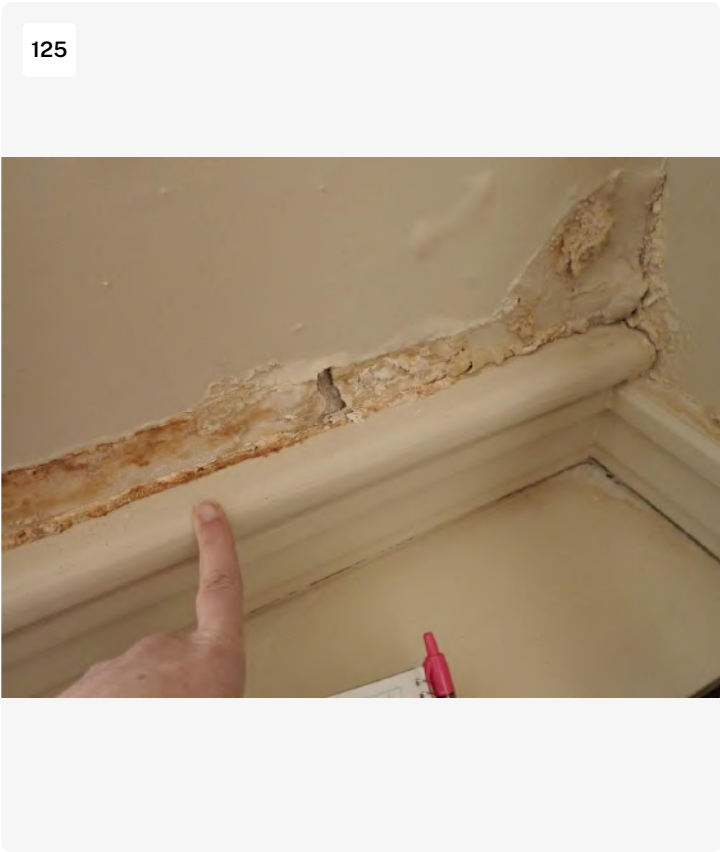
Same





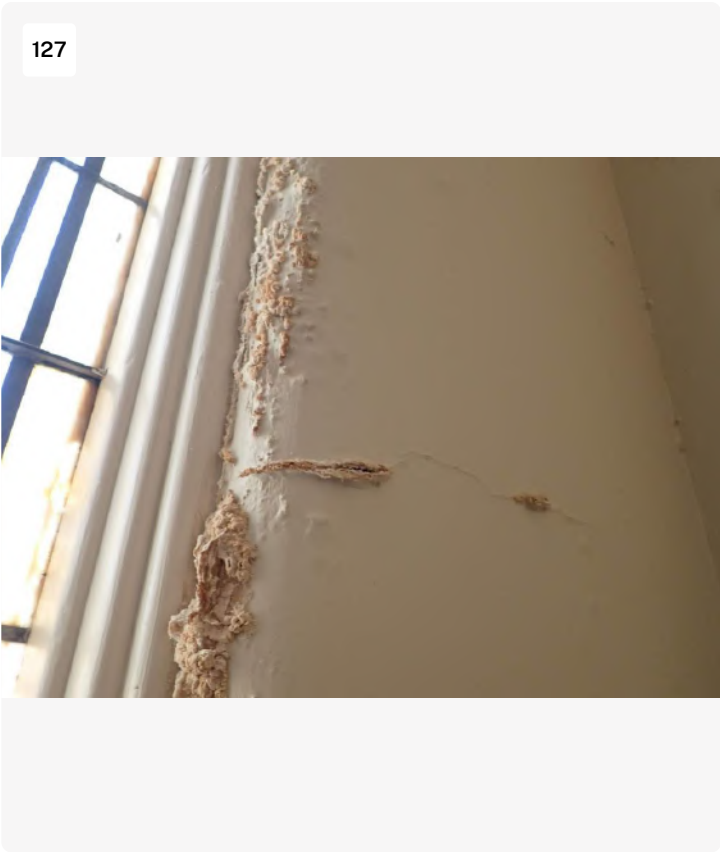
Same



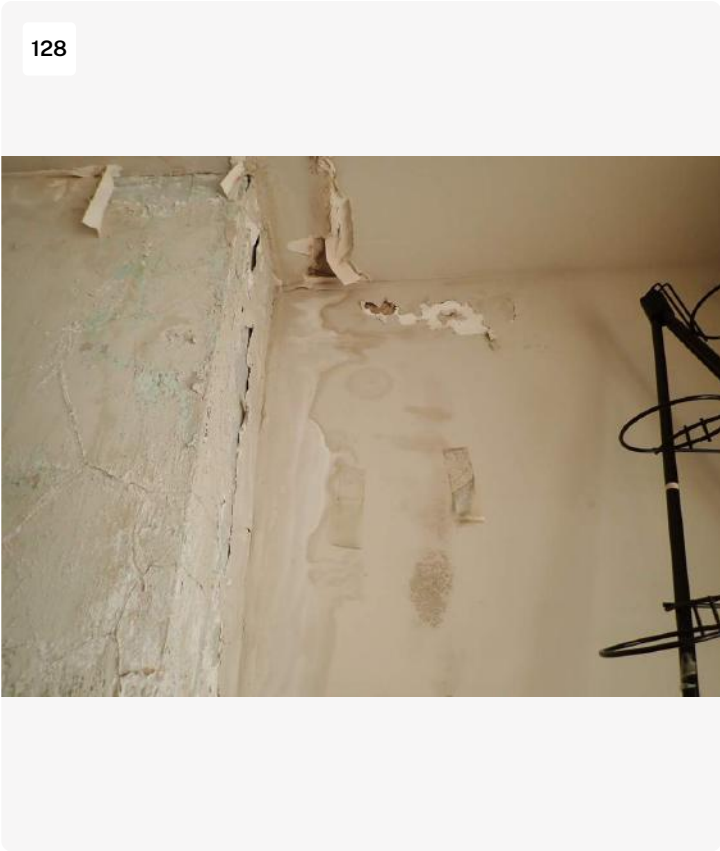


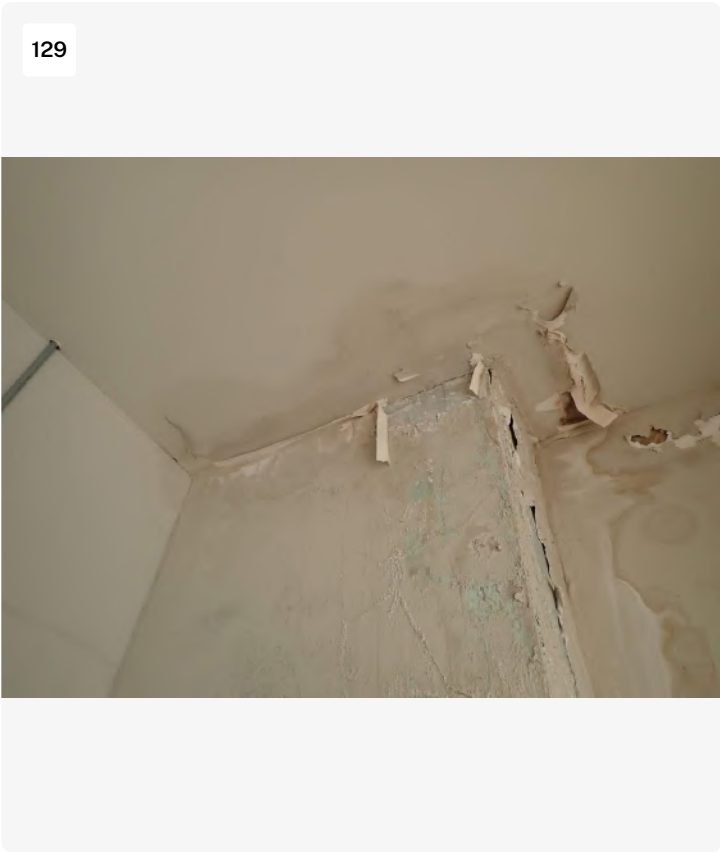
Same





Efflorescence

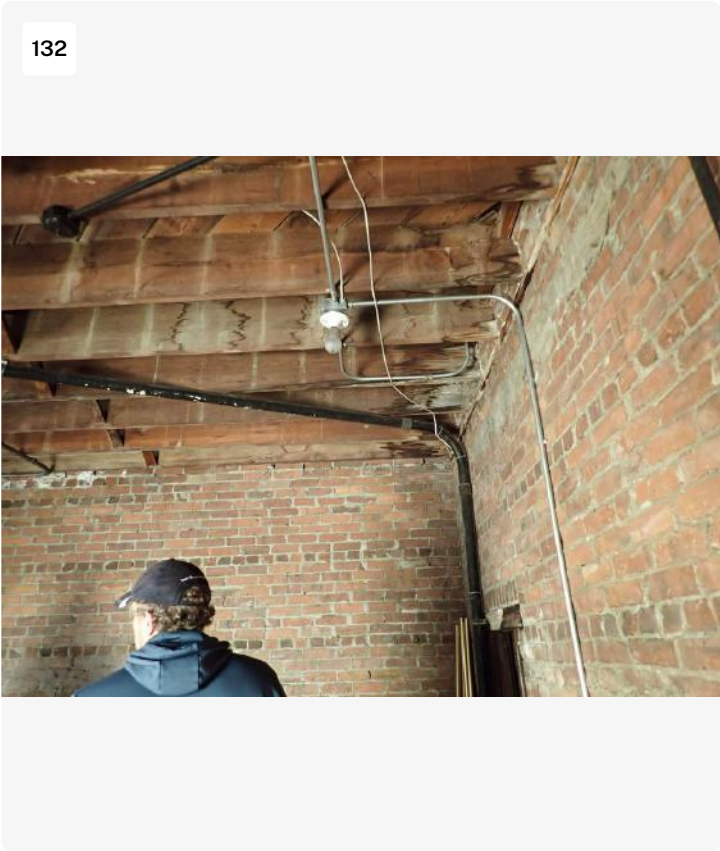


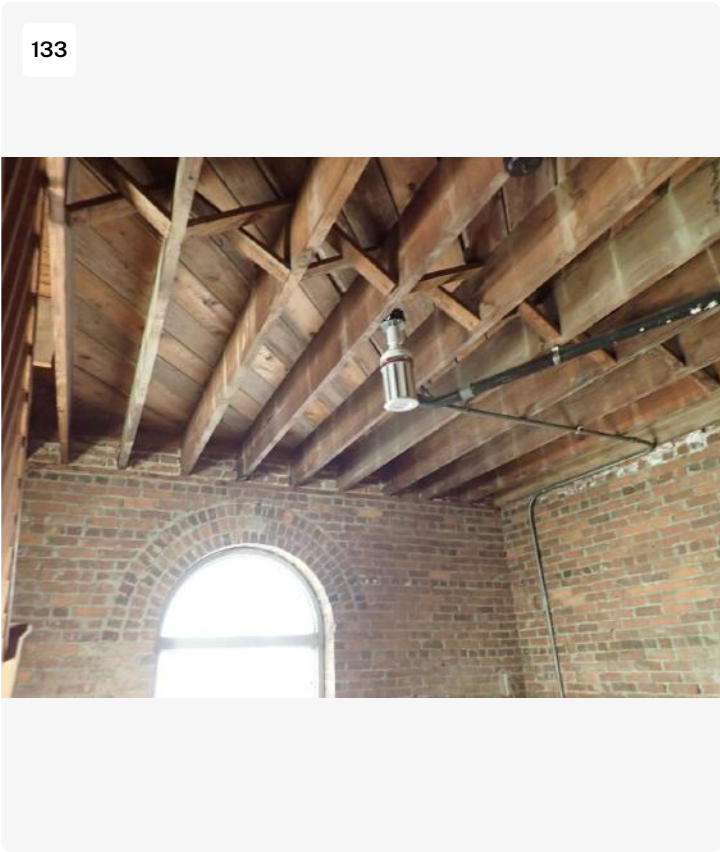


Efflorescence

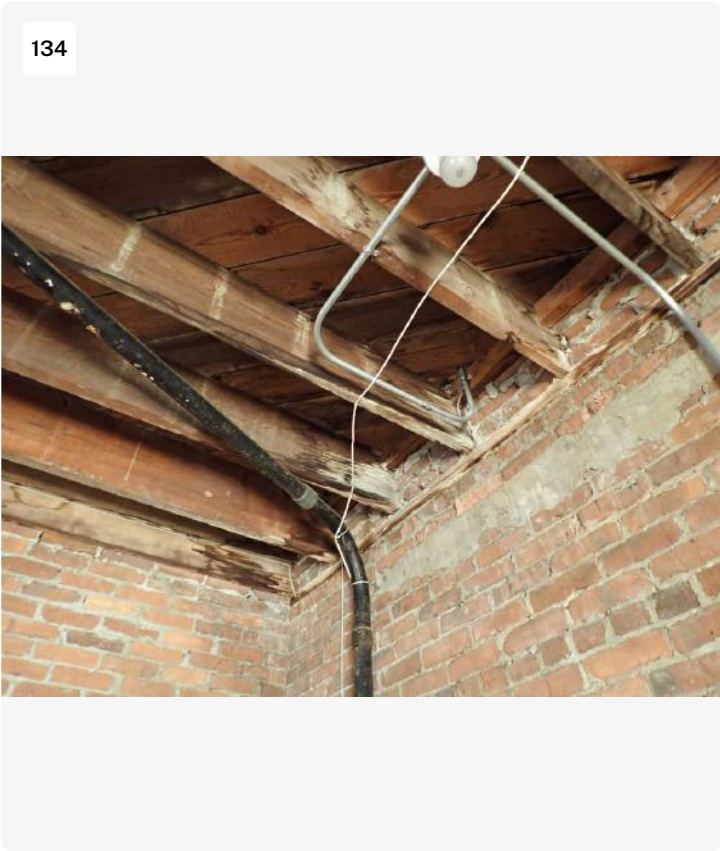


Displacement





Same



Same

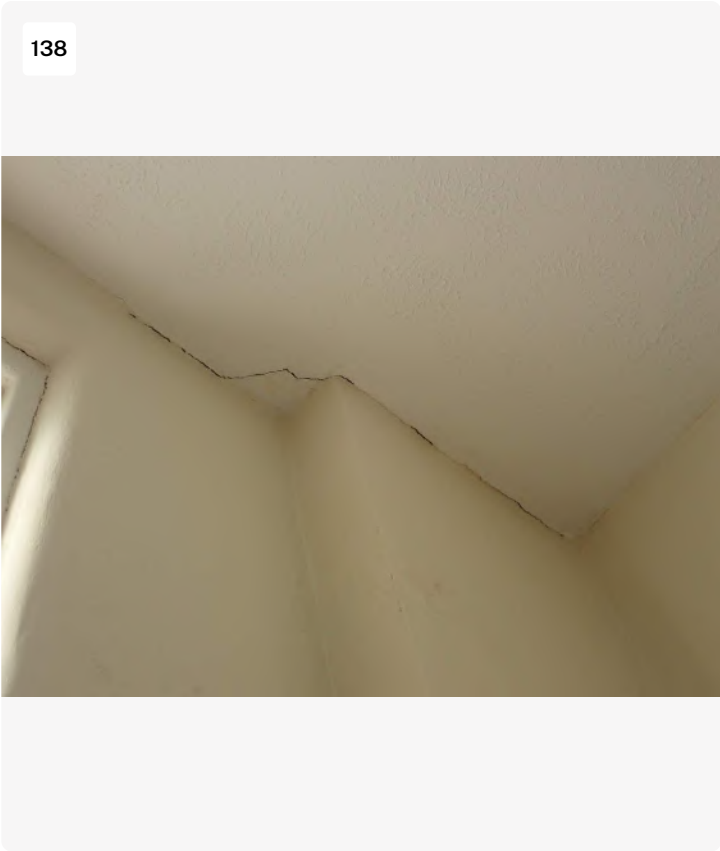


