HISTORIC STRUCTURE REPORT

FLUVANNA COUNTY HISTORIC COURTHOUSE
COUNTY OF FLUVANNA, VIRGINIA

FLUVANNA COUNTY VIRGINIA 1777

JOHN MILNER ASSOCIATES
Preservation • a division of MTFA

Train Architects

FLUVANNA COUNTY HISTORIC COURTHOUSE

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FINAL REPORT

September 7, 2022

Prepared for Fluvanna County by:

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INTRODUCTION

On March 1, 2022, Fluvanna County commissioned John Milner Associates Preservation (JMAP), a division of MTFA Architecture, PLLC, in association with Train Architects, to prepare of a historic structure report of the Fluvanna County Historic Courthouse. JMAP was directed to perform a condition assessment, develop treatment recommendations, create a maintenance schedule, and prepare a corresponding report. The structural and mechanical assessments were limited in nature. Examinations of the plumbing and electrical systems were excluded from the scope of work. JMAP enlisted a preservation cost estimator to prepare a cost estimate for the recommended work. As a part of the report, JMAP was directed to coordinate with the Fluvanna Historical Society (FHS), who prepared a statement of significance and the historical narrative for inclusion within the report. The historic structure report consists of these combined products.

<u>Property Information</u>
The Fluvanna County Historic Courthouse is located at 35 Court Square, Palmyra, Virginia 22963. The building and its site are owned by Fluvanna County. The building currently serves as a public assembly space with storage areas for the county registrar and FHS.

<u>Historic Designation</u>
The historic courthouse is the primary resource of the district known as the Fluvanna County Courthouse Historic District, which was listed on the Virginia Landmarks Register and the National Register of Historic Places in 1971.

<u>Existing Documentation</u>
FHS provided access to the FHS archives during the preparation of this report. In addition, FHS accessed archival information at the following repositories: Fluvanna County Clerk's Office, the University of Virginia Library, Swem Library at the College of William & Mary, Virginia Department of Historic Resources, and the Library of Virginia. The documentation efforts were utilized in the historical narrative and physical description in this report. The preparers of this report also spoke with Don Swofford, who contributed his knowledge as the project architect for the 1977 restoration project. The following key sources heavily informed this report:

- "Specifications Relating to the Plan for the Court House," n.d. *John H. Cocke Papers*, Box 182.
- Virginia Historic Landmarks Commission, *Fluvanna County Court House Historic District*. National Register of Historic Places Inventory – Nomination Form. (Washington D.C.: National Park Service, 1971).
- Grigg, Wood, Browne & Williams, *A Feasibility Study for the Restoration of Fluvanna County Courthouse, Palmyra, Virginia*. (Charlottesville: Grigg, Wood, Browne, & Williams, 1973).

- Grigg, Wood, & Browne, *The Restoration of the Fluvanna County Courthouse*. (Charlottesville: Grigg, Wood & Browne, 1977).
- Minnie Lee McGehee, "A County Seat for Fluvanna." B*ulletin of the Fluvanna County Historical Society*, No. 56 (Fall 1993)
- Will Rourk, University of Virginia Library *Fluvanna County Historic Courthouse*, point cloud scan data file, September 2021.

PROJECT TEAM

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EXECUTIVE SUMMARY

OVERVIEW

Significant investment is necessary to ensure that the iconic Fluvanna County Historic Courthouse lasts for many generations to come.

The historic courthouse building occupies a central place in the history of Fluvanna County and its architectural excellence is recognized at the state and national levels. Without critical repairs, the historic building will suffer progressive deterioration and lasting damage, leading to increased repair costs. A number of repairs are required to restore and maintain the integrity of this architectural masterpiece.

GOALS

The historic preservation goals for this building are the efficient and effective preservation of the historic fabric and the continued use of this important building and site.

These central goals serve as an overarching strategy for the preservation, which includes a number of detailed and targeted treatment approaches. The goals were developed through an assessment of the existing building and a thorough review with key contributors from the Fluvanna County government and the Fluvanna Historical Society. The adoption of a preservation approach recognizes that the various changes to the building over time are part of its physical record and emphasizes the treatment needed to maintain and repair the historic features. Further, it is desired for this building to continue to serve an important role as a public assembly space for the county.

It is also necessary to preserve the features which serve as the historic context for the building including its surrounding site, the other buildings in court square, and the whole of the village of Palmyra. These items are historic resources as well. Prior to any future work on the building and its environs, the county and historical society must carefully consider the impact on their historic integrity.

TIMELINE

Restoration and repair work must be executed with urgency in the near- and medium-terms to protect this historic building.

The restoration and preservation repairs and improvements are presented in three phases across a five-year window. The report provides descriptions of limited additional investigations and numerous recommended treatments. All efforts should be consolidated to the extent possible permitted by available funding and performed in brisk order to create a more efficient and effective resolution of the deficient conditions.

The initial phase includes items which represent active threats to the building and additional detailed investigations required for designing the upcoming restoration and rehabilitation projects. The second phase focuses on exterior repairs. The third phase includes interior work and any remaining minor exterior repairs and cleaning.

KEY FINDINGS

The report finds a number of deficient conditions in building components critical to the integrity of the building and elements which are essential to the original design intent.

Below are the key items which will have a significant impact on the preservation the building. The associated treatments are expected to incur the balance of both the effort and cost during a preservation construction project:

- Restoration of front columns
- Extensive repairs to roofing system
- Full window and door restoration
- Localized masonry repairs
- Refinishing exterior painted surfaces
- Addressing high humidity in basement
- Restoration and repair of interior finishes
- Localized structural repairs

FUNDING

A funding campaign which partners the county with the Fluvanna Historical Society is needed to raise and allocate the significant funding to complete the recommended repairs.

A rough order of magnitude cost has been prepared for each phase. Given the highly volatile construction market, these costs should be considered as the starting point for funding targets. Overall costs should be expected to grow as maintenance work is deferred or performed in piecemeal efforts. With the completion of additional investigations, the cost estimate should be updated to reflect any changes to the recommended treatment. Refer to the cost estimate included in Appendix A for additional cost breakdown and see the report for additional information on the work required.

PRIORITY MATRIX

The following table is a summary of the recommendations for Fluvanna County Historic Courthouse. The items are listed by discipline for easy reference. More information is provided on these treatments in the condition assessment and treatment recommendations portions of the report. Refer to Appendix A for the cost estimate for these scopes of work.

- Priority 1 – within one year
    - Urgent threats to building fabric
    - Investigation and testing required to develop the design for the Priority 2 and 3 repair and restoration projects
- Priority 2 – within three years
    - Improvements and repairs to the building's exterior envelope
- Priority 3 – within five years
    - Interior repairs
    - Minor exterior repairs

Maintenance items are not included in the following list. Refer to the Maintenance Schedule included later in this report.

Priority Matrix					
Discipline/Element	**Repair**	**Priority 1**	**Priority 2**	**Priority 3**	**Report Code**
Interior - General	Clean all interior spaces to remove debris and soiling.	X	X	X	GI.1
Mechanical	Regular servicing and tune-ups of all (4) AHU systems are recommended twice annually at season changes.	X	X	X	M.1
Exterior - General	Perform hazardous material survey to determine if lead-based paint, asbestos-containing materials, or other hazardous materials are present at the building. Survey should be completed before repairs are undertaken to allow for abatement of any hazardous materials in concert with associated work.	X			G.1
Exterior - Stucco	Perform selective removal of stucco at columns to determine to confirm binder. Follow fieldwork with petrographic analysis to determine composition of stucco. This analysis will determine if a lime mortar was used. An inappropriate material such as Portland cement may have been used, leading to the finish issues. Depending on the findings of the analysis, it may be necessary to remove the existing stucco from columns and pilasters to the brick substrate. If the composition of the stucco is appropriate, the issues may stem from application of the modern paint coating. To resolve this issue, remove paint and finish surface with breathable paint with sanded additive. Refer to Key Issues section of report for additional information.	X			ST.1
Exterior - Roofing	Immediately install shingles to cover location of exposed roof structure and address water infiltration at bell rope opening.	X			R.5
Exterior - Roofing	In the immediate near term, perform aerial lift survey Remove all unattached full shingles and portions of shingles from surface of roof. Refer to Key Issues section of report for additional information.	X			R.6
Interior - Walls	Selectively remove 5'-0" x 5'-0" area of deteriorated wall finish. Assess condition of plaster and masonry substrate. Determine impact of removal of interior wallboard finish on all courtroom walls to restore original design detailing. Refer to Key Issues section of report for additional information.	X			WA.2
Interior - Walls	Perform paint analysis on historic interior wood and plaster surfaces to confirm the original color scheme. Refer to Key Issues section of report for additional information.	X			WA.16
Interior - Other	Perform review and assessment of electrical and A/V systems. Review potential to update all lighting, electrical, and A/V systems as required. Review all floor receptacles in court room. Remove any nonfunctioning receptacles and provide blank off plate.	X			OI.5
Mechanical	Test all humidifiers and associated controls to confirm proper operation.	X			M.3

Discipline/Element	Repair	Priority 1	Priority 2	Priority 3	Report Code
Mechanical	Calibrate existing thermostats to confirm accurate operation and ability maintain desired indoor temperature conditions.	X			M.4
Exterior - General	Provide lightning protection system to mitigate potential for future damage.		X		G.2
Exterior - Masonry	Repoint open brick masonry joints with recommended mortar mixture using techniques to match original mortar joints. Refer to Key Issues section of report for additional information.		X		MB.1
Exterior - Masonry	Repoint localized areas identified on drawings, refer to MB.1 for repair and quantity.		X		MB.2
Exterior - Masonry	Remove cracked brick unit. Provide matching brick unit and install in concert with wall repointing.		X		MB.3
Exterior - Masonry	Remove and reset displaced brick unit.		X		MB.4
Exterior - Masonry	Remove biological growth and staining with architectural anti-microbial biocide. Use gentlest means possible.		X		MB.5
Exterior - Masonry	Repoint holes in masonry wall with compatible color-matched patching mortar.		X		MB.6
Exterior - Masonry	Remove paint staining from surface of masonry walls. Perform tests on masonry and pursue the gentlest effective method.		X		MB.7
Exterior - Masonry	Remove overpaint on brick surfaces. Perform tests on masonry and pursue the gentlest effective method.		X		MB.8
Exterior - Masonry	Clean localized staining from exterior walls. Preferred cleaning approach is hand-washing with mild detergent with care to be taken at mortar joints to minimize damage and erosion. A low-pressure water wash of less than 400 psi may be utilized in lieu of hand washing after testing a small area to determine impact to historic materials.		X		MB.9
Exterior - Masonry	Remove wood shutters at sham windows and assess masonry walls. Perform work in concert with shutter restoration.		X		MB.10
Exterior - Masonry	Remove brick pavers and reset at landing to resolve settling. Repoint 100% of brick walking surface and ramp walls.		X		MB.11
Exterior - Masonry	Remove chimney cap. Provide new copper chimney cap to cover, rather than abut, a new sloping mortar cap at top corbel.		X		MB.12
Exterior - Masonry	Repoint stone foundation wall at front steps and match existing mortar in color and composition.		X		MS.1
Exterior - Masonry	Remove paint and staining from stone stairs and bottom concrete step. Perform tests on masonry and pursue the gentlest effective method.		X		MS.2
Exterior - Masonry	Remove paint and clean stains on stone capitals. Removal of all stains is not the intended goal. Clean surface with mild detergent and gentle water wash to remove surface dirt. Perform tests on masonry and pursue the gentlest effective method.		X		MS.3
Exterior - Concrete	Remove cracked concrete at gutter. Provide replacement concrete to match adjacent existing to remain portions in profile and color.		X		C.1

Discipline/Element	Repair	Priority 1	Priority 2	Priority 3	Report Code
Exterior - Concrete	Remove concrete stair. Provide new concrete stair that spans over existing gutter. Review requirement for landing at exterior side of door with code official. Stair is to have code-compliant tread depth and riser height. Provide code-compliant painted metal handrail on both sides of stair. Do not fasten handrail to face of historic building.		X		C.2
Exterior - Concrete	Remove loose concrete at existing crack. Prepare joint and provide cementitious filler to match color of existing concrete.		X		C.3
Exterior - Stucco	Gently sound damaged areas of stucco ceiling surfaces to determine extent of delamination. Remove loose or damaged areas of stucco. Prepare wood lath substrate to allow for sufficient bond with new stucco. Saturate wood lath with water in advance of repairs. Provide new stucco surface that matches composition and texture of existing stucco. Paint 100% of ceiling using breathable paint.		X		ST.2
Exterior - Wood	Strip finish from damaged portion of wood cornice board. Remove rotted portions of wood and provide wood dutchman or epoxy repairs		X		WD.1
Exterior - Wood	Since much of paint history was previously removed from cornice, pediment, and tympanum, strip 100% of deteriorated paint finish. Assess wood substrate. Repair wood with minor surface damage. Remove elements where rotted and provide wood dutchman. Prepare wood surface for new sanded paint finish per original specifications. Repaint. Refer to Key Issues section of report for additional information.		X		WD.2
Exterior - Wood	Prepare surface and repaint all surfaces of exterior wood bench.		X		WD.3
Exterior - Metal	Remove metal access door. Provide new painted metal access door in existing opening.		X		MT.1
Exterior - Metal	Remove corroded sheet metal bell enclosure. Provide new enclosure. Perform additional historical research to determine earliest design of enclosure or if a steeple preceded the current enclosure. Include attic vent and metal roof flashing at base of new enclosure. Provide flashing and sealant to create weatherproof opening for bell rope at horizontal metal surface. Refer to Key Issues section of report for additional information.		X		MT.2
Exterior - Metal	Remove metal screen at crawlspace vent. Provide new metal screen in existing opening set back from face of masonry.		X		MT.3
Exterior - Metal	Prepare surface of metal handrail. Repaint.		X		MT.4
Exterior - Metal	Remove corrosion from surface of metal element. Repair surface deterioration. Paint.		X		MT.5

Discipline/Element	Repair	Priority 1	Priority 2	Priority 3	Report Code
Windows	Restore 100% of wood windows. Remove window sashes. Remove glazing putty and glass. Label and store glass for future reinstallation. Strip paint. Remove rotted wood from sash and frames. Remove perimeter sealant. Provide epoxy patch for all surface repairs and wood dutchman for rotted sections. Reglaze sash. Paint all sides of frame, sill, and sash. Reinstall sash. Provide perimeter sealant. Refer to Key Issues section of report for additional information.		X		W.1
Windows	Restore wood shutters. Remove all painted wood shutters. Repair shutter hardware and secure any loose shutter dogs. Strip paint. Remove rotted wood. Provide epoxy patch for all surface repairs and wood dutchman for rotted elements. Paint all sides of shutters and hardware. Reinstall shutters. Refer to Key Issues section of report for additional information.		X		W.2
Windows	Assess need for wiring. Reroute wiring and repair hole at wood window sash.		X		W.3
Windows	Remove cracked glass pane. Provide glass pane in existing window.		X		W.4
Doors	Restore wood doors. Remove wood doors. Repair door hardware to improve operability and latching. Remove deteriorated paint from door and frame. Remove rotted wood. Provide epoxy patch for all surface repairs and wood dutchman for rotted elements. Do not strip full surface of doors. Scrape and sand surface to prepare for new finish and paint all sides of door and frame. Reinstall door. Refer to Key Issues section of report for additional information.		X		D.1
Doors	Remove and replace door sweep.		X		D.2
Doors	Restore door hardware and provide new door knob for existing hardware.		X		D.3
Doors	Repair rotted portions at existing wood threshold with epoxy repair.		X		D.4
Doors	Remove and reinstall door stop. Repair and refinish wood base trim.		X		D.5
Exterior - Roofing	Remove broken slate shingles. Inspect decking substrate to determine integrity. Repair decking. Provide in-kind slate shingle replacement, matching color, texture, and size. Refer to Key Issues section of report for additional information.		X		R.1
Exterior - Roofing	Clean ferrous stains from slate shingles. Review cleaning methods. Complete tests to determine impact on adjacent fabric, including downstream surfaces, before full cleaning.		X		R.2
Exterior - Roofing	Remove and replace 100% of painted metal ridge flashing. Coordinate metal with new bell enclosure to avoid galvanic reaction between dissimilar metals.		X		R.3
Exterior - Roofing	Provide copper rain cap at opening and weatherproof seal and flashing between piping and opening in chimney cap.		X		R.4
Exterior - Other	Repoint joint along building at walk. Monitor joint to determine if settlement is active. Provide compacted fill to create level surface up to existing brick paving.		X		O.1

Discipline/Element	Repair	Priority 1	Priority 2	Priority 3	Report Code
Exterior - Other	Determine if wiring is in active service. Reroute surface wiring and remove mounting accessories. Repair surface as necessary. Provide concealed interior wiring.		X		O.2
Exterior - Other	Regrade planting bed at brick ramp to obscure concrete block foundation wall and create positive slope away from building.		X		O.3
Exterior - Other	Clean areaway and basement stair of all dirt and debris.		X		O.4
Exterior - Other	As a part of full exterior cleaning, remove bird nests while avoiding harm to any birds in the nest.		X		O.5
Structural	Repoint 100% of three chimneys in attic.		X		S.2
Structural	Remove rotted wood at existing roof member. Sister new member onto sound portions of existing member.		X		S.3
Structural	Install salvaged brick in missing location. Coordinate with chimney repointing.		X		S.4
Structural	Replace rotted areas of wood roof sheathing. Coordinate repairs with Exterior - Roofing repairs.		X		S.5
Structural	Remove and replace bell support members to match existing member.		X		S.6
Structural	Remove approximately 12” length of rotted wood and sister new member onto existing bottom chord on each side below bell enclosure.		X		S.7
Mechanical	Replace fans, wall switches, and existing open-ended outside air intake duct.		X		M.2
Interior - General	Address ladybug infestation via vacuum removal, installation of natural or chemical repellent, and/or traps. Perform removal after exterior repairs to prevent future reinfestation. Remove wasp nests from attic and fill openings with appropriate material to prevent additional infiltration.			X	GI.2
Interior - Floor	Remove deteriorated existing vinyl wall base. Provide new vinyl wall base.			X	F.1
Interior - Floor	As basement is expected to remain back-of-house space, maintain existing flooring and apply protective coating.			X	F.2
Interior - Floor	Provide heavy duty protector for condensate line until mechanical upgrades are completed in basement.			X	F.3
Interior - Floor	Remove temporary ramp. Install fixed ramp with handrail along east side of courtroom. Shorten benches to accommodate ramp location. Modify existing bar to install swinging gate to provide permanent accessible path. Refer to Key Issues section of report for additional information.			X	F.4
Interior - Floor	Provide broadloom carpet stair runner down center of stair to basement.			X	F.5
Interior - Floor	Remove carpet to allow for floor refinishing in courtroom, stairs, and gallery. Provide new broadloom carpet at stairs and gallery to protect stair surface from wear and to maximize safety. Return main courtroom floor to exposed wood flooring.			X	F.6

Discipline/Element	Repair	Priority 1	Priority 2	Priority 3	Report Code
Interior - Floor	Repair and sand area of floor damage. Prepare surface for new flooring finish. Fill gaps measuring ¼" or more with wood matching in species and graining. Provide new clear high-traffic coating on restored wood floor. Provide foot pads on all furniture.			X	F.7
Interior - Floor	Remove broken bricks. Prepare substrate and reset salvageable units. Replace heavily damaged units with bricks salvaged from elsewhere on building.			X	F.8
Interior - Floor	Install 4'-0" wide by ¾" thick plywood decking on existing ceiling joists to create maintenance access path to full length of attic.			X	F.9
Interior - Walls	Remove deteriorated paint finish on all wood surfaces. Prepare surface and repaint 100% of woodwork in courtroom and jury rooms per findings of analysis.			X	WA.1
Interior - Walls	Repair damaged areas of wallboard and plaster finish. Paint 100% of walls. Alternate approach includes removal of all existing wall finish applied on top of historic plaster and repair/replacement of plaster wall finish. Refer to Key Issues section of report for additional information.			X	WA.3
Interior - Walls	Remove metal fasteners in wall. Patch and paint wall.			X	WA.4
Interior - Walls	Repoint 100% of interior side of brick tympanum with recommended mortar mixture. Reset displaced brick units.			X	WA.5
Interior - Walls	Remove and replace existing basement stair handrail. Relocate light switches at basement landing to accommodate raised handrail.			X	WA.6
Interior - Walls	Remove basement wall-mounted vents and fans. Inspect crawlspace. Remove debris.			X	WA.7
Interior - Walls	Remove approximately 30" long portion of deteriorated wood paneling and pulley at gallery support beam. Remove wood paneling members in their entirety back to nearest joint. Do not cut wood to remove. Examine substrate to determine extent of damage. Remove any areas of wood rot and repair surface damage with epoxy. Reinstall paneling. Paint.			X	WA.8
Interior - Walls	Remove modesty panels. Patch and paint wood at fastener locations.			X	WA.9
Interior - Walls	Remove sealant fill at checks in hollow bored wood columns. Fill checks. For narrow checks (less than 1/8") use epoxy paste filler. For checks larger than 1/8," install a narrow, tapered slat of pine into crack during dry season. Apply adhesive to slat and drive slat into the check with light taps from hammer. Once glue dries, trim excess glue and slat. Repaint column.			X	WA.10
Interior - Walls	Repair damaged surface of wood column. Refinish column.			X	WA.11
Interior - Walls	Remove deteriorated paint finish from operable wood partition on all sides. Repaint. Consider restoring operability to wood panels. Refer to Key Issues section of report for additional information on interior refinishing.			X	WA.12