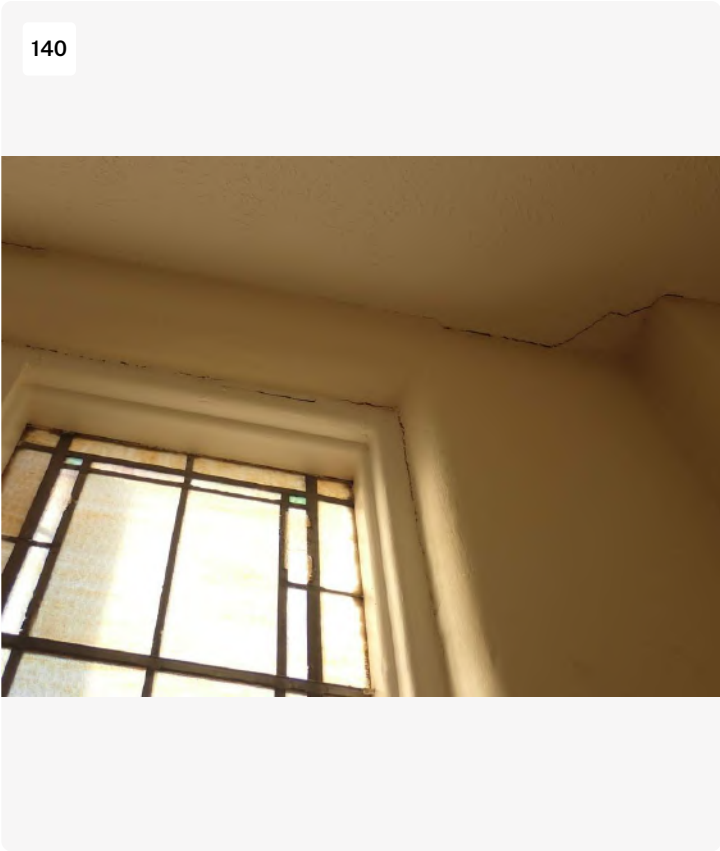
Same





Broken window







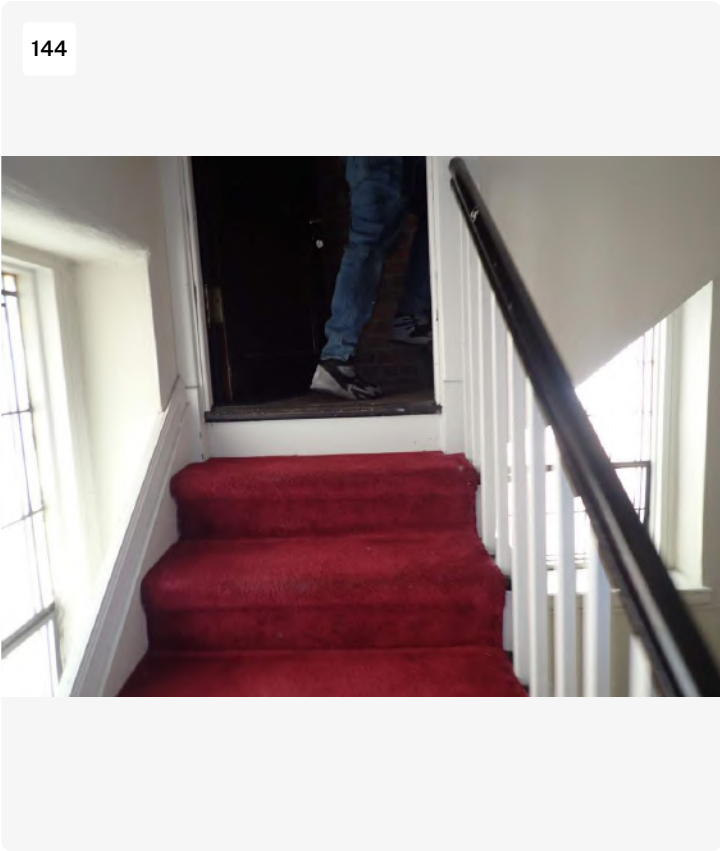
Cracked window



Cracked window



Same

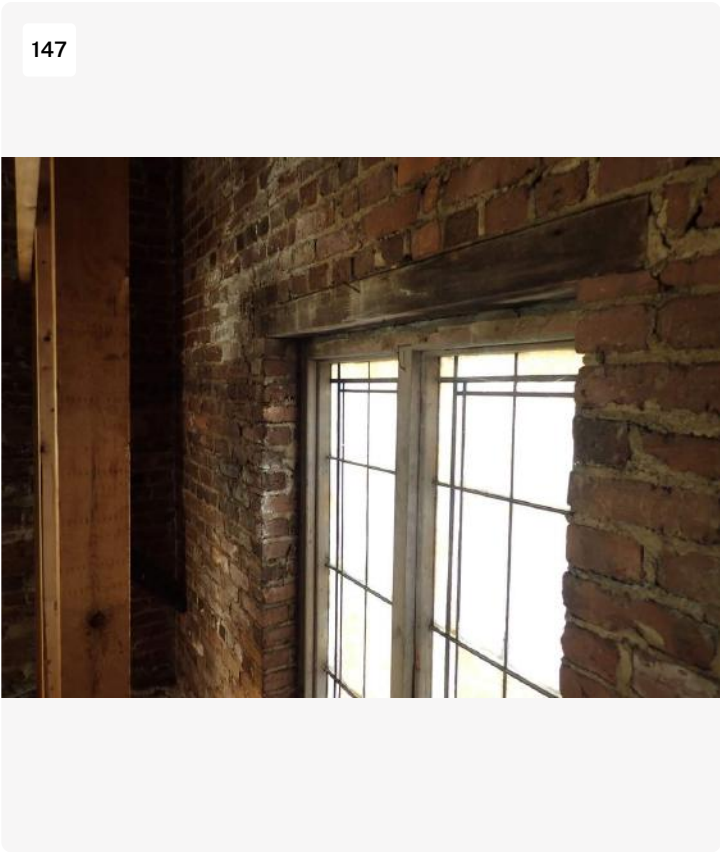




Water stains



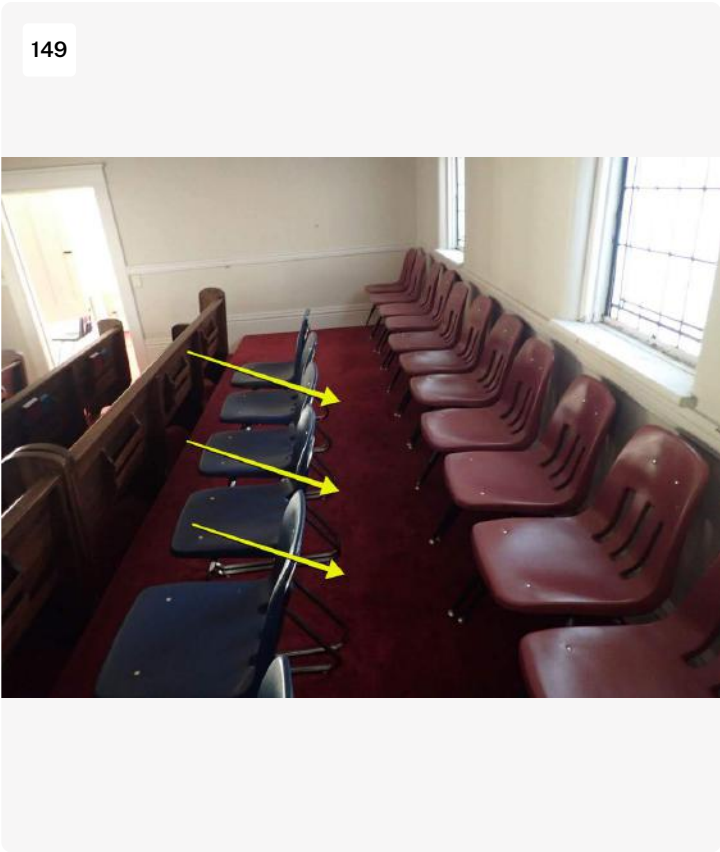
North tower



Water stains around windows



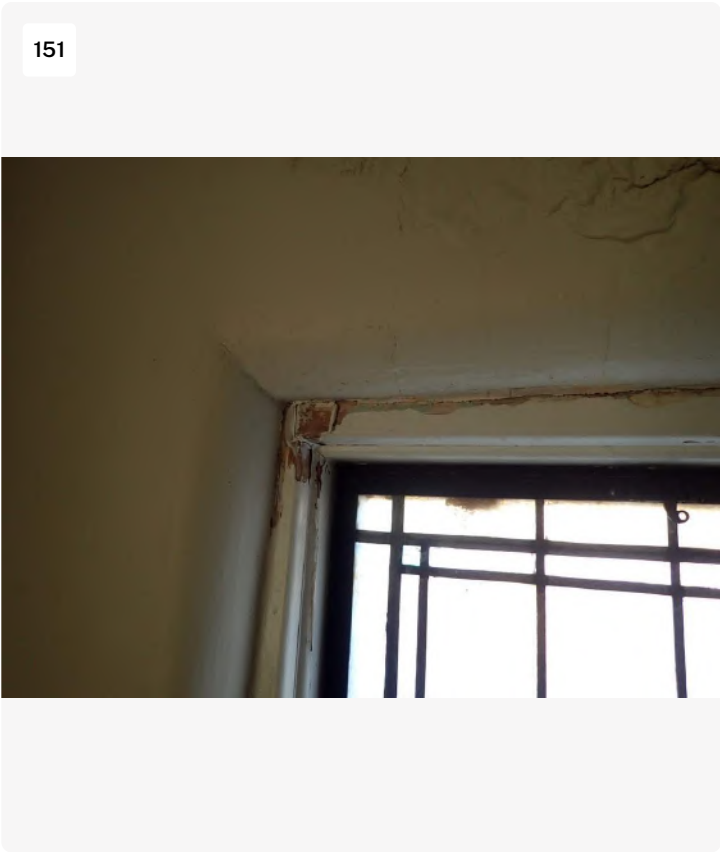
North tower



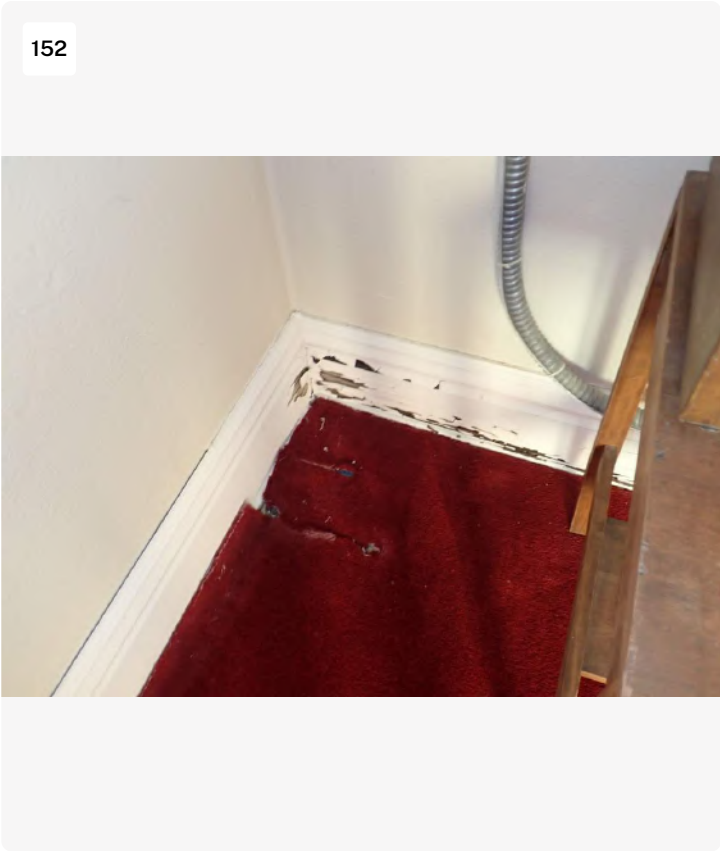
Water stains on carpet

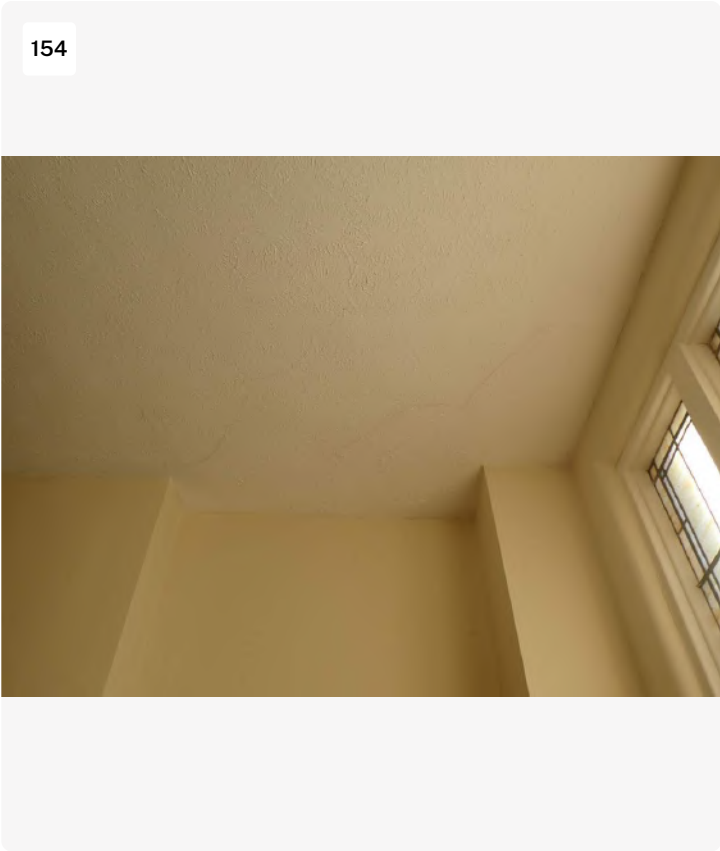