Discipline/Element	Repair	Priority 1	Priority 2	Priority 3	Report Code
Interior - Walls	Repair wood window trim. Coordinate refinishing with item WA.1.			X	WA.13
Interior - Walls	Install wood patches to eliminate signs of scars at second floor doors. Repair surface of door. Repaint trim and door.			X	WA.14
Interior - Walls	Repaint 100% of concrete block walls in basement.			X	WA.15
Interior - Ceiling	Remove damaged metal lath and plaster in mechanical closet. Provide new ceiling in entire mechanical closet.			X	CL.1
Interior - Ceiling	Refasten loose ceiling boards and cornice trim in courtroom. Prepare and repaint 100% of painted wood board ceiling and cornice trim. Coordinate painting with paint analysis findings.			X	CL.2
Interior - Ceiling	Patch damaged area of gypsum wallboard ceiling. Prepare and paint 100% of gypsum ceiling.			X	CL.3
Interior - Ceiling	Prepare and paint 100% of plaster ceiling. Perform work in concert with plaster repairs in item CL.5.			X	CL.4
Interior - Ceiling	Repair damaged locations of plaster ceiling. Paint 100% of ceiling. Consider replacement of textured ceiling finish with smooth ceiling finish. Coordinate work with item CL.4.			X	CL.5
Interior - Ceiling	Clean painted surface to remove mold. Coordinate mold removal with WA.8.			X	CL.6
Interior - Ceiling	Remove and repair deteriorated wood ceiling board. Remove rotted wood and repair with epoxy. Repaint wood board and reinstall.			X	CL.7
Interior - Ceiling	Remove and replace 100% of fiberglass insulation in attic.			X	CL.8
Interior - Other	Remove Venetian blinds at all windows. Replace in-kind.			X	OI.1
Interior - Other	Depending upon level of alteration in future restoration efforts, the handrail may need to be reinforced. If reinforcement is required, design improvements to minimize visual intrusion. Refer to Key Issues section of report for additional information.			X	OI.2
Interior - Other	Provide wood glue and/or tack to fix baluster in place.			X	OI.3
Interior - Other	Paint 100% of wood benches and jury room shelves.			X	OI.4
Interior - Other	Until mechanical system upgrades occur, a routine maintenance schedule should be developed for the basement dehumidifiers.			X	OI.6
Structural	Monitor gap at floor and base trim over time to determine if settlement is active.			X	S.1
Mechanical	Provide new energy recovery unit (ERU) to supply pre-conditioned / room temperature-and-humidity neutral outside air to the courtroom when Jury Rooms 1 and/or 2 are occupied. Include automatic digital controls to insure the ERU operates when occupants are present. Estimated capacity of 300 CFM.			X	M.5

Discipline/Element	Repair	Priority 1	Priority 2	Priority 3	Report Code
Mechanical	Replace defunct HRV with a new energy recovery unit (ERU) to provide exhaust and pre-conditioned room temperature-and-humidity neutral outside air to the occupied spaces. Provide automatic digital controls to insure the new ERU operates when occupants are present. Estimated capacity of 300 CFM.			X	M.6
Mechanical	Replace bathroom exhaust fan/lights in 1 existing operating bathroom. Determine potential for unused bathrooms to return to active use. If so, replace fans.			X	M.7
Mechanical	Install a ducted dehumidifier and associated interior ductwork to serve the basement level. This also may require an exhaust fan to remove the heat generated by the dehumidifier.			X	M.8

STATEMENT OF SIGNIFICANCE

Figure 1. South Elevation of Fluvanna County Historic Courthouse

Why is this building important?

Since 1831 the Village of Palmyra has been graced by a courthouse of particular distinction. Indeed, even in Virginia where a remarkable collection of historic courthouses and other public works of architecture are considered to be the Commonwealth's greatest artistic contribution, the historic Fluvanna County Courthouse stands as one of the finest in the state (Figure 1). Designed by John Hartwell Cocke and undertaken by Cocke and Walker Timberlake, the courthouse served its original function for 170 years.

Placed on the edge of a steep bluff backdropped by rolling hills, the temple form Greek Revival building executed in the Doric order conveys a permanence, strength, and reverence appropriate to its purpose. One enters through a pair of double doors and the courtroom opens up into a double-high space, emphasizing a sense of the importance of the place and seriousness of the occasion. Reinforcing these impressions is a carved inscription in the stone lintel above the entry that reads, "The maxim held sacred by every free people: obey the laws" (Figure 2).

The temple form, a rectangular structure fronted by a columned portico, was developed by the ancients to house gods. An imposing appearance was meant to instill a feeling of awe and respect among all who saw it. Many temples were built on raised sites, furthering this evocation of power.

Figure 2. Carved lintel above front entrance doors.

Palmyra's courthouse adopts these characteristics, and its well-conceived elevated siting heightens these emotions.

The application of the temple to county courthouse buildings must be credited to Thomas Jefferson, who adapted the ancient form for his Virginia State Capitol. In doing so, Jefferson declared that ancient classical architecture had achieved the approbation of the ages and was the ideal model for the public buildings of the new nation that he helped found. Nowhere is this better expressed than in the outstanding assemblage of Classical Revival antebellum courthouses spread through central Virginia. Many of the finest examples were designed and built by master builders who had worked on Jefferson's University of Virginia where they mastered the contemporary application of ancient architectural language.

The majority of the "Temples of Democracy" employed the Roman architectural orders favored by Jefferson. However, the courthouse at Palmyra stands out as Virginia's earliest courthouse to engage a Greek classical order – in this case, the Doric. The ultimate expression of Greek Doric is, of course, the Parthenon on the Athenian Acropolis. A distinguishing feature of the Greek Doric is the lack of a base on its columns. The Greek Doric was considered to be masculine order: an expression of its virility in that its columns could "go barefoot." The simple, square-capped conical capitals of the Doric order further this symbolic masculinity. Another distinctive element of the Doric order is the use of triglyphs in the frieze. The stylized reference to wood structural members grouped in threes turned what was once a structural element into an ornamental device.

It must be noted that John Hartwell Cocke's design at the Fluvanna County Courthouse is not a pure expression of the Greek Doric order. Similar to his design work elsewhere, Cocke employed the classical architectural language not as a rote recitation, but as a mode within which he could improvise. The liberties taken in the design details at the Fluvanna County Courthouse serve to underscore its distinctive character. This fluidity can also be seen at Cocke's country estate, Bremo, a design on which he collaborated with John Neilson, and which is considered one of the great houses in all of Virginia. Indeed, Bremo is recognized as a National Historic Landmark, a designation made by the U. S. Secretary of Interior and one reserved for properties of "surpassing interest to the American people" and considered "essential to understanding" our nation's history.

The appearance of simplicity as viewed from a distance belies the fine architectural and construction details of the Fluvanna County Courthouse. The brick building is five bays deep, excluding the portico, and three bays wide with all bays separated by stuccoed pilasters. Two levels of windows punctuate the east and west sides. So as to avoid disturbing the entablature, Cocke set the sills of the short upper windows just above the second-floor level. The rear elevation appears to have three semi-circular arched windows separated as well by pilasters. The center rear window is shuttered; it is a false window constructed for the sake of symmetrical design. A similar sham window is employed on the side elevations where the interior stairs rise along the side walls. The entablature features a fusion of the Greek and Roman Doric orders. Unlike the Greek Doric where the first triglyph is set at the corner of the building, Cocke instead employed the Roman Doric details to set the first triglyph centered on the column below. Cocke dispensed with the fluted columns of the Greek Doric in favor of plain columns, another fusion with a Roman Doric feature and one which also reflected the constraints of the available materials. The tympanum on the front elevation suggests the use of cut stone to fill the triangular space above the portico. Upon closer examination, it is revealed that wood paneling was used to mimic cut stone and, with its original sanded paint finish, this effective device imbued a solidity and mass beyond its material.

A variety of materials were used, and many trained workmen were required, including skilled enslaved workers from nearby Bremo plantation. Materials include: slate for the gabled roof; brick laid in Flemish bond for the exterior walls, brick paving in the portico and interior floor, and curved brick units to create the columns; stucco over the brick columns and pilasters; rubble stone for the foundation; rough-faced cut stone for the front steps and water table with a rough-textured finish; cut stone with a smooth face for the column and pilaster capitals; cut stone with carved patterning for the window sills and lintels; and wood for the front tympanum, entablature, shutters, doors, window sashes, and interior finishes; and plaster on the interior walls and ceilings.

As intended, this modest-sized courthouse commands the attention and esteem of those who approach it from the court square below. It has drawn to Palmyra a steady and continuing stream of students and scholars of architecture from around the country and beyond. Indeed, it has inspired architectural historians for many generations; noted architectural historian Talbot Hamlin was moved to describe the courthouse and its site, with the discrete array of surrounding buildings, as the "Acropolis of Palmyra."

How did this majestic building come to be?

Although six appointed commissioners, prominent men in the community, were charged with the responsibility of planning for the courthouse, only two played a central role in its design and construction. These two were John Hartwell Cocke of Bremo, and Walter Timberlake, Methodist minister, entrepreneur, and builder. These two men worked as partner "undertakers" on the project. Their correspondence, as shown in the narrative history, makes clear that Cocke was the principal, and Timberlake his deferential second in the partnership. Both practical and successful men of business, it was Reverend Timberlake who stimulated and shepherded the long process to locate Fluvanna's permanent seat of government in Palmyra, even donating the land on which the courthouse stands. General Cocke is rightly credited with the final design and the success of the courthouse as an esteemed work of architecture.

Born in 1780, John Hartwell Cocke was a wealthy planter who, despite owning well over a hundred slaves at various points in his life, was deeply opposed to slavery on moral grounds. He was a devout Christian who was committed to education for all peoples. Together with his second wife, Louisa Maxwell Holmes, he disregarded the laws of the time risking the reprisal of their neighbors and the couple's physical safety in order to educate the enslaved at Bremo. He also built a chapel as a place of worship for the enslaved. Cocke was a disciplined business man, a veteran of the War of 1812, an agricultural innovator of note throughout the South, and a leader in the temperance movement.

Although some thirty-seven years and considerable temperamental differences separated them, the younger Cocke and his senior neighbor, Thomas Jefferson, were trusted friends bound by a shared interest in agricultural experimentation and a passion for the study and practice of architecture. Jefferson offered advice and suggested builder John Neilson assist Cocke with the design and construction of his country mansion, Bremo. Cocke was tapped by Jefferson to serve on the founding Board of Visitors of the University of Virginia in 1819, a position in which he remained for more than three decades. He assisted Jefferson in overseeing the construction of the University's "academical village." Today, the campus is recognized as a UNESCO World Heritage Site, one of only twenty-four in the nation.

The connection of the courthouse to John Hartwell Cocke, and through Cocke to his mentor Thomas Jefferson, is historically significant. It adds an additional area of consideration effectively missed in the 1971 National Register of Historic Places nomination: an historical association with an individual important in our history. Moreover, through Cocke and the National Historic

Figure 3. Interior view of courtroom.

Landmark district (1971) at Bremo, the Fluvanna County Courthouse should be understood as a part of a singularly outstanding and richly varied body of work. The county's historic 1829 stone jail and the planning of the court square further embellish this oeuvre.

The architectural importance of the courthouse was formally recognized with its official listing in 1971 on the Virginia Landmarks Register and the National Register of Historic Places. These governmental listings validate this literal landmark as an important work of architecture. Underscoring this importance is the rapidity with which the courthouse was listed. In those earliest years following the establishment of the nation's historic preservation program, only the most obvious and most significant resources — the "low hanging fruit," if you will — were listed in quick order.

What will happen to this important building?

Just as the courthouse continues to draw wide scholarly and visitor interest, in Fluvanna County the building maintains its position as a source of civic pride and identity for the county and its citizens. The village that saw growth and prosperity following the siting of the courthouse in Palmyra is today a wonderfully intact historic village, providing a picturesque setting for Cocke's monumental courthouse. The courthouse district has yet to be fully tapped as a resource to support and enhance tourism and to encourage civic education and economic sustainability.

Important work remains to be done to acknowledge and honor the many enslaved workers involved in the creation of this architectural masterwork. The Fluvanna Historical Society (FHS) has undertaken outreach efforts with descendant communities and completed archival research to uncover stories from those who contributed significant skill and effort in the building's execution. As this work continues, the building offers an exceptional venue to tell these stories through events and interpretive opportunities. In addition, it is important that the National Register nomination for the historic district be expanded to more fully address the deep importance of the surrounding site and the village itself. FHS has begun initial steps to address this matter and it is expected that it will be completed in the near future.

Fluvanna County has been a good and faithful steward of the courthouse, the larger court square, and the village of Palmyra, even in the face of stiff competition for limited resources in this rural county. Indeed, the courthouse is a rare survivor of its era to have retained its original temple form without additions or significant changes to its interior arrangement, and while still possessing many of its interior fittings. The surrounding site has also avoided any significant diminishment in its historic integrity. One can still see Cocke's original vision for the court square and appreciate the valuable subsequent contributions, both architectural and landscape in nature, which demonstrate the centuries of use.

Together with the county's private partner, FHS, Fluvanna County is committed to repairing, restoring, and preserving this singular treasure for the twenty-first century and beyond. This historic structure report will guide the county and its partners carefully and appropriately in that work. We invite the interest and support of Fluvanna's citizens and the wider preservation community to join us in this important goal for the future of this distinguished landmark.

HISTORICAL NARRATIVE

Figure 4. One of the earliest known photographs of Fluvanna County Courthouse, 1904. Thomas Henry Tutwiler. Box 2.2, Folder 10, FHS.

Introduction

This section of the report provides a historical narrative of the Fluvanna County Courthouse. The research effort and preparation of the narrative were completed by Benjamin Ford and Patricia Gresham Johnson of FHS.

The Old Courthouse (Napiers Ford, Virginia)

Fluvanna County separated from Albemarle County in 1777. On March 23, 1778, the first Fluvanna County Courthouse was established. The justices met and established a site for a new courthouse. They decided that the "ridge near the head of the lane leading to Napier's ford on the south side of the Rivanna River on the lands of Col. Thos. Napier and Capt. Patrick Napier is the most convenient place for that purpose and do fix the same accordingly."[1] A frame courthouse and jail were subsequently constructed at Napiers Ford.[2] However the adequacy and accessibility

[1] *Courthouse Site 1778*, Box 1 Folder 3, FHS; Carl R. Lounsbury, *The Courthouses of Early Virginia: An Architectural History*, 349. (Charlottesville: University of Virginia Press, 2005).
[2] Minnie Lee McGehee, "A County Seat for Fluvanna" ii. B*ulletin of the Fluvanna County Historical Society*, No. 56 (Fall 1993): ii-38.

of these buildings soon came into question. In 1802 Fluvanna County Justices approved a plan for a new courthouse, a 24 by 36-foot frame structure. In 1819, following the destruction by fire of the old jail, a new jail was built, the adequacy of which also became an issue and ultimately initiated the move to relocate the county seat to a new site.[3]

Choosing a Site for a New Court Seat

Correspondence suggests that Walker Timberlake was the primary driver of the movement to relocate the county seat. Walker Timberlake lived at his residence ‘Rising Sun,’ located near Wilmington, Virginia. During the early nineteenth century, Wilmington was a town of growing importance in early Fluvanna County history.[4] Timberlake was one of several brothers who lived in Fluvanna County, each of whom was a prominent businessman. Timberlake converted to Methodism at a camp meeting in 1811 and became a minister in 1815. It was Timberlake who helped to spread the Gospel and establish the Methodist Church throughout Fluvanna County and the broader central Virginia region. Timberlake was also a businessman with numerous and varied interests. In the spring of 1811, he acquired 192.5 acres on the head branches of Ballenger Creek from his father-in-law John A. Strange. Two years later in 1813, he and his brother John established a dam and mill on the Rivanna River on this land, a location he named Palmyra. To facilitate commerce at his mill seat, Timberlake also established a ferry across the Rivanna. After receiving permission from the General Assembly in January of 1824, the ferry was replaced by a covered bridge he constructed ca. 1824.[5]

Although many Fluvanna justices and citizens in general recognized the need for a new jail and a more centrally located and representative courthouse befitting their prospering county, Timberlake and others orchestrated a behind-the-scenes strategy to move the courthouse and circumvent any opposition. In late 1823, Timberlake wrote to fellow Fluvanna County resident and prominent local leader John Hartwell Cocke regarding the removal of the courthouse. In an attempt to avoid early resistance due to the potential cost of constructing new buildings, he proposed that it was “best not to attempt to call the people together on the subject of removal of the Place of holding Court.” Rather, he proposed that privately circulated petitions be passed to interested individuals to garner a base of support prior to seeking ‘public’ opinion.[6]

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[3] David W. C. Bearr, “The Timberlakes: Shaping Fluvanna,” 18. B*ulletin of the Fluvanna County Historical Society*, No. 26-27 (April 1978): 4-40; McGehee, “County Seat,” ii, v-vi.

[4] Today, Wilmington is an unincorporated community which lies approximately four miles to the east of Palmyra. Thomas Jefferson Planning District, “Architectural History Identification and Assessment of Fluvanna County, Virginia,” 26-27. (Charlottesville: Thomas Jefferson Planning Districs, 1993, Revised 1995).

[5] McGehee, “County Seat,” iii, vi; Bearr, “The Timberlakes,” 15-16, 27-28; “Chapter 49 – An Act authorizing Walker Timberlake to erect a toll-bridge across the Rivanna River,” 63-64. *Acts Passed at a General Assembly of the Commonwealth of Virginia* (Richmond: Thomas Ritchie, 1824); Fluvanna County Deed Book O.S. 4:497. Clerk’s Office, Fluvanna County Courthouse, Palmyra, Virginia.

[6] McGehee, “County Seat,” v-vi. Interestingly enough, it was Walker Timberlake who constructed the last jail at Napiers Ford in 1817. This jail was completed in a single month but did not meet new state standards. A new jail was

In his attempt to move the county seat, Walker Timberlake also had assistance at the state level. A law partner of his brother John Timberlake Jr., Barrett G. Payne, introduced a bill in the General Assembly that allowed Fluvanna County to poll its citizens on where to establish the permanent seat of government. In February of 1828, the General Assembly of Virginia passed an act that authorized officials to determine where Fluvanna citizens wanted an improved county court seat.

According to the act, the existing "public buildings in the County of Fluvanna are out of repair, and that the present place for holding courts in the said county, is thought by many, to be inconveniently situated. To determine the most eligible place to build a new courthouse, the Act authorized holding a poll "for the purpose of ascertaining the number of voters for each respective place proposed as the most fit for the permanent seat of justice in said county." [7]

County officials held two polls to determine the new location of the county court. The first poll, "Concerning the Place for Holding Courts in the County of Fluvanna," was held in May with Palmyra receiving 283 votes, Wilmington 242 votes, and the current court seat at Napiers Ford 217 votes. Because no site received the required majority, a second poll was taken a month later in June with only Palmyra and Wilmington as candidates. In the second poll, Palmyra received the majority of votes. On June 25, 1828, the Court declared "Palmyra to be the future seat of Justice for the County."[8]

Following the selection of Palmyra as the new county seat, Walker Timberlake offered four acres of his property at Palmyra to serve as the location for the new courthouse and jail. The county accepted his offer and a deed for the land transfer was agreed upon. On July 24, 1828, county commissioners laid out the four acres deeded to them by Walker Timberlake for the new county seat.

> Pursuant to the order of Court of which is hereunto annexed we the undersigned three of the commissioners in said order named have the 24th day of July 1828 proceeded to cause to be located and laid off by metes & bounds, four acres of land of the property of Walker Timberlake at the place called Palmyra in said County a plat of which said four acres of land is made out by the County Surveyor of said county is hereto annexed & herewith returned. We have also procured from Walker Timberlake & Sarah his wife a deed of conveyance of the title of said four acres of land to the acting Justices of said County & their Successors for the use of said County which is herewith returned.
> …The above is a true plat of 4 acres of land lying in the County of Fluvanna on the

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then constructed by Timberlake and Wilson Jefferson Cary in 1819. This jail needed repairs in 1822 and again in 1823. See Bearr, "Timberlakes," 18-19.

[7] Bearr, "Timberlakes," 20; Chapter 53, "An Act Concerning the Place for Holding Courts in the County of Fluvanna," Passed February 18, 1828, 35-37. *Acts Passed at a General Assembly of the Commonwealth of Virginia*, (Richmond: Thomas Ritchie, 1828).

[8] Bearr, "Timberlakes," 20; McGehee, "County Seat," vii; David W. C. Bearr, "…At a Place Called Palmyra. A Village Scrapbook: History and Legacy," 7. *The Bulletin of the Fluvanna County Historical Society*, Number 34 (October 1982): 7-41.

> North side of the Rivanna River at Palmyra laid off by the directions of J. M. Wills, James Magruder and Basil M. Jones being three of the Commissioners.[9]

The plat articulated a 528 foot long by 330 foot wide north-south oriented rectangle containing 174,240 square feet or precisely four acres. A schematic courthouse structure was drawn in the center of the four-acre parcel, with a smaller jail structure depicted in its southeast corner (Figure 5).

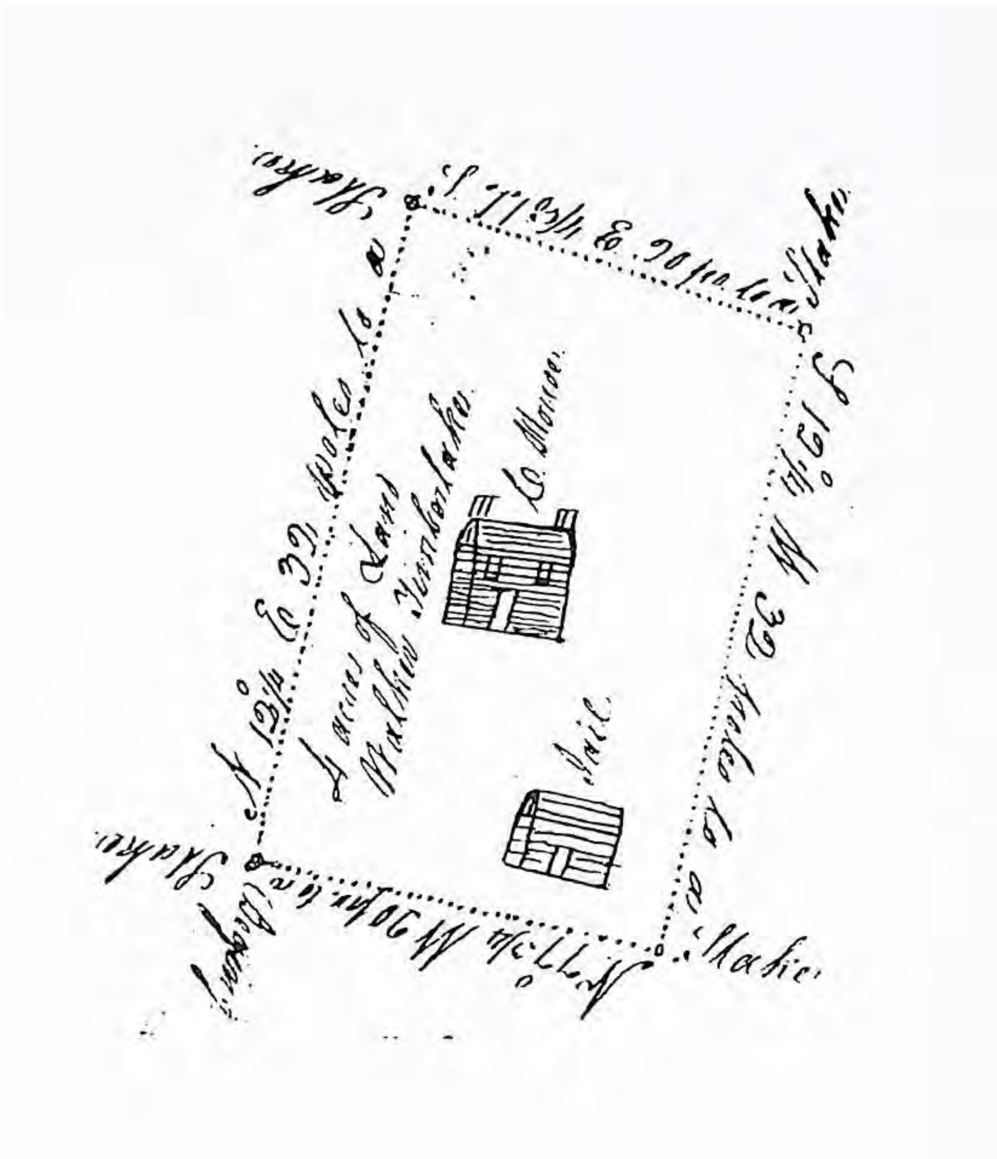

Figure 5. Plat of 4-acre parcel granted to Fluvanna County by Walker Timberlake in 1828. Box 2.2 F9, FHS.

[9] Fluvanna County Deed Book 9:390; [4-Acre Plat of New Courthouse Site], n.d. Box 2.2 F9, FHS.

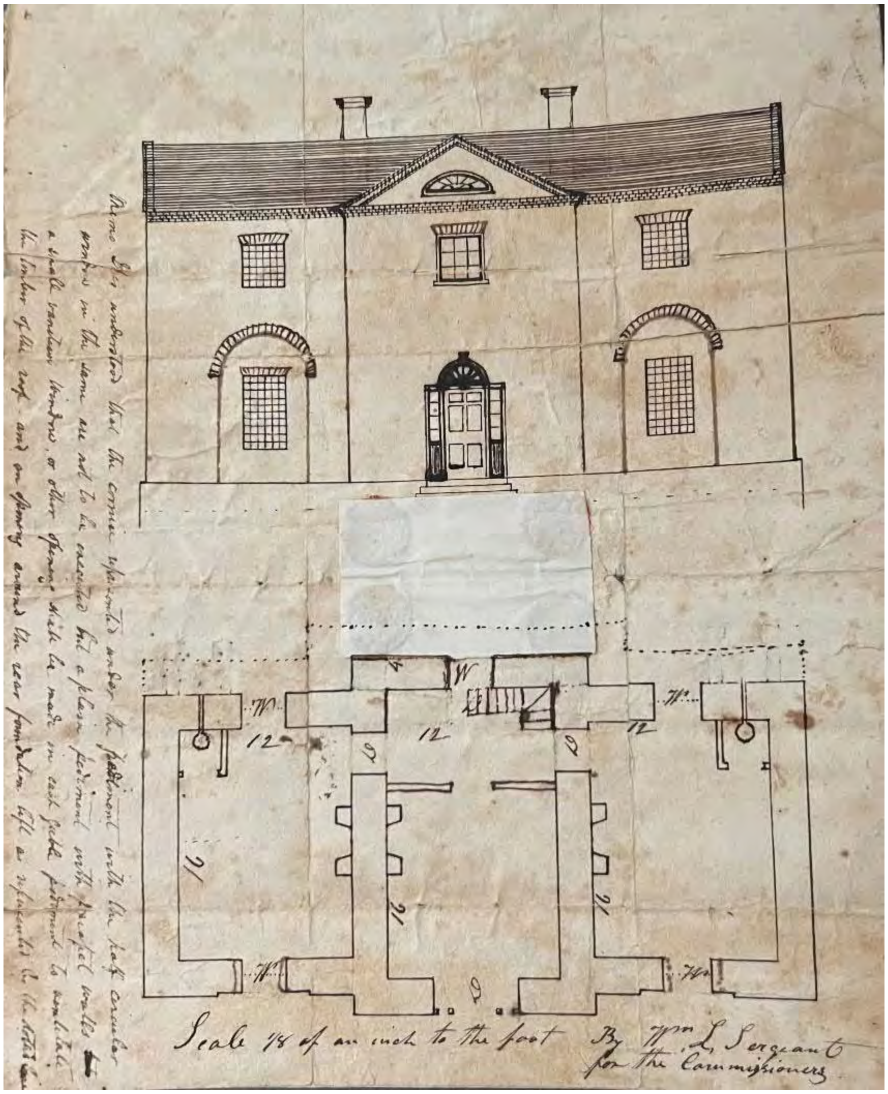

Figure 6. Plan of Jail for Fluvanna County, 1828. FHS.

The Fluvanna County Jail

Because it was so desperately needed, the new county jail was the first structure to be planned and constructed at Palmyra. In June of 1828, John Hartwell Cocke, John M. Wills, James Magruder, Basil M. Jones and James Currin were appointed by the court as commissioners "to draft a plan of a jail for the use of this County." Although the commissioners were assigned as a group to develop a plan, the design and specifications for the jail were written in John Hartwell Cocke's hand and it is believed that he had a leading role in their execution. The plan was approved by the court in August and the commissioners were ordered to advertise and let the project out. John G. Hughes of Fork Union was ultimately hired to build the jail for $2,500 and signed a contract on October 27, 1828. The jail was to be paid for by a new county levy.[10]

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[10] McGehee, "County Seat," 1-6. John G. Hughes had constructed many buildings at Bremo, the residence of John Hartwell Cocke.

According to the contract and specifications, the new jail was to be constructed of stone, measure 21 by 46 feet, stand two stories tall, and possess three rooms each on the first and second floors (Figure 6).[11] Construction of the jail moved slowly. A year after the awarding of the contract, in November 1829 the new jail was inspected and found to be only partially complete. John Hartwell Cocke reported that "the walls had been raised only to the level of the upper floors of the building and…the work had fallen short in so many particulars of the requirements of the contract." Masonry work on the new jail was suspended for the coming winter. Based on the inability of Hughes to adhere to the specifications, a supplemental contract was written with Hughes agreeing to fix certain items before the existing work was received. In March of 1831 the jail was deemed to be complete. However, the commissioners, and particularly John Hartwell Cocke, were less than pleased with the structure.[12]

Awarding of the Contract and Plans for the New Courthouse

While construction of the new county jail was underway, in October 1829 the court appointed the commissioners Walker Timberlake, John Hartwell Cocke, John M. Wills, James Magruder, Basil M. Jones and James Currin "to draft a plan or plans for a Court house for the use of this County."[13] Only a month later in November 1829, John Hartwell Cocke submitted a plan for the new courthouse. The plan was approved and the commissioners were ordered to let the work out, "provided the same can be built according to the said plan for the sum of five thousand five hundred dollars, and if not, upon any other plan which the said commissioners may think equally good that can be executed at less cost than the said sum above referred to."[14]

Although the manuscript plans for the new courthouse have been lost, the construction specifications do exist and provide a detailed picture of how the structure was to appear (see Appendix D). The specifications called for a rubble stone foundation, no less than twenty-seven-inches thick, held together with a strong cement and finished with a hammer dressed stringer [water table] course with square-faced stone extending one and a half inches beyond the façade. The walls of the courthouse were to be constructed of mortared brick of uniform color. The roof was to be framed with square timbers and one-inch-thick planking supporting slate shingles. Doors and window openings were to have cut stone sills. The entablature, including a pediment, was to be composed of knot free heart pine, sanded and painted "to give it the appearance of free stone."[15] Columns and pilasters composed of brick shafts finished with stucco and topped by stone capitals were to grace the front portico. The floor of the portico was to be brick, and similar brick paving was to be used on the interior. Two staircases, one on either side of the court room,

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[11] "Articles of Agreement – Jail Contract." *John H. Cocke Papers, 1725 – 1949*, Box 182. Acc 640, Special Collections Department, University of Virginia Library, Charlottesville, Virginia.
[12] McGehee, "County Seat," 10-17.
[13] McGehee, "County Seat," 19; Grigg, Wood, Browne & Williams Architects, *A Feasibility Study for the Restoration of Fluvanna County Courthouse, Palmyra, Virginia*, 4. (Charlottesville: Grigg, Wood, Browne & Williams, 1973).
[14] "Report of Commissioners," November 23, 1829. B2.2 F9 Oversize / Box 2.2 F8, FHS.
[15] Free stone is a historical architectural term that referred to a type of fine-grained stone, typically sandstone or limestone, which lacked the bedding planes, thereby providing the ability to work the stone in all directions.

were to lead to two second-story jury rooms. The interior walls were to be finished in plain plastering finished with whitewash. The woodwork was to be painted a stone color. Two wood stoves were intended to provide heat for the courtroom while a fireplace served each of the jury rooms.[16]

Almost immediately the commissioners advertised the work, writing to noted regional undertakers with experience in Classical Revival architecture to see if they would put in a bid on the project. John Hartwell Cocke wrote to William B. Phillips, a brick mason and noted contractor who worked on the University of Virginia and who built the Madison County Courthouse (1830), the Page County Courthouse (1834), the Caroline County Courthouse (ca. 1835), and Greene County Courthouse (1838–1839). He also wrote to William A. Howard who worked for Dabney Cosby a contractor who helped to build the University of Virginia and also constructed the Cumberland County Courthouse (1818–1821), the Lunenburg County Courthouse (1827), and the Mecklenburg County Courthouse (1838–1842).[17] William A. Howard politely declined Cocke's invitation, noting that he had built three "within a few years back," and that he was "obliged to decline putting in a bid for your Court House, tho' I feel very grateful for the kind notice you have taken of me."[18] Although it is not clear when Cocke first wrote William B. Phillips, Phillips responses dated to March 1830 occurred after Cocke and Timberlake were awarded the construction project. Phillips declined Cocke's proposal to contribute to the construction project over two issues: how brick work was counted and reimbursed and because Cocke insisted that he hire Bremo's enslaved bricklayers and laborers.[19]

By early December John Hartwell Cocke and Walker Timberlake had begun to pull together a group to undertake the construction of the courthouse themselves. Cocke wrote to a Fluvanna colleague and Wilmington resident, Gideon A. Strange, to see if he might be interested in the venture. In response, Strange replied positively while making some stipulations of his own.

> "With regard to undertaking the work, suggested by you – I am perfectly agreed – if we include Doct Jones – who has in conjunction with myself made some previous calculations on the matter, then we will hold on 1/3 each, giving at the same time employment to all your hands – at a fair price; that can be profitably employed – If you are unwilling to hold as small a portion on this – with the advantage of giving employment to your hands, please say so, in reply to this - From what has passed between Doct. Jones & myself – I do not feel at liberty, to

[16] The columns and pilasters were likely constructed of lower quality brick as they were to be covered in stucco. The original interior paint scheme noted in the specifications does not match the 1977 restoration. Paint analysis is required to confirm the original paint scheme. "Specifications Relating to the Plan for the Court House," n.d. *John H. Cocke Papers*, Box 182.

[17] Calder Loth, "Jeffersonian Temples of Justice," June 3, 2012. Electronic resource: https://www.classicist.org/articles/classical-comments-jeffersonian-temples-of-justice/, Accessed April 9, 2022.

[18] William A. Howard to John H. Cocke, December 2, 1829. *John H. Cocke Papers*, Box 62.

[19] William B. Phillips to John H. Cocke, March 8, 1830; and William B. Phillips to John H. Cocke, March 18, 1830. *John H. Cocke Papers*, Box 63.

> make any other engagement."[20]

By mid-December 1829 Cocke and Timberlake had submitted a proposal to the county court to construct the courthouse themselves. Shortly after their submission, in late December 1829 the Fluvanna County Court approved of the bid, and Cocke and Timberlake signed a contract and took out a bond in the amount of $10,000.

> "The condition of the above obligations is such that whereas the said Walker Timberlake and John Hartwell Cocke have become the undertakers to build a new courthouse at Palmyra in the said County agreeably to the annexed plan and specifications. The said courthouse to be finished so as to admit of holding court therein by the first day of Fluvanna November Quarterly Court next and to be compleated by the twenty fifth day of December next for the sum of four thousand nine hundred and ninety nine dollars."[21]

Perhaps because John Hartwell Cocke may have been out of town, or been unable to make it to court, Walker Timberlake wrote to him on January 5, 1830, declaring "the Building of the Court House is given to us at my bid."[22] The commissioners made their report to the county court in April 1830 noting that they had contracted with Walker Timberlake and John Hartwell Cocke.[23] The commissioners were also authorized "to make any alteration from the original plan and specifications that may seem conducive to the interest of the County and particularly so to alter the original plan and specifications so as to leave a place for a bell and steeple to be placed at the top of the courthouse provided the undertaker will consent thereto."[24]

The Fluvanna County Courthouse was executed in the Greek Revival style, emulating the ancient temples of that early democracy. The courthouse is an early example of the style's application in public buildings. Greek Revival architecture became popular in the United States during the second quarter of the nineteenth century and was used in numerous prominent public buildings throughout the country. The Fluvanna County Courthouse is a Doric order temple-form building possessing four plain stuccoed brick columns at the front portico and stuccoed pilasters set between windows on the remaining facades. The portico is raised on a stone foundation and finished with brick paving. Supported on the columns are a wood entablature ornamented by triglyphs in the frieze and a wood paneled pediment designed to resemble ashlar stone. These wood features were finished with sanded paint. A gabled roof finished with slate shingles covered the building. With the foundation, front steps, windowsills and lintels built of stone, the superstructure was primarily of brick and frame construction. Scholars have noted that the Fluvanna County Courthouse did not adhere to the strict definition of Greek Revival form. Architectural historian Muriel Brine Rogers and others have noted that the building also

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[20] G. A. Strange to John H. Cocke, December 10, 1829. *John H Cocke Papers*, Box 62.

[21] "Contract and Bond for Court House, December 29, 1829." Box 2.2 F7, FHS; McGehee, "County Seat," 20.

[22] Walker Timberlake to John H. Cocke, January 5, 1830. *John H. Cocke Papers*, Box 62.

[23] "Report of Commissioners, April 1830." B2.2 F9, Oversized. FHS; McGehee, "County Seat," 21.

[24] Grigg, Wood, Browne & Williams Architects, *Feasibility Study*, 5-6.

possesses Roman Revival and Adamesque architectural features, suggesting it be considered a fusion of styles. The architectural design created an effective symbol of law, one that was punctuated by a potent statement from the county's leading men; the inscription on the lintel above the front door reads: *The Maxim Held Sacred by Every Free People /Obey the Laws*.[25]

Cocke's design for the new Fluvanna County Courthouse likely had multiple influences. On the one hand, Cocke had a long tradition of Virginia courthouse architecture upon which to draw. As architectural historian Carl Lounsbury notes, most late-eighteenth and early-nineteenth century justices preferred vernacular architectural forms that were common and known to them. Direct copying of neighboring courthouses, particularly those Virginia counties from which a locality was created, was also quite common.

Indeed, the Fluvanna County Courthouse was traditional in its design. It was rectangular in plan with a front entrance and entrances on each long side. Likewise, the interior arrangement followed a traditional layout. Historical architect Milton Grigg noted that in 1829 Cocke wrote William Bolling, a prominent resident of Goochland County, inquiring about the details of the Goochland County Courthouse built in 1826. The specifications for the Goochland County Courthouse were copied and sent to Cocke. They note that the Goochland County Courthouse was to be modeled after the Buckingham County Courthouse and was to be 36 by 48 feet in dimension, a projecting 10-foot-wide portico, four columns of plastered brick with stone bases and caps, stone sills at doors and windows, and two chimneys. The interior was to possess a brick floor. Based on this document it is likely that design of the Goochland County Courthouse had a strong influence on the Fluvanna County Courthouse. However, Cocke was already very familiar with Classical Revival architecture. His Upper Bremo residence, completed in 1820 by John Neilson in collaboration with Cocke, was designed in the Palladian style using the Tuscan order. Many other buildings at Bremo also possessed classical architectural elements.[26]

Beyond the courthouse proper, there is evidence to suggest that Cocke's 1830 design for the court seat also included a pair of flanking supporting buildings. Following two unanswered court orders requiring the appointed commissioners to design a plan for and to let out the construction of a clerk's office within the enclosure, the commissioners led by county clerk Abram Shepherd finally took action in late 1835. In reporting to the court, the commissioners recommended the construction of one outbuilding adjacent to the courthouse. Although two supporting outbuildings were needed, a second building was deemed to be too costly to the public.

[25] Muriel Brine Rogers, "John Hartwell Cocke (1780-1866): From Jeffersonian Palladianism to Romantic Colonial Revivalism in Antebellum Virginia," 80-86. Masters Thesis, Virginia Commonwealth University, 2003; See also Marcus Whiffen, "The Early County Courthouses of Virginia," 10. *Journal of the Society of Architectural Historians*, Vol. 18, No. 1 (March 1959): 2-10.

[26] Lounsbury, *The Courthouses of Early Virginia*, 181, 183, 189; McGehee, "County Seat," 19-20. A 1978 *Daily Progress* article quotes Milton Grigg as noting that "it is modelled very closely on the original Buckingham County courthouse since the agreement reached with the governing body and the builder follows almost word for word a description of the Buckingham building, which burned in 1869." See Woody Greenberg, "Fluvanna Rededicates Courthouse." *The Daily Progress*, October 28, 1978. B36.1 F10, FHS; Rogers, "John Hartwell Cocke," 81-82; Col. William Bolling to John H. Cocke, December 1829. "Goochland County – Courthouse Specifications and Roads. *John H. Cocke Papers*, Box 182.

> Your Commrs will suggest that *the Commr who drafted a plan for the Courthouse* [John Hartwell Cocke], *originally intended to connect with it two offices by means of covered ways, which plan was not carried out, because it was tho't too expensive*. – Your Commrs now think that the original plan carried out except the connection by covered ways would add to the beauty of the main building, but consider that expense would be greater than they ought to burden the County with & think it best only to build one office at the cost of the County to be situated 18 feet in front of the door on the East side of the Courthouse, if the situation of the Chouse enclosure will allow it, if not as far as possible. – They would further suggest, that Abraham Shepherd one of your Commrs is willing to build an office on the opposite side of the Courthouse of the same dimensions and workmanship precisely as the one which they recommend for the use of the County, with the understanding that said Shepherd is to have and enjoy the use of the House until such time as the Court may wish to have the use of it, in consideration of building it, and whenever the court may wish to use it they shall have the right to it upon paying said Shepherd, the original cost [Emphasis added].