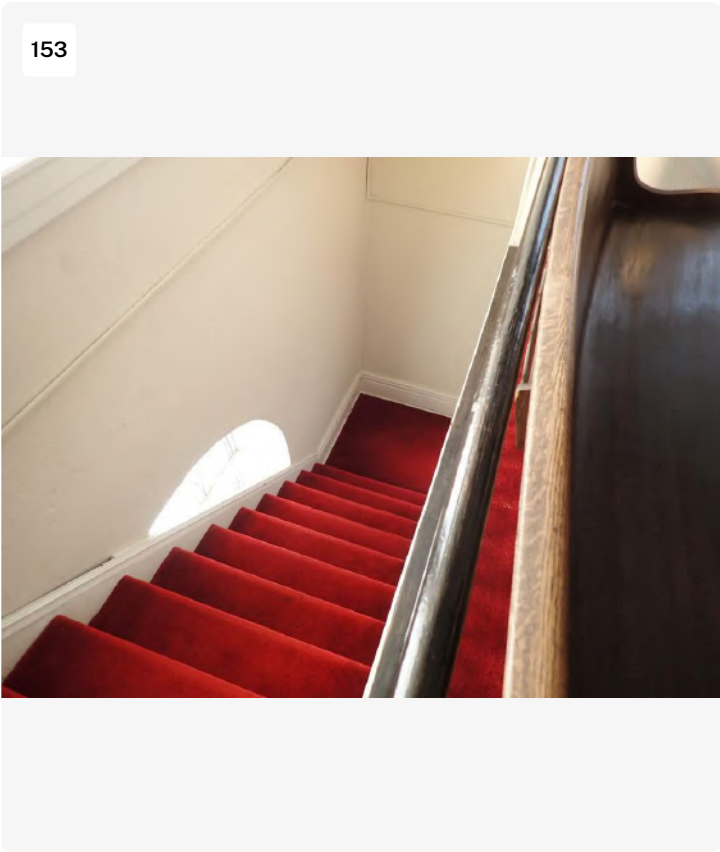


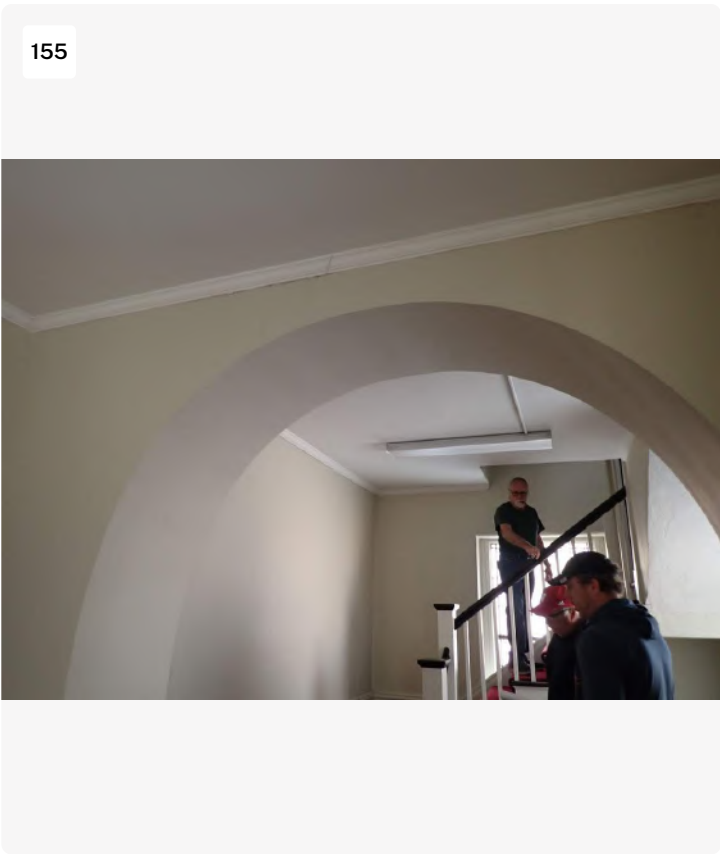
Water damage



Same



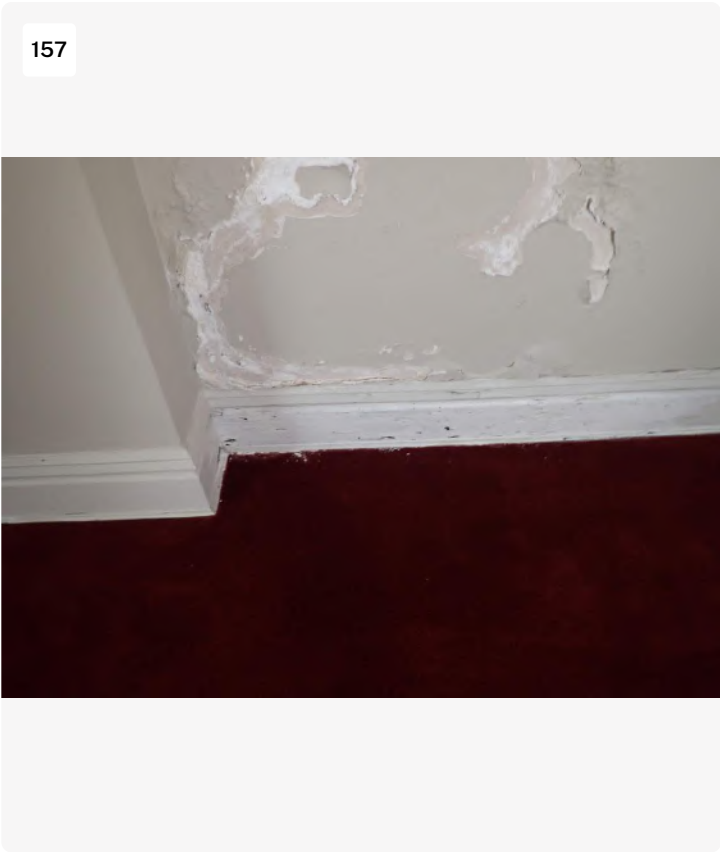




Displacement



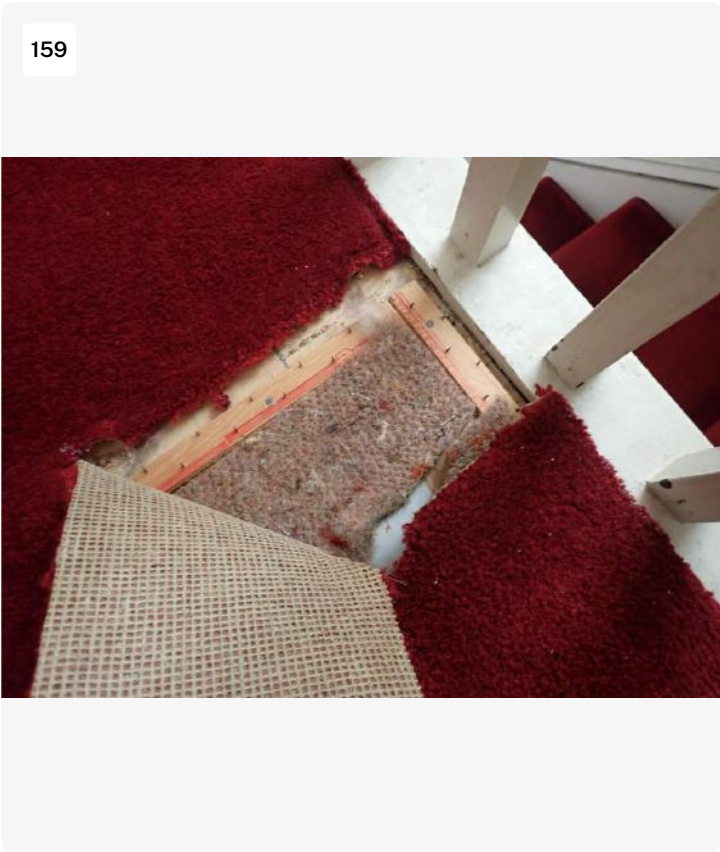
Water damage



Same

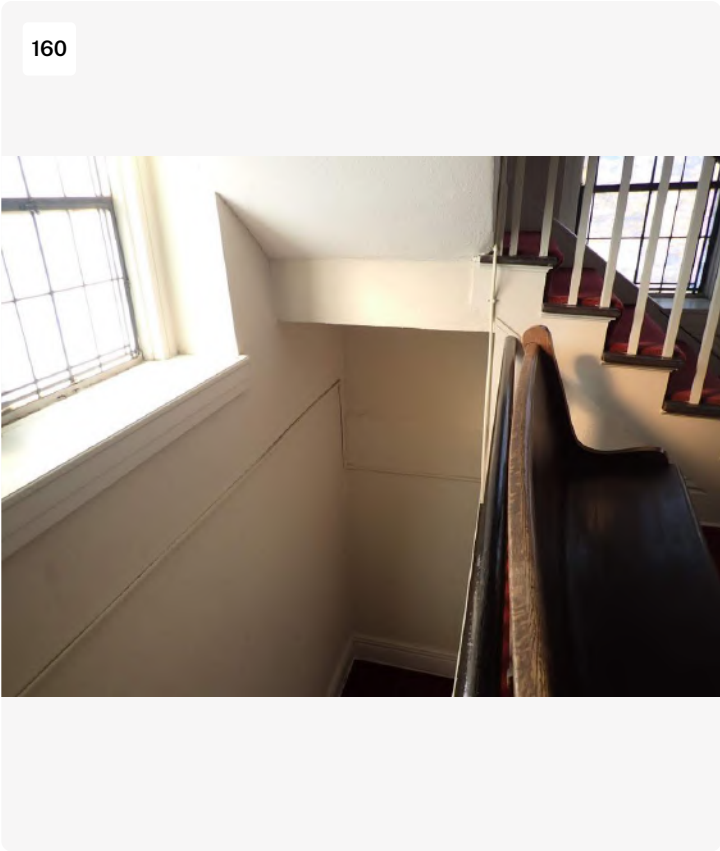


Carpet underlayment

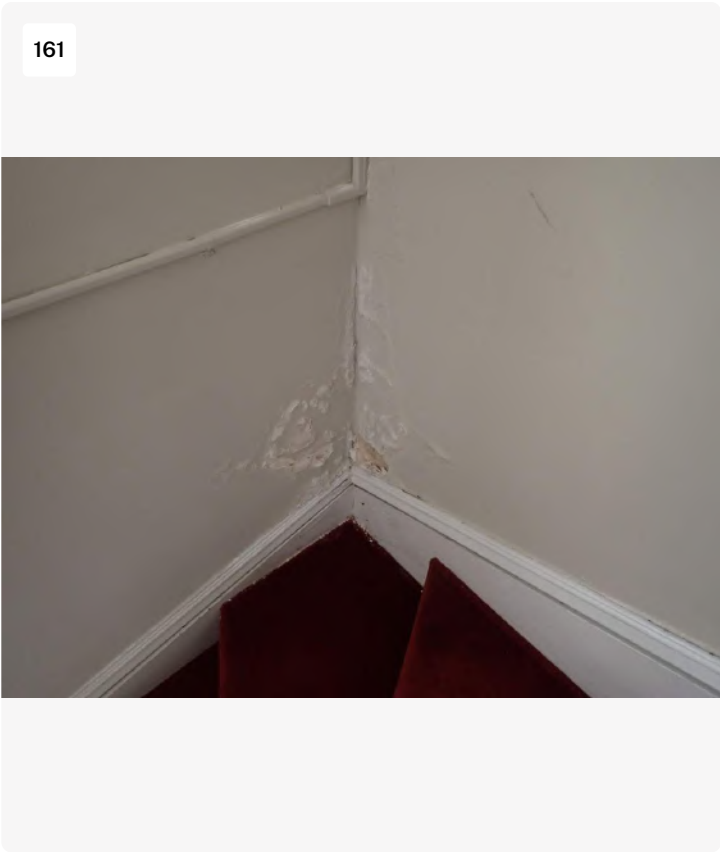


Same

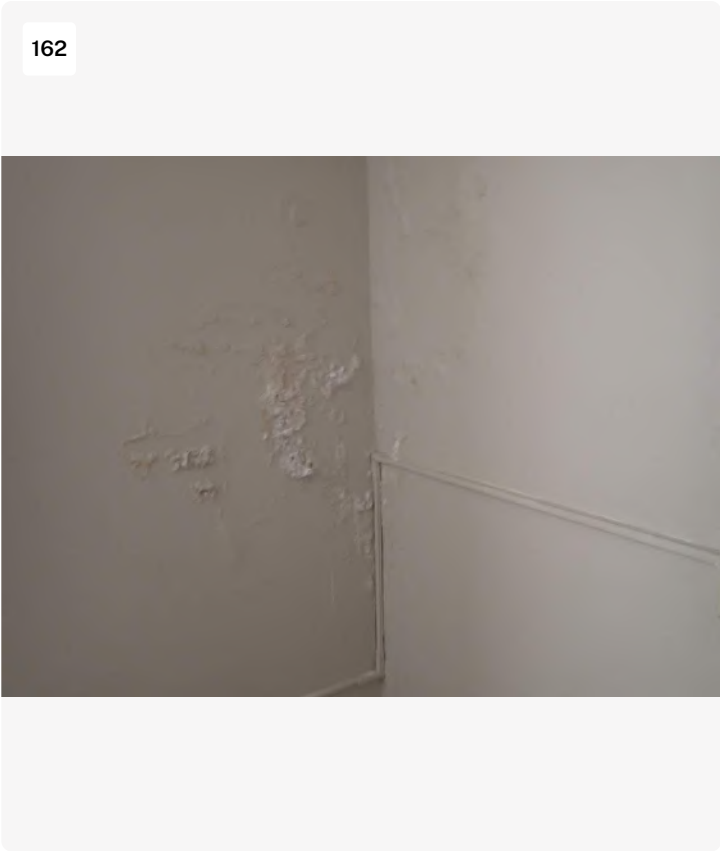
Project: Newnan Presbyterian Church
Date: 11/9/2021, 9:37am