The reference to a 'plan' drafted by a former commissioner is likely John Hartwell Cocke's 1830 design for the courthouse. In addition, the language used by the commissioners to describe that plan, that it "originally intended to connect with it [the courthouse] two offices by means of covered ways," clearly implies that Cocke was also considering the placement of the courthouse within the larger grounds and its arrangement with at least two supporting outbuildings, one each on its eastern and western sides. If accurate, this plan would have reflected his preference for Palladian symmetry in design, as well as conforming to another long-standing tradition of a separate space for court records within the courthouse grounds.[27]

Construction of the New Courthouse

According to Lounsbury, most undertakers of public buildings in Virginia were local men of prominence who were active in county affairs, may have donated land for the courthouse, and had varying degrees of building experience. John Hartwell Cocke and Walker Timberlake fit this profile precisely. Both were men who were active in local politics and government and came from prominent Fluvanna County families. Walker Timberlake actively worked to move the court seat to Palmyra and donated four acres of land for the public buildings. Both men had extensive experience designing and building private structures for themselves and family members.[28]

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[27] McGehee, "County Seat," 27-28; Court Order, September 28, 1835, FHS Box 3, Folder 4; Lounsbury, *Courthouses of Early Virginia*, 299-300.

[28] Timberlake was frequently appointed to oversee by the county court, including the jail in 1817, supervised a new jail in 1819 and repairs to the courthouse in 1821, as well as a number of roads and bridges. He built his first home, "Rising Sun," and around 1825 he built a brick residence and tavern in Palmyra. See Bearr, "Timberlakes," 18-19, 24; Lounsbury, *Courthouses of Early Virginia*, 194-197.

Initial preparation for construction of the new courthouse began nearly immediately after the contract was let in late 1829. In an early January 1830 letter to John Hartwell Cocke, Walker Timberlake conveyed his eagerness to begin, discussing the need for certain activities that could be undertaken during the mild winter weather.

> …I shall send to you tomorrow or next day for some help to throw up dirt & commence getting brick wood, I must see you immediately on your return home to aid me in making out a bill of timbers to be gotten forthwith – I shall be selecting some for sash & blind which I shall saw 2 inches thick – I wish to lose no time in getting the timber - & I think if the weather continues mild we had better dig out the foundation & lay the rock part – you must be here before I commence that – when will you be at home?
>
> We ought to make a bill of the best stone necessary & engage that to be done, I think we can get hammered stone for the range on top of the stone wall.[29]

From the beginning, Walker Timberlake and John Hartwell Cocke had intended to use their own enslaved African-American labor to perform both skilled and unskilled work required for the construction project. According to Lounsbury, the use of enslaved carpenters, stonemasons, brickmakers, and bricklayers was quite common for 'gentlemen undertakers' of public buildings. Walker Timberlake's request to John Hartwell Cocke for "some help to throw up dirt & commence getting brick wood" was a direct reference to servants or enslaved African Americans. Indeed, a week later, John Hartwell Cocke Jr. wrote to his father noting the request for assistance. Cocke Jr. reported that:

> "I did not hear until the day before yesterday that Mr. Timberlake and you had got the contract for the C. H. – he wrote me a note desiring that I would send over two of your hands to aid him in getting the earth & wood ready for the bricks – I sent Charles & Toby and wrote him that there were several others here whom I had no doubt you would be glad to see at work with him as soon as possible."[30]

Charles and Toby were just two of Cocke's enslaved laborers who were sent to assist Walker Timberlake in preparing for the construction project. In addition to Charles and Toby, it is likely that many other enslaved men owned by both Timberlake and Cocke assisted in the preparation work. Examination of the 1830 Census and Personal Property Tax Records for Fluvanna County document that each of these men held significant numbers of enslaved African Americans (Table 1). In the case of John Hartwell Cocke, many of these were skilled craftsmen that he regularly leased out.

[29] Walker Timberlake to John H. Cocke, January 5, 1830. *John H. Cocke Papers*, Box 62.

[30] John H. Cocke Jr. to John Hartwell Cocke, January 11, 1830. *John H. Cocke Papers*, Box 62; Lounsbury, *Courthouses of Early Virginia*, 197.

Owner of Enslaved	*1830 U.S. Federal Census*	*1830 Fluvanna County Personal Property Tax Records*
Walker Timberlake	27	16
John Hartwell Cocke	146	93

Table 1: Total Enslaved Men, Women and Children owned by Walker Timberlake and John Hartwell Cocke in 1830.[31]

The work conducted in the early months of 1830 was largely unskilled physical labor that entailed the identification, felling, and preparing of trees for use in burning bricks as well as future use as lumber in the courthouse. Likewise, clay for use in brickmaking had to be located, dug out, and prepared for firing. Lastly, according to the contractor's specifications, the foundation for the new courthouse had to be excavated to a minimum depth of eighteen inches below a "dead level" grade for the entire footprint of the building.[32]

By the end of January 1830, Walker Timberlake was preparing for the construction of the stone foundation. On January 20th he again wrote John Hartwell Cocke requesting his advice on where to get the required stone and inquiring about his enslaved stone cutter.

> We had better send on & have the Stone Cut – I have been thinking we could get Rock of excellent quality just below Columbia and have it cut on some better terms than to send to the Man you proposed – Mr. Brockenbrough told me he had an Excellent Stone Cutter if yours could not do all you have to do and that too we may get his. But this is only a suggestion – I should also think that if we can get stone cut at 75 & ½ ~ foot we may get it lower at the same place Hammer dressed – which will not look quite as well but would be as durable – this is also a suggestion only.
>
> The Rock I speak of just below Columbia is such as Mr. Wood got for his Locks which is hard & will split 10 or 12 feet long – no veins or Joints in it – My Object is to Economise. I submit the matter entirely to you – The bringing up of the stone is a small matter I have a Boat of my own & many others return Boats would take …a load very soon [sic].[33]

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[31] The difference in numbers of enslaved African Americans lies partly in the fact that the U.S. Census counted everyone, and the personal property tax records counted only those individuals 12 year or older, as well as omitting those enslaved leased for a term to other individuals.

[32] "Specifications Relating to the Plan for the Court House," n.d. *John H. Cocke Papers*, Box 182.

[33] Walker Timberlake to John H. Cocke, January 20, 1830. *John H. Cocke Papers*, Box 62. Arthur S. Brockenbrough was the Proctor of the University of Virginia in 1830. The stone cutter that Timberlake was referring to was an enslaved man owned by Brockenbrough named Thrimston Hern. Hern was originally owned by Thomas Jefferson but purchased by Brockenbrough after his 1826 death. Hern was trained as an apprentice under stone mason John Gorman who completed many projects for the University of Virginia. Brockenbrough purchased Hern in 1829. "I have purchased Mr. Jefferson's stone cutter at $600. He is fully competent to do the work of the Rotunda Steps. (Arthur S. Brockenbrough to John H. Cocke, January 6, 1829, *John H. Cocke Papers*).

While the quarrying of stone required significant unskilled labor, the selection, splitting, and finishing of stone for a construction project required a skilled stone cutter. Several enslaved laborers owned by Cocke and residing at Bremo possessed the knowledge and skill required to construct the foundation for the Fluvanna County Courthouse. Although the names of the specific enslaved stone cutters and their assistants who worked on the courthouse are not known, it is likely that Timberlake and Cocke utilized their own enslaved labor wherever possible. Peyton Skipwith, Anthony Creasy, and Charles Morse were enslaved stonemasons who had worked for Cocke on other structures at Bremo and had been hired out on other regional projects.[34]

The stone used in the courthouse foundation likely came from a local source to reduce transportation costs. Timberlake's January 20th letter suggests using an active quarry located below Columbia on the James River where a hard, relatively vein-free stone could be retrieved. Likewise, Cocke had a local quarry that he used to construct buildings on his Bremo plantation. The stone used in the door and windowsills, as well as in the capitals on the columns is of a higher quality and was likely acquired from a different source.[35]

Bricks too had to be made for the courthouse walls and portico columns. Brickmaking incorporated both skilled and unskilled labor, primarily utilizing enslaved young boys and men. Brickmaking in the early nineteenth century was a labor-intensive process. Clay had to be quarried by hand, an arduous task. The clay was then soaked in water and kneaded or tempered until reaching the proper consistency. Kneading of the clay was generally done in a small pit by treading and stomping. At the University of Virginia this process, at least early on, was noted to have been done manually using spades in small piles. Other ingredients such as sand and lime were also added to the clay to ensure proper consistency and firing. The clay was then packed into wooden molds to form the desired bricks. The excess clay was scraped off the top of the molds. The bricks were then ejected and dried in the open for a few days. After initial drying, the bricks were stacked under shelters for a period of several weeks to allow for even and consistent drying. Burning of the bricks could occur in a proper kiln, generally a masonry structure, or be fired in a clamp, a large stack of bricks designed to be fired as is. Bricks would be fired at temperatures of approximately 1800 to 1900 degrees Fahrenheit for a week or more. After burning and controlled cooling, the bricks were sorted by quality and color. The typical fuel used to fire a kiln was wood.

Brickmaking was an inherently seasonal process as it was conducted outside in the open air. Clay was usually dug during the fall and left to settle over the winter. Tempering and molding of the clay began in the spring and lasted through the fall. Firing of bricks occurred as needed throughout the year. Winter was typically a down time with little or no brick production occurring. Due to the seasonal nature of production, laborers of all skills were hired on a

[34] Thanks to Andi Cumbo who provided information on the skilled enslaved laborers owned by John Hartwell Cocke and residing at Bremo. Charles Morse's surname is also spelled 'Moss,' and 'Morris.'

[35] Based on the location described in the letter, the quarry Timberlake is referencing was likely Cowherd's Quarry. The stone sourced for the capitals, sills, and lintels may have come from the same source as the stone used at Bremo, but additional research is needed to confirm this supposition. McGehee, "County Seat," 22.

temporary, seasonal basis to work in the brick yard.[36]

The bulk of the labor involved in brickmaking in pre-Emancipation Virginia was conducted by enslaved African Americans. In a March of 1823 letter to John Hartwell Cocke, Proctor of the University of Virginia Arthur S. Brockenbrough requested the use of "one or two brick moulders and a few boys that would answer as bearers off, which you wish to hire out." Brockenbrough noted that he was making arrangements "to have the greater part of the bricks for the Rotunda made by the laborers hired by the year, and would be glad to get your hands if you are disposed to hire them to this institution."[37] On April 14, 1823, Cocke replied that he was sending Charles, an experienced brick maker, and six 'boys:' Anthony, Giles, Mike, Frank, Mat & Ben. Describing their experience, he continued:

> All [of the boys]…have had more or less experience in bearing off bricks – but any arrangement you may make will be satisfactory to me. …Should you want another moulder, in the course of 2 or 3 months I shall probably be able to spare one – and I shall be particularly anxious to do so provided there would be a prospect of employing them at some period in the course of the work in laying bricks at which they are both rough hands.[38]

Charles and the six boys were discharged by Brockenbrough at the end of the brickmaking season on October 4, 1823.[39] Frank Randall, an enslaved brick mason owned by John Hartwell Cocke and residing at Bremo, also may have assisted on constructing the Fluvanna courthouse.[40]

The roof for the courthouse was to be covered in slate from the well-known Buckingham County, Virginia slate quarries. In early 1830, John Hartwell Cocke wrote Finch Scruggs, who operated a quarry near Bridgeport on Slate Creek in Buckingham County, inquiring about the availability of slate for the courthouse. Scruggs wrote back on March 23, 1830, noting that he could "deliver at Palmyra the quantity of slates you mention." Presuming that Mr. Jones was to do the slating for the project, he recommended that it might "suit his convenience to attend to its measurement here." Scruggs closed his communication by requesting that Cocke "ascertain as soon as practicable the exact number of squares you may want," as he was closing out his slate business.[41]

In May of 1830 the courthouse foundation was well underway. In an interesting letter to John Hartwell Cocke, Walker Timberlake revealed an omission in superintending construction of the stone foundation.

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[36] Kathleen A. Watt, "Nineteenth-Century Brickmaking Innovations in Britain: Building and Technological Change," 28-29. Ph.D. Thesis, The University of York, 1990.

[37] Arthur S. Brockenbrough to John H. Cocke, March 13, 1823. *John H. Cocke Papers*, Box 38.

[38] John H. Cocke to Arthur S. Brockenbrough, April 14, 1823. Box 3. *Papers of the Proctor of the University of Virginia [Proctor's Papers]*, RG-5-3. Special Collections Department, University of Virginia Library, Charlottesville, Virginia.

[39] Arthur S. Brockenbrough to John H. Cocke, October 4, 1823. *John H. Cocke Papers*, Box 39.

[40] Thanks to Andi Cumbo who provided information on the skilled enslaved laborers owned by John Hartwell Cocke and residing at Bremo.

[41] Finch Scruggs to John H. Cocke, March 23, 1830. *John H. Cocke Papers*, Box 63.

> I have been truly astonished at myself for an omission made in laying the foundation of the Courthouse and that it has been overlooked and unnoticed by so many – I mean in laying the cross wall for the main body of the House cutting off the Portico
>
> – the reason I omitted it in laying off the foundation at first I will recollect was, that the size of the Portico not being marked on the Dft. I could not trust my memory to say whether it was 10 or 12 feet and there being no scale to the Dft I could not correctly ascertain it & after that it intierly went out of my mind until Saturday night
>
> – I have now by measurements of other parts of the Dft made it out 10 feet and am digging out the foundation – and when we lay the stringing course [on the Courthouse foundation] we will lay that. I suppose on that [Portico foundation] there is to be no stringing course at all [sic].[42]

As the stone foundation was nearing completion, Timberlake was also preparing for the arrival of a skilled carpenter who would complete the construction of particular details on the courthouse. By May 1830, John Hartwell Cocke had apparently intended to hire a local carpenter John M. Kie to finish the entablature. In a May 1830 letter to Cocke, Timberlake expressed his great displeasure with the choice of Kie to work on the project.

> I have been thinking more of the contract with M Jno M Kee and hope you will not think from any remarks I am about to make that I do not hold any contract binding & sound which you have made or extend into, I would not by any means throw you into any difficulty. But I wish to know whether there is a full understanding with M Kee as to the length of time he is to work; you said in your note he was to do the Entabliture – is that all! But with me the greatest difficulty is the use of ardent spirits
>
> – If he yields to passion when touched on that subject, I am sure we shall not continue long together, as I suppose you told him or he understands I am superintending the work. …If he boards at my boarding table, he can't have it [ardent spirits] then – If I board him with Randall when I board M McMullin & have boarded a good many of the family are none & will not suffer it to some in their house or to their table. …I wish there to be a full understanding with M Kee at least
>
> – and if he cant agree to come into the Rules of the place where there is so many hands, it shows he does not regard my interest or feelings and such a man and myself could not agree long. Why would he expect or wish me to sacrifice and give up so important a Rule? Only to gratify his propensity – I have employed many men and many intemperate ones too, but I have always been respected by them, and never found them passionately to refuse to comply with any Rule of the kind

[42]Walker Timberlake to John H. Cocke, May 24, 1830. *John H. Cocke Papers*, Box 63. Examination of the portico foundation found that there is indeed a stringing course, or water table, perhaps suggesting that Cocke corrected Timberlake after receiving this letter.

that I might make. …You have my thoughts fully on the subject & hope you will receive them as I intend & make such use of them as you please [sic].[43]

Enslaved carpenters owned by John Hartwell Cocke may also have assisted John M. Kie on the entablature and other tasks such as framing and interior woodwork. Two young enslaved men, Armistead Hewitt, a carpenter, and Leander Creasy, a carpenter's apprentice, could have been employed to labor on the Fluvanna County Courthouse (Table 2).[44]

Names	*Role in Construction*	*Status – Race*	*Association*
Walker Timberlake	Superintendent	Free - White	Documented
Charles	Excavation, cutting brick wood, digging brick clay	Enslaved – Black	Documented
Toby	Excavation cutting brick wood, digging brick clay	Enslaved – Black	Documented
Peyton Skipwith	Stonemason	Enslaved – Black	Possible
Antony Creasy	Stonemason	Enslaved – Black	Possible
Charles Morse/Moss/Morris	Stonemason	Enslaved – Black	Possible
William McMullen	Brick mason	Free – White	Possible
Frank Randall	Brick mason	Enslaved – Black	Possible
Mr. Jones	Slate roof	Free – White	Possible
John M. Kie	Carpenter	Free – White	Possible
Armistead Hewitt	Carpenter	Enslaved – Black	Possible
Leander Creasy	Carpenter's apprentice	Enslaved – Black	Possible

Table 2: Free and Enslaved Individuals Involved in Building the Fluvanna County Courthouse[45]

By June of 1830 the Sheriff of Fluvanna County made the first of four annual payments in the amount of $1,249.75 to Walker Timberlake and John Hartwell Cocke for their work on the courthouse.[46]

[43] Walker Timberlake to John H. Cocke, May 24, 1830. *John H. Cocke Papers*, Box 63. It is not clear if John M. Kie was kept on as a carpenter for the project particularly following Walker Timberlake's complaint. However, a daybook of John H. Cocke's notes a March 30, 1831 entry "[pd to] J. M Kie, balance in full of his a/c for work at Palmyra - $13.25" suggesting that he did contribute to the construction of the Courthouse. See *John H. Cocke Papers*, Daybook 1830-1831, Mss 640, Box 190. A brick mason named William McMullen did a considerable amount of piece work for the University of Virginia during the mid-nineteenth century. A William McMullen is noted as a resident of Fluvanna County in the 1830 U.S. Census adjacent to Walker and John H. Timberlake and John Shepherd. It is likely that it was this William McMullen who also assisted with the brick work at the new courthouse.

[44] Thanks to Andi Cumbo who provided information on the skilled enslaved laborers owned by John Hartwell Cocke and residing at Bremo.

[45] This table reflects the documented and probable presence of both free and enslaved individuals that are, or are likely to have been, associated the construction of the Fluvanna County Courthouse. For enslaved laborers, the fact that they were owned by John Hartwell Cocke, were of an appropriate age, and that they possessed a skill and the experience required for the project suggests the likelihood that they may have contributed to its construction.

[46] McGehee, "County Seat," 25.

Very little information exists recording the progress of construction of the courthouse between May of 1830 and March of 1831. However, in the Spring of 1831, John Hartwell Cocke notified the commissioners overseeing the construction that the courthouse was ready to be accepted. In a March 28th report to the court, the commissioners met with Walker Timberlake and John Hartwell Cocke to review the project against the required specifications. Despite missing the completion date, the commissioners presented an overwhelmingly positive approval of the undertaker's accomplishments.

> We commenced our examination of the building at the base and carefully examined the whole house throughout both the interior and exterior as well also the additional work directed by the commissioners in the progress of the work for the greater durability convenience and comfort of the building which will be seen by the bill for the same which accompanies this report and which we have allowed believing to be reasonable and have cause to the following report - 1st that the building was not completed by the time specified in the contract which was delayed by providential and unforeseen causes first the unparalleled drought of the summer which deprived the undertakers of the advantage of getting stone and other heavy articles up the river, secondly the long and continued rains of the autumn and thirdly the long and continued snow and cold of the winter which presents a sufficient and satisfactory reason to your commissioners for the delay in finishing the work agreeable to the time specified in the contract - 2nd we find that upon the examination made as aforesaid that the whole of the said work is executed and finished not only in a faithful and strict compliance with the said contract in every respect but so as to endure us to add in justice to the undertakers our unqualified attestation in their favour for the manner in which they have performed their contract and moreover to say that in our opinion they deserve well of their Countrymen for the superior quality of the materials used for the building and the superior stile in which the whole work is executed all of which is respectfully submitted."[47]

A full year after the acceptance of the courthouse, Timberlake and Cocke began to settle their expense accounts with each other as partners. On March 31, 1832, the parties agreed to the labor, cash advances for materials, and interest on the advances over the course of their partnership. Their statement of expenses recorded a profit of $120.39 which left them with $60.19 ½ cents each. It should be noted however that both Cocke and Timberlake received compensation for the hire of their enslaved workers. For both his own and his enslaved laborers work, Walker Timberlake was paid $699.29. For both his own and his enslaved laborers work John Hartwell Cocke was paid $1,014.27. In addition to profiting off their enslaved laborers, these payments also offset the expense involved in feeding, clothing, housing, and obtaining medical care for their chattel, and thus were a substantial financial benefit to Cocke and Timberlake as well.[48]

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[47] "Report of Commissioners, March 28, 1831." Box 2.2 F11, FHS.
[48] "Settlement of Accounts, April 1, 1832." *John H. Cocke Papers*, Box 70.

<u>The Courthouse Bell</u>

As noted in the orders given to the commissioners who oversaw the construction of the courthouse, the undertakers were required to “leave a place for a bell and steeple to be placed at the top of the Courthouse.” The county court approved a $60 levy specifically for the acquisition of a bell and the completion of its mounting. In October 1832, the court ordered Walker Timberlake to finish “the roof of the Court House according to the original plan…and to furnish a bell suitable thereafter.”[49]

It is not exactly clear when the bell was acquired and mounted on the top of the courthouse. In a March 6, 1833, letter to John Hartwell Cocke, Timberlake inquires of him whether he was still willing to sell his to the county for installation on the courthouse.