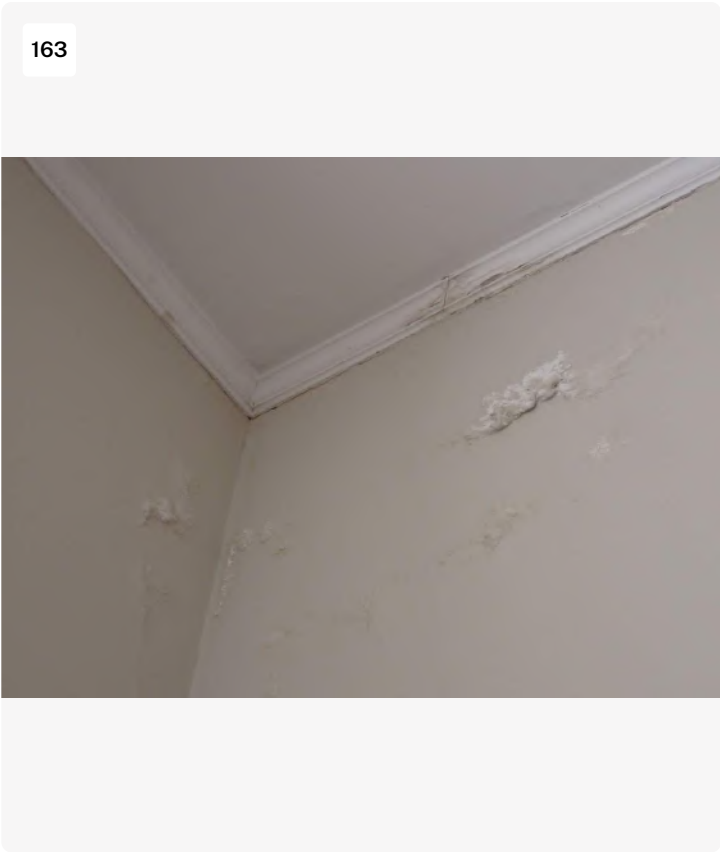
Project: Newnan Presbyterian Church
Date: 11/9/2021, 9:51am