> …I should not have called on you for the bell but was informed that the Court called on you to know if you would furnish it at the time the order was made and you replied you would do so tho you thot it hardly necessary. I therefore considered your promise to the Court, such as to require me to call for it, and my wish has been for you to make the iron or gallows for it & I would send over for it. I have Stratton now here doing some repairs to the Courthouse and he has made a ladder prepatory to putting the bell up. I should be glad to get it up by March Court. If however you can’t spare yours I must send for one but do not like to get a less one – I can send for one of same size and replace it if you wish it – you will no doubt recollect I spoke to you about it & you then seemed indifferent or wished not to sell it. Yet I was told you promised it to the Court.[50]

Timberlake’s letter implies that the bell for the courthouse was not made new and ordered from a bell-making firm but rather was taken from John Hartwell Cocke’s Bremo estate.[51] The design of the steeple which enclosed the bell referenced in the earlier order is not known.

A year later in 1834, two lightning rods were purchased and installed on the courthouse structure.[52]

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[49] Grigg, Wood, Browne & Williams Architects, *Feasibility Study*, 5-6; McGehee, “County Seat,” 29.

[50] Walker Timberlake to John H. Cocke, March 6, 1833. *John H. Cocke Papers*, Box 73.

[51] Milton Grigg has stated that the bell installed on the Fluvanna County Courthouse was supposed to be a copy of the bell on the University of Virginia’s Rotunda. To date, no evidence has been found to suggest this.

[52] McGehee, “County Seat,” 30. No physical evidence for lightning rods were found upon examination.

Figure 7. Courthouse, looking north with adult and child on front steps. Undated, ca. first decade of the twentieth century. Box 36.1, Folder 8, FHS.

Documented Alterations and Repairs to the Courthouse 1831 – 1900

A limited number of alterations to the interior and exterior of the courthouse were completed during the nineteenth century. In June of 1831, and only three months after moving in, the Court authorized unknown minor expenses totaling $10 to the bar. Additional unknown changes to the bar were again ordered by the Court in 1848.[53] Significant repairs to the courthouse itself were undertaken near mid-century. In November of 1847 unidentified repairs to the roof and interior ceiling plaster were undertaken, presumably due to leaks. Again in 1854 similar repairs to the interior plaster ceiling were again made and the interior walls received a new coat of whitewash. By 1860, carpeting was ordered to cover the floor of the courthouse. In 1871 the gutters to the courthouse underwent unidentified repairs.[54] In the last decade of the nineteenth century, it is believed that the plaster ceiling in the courtroom was removed and replaced with a wood plank ceiling. Around this time, the Board of Supervisors also approved the painting of the interior and exterior of the courthouse (Figure 7). William Sclater supervised the work.[55]

[53] McGehee, "County Seat," 29.

[54] McGehee, "County Seat," 29-30. It is not clear what is meant by gutters here, either the roof eaves or at the base of the building.

[55] Board of Supervisors Minute Book 2:35, June 10, 1897.

Documented Alterations and Repairs to the Courthouse 1900 – 1975

Minor alterations were carried out to the courthouse in the early twentieth century. These changes included unidentified repairs "upon the building of the Courthouse" as well as the addition of a new carpet on the interior floor.[56] In 1913, unidentified repairs were made to the buildings within the courthouse yard due to damage caused by children playing baseball in the grounds. In the same year, two new wood stoves "for the use of the Courthouse" replaced the existing old ones.[57]

By the end of the first quarter of the twentieth century, significant alterations were accomplished in the arrangement of the first-floor interior of the courthouse. In 1919 the Board of Supervisors authorized a plan that modernized and rearranged the pre-Emancipation setting of the judge, jury, attorneys, and clerk. The plan included making unidentified changes to "the judge's stand, clerk's desk, and the jury box" as well as the bar. In the same year, the carpets were also replaced with linoleum up to the bar railing.[58]

In September of 1937, Works Progress Administration historian R. E. Hannum visited the historic courthouse and grounds to document the structure (Figure 8). She described the then century old courthouse in great detail:

> The building is rectangular in shape, 40 by 60 feet. It is a brick building laid in Flemish bond, one story high with a gabled roof covered with slate. There are four brick chimneys, two on the east side and two on the west side. The outside cornices are plain wood. There are ten large windows and ten smaller windows, all with slatted shutters. There are four large windows to a side; the small windows are above the large ones and over the end doors, and two on the north end. The building faces south; it has four stone steps leading up to the porch which has two-story plain columns; there are four of these across the front. Two large double doors open from the porch to the hallway which goes across the front. These doors have iron locks and brass knobs. At each end of the hall there are double doors. Between the hall and the Court room proper there is a paneled wall with swinging doors at each end; in the center there are large double doors that can be thrown open for special occasions.
>
> On each side of the room there are open string stairways; they are of one flight with a small landing half-way up. There is a balcony across the front with two jury rooms opening off from it. These rooms are 18 by 18 with a fireplace in each one and two windows; one on each side of the fireplace, which are on the east and west walls.

[56] Board of Supervisors Minute Book 2:223, Mary 26, 1908.
[57] The furnaces are believed to have been located in alignment with the two northern chimneys. Board of Supervisors Minute Book 2:380, September 3, 1913.
[58] McGehee, "County Seat," 29.

Figure 8. Courthouse, looking north-northeast. R. E. Hannum, Works Progress Administration, September 7, 1937. Box 36.1, Folder 6, FHS.

> Large folding doors make it possible to have these rooms as one. There are two large plain columns supporting the balcony and jury rooms. The Judge's bench is at the north end of the Court House and to his right is the Jury box and to his left is the Clerk's desk; across the front of these is a railing with rail about eight inches wide and heavy turned balusters; there is also a railing dividing the space for council from the rest of the room; this is the same type as that just described.[59]

Hannum's description and an accompanying photograph document that by 1937 at the latest, the three original front stone steps of the courthouse were underpinned with a fourth concrete step. This alteration is believed to be associated with the re-landscaping of the front entrance to the court that Hannum describes as a "wide brick walk bordered with dwarf box" (Figure 8).[60]

Throughout the twentieth century, the Fluvanna County Courthouse continued to serve as an important authority in reinforcing heritage, tradition, and civil government (Figures 9 and 10). In 1957, during the statewide 350th celebration of the founding of Jamestown Colony, a government-sponsored Courthouse Day was held as part of the broader Fluvanna Festival at the courthouse

[59] Although the doors separating the jury rooms are described as folding, it is unclear if Hannum was actually referring to the hinged doors arranged to create an operable wall of sorts. R. E. Hannum, "Fluvanna County Court House," September 7, 1937. Virginia Historical Inventory Project, Library of Virginia, Richmond, Virginia.
[60] Hannum, "Fluvanna County Court House," September 7, 1937.

and on the courthouse grounds. The well-attended festival publicly celebrated the seventeenth-century origins of Virginia, but also the social, military, and governmental history of Fluvanna County. Festival attendees were entertained by the county high school band and African-American students from Abrams Negro School. The charter of Fluvanna County was reviewed, Dr. R. E. Loving read a history of 'Fluvanna Milestones,' and Fluvanna veterans who "fought for State's Rights and Individual Liberty" were celebrated during the presentation of a Confederate flag.[61] During hours when the court was not in session, the courthouse also served a civic role, hosting numerous group meetings. In 1957, the courthouse hosted a planning meeting for the Fluvanna County Fair.[62]

Figure 9. Courthouse, looking north. Undated, mid-twentieth century. Box 2.2, Folder 9, FHS.

Figure 10. Courthouse, looking northeast. February 1957. Earliest view of bell enclosure. Box 2.2, Folder 9, FHS.

[61] "Courthouse Day Scheduled in Fluvanna June 8," *Scottsville (Virginia) Sun*, May 23, 1957. Box 36.1, Folder 8, FHS.
[62] Fluvanna County Fair Board Meeting, 1957. Box 36.1, Folder 8, FHS.

Late Twentieth-Century Restoration and Expansion – The Firm of Grigg, Wood, Browne & Williams

Led by the Fluvanna Historical Society, in January of 1971 the Fluvanna County Courthouse District (032-0040) was placed on the Virginia Landmark Register. In September of the same year, the district was also placed on the National Register of Historic Places.[63]

Recognizing the court's need for additional space and a modern courthouse, yet acknowledging the desire to preserve a significant structure, the Fluvanna County government considered the options available to it. In October of 1972 Calder Loth of the Virginia Historic Landmark Commission visited the courthouse and agreed with the need for both interior and exterior renovation. He recommended that the county hire "an architect well versed in the Jefferson-Cocke style to survey the building and to provide cost figures" for its updating and restoration.[64] In December of 1972 Milton Grigg, then a senior partner in the prominent Charlottesville firm of Grigg, Wood, Browne & Williams, visited the Fluvanna County Courthouse to tour the facility and provide guidance to the county.[65] In a letter to the director of the Fluvanna Historical Society, Grigg recommended the preservation of the historic structure. The letter also noted the availability of federal grant programs to aid important restoration projects.[66] The following year, Grigg's firm was hired to conduct a feasibility study assessing the cost of conducting a restoration of the courthouse. The study concluded that the Greek Revival courthouse and its dependencies were unique in the commonwealth as a unit, and that the courthouse itself was generally well-preserved with few alterations from its original form. Grigg recommended a program of adaptive restoration and preservation.[67]

Following a commitment of funding from Fluvanna County, a matching grant from the Virginia Historic Landmarks Commission, and the receipt of a grants-in-aid award from the federal government, work was begun on the Fluvanna County Courthouse in the Spring of 1977. On the recommendation of Milton Grigg, Fluvanna County approved the excavation of a new basement underneath the existing historic structure. Excavation work began on October 7, 1977. Reinforced concrete masonry blocks comprised the basement retaining walls and a new concrete floor slab-on-grade was poured. The new basement space contained a judge's office, a jury room, a

[63] Virginia Historic Landmarks Commission, *Fluvanna County Court House Historic District*. National Register of Historic Places Inventory – Nomination Form. (Washington D.C.: National Park Service, 1971).
[64] Calder Loth to Mrs. Thomas T. Loving, Fluvanna Court House and Grounds Committee, October 26, 1972. B36.1 F9, FHS.
[65] Milton Grigg had an extensive background in historic reconstruction and preservation working at Colonial Williamsburg in the 1930s among many other places. His Charlottesville architectural firm was known for preservation projects.
[66] Milton Grigg to Virginia Snead, December 18, 1972. Full Citation, Box 36.1 Folder 9, FHS.
[67] Grigg, Wood, Browne & Williams, *A Feasibility Study for the Restoration of Fluvanna County Courthouse, Palmyra, Virginia*. (Charlottesville: Grigg, Wood, Browne, & Williams, 1973).

Figure 11. View of courthouse from southeast. July 31, 1977, Daily Progress, B2.2 Folder 12, FHS.

conference room for the attorneys, bathrooms, and a mechanical room.[68] All interior walls in the basement were concrete block masonry as well. Interior restorations to the courtroom and jury rooms included the removal of existing brick and wood floors, the repair and repainting of all plasterwork, repainting of all woodwork, the relocation of the bar, and the replacement of existing seating with traditional benches. Due to the presence of a new basement, a new brick floor was installed on steel decking set on steel joists. Wood flooring was salvaged and reinstalled on wood framing for the bar area and the judge and jury boxes.[69] During sanding of the wood floors, markings revealed the historic location of the witness block and circular rails of the bar at the base of the gallery. The marks were left in the refinished pine floors.[70] Exterior work on the courthouse included the repointing of brick and painting of woodwork and stucco along with service improvements to accommodate the new basement.[71]

In June 1978 the restoration program was nearing completion with only minor interior details such as carpeting and new chairs remaining. In late October of 1978, the renovated Fluvanna County Courthouse was rededicated at a ceremony sponsored by the Point of Fork Chapter of the Daughters of the American Revolution.[72]

[68] Architect's Field Report, October 7, 1977; November 23, 1977, December 29, 1977. B36.1 F10, FHS. The only other option of expanding the old Courthouse was to build an addition on to it. This would have jeopardized the integrity of the historic structure and Grigg did not recommend it.
[69] Joseph Yates to Richard Mehring, March 3, 1977. B36.1 F10, FHS.
[70] Architect's Field Report, April 21, 1978. B36.1 F10, FHS; McGehee, *County Seat*, 29.
[71] Woody Greenberg, "Fluvanna Rededicates Courthouse." *The Daily Progress*, October 29, 1978. Examination of existing paint on the exterior of the courthouse suggests the color was changed from white to the warm beige color of the stone capitals during the 1977 restoration. The columns were painted a warm gray sometime in the late 1990s.
[72] Milton L. Grigg to James D. Campbell, June 28, 1978; Invitation to bid on carpet, June 12, 1978; Solicitation to bid on Chairs, June 26, 1978, B36.1 F10, FHS; Woody Greenberg, "Fluvanna Rededicates Courthouse." *The Daily Progress*, October 29, 1978.

Figure 12. Courthouse from south. May 1996. B36.1 Folder 6, FHS.

By the early 1990s, Fluvanna County Circuit Court justices were insisting that the Court facilities be brought up to the standards of the Americans with Disabilities Act (1990) (Figure 9). Justice F. W. Harkrader Jr. urged the Board of Supervisors to consider an evaluation of the historic courthouse to determine if it met the federal legislation as required by the regulation, and if not what renovations were required. The exterior ramp and removable accessible ramp were likely installed on the courthouse during this period.[73]

During the early 1990s the Board of Supervisors were also considering the need for expanded court facilities. The Circuit Court, General District Court, and Domestic Relations court all shared space in the 1830 courthouse. Further, the late 1970s renovations worsened the acoustics in the courtroom making it more difficult to hear what was being said.[74] Initial plans were made to build a large addition to the existing courthouse. Schematic plans were drawn up by the Charlottesville firm of Browne, Eichman, Dalgleish, Gilpin & Paxton.[75] These plans called for the construction of a new 5,755 square-foot courts facility east of and abutting the basement level of the existing courthouse (Figure 13). This solution avoided an above-grade addition and allowed the continued use of the existing courthouse, an approach favored by the Circuit Court justices, but it did not accommodate the space needs of the General District Court, Sheriff's Department and other Fluvanna County government offices.[76]

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[73] F. W. Harkrader, Jr. to Fluvanna County Board of Supervisors, January 23, 1992. FHS.

[74] Rex Bowman, "Fluvanna Courts growing out of house, home." *The Rural Virginian*, November 4, 1992.

[75] The partnership was the descendant firm of Grigg Wood Browne and Williams.

[76] Minnie Lee McGehee, Courthouse Committee to Virginia Division of Historic Landmarks, August 17, 1992. B36.1 F13, FHS.

Figure 13. Rendering of unexecuted courthouse expansion by Browne Eichman Dalgliesh Gilpin Paxton Architects. 1992. Box 36.1, Folder 13, FHS.

Plans for an addition within the existing courthouse grounds were ultimately abandoned. In the late 1990s the Board of Supervisors held a county-wide referendum that proposed to move the court to a new facility located on county-owned land at Pleasant Grove, just west of Palmyra. Voters rejected the move to the new location, forcing any new facility to be constructed on land contiguous to the existing courthouse. A new county courts facility and county office building were constructed between 2000 and 2001 at a site on the east side of Main Street approximately 525 feet south of the old courthouse. The new courts facility was designed by the Richmond firm Moseley, Harris & McClintock and constructed by Haley Builders, Inc. of Ashland, Virginia. Prior to the completion of the new courts facility, in early 1998 the historic courthouse received some minor renovations designed to make its functioning more comfortable. New carpet was placed in front of the judge's bench, the wooden benches received soft cushions, and new matching furniture was placed in the jury deliberation rooms.[77]

Following the completion of the new courts facility, all court functions formerly held in the historic courthouse were removed. For the past two decades the historic courthouse has continued to serve the wider Fluvanna community. It has been used on a regular basis as a meeting space by numerous civic organizations. During periods where other county departments are being renovated, the historic courthouse also hosted entire offices for periods lasting several months. During local, state, and federal elections, the courthouse serves as a space for voting as well as tallying votes and storing voting machines. The Fluvanna Historical Society uses the courthouse for regular meetings and storage, and community lectures and book talks are common events.

[77] Josh Barney, "Fluvanna Making Courthouse more fit until new one is built," 1, 3. *The Rural Virginian*, January 7, 1998.

The Courthouse Grounds

Although the Fluvanna County Court was ordered to occupy the new courthouse in the spring of 1831, the courthouse grounds were largely unfinished and devoid of supporting structures and landscaping features which facilitated the use of a seat of government. To that end, in May 1831 John Hartwell Cocke submitted a plan for the improvement and enclosure of the courthouse grounds. The court ordered the consideration of the plan and its expense estimate. A month later, the court approved of Cocke's plan of enclosure.[78]

Cocke's plan called for a stone wall enclosure surmounted by a wood railing, shaped like a piano, and following the topography of the grounds, with three stairway access points east, west, and south of the front portico. The front or southern gate was the most formal of the three with octagonal posts with two swinging sides that opened in the middle (Figures 14 and 15).

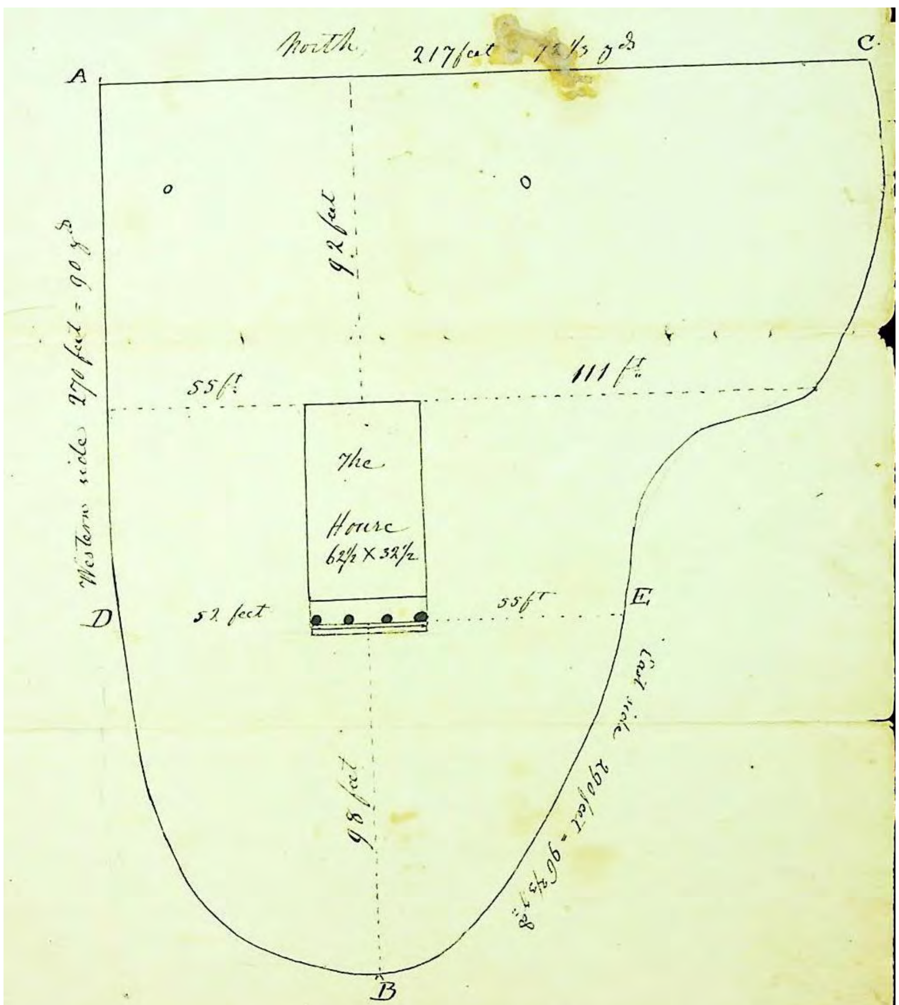

Figure 14. Plan of the Fluvanna County Courthouse Grounds, n.d. [John Hartwell Cocke, 1831?]. Box 2.2, Folder 11, FHS.

[78] "Plan and Estimate for Enclosing the Courthouse, May 23, 1831. Box 2.2 F11, FHS; McGehee, "County Seat," 30-31.

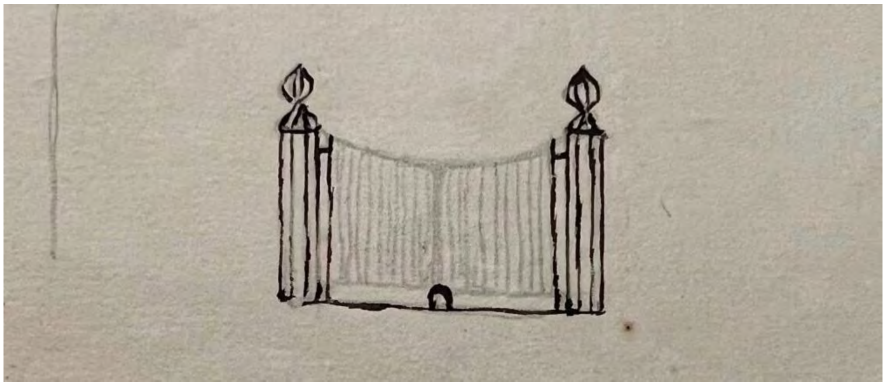

Figure 15. Sketch of the main south gate to the Fluvanna County Courthouse grounds, 1831. John Hartwell Cocke. Box 2.2, Folder 11, FHS.