Efflorescence



Efflorescence



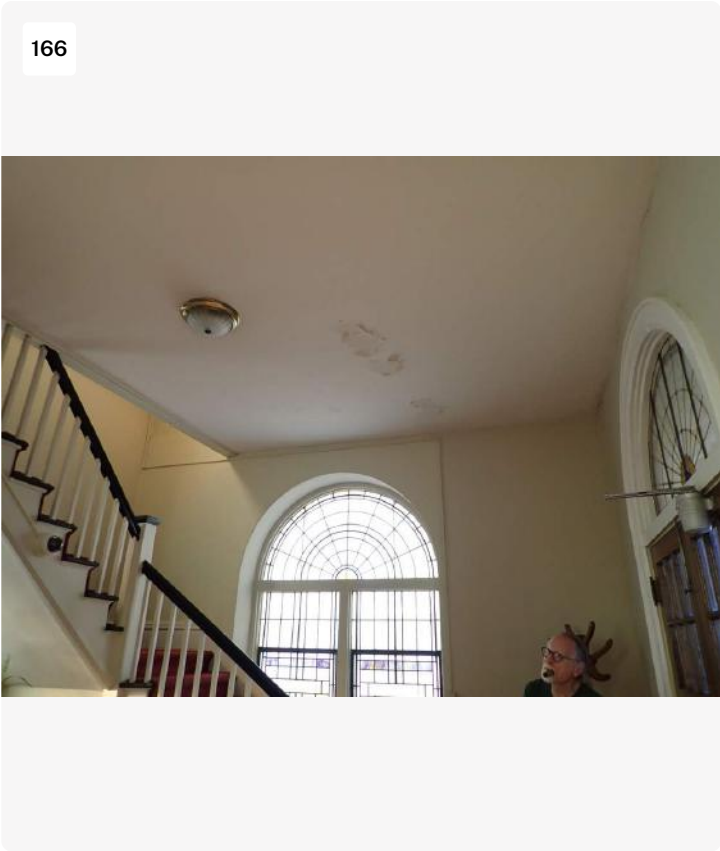
Water damage

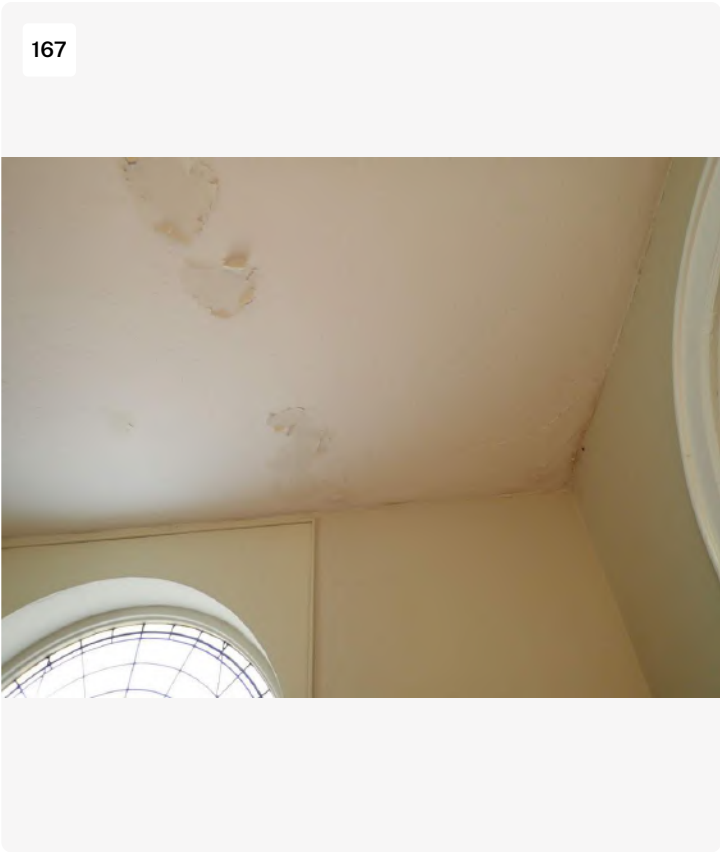


Same



Water stains





Same



Water damage

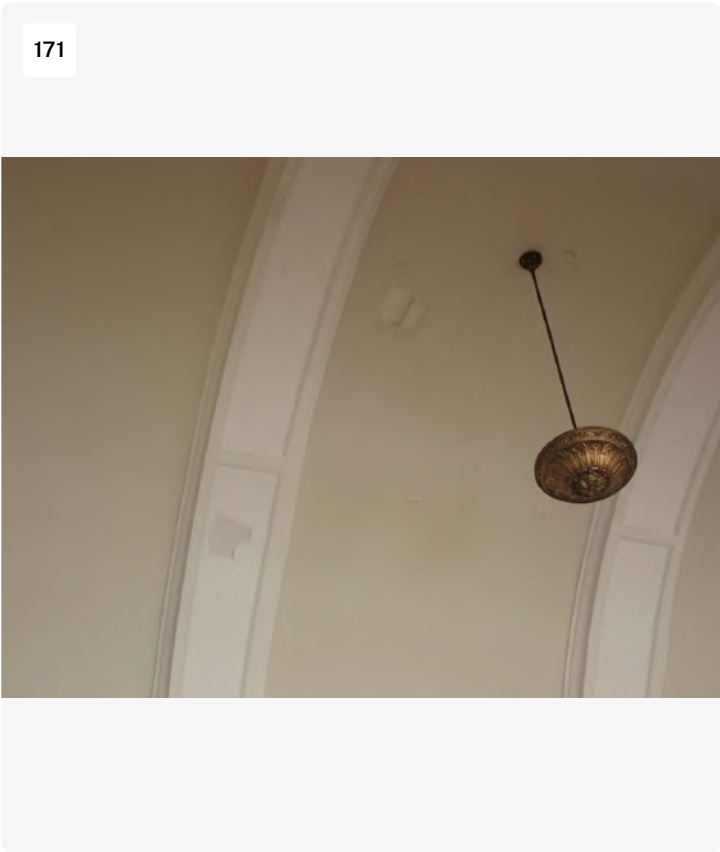


Project: Newnan Presbyterian Church
Date: 11/9/2021, 9:52am

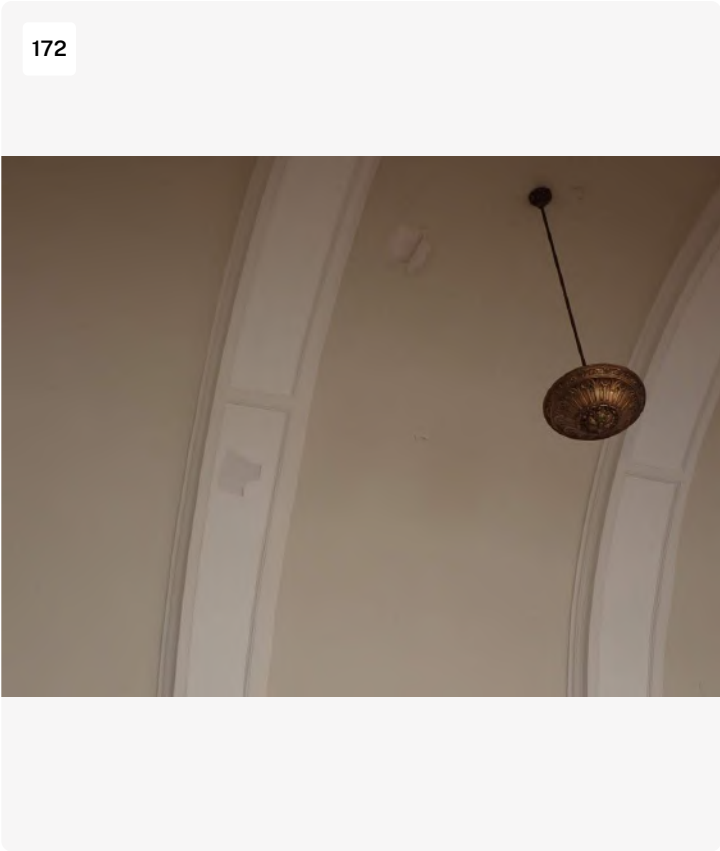
Sanctuary



Project: Newnan Presbyterian Church
Date: 11/9/2021, 9:25am



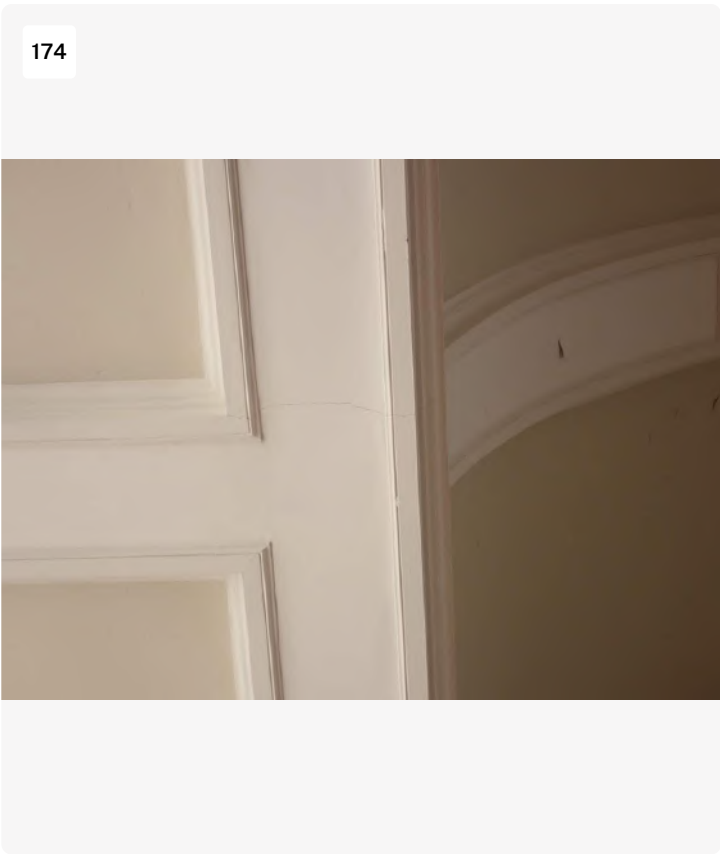
Same



Same



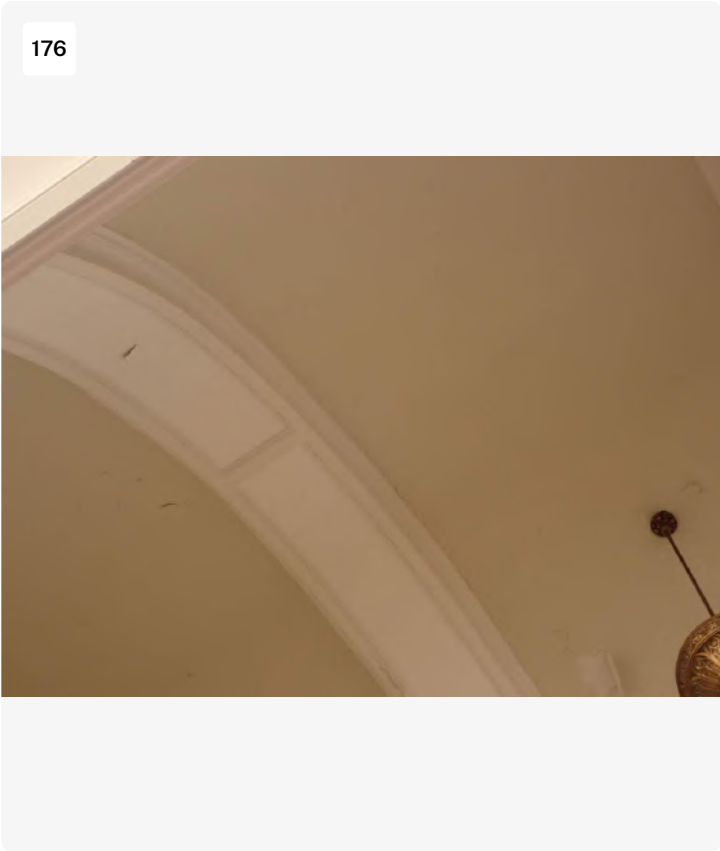
Same



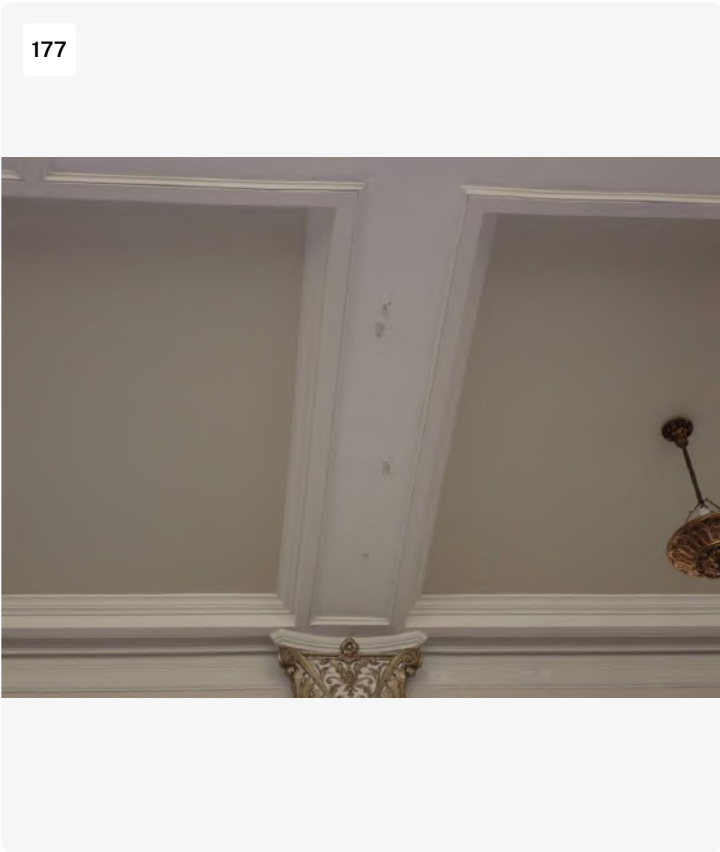
Displacement



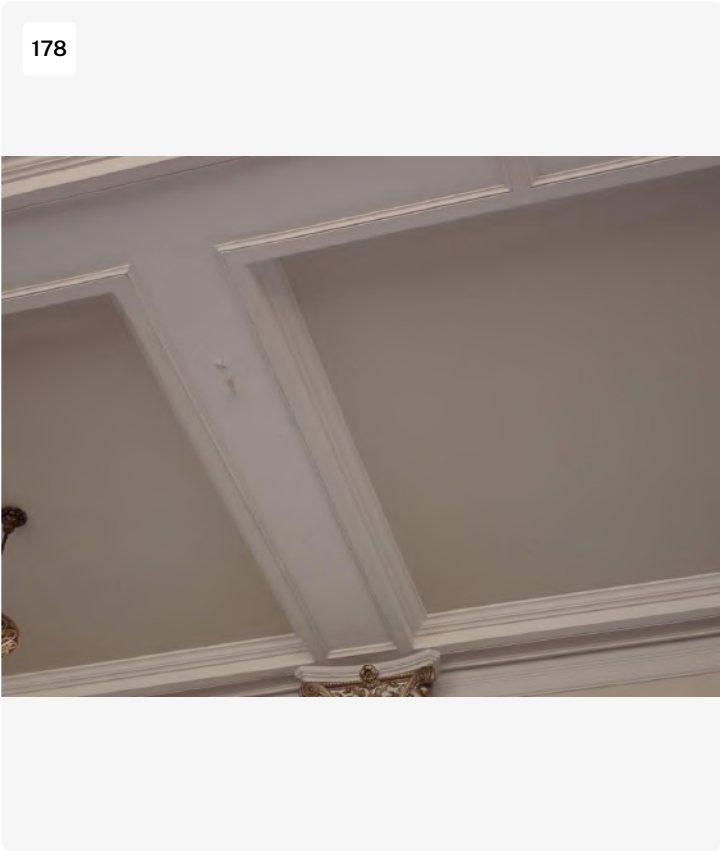
Same



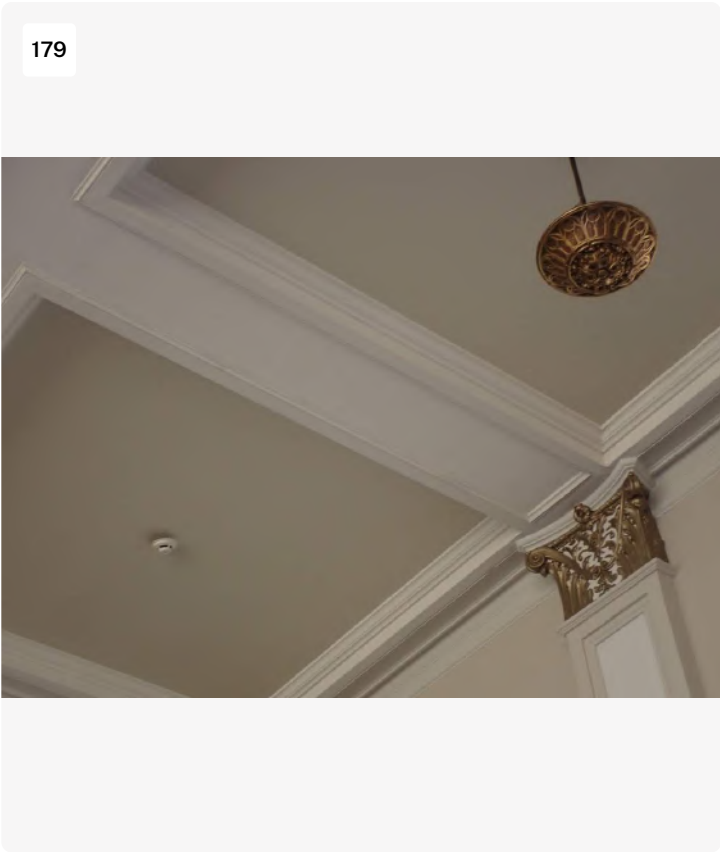
Same



Same



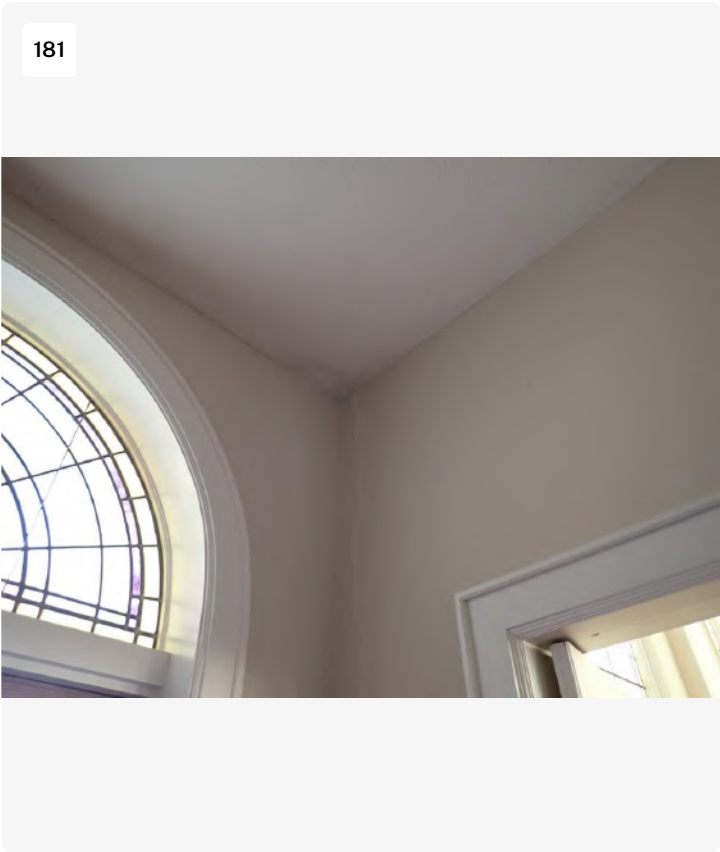
Same



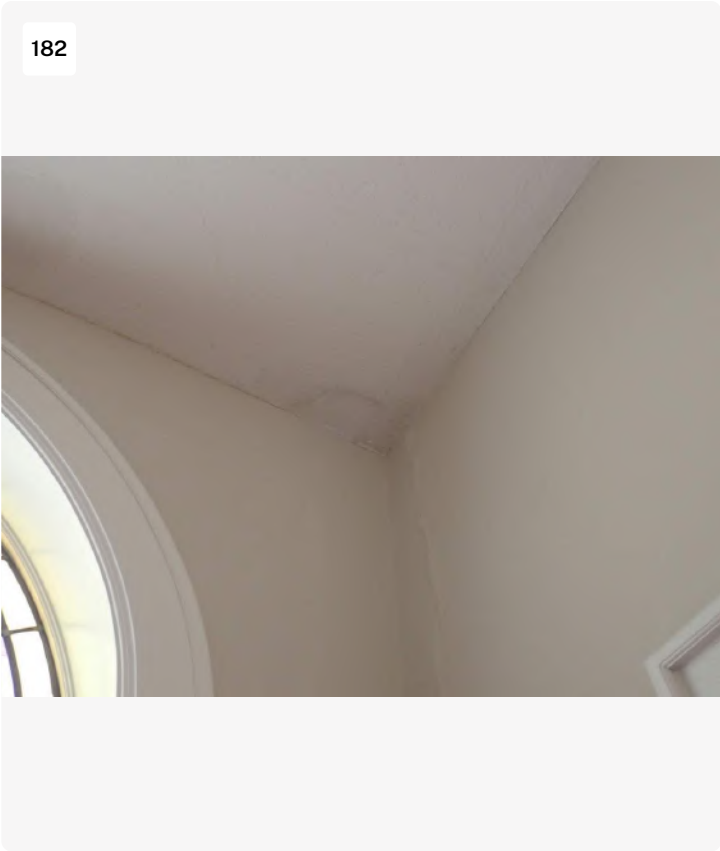
Water intrusion



Moisture intrusion



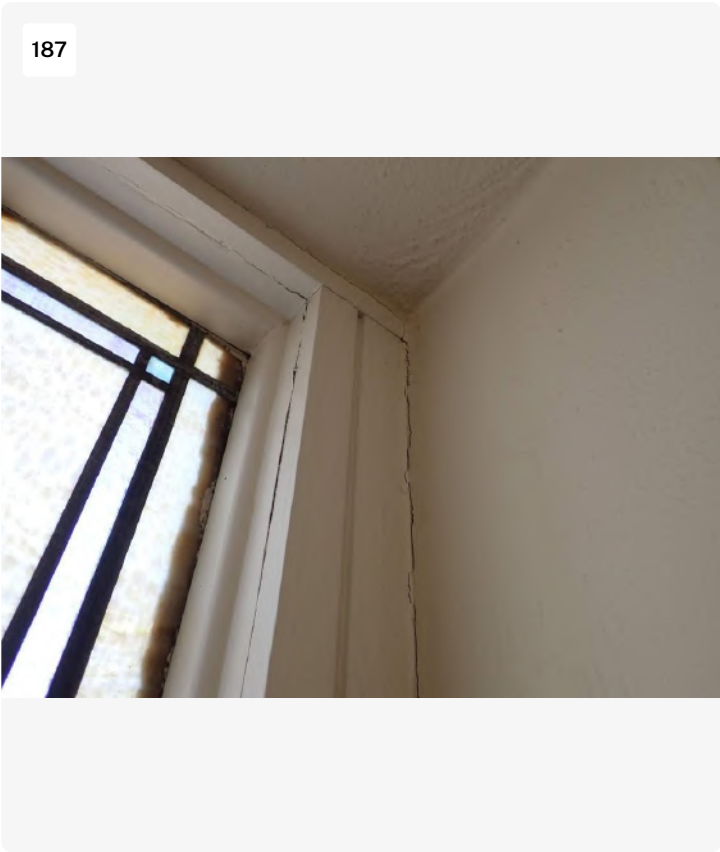