> The wall around the court house yard is proposed to be 2 feet at bottom one foot at top and 3 feet high. This would give one cubic yard for every two running yards or 94 cubic yards from A to B & thence to C at one dollar per yard will be for the wall $94.00. For a fence on this wall at 50 cents for a panel of 8 feet = 35.00; For stone steps & gate 8 feet wide in front of the yard at B = 25.00; For two pair steps at D and E each 5 feet wide with a gate & railing at each 15 x 2 = 30.00; Plain railing on north side from A to C at 4 per yard = 24.00; Removing 560 yards of earth to make road & foundation for wall at 8 cts = 44.80; Removing 400 yds from north end of Court House & filling in with some behind the wall in such places as it may be wanted 12 cts = 48.00. …The railing as shown above the walling to be made of one plank 1 foot wide & 1 plank six inches wide, inch thick. The post to be planed four inches above the level of the wall and the second six inches above the first, making the whole inclosure 5 ft 4 in height – The plank to be of heart pine and the posts of either locusts or post oak and not less then 5 inches square each panel to be 8 feet in length, the plank to be planed & the heads of the post cut into polygons. The posts to be so planed as to make an angle of 22.5 degrees inward from perpendicular & the plank to be nailed on the inner side of the posts. The front gate to be composed of two parts to meet in the middle and to be hung to posts of an octagonal form not less than one foot in diameter with heads of plain – formation like the angled patterns the side gates to be simple, to be hung to similarly formed posts, not less than 9 inches in diameter.[79]

Despite receiving bids from other contractors, John Hartwell Cocke's bid on the enclosure project was accepted. He agreed to do it for just over $300 and complete it within a year.[80] It is not clear who built the stone wall and wood railed enclosure. However, the following June 1832 Basil M. Jones reported back to the court on the progress of the project. Jones noted some diversions from the specifications, particularly in the thickness of the wall, ultimately stating that the work was

[79] John H. Cocke, "Plan for Court House Enclosure," May 1831. Box 2.2 F11, FHS.

[80] George McLain, Proposal to Erect the Courthouse Enclosure, n.d. [1831]. Box 2.2 F11, FHS; McGehee, "County Seat," 31.

"no better than common work fences put up by common hands." Cocke agreed to repair the deficiencies as long as he was paid for the work.

> [The commissioner] has by the suggestion of some of your body enlarged the inclosure at the north end two hundred and thirty seven feet, he has to inform the court that agreeable to his understanding of the plan and estimate as presented by one of your body, (who afterwards became the contractor of the work) that the execution of the rock wall is not in his opinion agreeable to the contract, one third of the wall at its foundation is only 18-inches instead of two feet, as soon as your commissioners discovered it, he informed the undertaker who had the balance of the wall put up to its proper thickness, your commissioner tho not a judge of masonry, does not consider the wall built of rock of sufficient size to make it permanent and durable his of the opinion that the wall is no better than common work fences put up by common hands in a form only that is backed with dirt. The undertaker is willing to bind himself that the wall which is too thin at its foundation shall stand as long as the balance. The stone steps your commissioner believes that they are done in the best manner agreeable to the contract, the Road, around the enclosure is complete the earth on the inside of the wall in part has been leveled tho not complete, which your commissioner believes when complete will be much better than calculated by the plan presented. Your commissioner having as he considers complied with the intention of the order, as the wall is immediately under the eye of the court as such your commissioner would respectfully suggest that the court examine and satisfy themselves. The additional work on the wall if done agreeable to contract would be forty five dollars and twelve cents additional all of which is respectfully submitted to your worships by the commissioner.[81]

In addition to enclosing the courthouse grounds, the construction of support structures such as the clerk's office was undertaken. In November 1834, the court ordered that a new clerk's office be constructed at a location to be determined in the court grounds and that a plan be drawn up. The order was again issued in February of 1835. In September 1835, Clerk of the Court Abraham Shepherd submitted a plan for the construction of two small structures following the original design of John Hartwell Cocke. Shepherd's plan called for placing a small structure both east and west of the courthouse approximately 18-feet from and opposite each side door of the building. One was to be built by the county with public funds, and the second was to be constructed by Shepherd himself "of the same dimensions and workmanship precisely as the one which they recommend." The proposal for two new outbuildings was accepted by the court in the same month and two new 18-foot square brick offices were constructed. The western building constructed by Abram Shepherd was used by him as his personal office. The eastern building constructed using public funds, was used by Shepherd's deputy clerk, and would come to be known as the clerk's office. Not until 1945 did the county purchase "the building located on the

[81] "Report of Commissioner [Basil M. Jones], June 23, 1832." Box 2.2 F11, FHS.

Court Green, known as the Old Abram Shepherd's Office Building," for $1,500 from a descendant, Blanche L. Shepherd.[82]

In 1840, the court approved the construction of a new church located on the grounds just north of the courthouse. Construction of the Palmyra Methodist Church was begun in the same year. Funding for the church was made possible through contributions of the Shepherd and Timberlake families, among others. Walker Timberlake was one of the early church elders and leaders. In the late nineteenth-century, the brick church building developed structural issues and had to be abandoned. By 1888, the site for a new church adjacent to and north of the courthouse grounds was chosen and the old church was demolished.[83]

Repairs to the court grounds enclosure were found to be needed in just over a decade following construction. In March of 1844 the court appointed commissioners "to let the necessary repairs to the inclosure around the Courthouse of this county."[84] A month later in April of 1844, the project was advertised to prospective contractors. It noted the need for the work which appeared to be a both a failure of the stone wall and repair of the gates. The general specifications required a thorough repair of the enclosure around the Court house lot upon the original plan, with the addition of a coping with flat stones not less than two feet in length and width sufficient to cover the whole thickness of the wall, the missing and unsound posts to be replaced by new ones of sawed post oak not less than 4 by 5 inches square edges or hewed locusts 5 by 6 inches, and with rails of heart pine one inch thick and nailed as formerly to the posts. The whole to be covered with a full coat of tar, except the heads of the posts which are to be painted white.[85]

Only one bidder submitted a proposal and cost for the project. However, according to the commissioners, instead of repairing the existing stone wall as the specifications required, the contractor proposed a "brick enclosure at the same price as he would undertake the repairs mentioned in our advertisement, which bid is herewith submitted, and being of opinion that a brick wall would be the cheapest in the end, and much handsomer and durable." The commissioners sent the proposal back to the court to get its opinion.[86] The proposal for a new brick enclosure was not accepted and it is presumed no work was accomplished on the enclosure in 1844.

A new, larger Clerk's Office was later constructed northeast of the courthouse. Although the precise date of construction is not yet known, with the exception of the courthouse, the mid-

[82] McGehee, "County Seat," 27-28, 34-35; Bearr, "A Place Called Palmyra," 8-9; Court Order, September 28, 1835, FHS Box 3, Folder 4; Minutes of the Board of Supervisors, May 21, 1845: 24; June 18, 1845, 25; August 20, 1845, 27. FHS Box, 3, Folder 4; Court Order, September 1835, FHS Box 3 Folder 4.. The Court paid for the construction of the office by a County levy, covering half the costs in a levy in 1835, and the remainder in a levy in 1836. By the early twentieth century, the small outbuilding to the east of the Courthouse was being used as the County Treasurer's Office.
[83] Jerry L. Holloway, ed., *The Churches of Fluvanna County, Virginia*, 113. (Richmond: Cavalier Press, 1966).
[84] "Order of the Fluvanna County Court, March 25, 1844." Box 2.2 F11, FHS.
[85] "Notice, April 23, 1844." Box 2.2 F11, FHS.
[86] "Report of Commissioners, May 6, 1844." Box 2.2 F11, FHS.

nineteenth-century Clerk's Office was the largest building within the grounds. The 1840 Palmyra Methodist Church and the new Clerk's Office appear on an 1854 map of Palmyra drawn by William Clarke (Figure 16).

By the mid-1850s the courthouse enclosure was repaired again. This time the rock wall was demolished and a four-rail plank fence was erected in its place. The plank fence can be seen in a ca. 1902 - 1904 photograph of the courthouse taken from the southwest (Figure 17).[87]

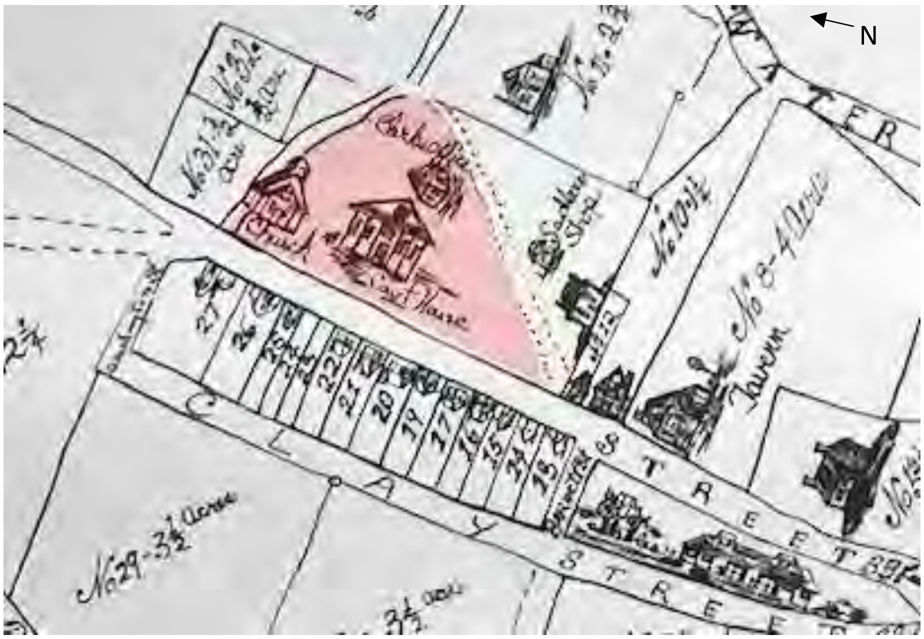

Figure 16. Detail, A Map of Palmyra, showing the red-shaded courthouse grounds with the courthouse, Palmyra Methodist Church to the north and new clerk's office to the east. Survey by William L. Clarke, January 1, 1854. FHS.

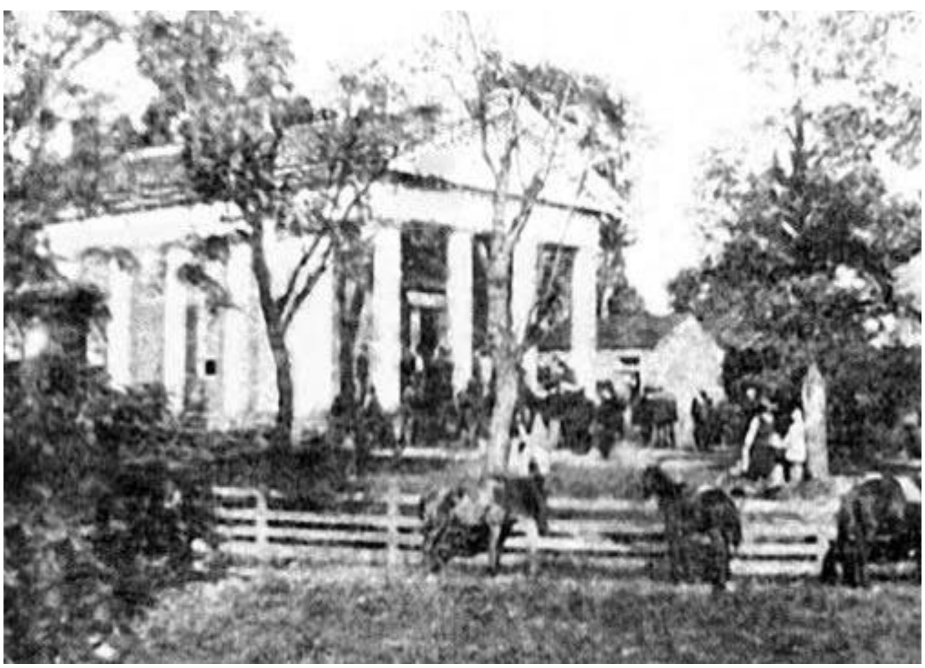

Figure 17. ca. 1902-1904 photograph of the Fluvanna County Courthouse grounds. Box 2.2 Folder 10, FHS.

[87] McGehee, "Court Seat," 32.

Other landscape features known to be present within the courthouse grounds include a well which was dug ca. 1850. The well's original windlass, rope, and bucket were replaced with a manual pump stock in 1854. Between 1909 and 1920 the pump was repaired again. Likewise in the early 1870s the Court ordered a public privy to be constructed within the courthouse enclosure. Following numerous complaints about the privy between 1907 and 1909, it was replaced with a new public privy in 1912.[88]

During the Civil War Palmyra, the court grounds and its immediate developed vicinity served as a hospital treating the Confederate wounded. All of the buildings within the courthouse grounds, as well as numerous buildings adjacent to it, were utilized for various purposes. In a February 1863 inspection of the Palmyra hospital and its facilities by a Confederate official, the structures within the courthouse grounds were generally described. A sketch map also documents the general appearance of the courthouse grounds during this period.

Six structures are recorded within the courthouse grounds: the courthouse (#2), southeast outbuilding (#1) identified as 'Surgeon's Office & Dispensary,' the northeast outbuilding (#3) identified as the 'Clerk's Office,' the Methodist Church (#4) identified as 'Ward B,' the northwest outbuildings (#5) identified as the 'Baggage Room,' and the southwest outbuilding (#6) identified as the 'Store Room' (Figure 18).

> The hospital comprises 13 buildings. …The Court House (no. 2) is a brick building of two stories, the rent of which is free; it has a capacity of 15 patients, the building is well ventilated, is in good condition, and is unoccupied; it is known as Ward A.
> …The Methodist Church (No. 4) is a brick building 40 x 35 and was being thoroughly cleaned on the day of my visit; it is occupied by the government without rent.
> …No. 1 is a one story brick building and is used for Surgeon's office and dispensary; the hospital records are present here; and the dispensary, for a County hospital, is in good order and condition.[89]

In late 1900, the county resurveyed the courthouse grounds and placed stone markers at each corner. In the same year, the board fence enclosing the courthouse grounds was refreshed.[90] A blueprint plat, generated from a 1909 survey, depicts the courthouse grounds at the beginning of the first decade of the twentieth century and shows the enclosure, posts, and encircling road (Figure 19).[91]

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[88] McGehee, "Court Seat," 33; Fluvanna County Minute Book 2:193 April 18, 1907; 2:230, July 27, 1908; 2:236 September 3, 1908; 2:253 March 22, 1909; 2:271, November 22, 1909.
[89] "[Report of Inspection of the Palmyra Hospital] February 27, 1863." Fold3.com.
[90] Fluvanna County Minute Book 2:63, September 22, 1900; 2:77, August 3, 1900.
[91] Fluvanna County Minute Book 2:267, November 10, 1909.

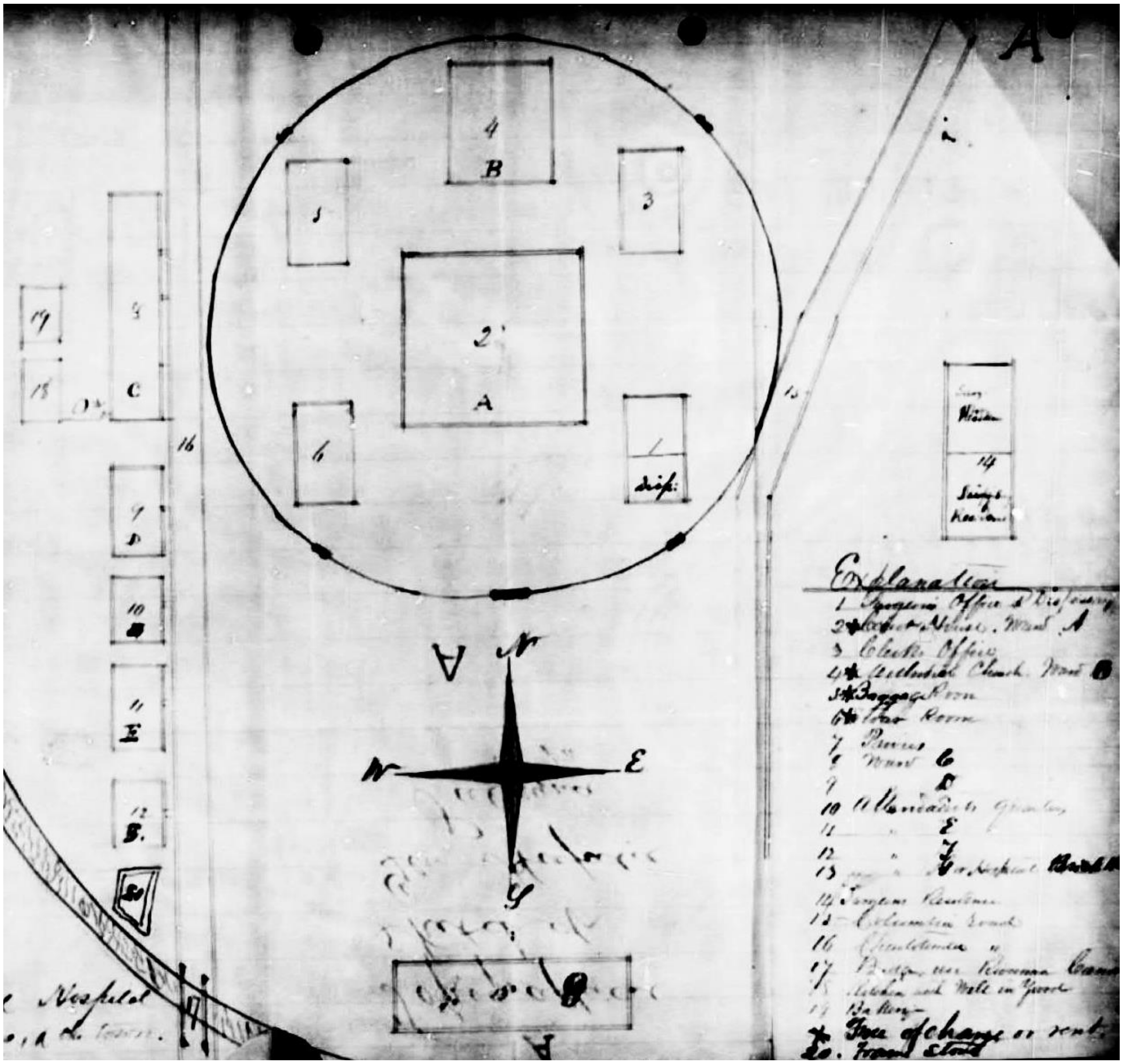


Figure 18. Detail, Plan of the General Hospital, Palmyra, Virginia showing the Fluvanna County Courthouse and Grounds, February 1863. Fold3.com.

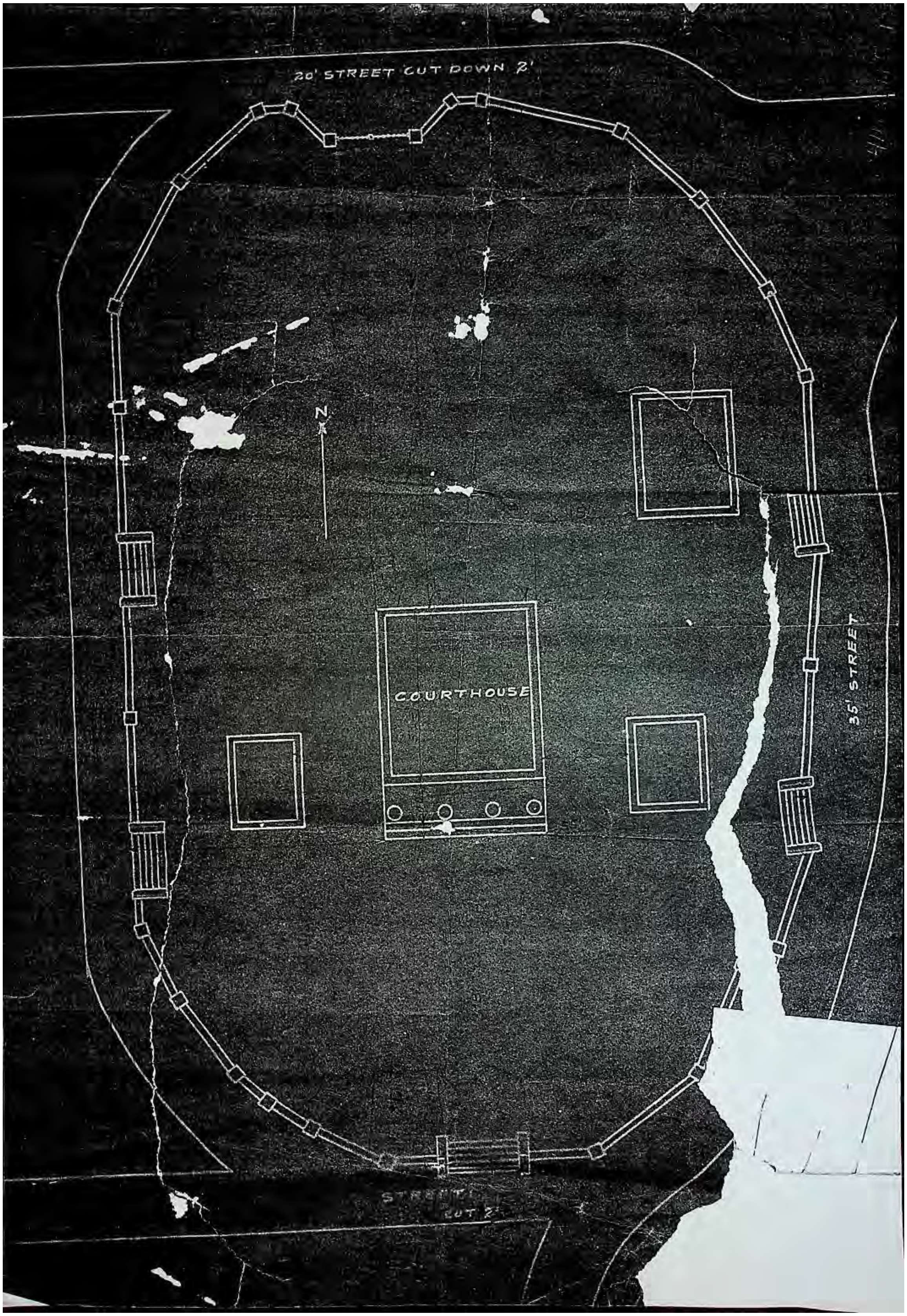


Figure 19. Plat of the Fluvanna County Courthouse grounds, ca. 1909. B2.2 F9 Oversized, FHS.

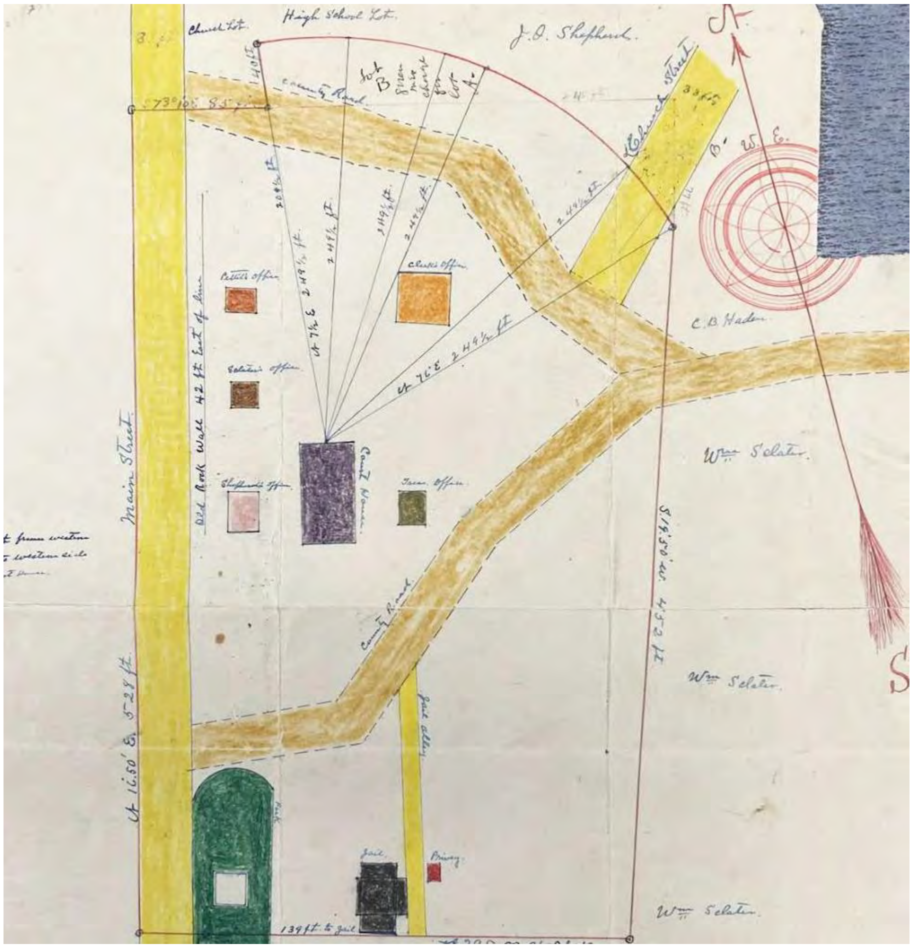


Figure 20. Plat showing survey of Fluvanna County Courthouse grounds, 1913. Box 22, Folder 9, FHS.

On May 26, 1913, the Board of Supervisors appointed commissioners to ascertain the official boundaries of the courthouse grounds as well as to initiate an exchange of land with the near neighbor to the north, J. B. and R. C. Shepherd. A ca. 1914 color plat accompanying the survey documents the presence of five smaller buildings surrounding the courthouse. The 'Treas. Office' off the southeast corner, 'Shepherd's Office' off the southwest corner, 'Sclater's Office' off the northwest corner, 'Pettit's Office' in the northwest quadrant of the grounds, and the 'Clerk's Office' in the northeast quadrant of the grounds (Figure 20). Clearly the 1914 plat documents that two new small offices, Pettit's and Sclater's, had been constructed in the courthouse grounds by this time. In 1916, the land exchange with the Shepherd family was formalized with deeds.[92]

In mid-1913, the Board of Supervisors accepted bids for 'fire proofing' the existing clerk's office located off the northwest corner of the courthouse. Plans were submitted and the B. F. Smith Fireproof Construction Co. of Washington, D.C. was hired to retrofit the building for $3,900. The

[92] "Plat of Court House Lot, December 2, 1914." B2.2 F9, FHS; McGehee, "County Seat," 32-33; Fluvanna County Minute Book 2:404, July 2, 1914; 2:414 November 1914; 2:465-466, July 3, 1916; 2:468-469, July 24, 1916. It should be noted that this May of 1913 plat shows a Clerk's Office in the general location of what would become the new fireproof Clerk's Office completed in late 1913.

project was superintended by William Sclater, Clerk of the Court, and was completed in late 1913. Metal furniture for the new fireproof building was also supplied by B. F. Smith. Sometime in the mid-twentieth century the clerk's office was expanded, nearly doubling its size. Two wings were also added in the late twentieth century.[93]

It was during the early twentieth century that the courthouse grounds acquired its current retaining wall enclosure. In August 1916 the firm of Caylor and Snyder was awarded the contract for the amount of $2,393.00. The design called for the construction of solid cement walls with vertical posts at regular intervals. A grand concrete staircase to the southern entrance of the grounds was also proposed. As part of their work, Caylor and Snyder recommended the replacement and rerouting of several drains which now lead from the corner downspouts of buildings through the wall and into the road.[94]

By the end of the first quarter of the twentieth century, the courthouse grounds received numerous plantings and trees.[95] In 1937, R. E. Hannum noted that the grounds surrounding the courthouse were planted with old locust trees that "have been so mutilated by wind storms that other trees have been planted recently." Sometime prior to Hannum's visit, what was once a dirt and sod covered courthouse grounds had been transformed into a landscaped green with formal walks. In addition to a new brick paved front entrance to the courthouse, brick walks led to either side of the structure connecting it to the Treasurer's Office, the Clerk's Office, and other buildings. Dwarf box graced the front entrance and sides of the paths.[96]

[93] Minutes of the Board of Supervisors, 2:371-372, 375-376, 383. The B. F. Smith Fireproof Construction Company was a firm that specialized in fireproof public buildings such as Courthouses, Clerk's Offices, and Register of Deeds' Offices throughout the mid-Atlantic region. The firm went bankrupt in 1914. See *North Carolina Architects & Builders. A Biographical Dictionary*. Accessed, May 23, 2022. https://ncarchitects.lib.ncsu.edu/people/P000355.
[94] McGehee, "County Seat," 33; Fluvanna County Minute Book 2:471, August 23, 1916; 2:473, September 25, 1916.
[95] McGehee, "County Seat," 33.
[96] Hannum, "Fluvanna County Court House," September 7, 1937.

CHRONOLOGY OF DEVELOPMENT AND USE

Introduction

This section of the report provides a timeline of the development and use of the Fluvanna County Historic Courthouse. This chronology relies upon historical research and fieldwork analysis of the building.

Chronology

June 1828	Palmyra selected as new county seat for Fluvanna County, Virginia.
July 1828	Walker Timberlake deeded land for new county seat.
Nov 1829	John Hartwell Cocke submitted plan for design of Fluvanna County Courthouse. County commissioners approved plans and appropriated funds.
Dec 1829	Cocke and Timberlake awarded contract to build courthouse.
Jan 1830	Construction of courthouse began.
Mar 1831	Construction completed and county began use of courthouse.
June 1831	Alterations made to courtroom bar.
Oct 1832	Roof finished and bell installed.
1834	Lightning rods installed.
Nov 1847	Roof repaired and ceiling replastered.
1848	Additional changes made to the bar.
1854	Ceiling replastered and white wash applied to walls.
1860	Carpeting installed in courtroom. New desks and chairs purchased.
1871	Gutters repaired.

ca. 1890	Wood ceiling installed in courtroom.
June 1897	Interior and exterior painting completed.
Sept 1916	Storm sewer pipe installed below grade from courthouse gutter.
1919	Changes to the bar, judge's stand, jury box, and clerk's desk. Linoleum installed on the brick floor.
Sept 1937	Building surveyed by Works Progress Administration.
Pre-1957	Metal bell enclosure constructed at an unknown date.
1971	Fluvanna County Courthouse District listed in the Virginia Landmarks Register and the National Register of Historic Places.
Nov 1973	Feasibility study completed by Grigg, Wood, Browne & Williams (GWBW) of Charlottesville.
Spring 1977	Construction began for restoration and renovation project designed by GWBW, including exterior and interior repairs and restoration and basement expansion.
Oct 1978	Construction completed for restoration and renovation project.
Ca. 1985	Accessibility improvements including exterior brick ramp by Wyant Associates of Charlottesville.
Nov 1992	Below-grade courthouse addition proposed by Browne Eichman Dalgliesh Gilpin Paxton Architects of Charlottesville.
2001	New courts facility constructed south of court square. 1831 courthouse building ceases to hold court functions. The building continued use as a public assembly building with county and FHS storage.
2018	Repairs to kingpost truss compleed.

PHYSICAL DESCRIPTION

Figure 21. Aerial view of Fluvanna County Courthouse from southeast.

ARCHITECTURAL

The Fluvanna County Historic Courthouse is the current name for the old Fluvanna County Courthouse built from 1830 to 1831 by John Hartwell Cocke and Walker Timberlake in Palmyra, Virginia. This Greek Revival temple form building employs a modified Doric order to ornament its simple front gable form (Figure 21). The masonry building was constructed with a large full-height courtroom with a mezzanine and partial second story equipped with two jury rooms. The below-grade basement was added in the 1977 renovation to accommodate modern needs for the county's various courts, including the provision of jury rooms, judge's chambers, storage, and restrooms. The building measures approximately 32′ by 63′ in plan and 32′ in height from grade to the ridge line of the roof. A new courts facility and county office building was constructed in 2001 to the south of the court square and this building was converted to use as a public assembly building with areas for storage.

SITE

The courthouse stands at the heart of court square in the village of Palmyra, Virginia. It is surrounded by several county buildings, the layout of which was partially influenced by Cocke's

Figure 22. Aerial View of Site. 1. Fluvanna County Courthouse (1831), 2. Outbuilding (1835), 3. Outbuilding (1835), 4. Clerk's Office (ca. 1854), 5. Lawyer's office (ca. 1914), 6. Outbuilding (ca. 1914).

original plan for the county courthouse (Figure 22). These buildings include two small outbuildings on the southeast and southwest corners (1835), a clerk's office (ca. 1854), a two-story lawyer's office (ca. 1914), and another outbuilding (ca. 1914). Brick walks surround the courthouse and connect to a brick-paved plaza is located on the south side of the building. Plantings line the paved walks and there is a tree-filled lawn comprising the majority of the historic court square. The site sits above the surrounding roads and has a concrete retaining wall on the west, south, and east sides. The boundary and its walls are a historic feature of the site. Analysis and assessment of these site components were not included in the scope of work for this report. This area is recommended for additional study and continued preservation initiatives.

Figure 23. Detail view of exterior wall

Figure 24. Detail view of foundation

<u>EXTERIOR</u>

FOUNDATION

The masonry building stands on a rubble stone foundation with a hammer-dressed ashlar stone outer wythe (Figure 23). An 8″ thick water table lines the top of the stone course. It projects 2″ from the face of the wall below and just over 6″ from the face of the brick wall above (Figure 24). The foundations were indicated to be 27″ thick in Cocke's original specifications. This dimension was not able to be verified on site. A stone footing measuring 10″ thick is partially visible through a wall hatch under the 1977 metal interior stair down to the basement. The top of the stone wall footing is also partially visible at the exterior at the base of the west wall through cracks in the concrete gutter. The relatively shallow depth of the foundation aligns with Cocke's direction to place the footing a minimum of 18″ below grade, and it also reflected the contemporary building practices. The foundation was executed with granite sourced from a local quarry in Columbia, a small river town in Fluvanna County. The stone is discolored by various staining, biological growth, and apparent previously applied finishes, altering its natural gray color. The foundation has crawlspace ventilation holes on the east and west sides of the building within the three northern bays. These vents are believed to be original and would have served to ventilate the area below the raised wood courtroom floor.

PORTICO

The front portico is located on the south side of the building. The portico is accessed from the south via a four-riser stair (Figure 25 and 26). The top three steps are granite and the bottom step is concrete. The concrete step is a modern alteration to resolve grade changes

Figure 25. Portico floor and stairs

Figure 26. View of columns and portico on south side

Figure 27. Column capital detail

Figure 28. Portico entablature detail

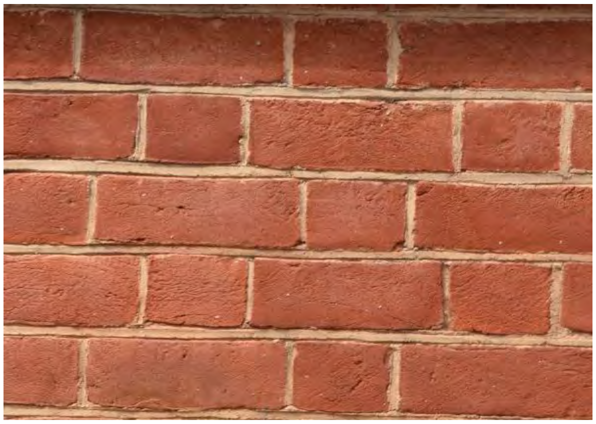


Figure 29. Detail view of brick wall

Figure 30. Detail of stone sill and lintel

around the building. As noted above, the four smooth-surfaced columns are executed in the Doric order (Figure 27). In adherence with the order, the column shafts lack a plinth or base at the bottom and they possess a simple, rounded capital. The columns are constructed of brick masonry finished with painted stucco. The installation date and composition of the extant stucco is unknown, but is believed to predate the 1977 renovation. The stuccoed column shafts and the carved sandstone echinus, the molded round bottom of the capital, are painted a warm gray (Figure 28). The current paint scheme dates to sometime after the late 1990s.

WALLS

The exterior walls are loadbearing brick masonry walls laid in Flemish bond (Figure 29). Including interior finish, the south wall is 20" thick and the north, east, and west walls are 16" in depth. The thicker south wall is four wythes deep and the others are three wythes. The increased thickness of the south wall was the design solution to accommodate the structural framing for the wood-framed portico ceiling. Dutch corners are laid at wall openings where required by the bond pattern. The brick is a uniform red in color. The bricks vary slightly in size across the building with estimated average dimension of 8 1/4" length by 2 3/8" in height by 4" in depth. The bricks were made locally, likely by Cocke's enslaved workers. The mortar joints in the brick walls were set to the face of the brick and then struck along the edge of each brick to create a shadow line. The mortar varies slightly in color from a warm tan to a warm gray. A mortar analysis was performed as a part of this project, refer to Appendix B for findings. In general, the historic mortar is very soft and can be easily removed by one's finger with little force, while the repointed areas are harder and exhibit greater strength and integrity. Mortar joints range in width from 3/8" to 1/4".

All walls have masonry pilasters finished with stucco and capped with a carved sandstone capital, matching the columns of the front portico. The pilasters stand 4 ¼" from the face of the brick wall surface. All wall openings are situated between these pilasters. The windows have sandstone lintels and sills which are ornamented with a carved linear pattern. The doors have

Figure 31. South entrance doors

Figure 32. Typical ground floor window

sandstone lintels, two instances of which have carved text (Figure 30). The stone sills project 1 ½" at each window opening, while the lintels are set flush to the face of the brick. The building has paneled wood doors arranged in pairs set in a molded wood frame in the doorways on the south, west, and east sides (Figure 31). All doors are painted a light warm gray color. The windows have divided light sash in a painted molded wood frame (Figure 32). A 9-over-9 window pattern is used on the ground floor double-hung windows and nine-light casement windows are used at the upper level. The northernmost ground floor windows at the east and west sides appear to be replacement wood windows as evidenced by their distinctive muntin profiles. Sham windows are used in three locations where interior elements, such as the stairs or judge's bench, preclude the practical use of a window. These false openings have wood shutters fixed in the closed position in front of a masonry recess. All windows are painted warm gray. Painted louvered wood shutters are held in the open position with painted metal shutter dogs at all windows. The shutters are painted dark green.

The Doric entablature is executed in painted wood paneling and moldings (see Figure 29). A simple rectangular-edged molding divides the plain board architrave from the frieze above. The frieze has triglyphs also of wood paneling. An ogee molding transitions from the frieze to a simple rectangular-edged cornice. The painted wood paneling of the front tympanum mimics a fine, sharp-edged ashlar stone coursing. The rear tympanum is built of brick.

Figure 33. View of roof

ROOF

The building is topped by a slate shingle gable roof sloped at roughly 3-to-12 (Figure 33). The rectangular shingles are Buckingham slate of varying widths and blue-gray in color. The shingles appear to be a mix of mostly original shingles with several areas of patches from recent repairs. A painted sheet metal flashing lines the gable ridge. Four thin brick chimneys aligned with the side exterior walls extend above the roof. The chimneys are original to the building and were repointed and repaired in 1977 renovation. All chimneys have a metal cap, although three have uncovered openings for exhaust flues. The roof supports a painted metal bell enclosure that dates to sometime before 1957. A bent metal hood serves as the roof and perforated metal grilles are mounted at each side to prevent nesting. The bell is believed to be original to the building. It is mounted on an embellished metal frame. The wood frame structure that supports the bell enclosure is visible in the attic.

Figure 34. View to south in courtroom

INTERIOR

The Fluvanna County Historic Courthouse interior is dominated by one large room, the courtroom, on its ground floor (Figure 34). The building has three entrances on its south end with pairs of doors on the south, west, and east walls. A small non-historic vestibule is located at the south entrance. There are three stairs in the space: two flanking staircases up to the second level and a stair down to the basement, the latter is tucked behind the judge's and jury box at the north end. The second level includes a gallery and two small jury rooms. Meanwhile, the basement, added in 1977, consists of a series of small rooms intended to support modern court proceedings.

GROUND FLOOR

The ground floor entry area has a brick floor laid in a herringbone pattern on steel decking supported by steel joists (Figure 35). The brick floor was installed during the 1977 renovation. It extends just under 19'-0" from the south wall where it meets a raised wood plank floor. Although only a single step, the change in level clearly delineates the audience at the rear from the legal proceedings which occurred in the bar area at the raised wood floor. A temporary ramp with a textured metal walking surface provides an accessible path to the raised area (Figure 36). Benches constructed for the 1977 renovation flank the central aisle that extends from the south entrance to the bar. The raised wood floor has burgundy carpet which runs from the edge of the raised floor, past the bar railing, and to the front of the judge and jury box (Figure 37). The carpet then turns to both the east and west flanking walls and continues up the stairs to the upper level. The entire wood floor in the northern portion of the courtroom was removed and reinstalled during the basement excavation as a part of 1977 renovation. The removal appears to have necessitated the cutting of the original tongues from the tongue-and-groove boards and, in many locations,

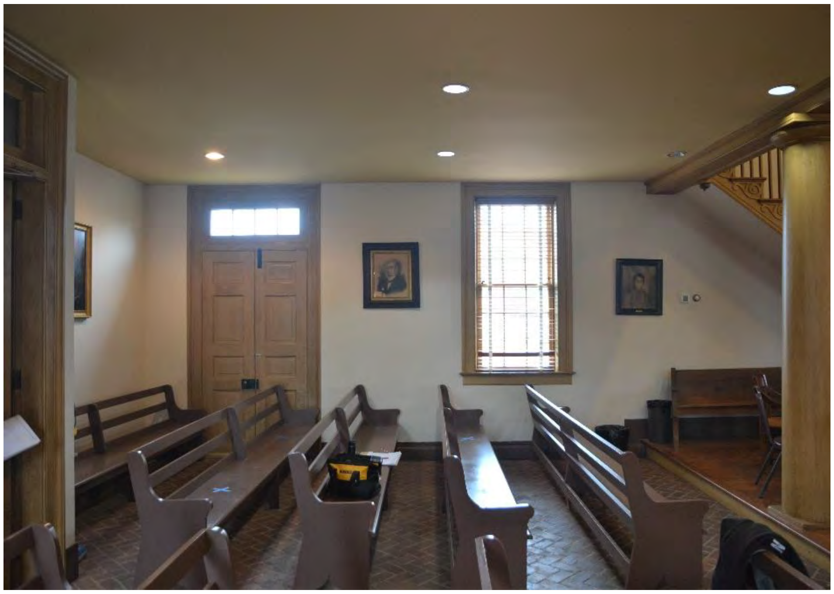


Figure 35. View facing west at rear of courtroom

Figure 36. View of ramp at center aisle

its reinstallation on modern wood framing has left abandoned original nail holes adjacent to the modern nail locations. The wood floorboards vary in width between 4" and 6". The flooring finish has darkened the color of the wood from the original natural finish likely due to repeated applications and typical wear and tear.