Same



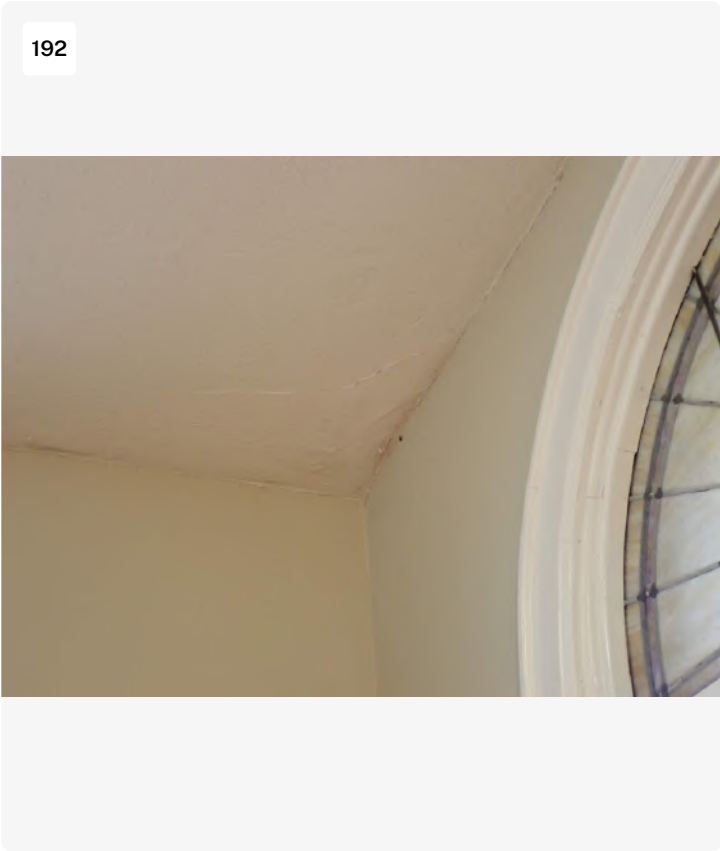
Same

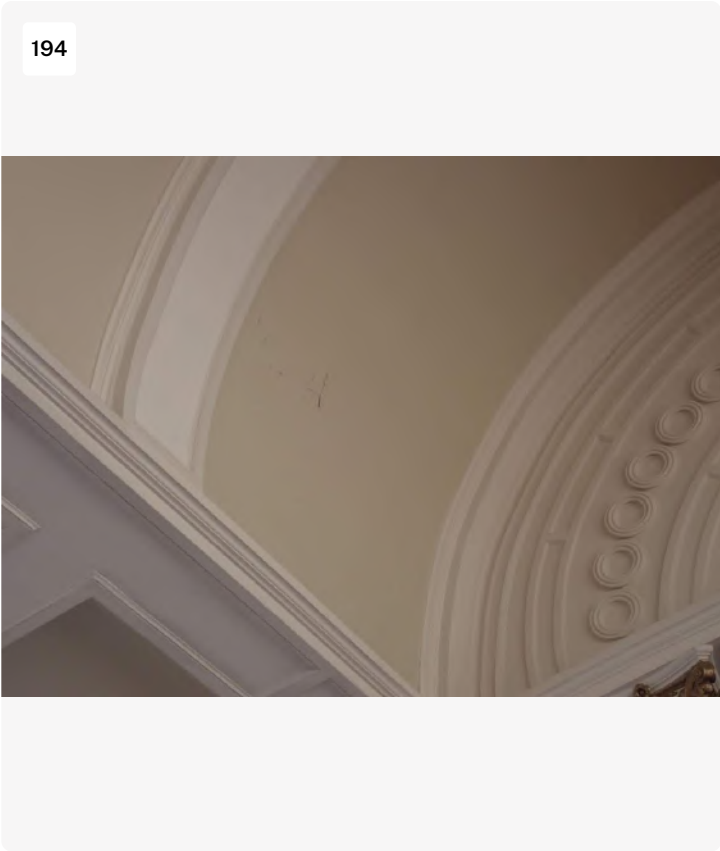
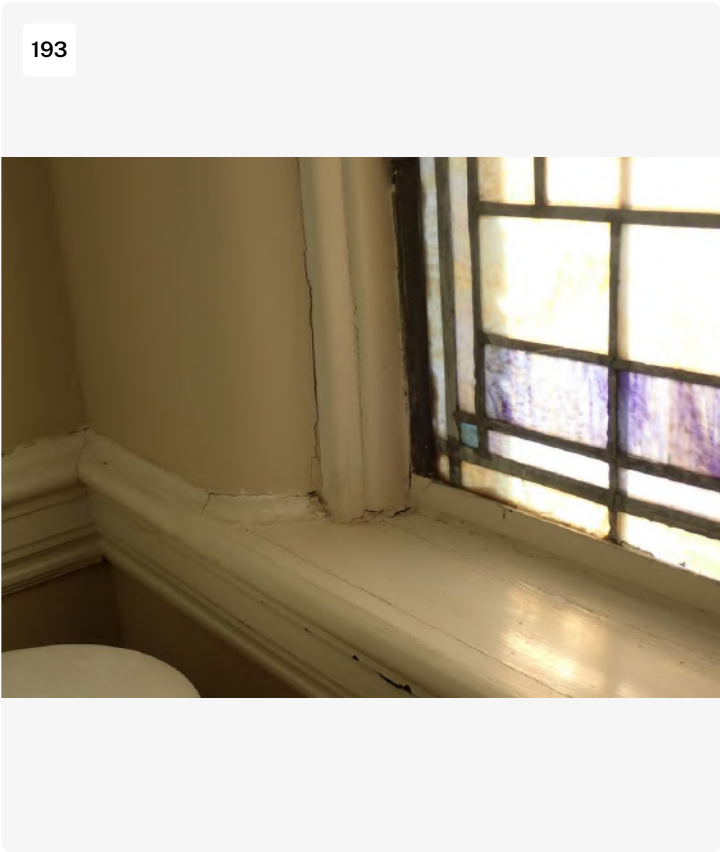












195



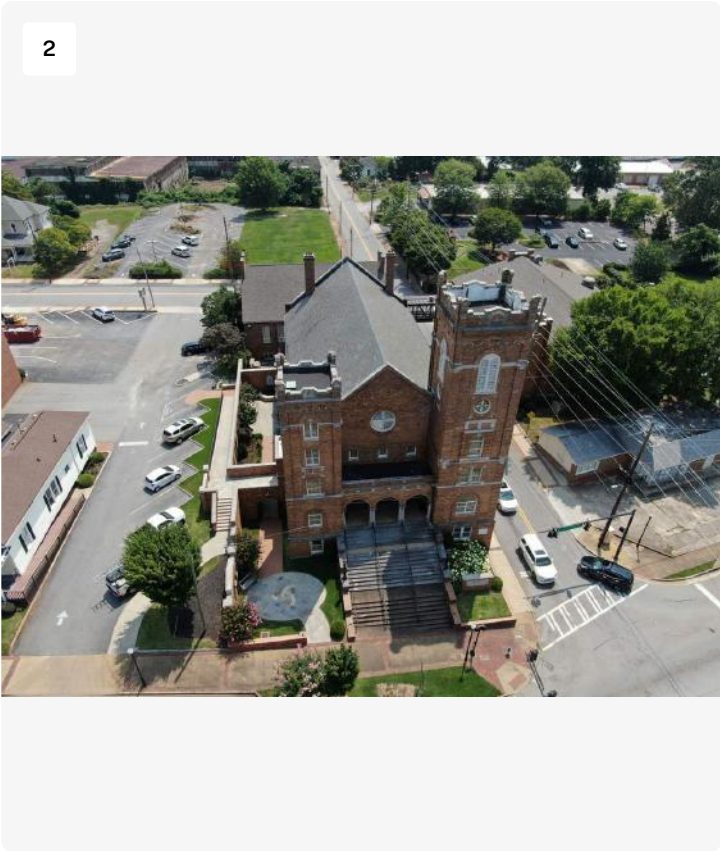
Project: Newnan Presbyterian Church
Date: 11/9/2021, 9:57am

Photos by Precision Construction and Roofing

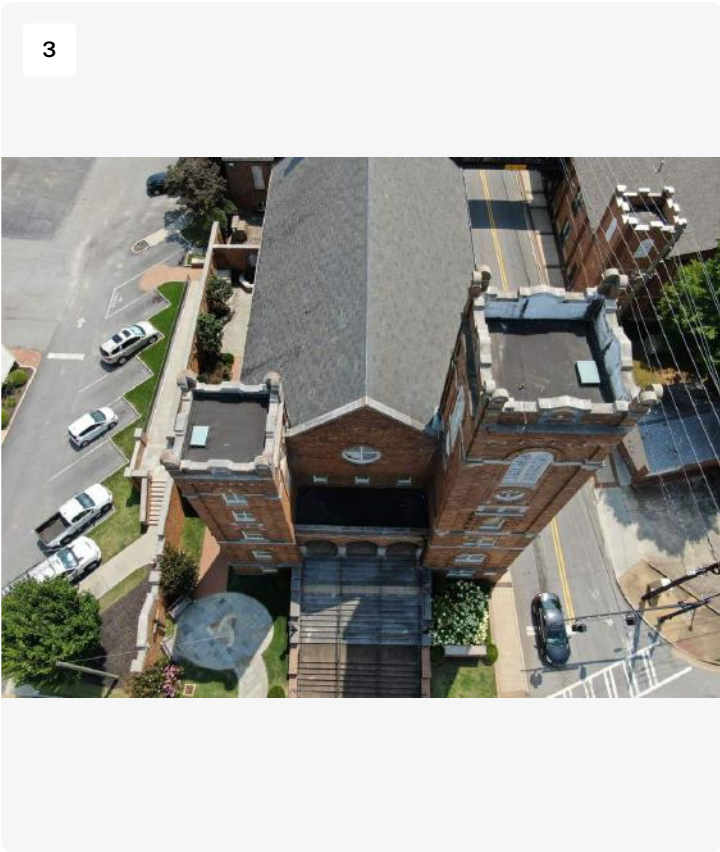
Drone photos and up-close inspection taken by Precision Construction



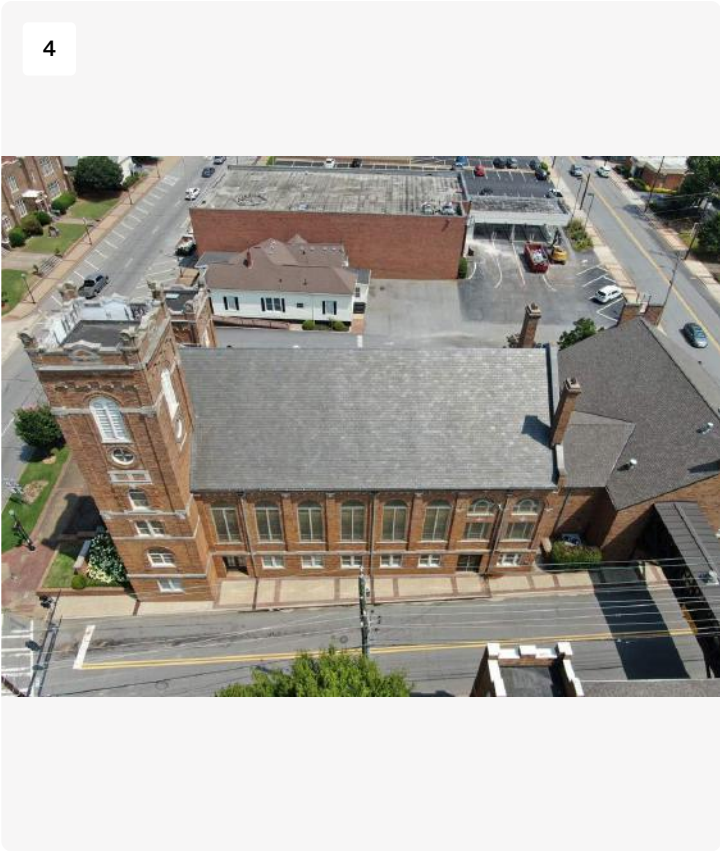
NW corner



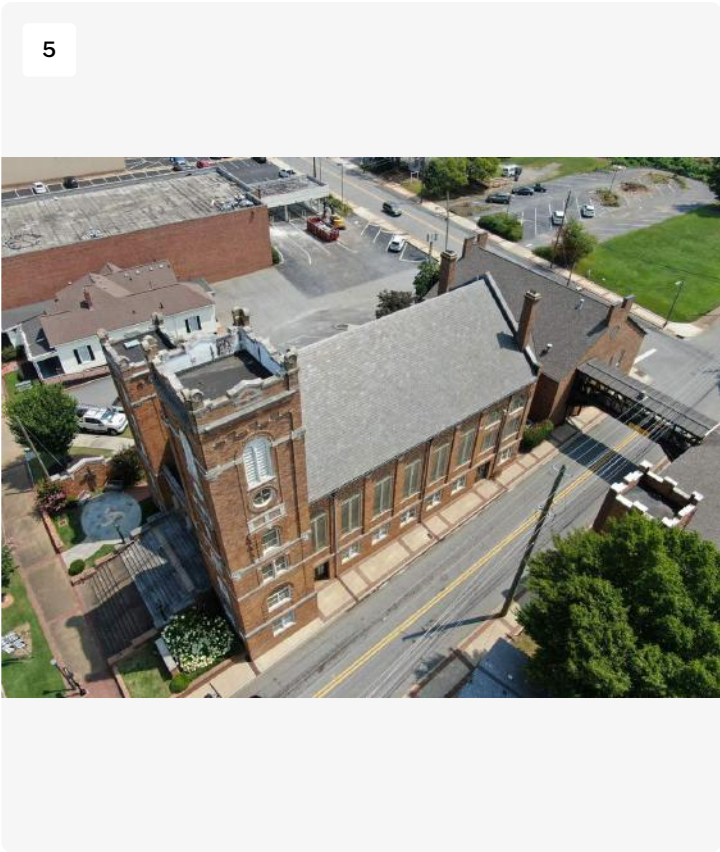
West



West



South slope



South slope



South slope



South slope



North slope

9

North slope



Project: Newnan Presbyterian Church
Date: 7/29/2021, 12:13pm

10

North slope



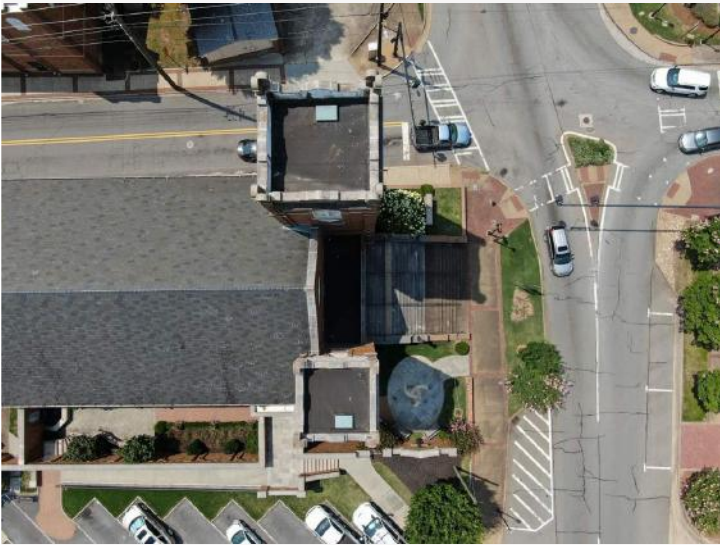
Project: Newnan Presbyterian Church
Date: 7/29/2021, 12:14pm

11



Project: Newnan Presbyterian Church
Date: 7/29/2021, 12:12pm

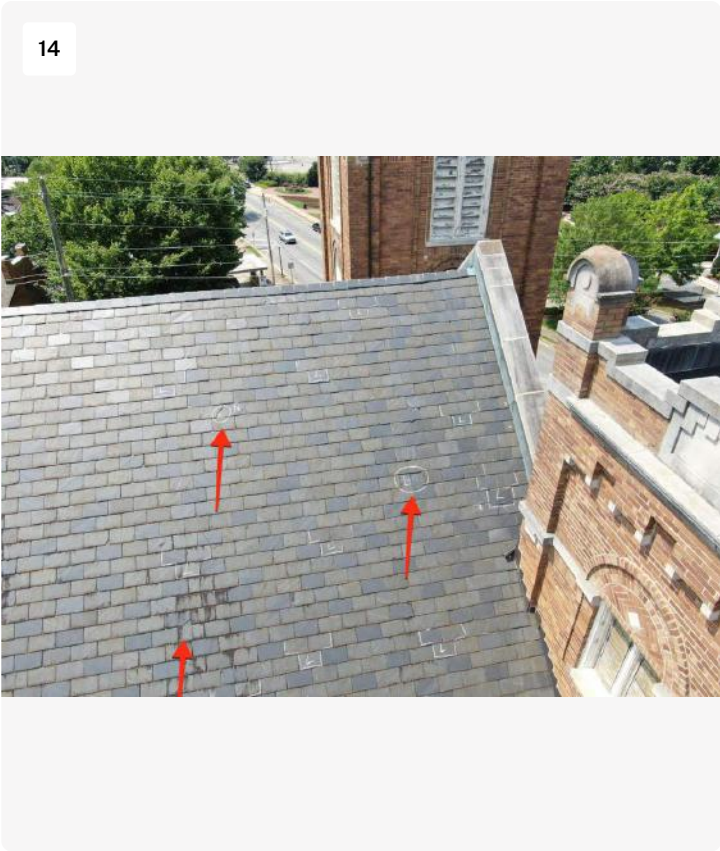
12



Project: Newnan Presbyterian Church
Date: 7/29/2021, 12:12pm



East



North slope
L = loose slate tiles
N = New chips/cracks



Missing, displaced and chipped tiles noted



Cracked and displaced tiles



Same



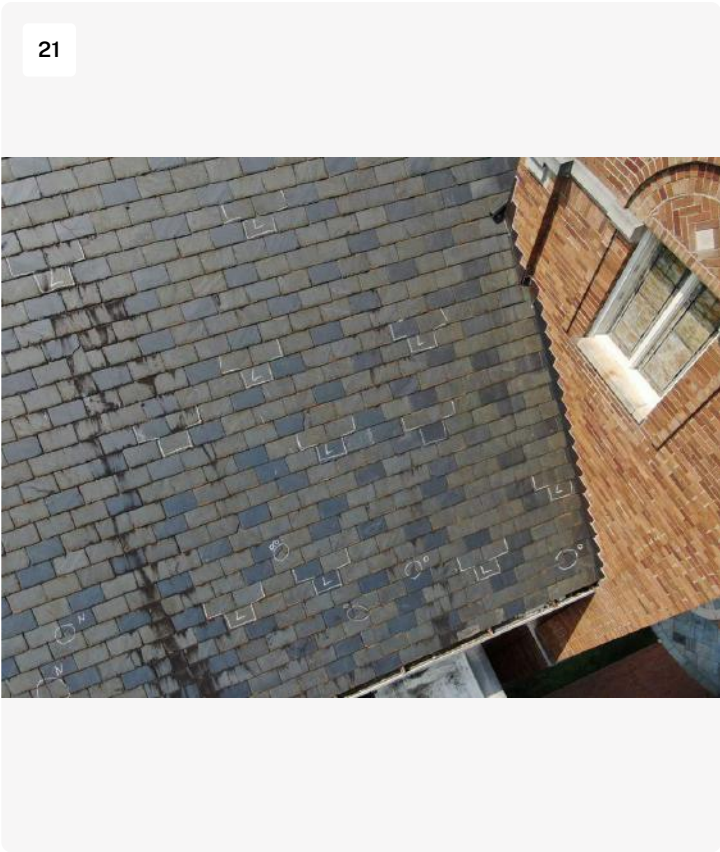
Missing, cracked and displaced tiles



Same



Old cracks were noted along with fresh cracks
Displaced tiles



Same



Same
North slope



Broken and cracked tiles



Same



Broken, cracked and displaced tiles



Same

27

Same



Project: Newnan Presbyterian Church
Date: 7/29/2021, 12:04pm

28

Same



Project: Newnan Presbyterian Church
Date: 7/29/2021, 12:04pm

29



Broken tile in gutter

Project: Newnan Presbyterian Church
Date: 7/29/2021, 12:05pm

30



Displaced and broken tiles near chimney

Project: Newnan Presbyterian Church
Date: 7/29/2021, 12:06pm



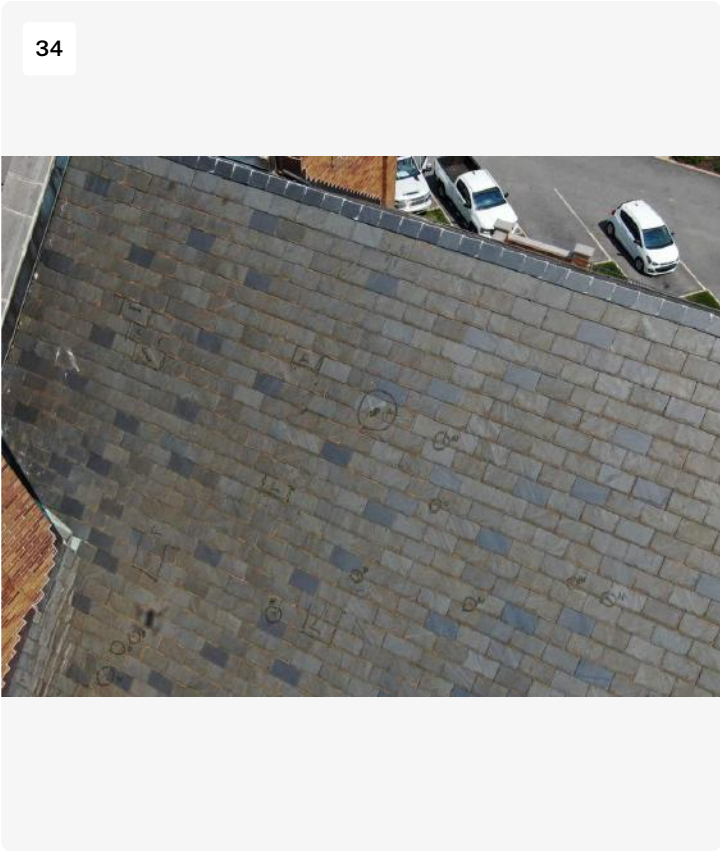
Same



North slope



North slope



South slope



Broken and displaced tiles



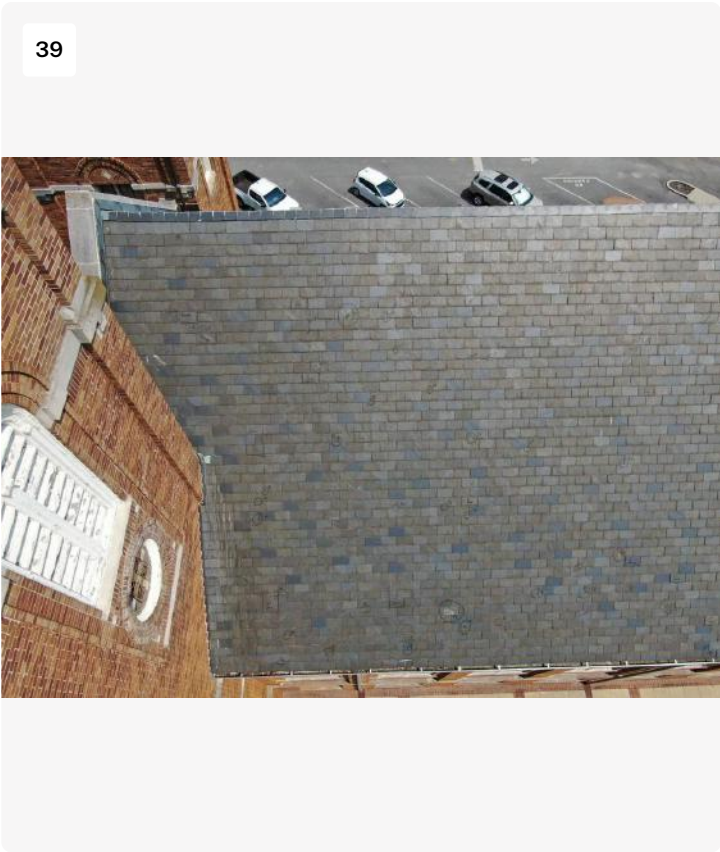
Broken tiles



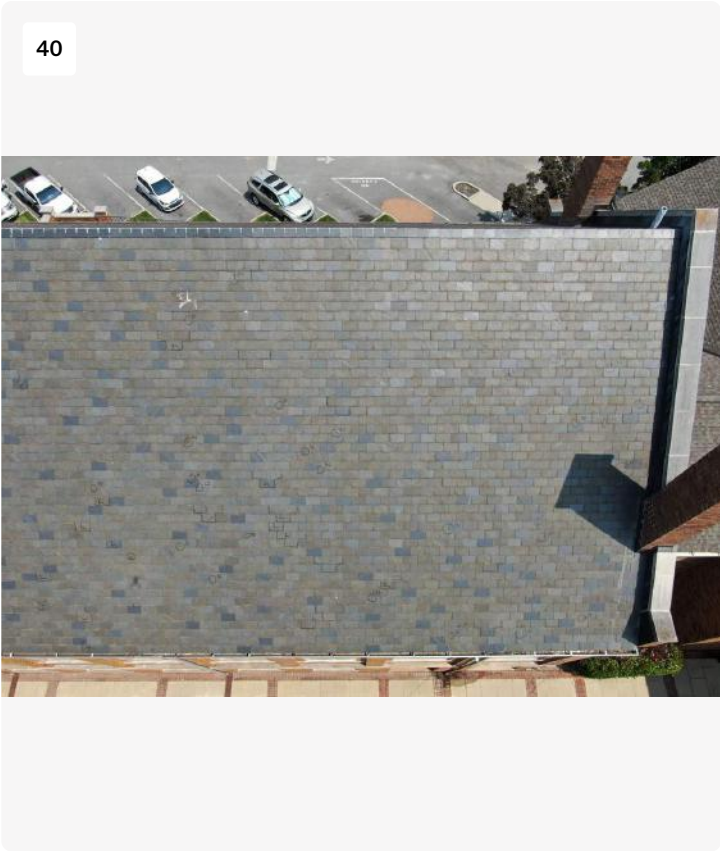
Displaced and broken tiles



Same



Same



Same



Same

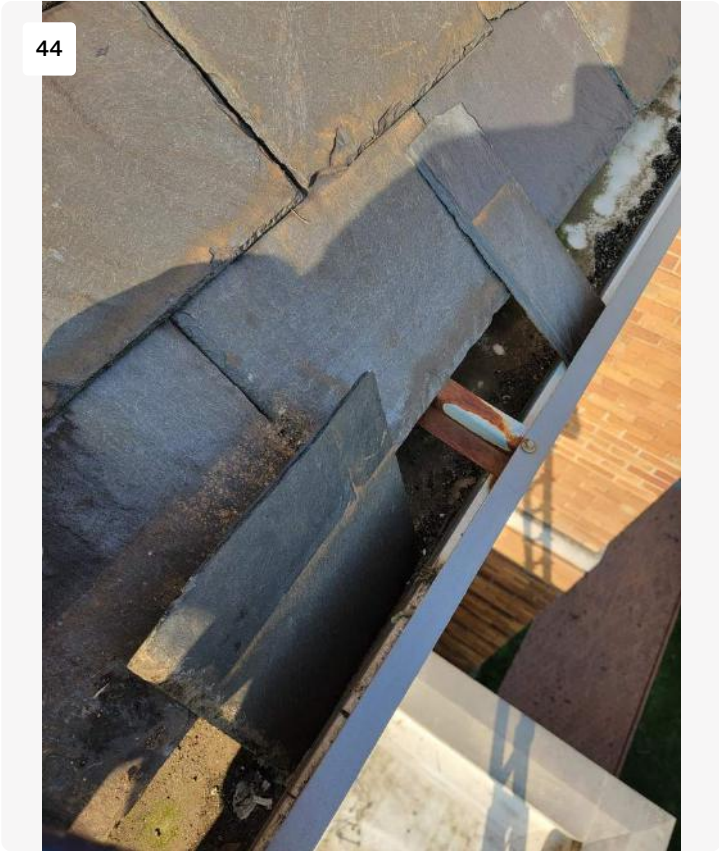


Same



Displaced slate tile

Project: Newnan Presbyterian Church
Date: 12/6/2021, 1:30pm



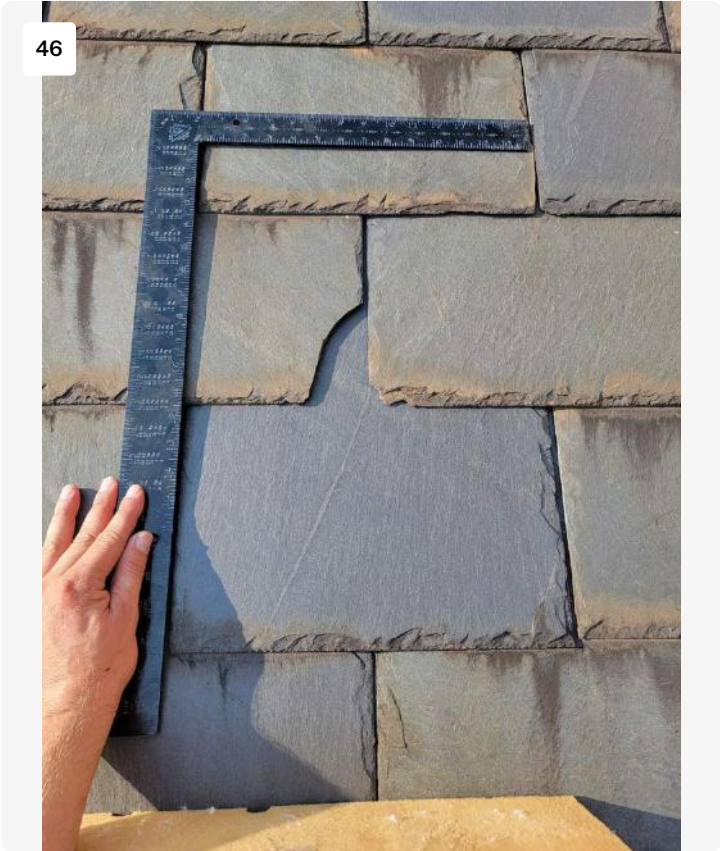
Broken tile in gutter

Project: Newnan Presbyterian Church
Date: 12/6/2021, 1:30pm

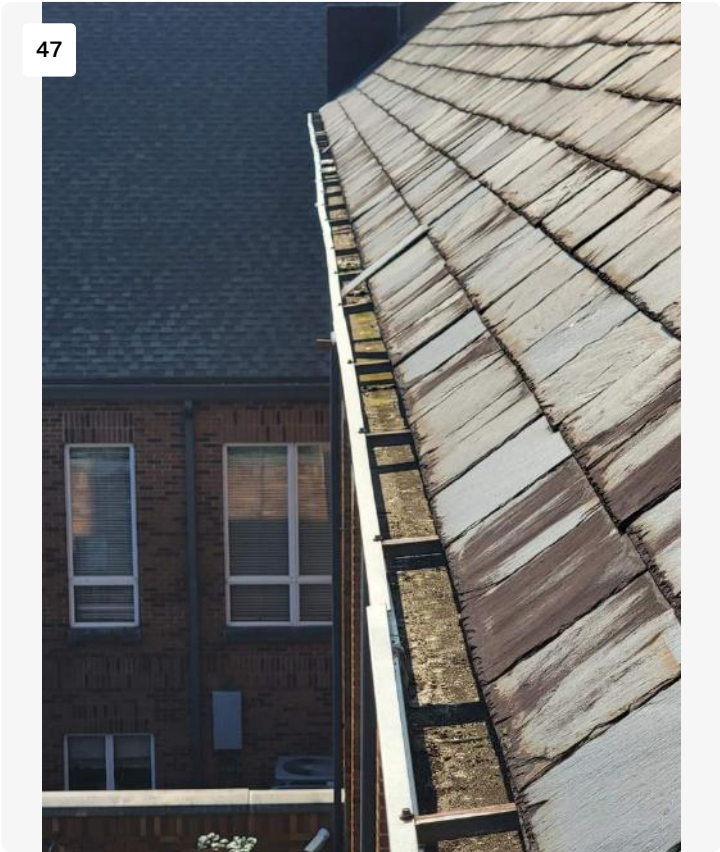


Cracked tile

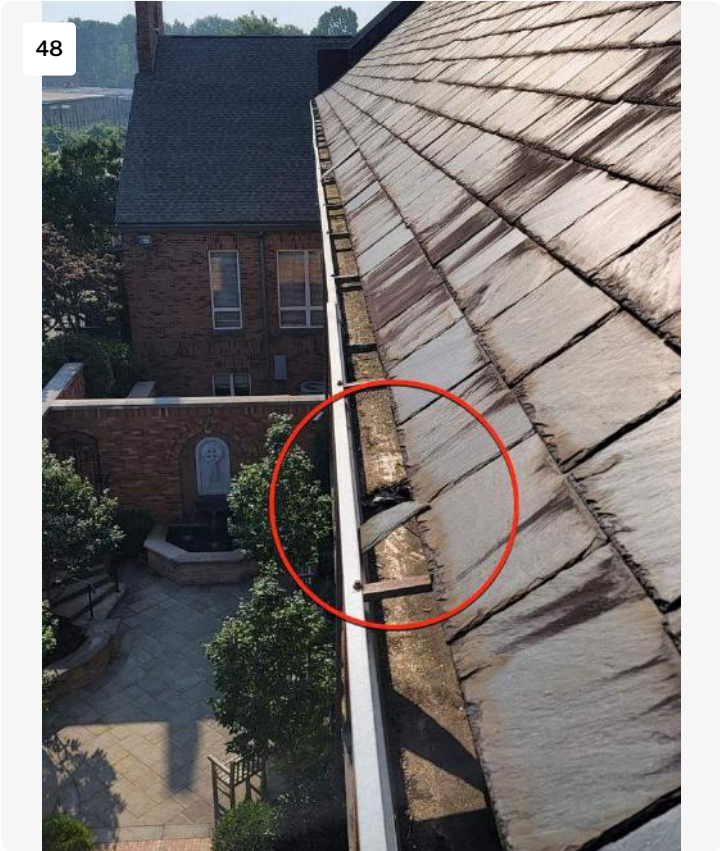
Project: Newnan Presbyterian Church
Date: 12/6/2021, 1:30pm



Project: Newnan Presbyterian Church
Date: 12/6/2021, 1:30pm

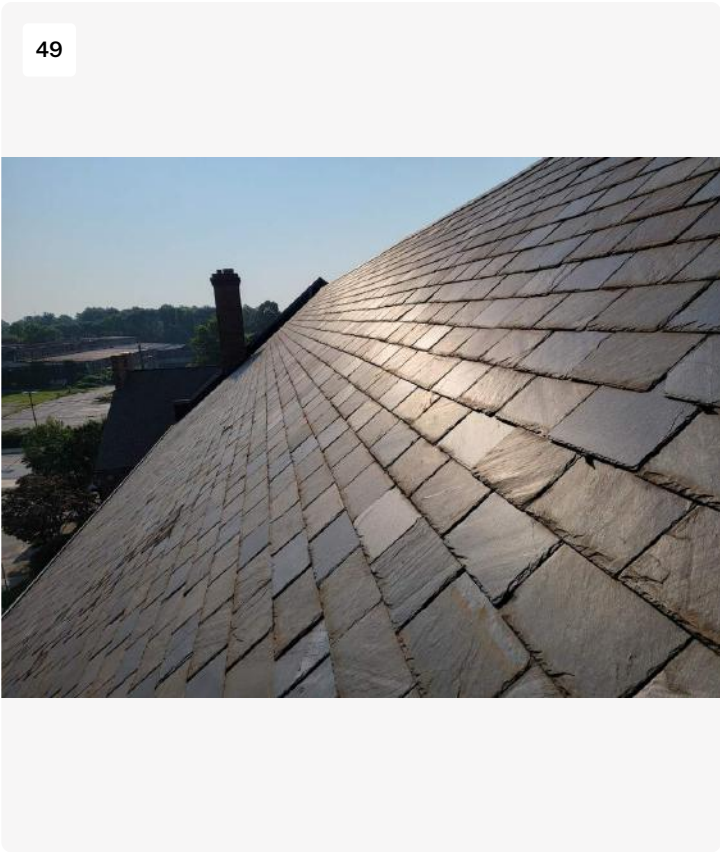


Project: Newnan Presbyterian Church
Date: 12/6/2021, 1:30pm

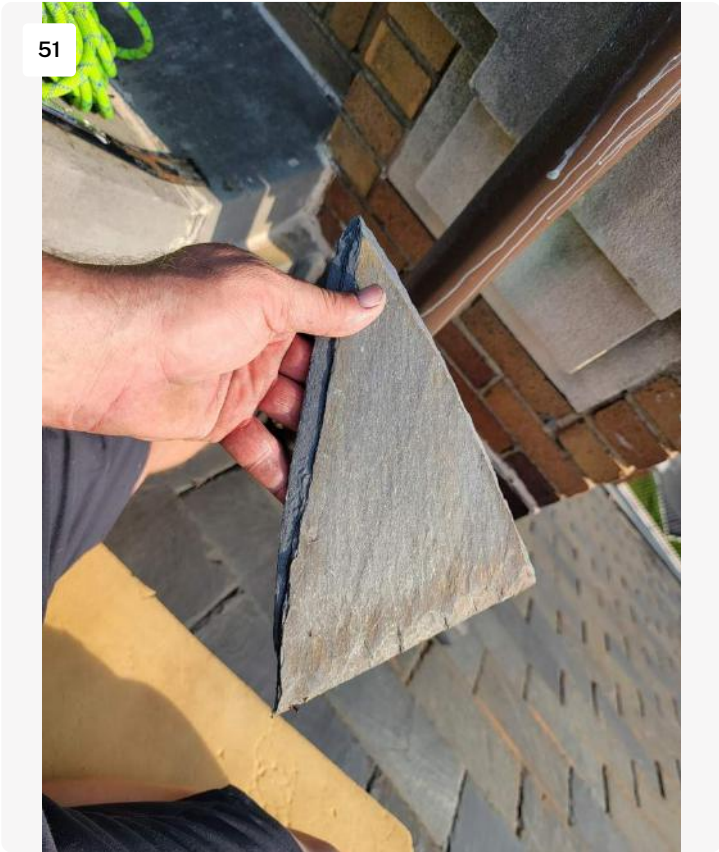


Broken tile

Project: Newnan Presbyterian Church
Date: 12/6/2021, 1:30pm



Missing tile



Broken tile

Project: Newnan Presbyterian Church
Date: 12/6/2021, 1:30pm



Same

Project: Newnan Presbyterian Church
Date: 12/6/2021, 1:30pm



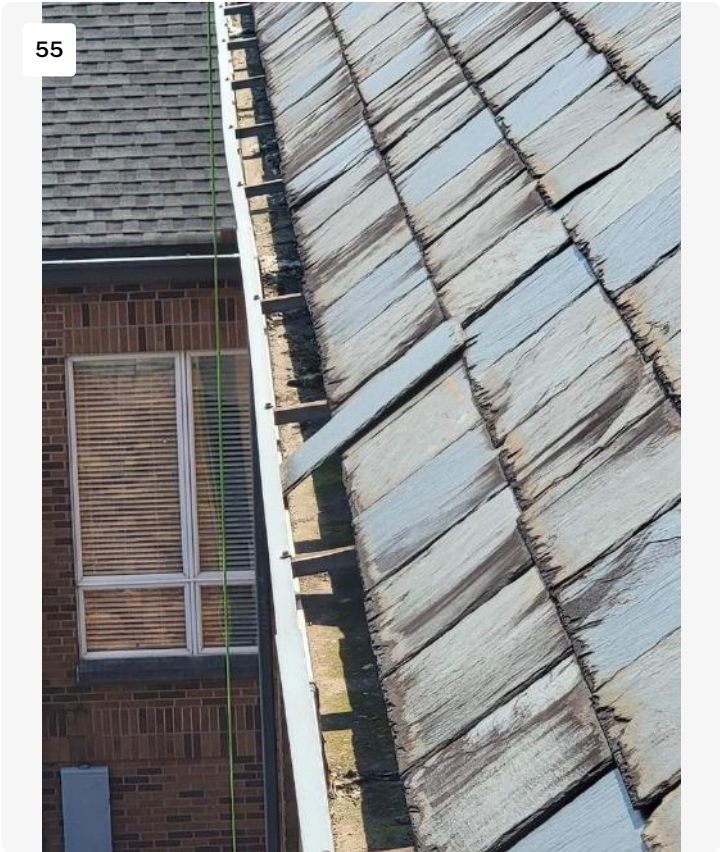
Old crack

Project: Newnan Presbyterian Church
Date: 12/6/2021, 1:30pm



New crack

Project: Newnan Presbyterian Church
Date: 12/6/2021, 1:30pm



Broken tile in gutter

Project: Newnan Presbyterian Church
Date: 12/6/2021, 1:30pm