A turned wood post balustrade arranged in a U-shaped plan serves as the bar (see Figure 34). As in contemporary courtrooms, the bar served to separate the parties involved in the legal proceedings from those observing at the rear of the courtroom. The bottom rail of the balustrade is set directly on the floor and connected to a heavy beveled top rail via turned balusters. The top rail is interrupted at both corners and intersections by turned square posts capped by a semi-spherical finial. This same railing design is used for the judge's and jury boxes as well. The bar has changed numerous times over the building's history. Although precedent examples from

Figure 37. View of floor in courtroom area

Figure 38. View of balustrade at judge's and jury box

contemporaneous courthouses provide potential clues to the original arrangement, it is unlikely to be confirmed without the discovery of a set of Cocke's plans due the lack of documentation for many of the changes across the building's history. One earlier bar location can be seen via a series of markings in the floor, including a row of square balusters at the east side which meets a rounded south end at long, angled members in the southeast and southwest corners (see Figure 37). In the years prior to the 1977 renovation, the bar was arranged in a straight transverse line about halfway from the start of the raised floor to the judge's box. According to Don Swofford, the project architect for Milton Grigg's office during the 1977 renovation, the current location of the bar was moved approximately 3'-0" to the south of markings found from an earlier location so as to provide additional space within the bar area. The marks from this earlier iteration are supposed to be visible under the existing carpet, although they could not be confirmed during this project. Additional investigation of these markings upon removal of the existing carpet is recommended.

The judge's and jury boxes are located at the north end of the courtroom (Figure 38). A wood floor of unknown vintage is raised by steps from the level of the bar area. The judge's box is centered in the courtroom and it is almost square in plan. Accessed via a single step at the adjacent clerk's area and two additional risers at its east side, the judge's box is situated approximately 18" above the main wood floor. Excluding the stair location on the east, a balustrade lines all sides of the judge's box. A sawn trim board with a wave motif ornaments the base of the courtroom side of the jury and judge's box (Figure 39). A painted modesty panel was installed on the interior face of the balustrade—an alteration of recent vintage. To the west is the jury box. It is an elongated rectangle in plan located in the northwest corner of the courtroom. Similar to the clerk's area, a single riser provides access to the jury box. Two additional risers in the jury box create three levels for the jurors to observe the proceedings without visual obstruction while seated. Similar to the judge's box, the jury box has a modern, painted modesty panel on the rear of the front balustrade. The clerk's area is located on the east end and it also has an elongated rectangular shape. As noted above, a single riser steps up to this small rectangular space with room for a single table and chair. Behind the clerk's area is a staircase to

Figure 39. Detail view of wave motif and painted wood graining

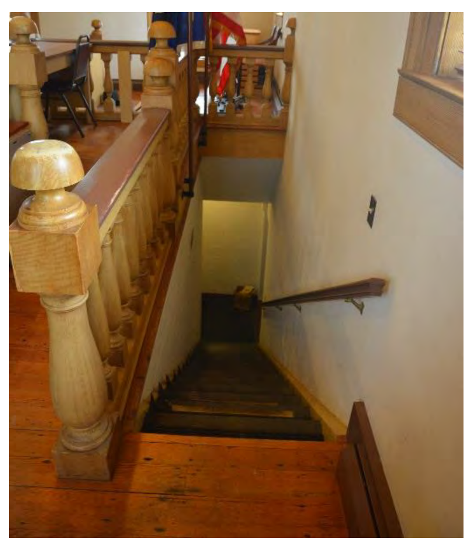


Figure 40. View of stair to basement

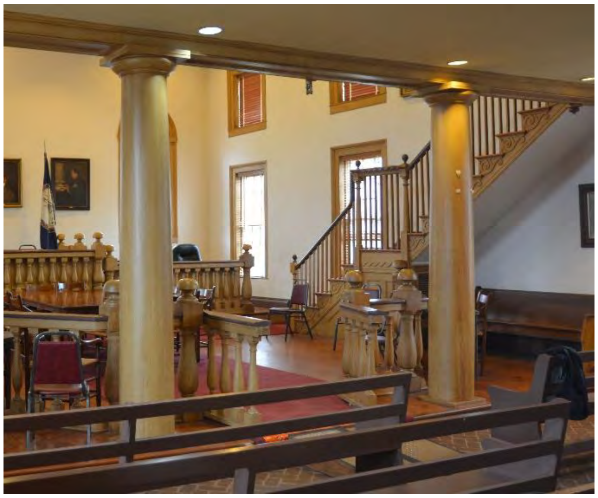


Figure 41. View of wood columns in courtroom

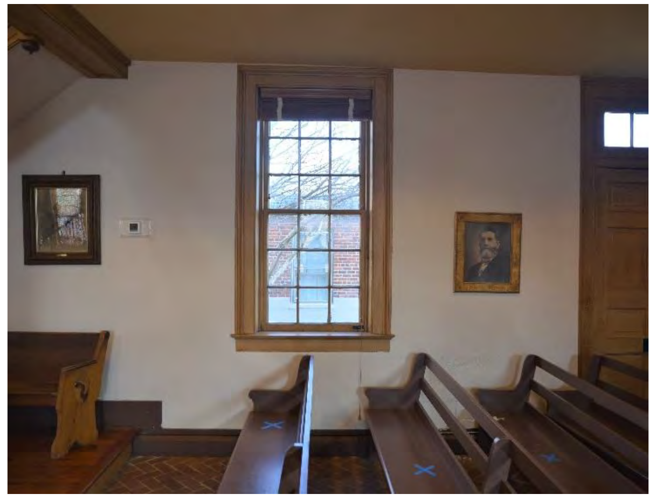


Figure 42. View of east wall in rear of courtroom

the basement (Figure 40). The 1977 renovation added the stair in this area to access the below-grade addition in order to minimize the overall impact on the courtroom. Accordingly, the jury and judge's box were moved forward, or to the south, so as to accommodate the stair. Beyond its placement at the north end of the courtroom, the original layout of the jury and judge's box is not confirmed. Historically, wood stoves were located near the jury and judge's box, but their precise location and arrangement has not been confirmed by historical documentation.

Like most of the woodwork in the courtroom, the bar is painted with a faux-graining dating to the 1977 renovation (see Figure 39). The extant faux-grained paint finish on the courtroom woodwork was designed to mimic the painted wood graining employed at Bremo, John Hartwell Cocke's mansion. The original specifications, however, indicate that the woodwork was to be a painted "a stone color" (refer to Appendix D for a transcription of the specifications). Paint analysis of the interior will be necessary to confirm the original paint scheme.

Two Tuscan columns are located at the south end of the raised wood floor and support the gallery above (Figure 41). Flanking the opening at the bar, the columns also serve as a transition between the legal participants and observers. Based on the form of cracking occurring along the vertical length, it appears that the columns are a single piece of wood with a hollow, bored out interior. The columns are finished with the typical faux-grained paint.

Cocke's specifications indicated that the walls of the courtroom were originally whitewashed plaster. The historical record documents a number of repairs to the plaster walls over time. At some point after the 1977 renovation, possibly as a part of the ca. 1985 project by Wyant Associates of Charlottesville, the plaster walls were covered by a wallboard with a skim coat of plaster and then painted white (Figure 42). The purpose of installing the wallboard is not known, but it may reflect an issue with the condition of the plaster walls, and potentially a consequent concern over the cost of repairing the plaster. The application of wallboard has negatively impacted relationship between the wood trims and the wall surface, wherein the trim and wall are essentially in the same plane. An unmolded, plain board base trim, painted brown, lines the

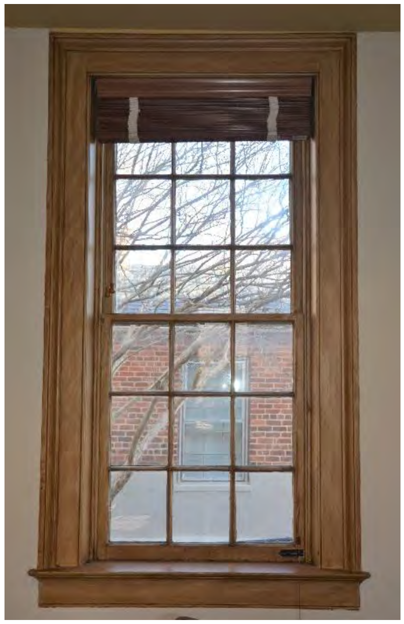


Figure 43. View of typical window

Figure 44. View of east doors

base of the courtroom walls, including stepping up at a right angle in concert with floor level changes.

The windows are set in a molded wood frame with molded wood trim at the wall (Figure 43). The frames have a beaded sash stop. The jamb trim has a beaded corner which turns along the wall and transitions to a cyma reversa profile at the outer edge of the window wall trim. The projecting stool has a rounded underside that meets a cavetto molding and transitions to the apron below. The window aprons are flat boards with a beaded bottom edge. The two arched windows on the north wall are ornamented with a molded wood keystone at the head trim and plain spring blocks at the base of the arches. The double-hung windows at the ground floor do not have sash ropes and appear to be painted shut. A bolt latch was installed on the windows at a later date to increase security. The upper casement windows have a simple wood latch with a hinge for the out-swinging sashes. Several of the upper windows have bolt latches as well. All wood surfaces of the windows are finished with the faux-graining used elsewhere on the woodwork. These windows also do not operate and appear to be painted shut. All windows have wooden Venetian blinds and the two arched windows have a fanned shade set into the upper semi-circular light. The blinds were installed during the 1977 renovation.

The ground floor doors are located near the south end of the building. Each door has four beaded and raised panels of two alternating heights (Figure 44). All doors are similar in design and appear to date to the original construction of the building, save the new door at the south vestibule which was added in the 1977 renovation. The east and west pairs of doors, as well as the vestibule doors, have a divided light wood transom window with four square panes. The taller main entrance doors on the south wall do not have a transom. The door trim consists of a beaded board that meets a cyma reversa molding with a square edge. All ground floor exterior doors have rim locks manufactured by Ball and Ball that were installed during the 1977

Figure 45. View of courtroom ceiling

Figure 46. View of east stairs

renovation. Additional modern locking hardware, including dead bolts and bolt locks have been installed on the doors as well. The exterior and interior pairs of doors at the south entrance have door closers.

The ceiling of the courtroom consists of painted wood planks arranged in an east-to-west direction (Figure 45). Originally, a plaster ceiling was installed in the courtroom. However, after a series of repairs, presumably tied to roof leaks, the plaster ceiling was removed and replaced with the current ceiling in ca. 1890. The ceiling is painted a light ochre color. Similar to other painted surfaces, paint analysis of the interior is necessary to confirm the original color. The ceiling boards match in width and the courses alternate between two or three boards set lengthwise in each run so as to stagger the joints. A wood ovolo molding transitions between the ceiling and the wall. Three rows of recessed can lights are located in the ceiling.

Wood stairs are located on the west and east walls of the courtroom (Figure 46). These stairs connect to the upper gallery and historically would have been used by jurors to access the second-floor jury rooms. The stairs have wood treads and risers which are covered by a carpet runner along their full length. There is a landing at the sixth riser on each stair. The square landing has an angled wood board set on top of the railing. These landings were apparently used historically by court officials to monitor and record the proceedings with the angled board serving as a writing surface. The stair railings consist of small, rectangular balusters capped with a rounded wood handrail. Turned posts are located at landings. Similar to the jury and judge's box, a sawn trim board ornaments the paneled face of the stair and gallery with a wave motif. The motif changes in direction at the center of the gallery where it meets at the courthouse bell rope pulley mount. Both stairs have beaded wood paneling on their face below the lower run, while the underside of the stairs have mechanical openings with painted louvers that were installed in the 1977 renovation. The balusters, posts, paneling, and louver are painted with the faux-wood graining and the handrail has a dark brown paint color. The 1977 renovation appears to have replaced in-kind, or perhaps removed and reinstalled, the lower run of stairs. However, the remaining stairs are believed to be original to the building.

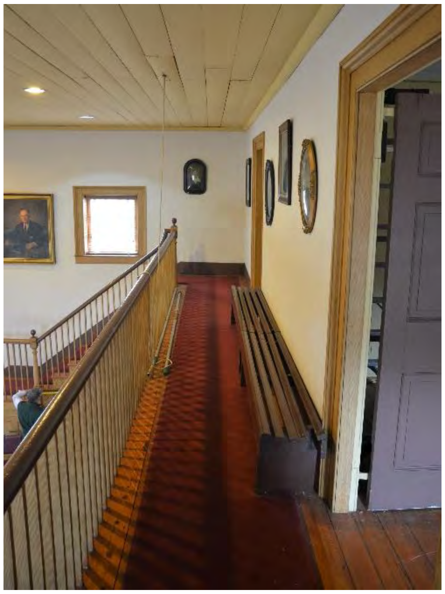


Figure 47. View of upper floor gallery

Figure 48. View to north in east jury room

UPPER FLOOR

The upper floor consists of a gallery and two jury rooms. It is situated on the south end of the building and accessed by the aforementioned stairs on the east and west walls. The gallery has a narrow walking surface between a wood handrail overlooking the courtroom and the wall of the jury rooms. The wood floor is oriented east-to-west and covered by a burgundy-colored carpet runner (Figure 47). The 3'-0" tall wood railing is set into the floor, and it is finished to match the stair railings. Door openings into the jury rooms are located in the south wall of the gallery. The courthouse bell rope extends down through the ceiling above the gallery. The wood plank courtroom ceiling described earlier covers the gallery as well.

The jury rooms are accessed via a single 3'-4" wide in-swinging door (Figure 48). Similar to the exterior doors, the six-paneled doors have rim locks manufactured by Ball and Ball installed in the 1977 renovation. The west jury room has strap hinges set on the room side, while the east jury room door has modern mortise hinges. Both door frames have scars indicating a previous generation of door hardware. The doors are painted a burgundy color, while their wood trim, the profile of which matches the ground floor doors, is painted the same light ochre as the courtroom ceiling. Both jury rooms have wood plank flooring that continues uninterrupted from the gallery and between rooms. The walls of the jury rooms are finished with painted plaster, matching the original design. Unlike the courtroom, the plaster walls in these two rooms were not covered by a modern wallboard. The base trim on the walls is a simple beaded board with quarter-round shoe molding. The wall shared by the two jury rooms was intended to be an operable partition executed with four hinged doors that could be opened to connect the two rooms. This wall is no longer operational as the four wood doors are now painted shut. The painted color on the wood partition matches the color used on the wood trim and courtroom ceiling. Each jury room has two windows on the outer wall. These windows match those upper

Figure 49. View of fireplace in west jury room

windows in the main courtroom with the exception of the light ochre painted finish. Both jury rooms have a simple, molded painted wood mantelpiece that extends beyond the sidewalls (Figure 49). The opening at the firebox is infilled. A brick hearth is set level with the surrounding wood floor and continues under the firebox infill panel. Both jury rooms have plaster ceilings, although the west jury room has a modern textured finish that is distinct from the smooth-finished ceiling of the east jury room. An access hatch to the attic is located in the northeast corner of the west jury room.

ATTIC

The attic is an unfinished space that does not serve an active use. Wood king post trusses span between the east and west walls as smaller members support the roofing and the interior and exterior ceilings (Figure 50). See the structural description later in this report for more

Figure 50. View of attic to south

Figure 51. View of south end of attic above portico ceiling

information on the wood trusses. The upper floor mechanical unit is located in this space with plywood panels installed on the attic floor to provide access to the unit. The bases of the chimneys are visible along the side walls. The interior sides of the north and south tympanums can be seen at the end walls. The ceilings for the portico and the interior spaces can be viewed as well (Figure 51). Fiberglass insulation is installed on top of the ceiling of the interior spaces.

BASEMENT

The basement was completed in the 1977 renovation so as to provide modern conveniences and additional space in the courthouse while minimizing the visual impact to the original building. The basement is accessed via an exterior cast-in-place concrete stair on the north side of the building and an interior slate tread stair on the north end of the courtroom. Both stairs meet at

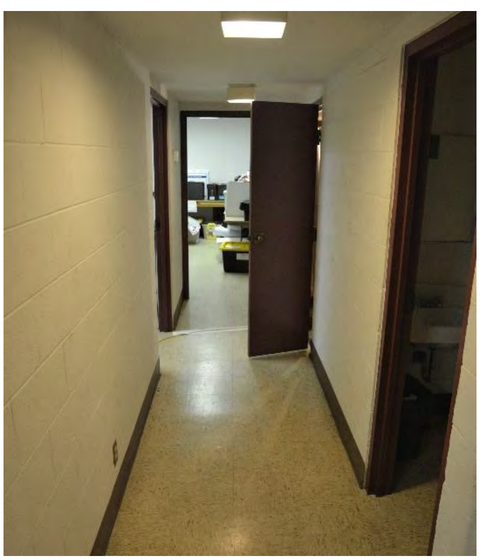


Figure 52. View to south in basement corridor

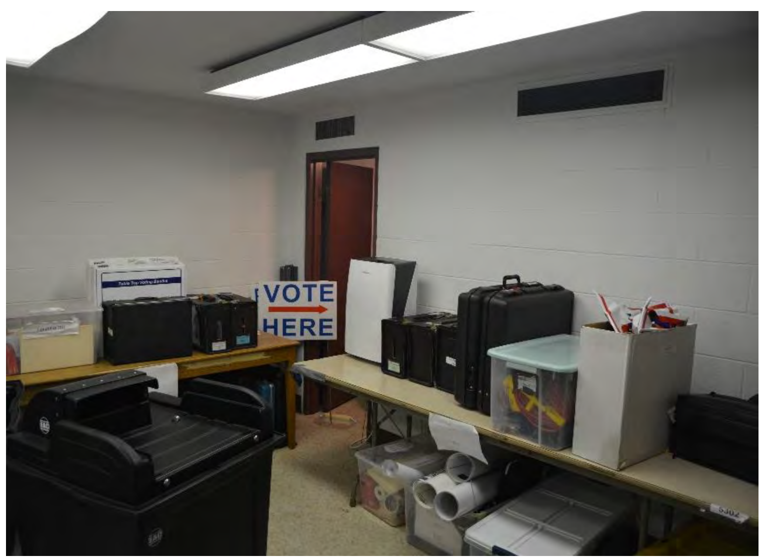


Figure 53. View of typical storage in basement

an indoor entry area in the northwest corner of the basement. Jury rooms, judge's chambers, witness rooms, restrooms and a mechanical closet were housed in the basement and were intended to support the continued use of the courthouse. The utilitarian design of the basement is displayed in the painted concrete masonry walls, vinyl wall base, vinyl composition tile flooring, and painted gypsum board ceilings throughout the space (Figures 52 and 53). Circular steel tube posts support the original wood beam located at the mid-span of the ground floor above. Excluding the removal of several toilet fixtures in the small restrooms, few changes appear to have been made to the basement since its construction. Today the basement is primarily used as a storage space by the county registrar.

Figure 54. View of basement mechanical room

Figure 55. View of mechanical unit in attic

MECHANICAL SYSTEMS

The building is served by (4) DX split air conditioning / heat pump systems – each with an indoor air handler and associated outdoor condensing unit. Three of the air handlers (AH-1, -2 and -3) are located in a mechanical closet in the basement, and the other air handler (AH-4) is located in the attic above the second floor (Figures 54 and 55).

EQUIPMENT SUMMARY

System 1 serves the basement: The air handler AH-1 is Lennox model CBX25UH-030 of nominal 2-½ ton cooling capacity with Space-Gard model 2200 high-efficiency air cleaner (filter), and Aprilaire model 600 bypass humidifier. Though the air handler nameplate does not indicate an integral electric heater, it appears the unit may contain one as the electrical panel schedule indicates the 50A/2P breaker in spaces 31/33 is for the "Air Handler to the Right" – an apparent reference to the location of this air handler. The air handler appears to be of recent vintage, while the humidifier appears to be of older vintage. The wall thermostat for this system is located in the basement hallway. Adjacent to this air handler is a York heat recovery ventilator. In practice, this unit would introduce preconditioned outside air into the return of the air handler and exhaust a corresponding amount of room air, while exchanging heat between the two airstreams. However, according to maintenance personnel, this unit is no longer functioning.

System 2 serves the west side of the first-floor courtroom. The air handler is Lennox model CBA25UH-042 of a nominal 3-½ ton cooling capacity with electric heater, an associated integral circuit breaker, Space-Gard model 2200 high efficiency air cleaner, and Aprilaire model 600 bypass humidifier. The air handler and humidifier appear to be of recent vintage, the air cleaner appears to be of older vintage. The wall thermostat for this system is located on the west wall near the return grille beneath the stair to the second floor.

System 3 serves the east side of the first-floor courtroom. The equipment includes a Lennox model CBA38MV-042 air handler of nominal 3-½ ton cooling with Space-Gard model 2200 high efficiency air cleaner, and Skuttle model 60-1 humidifier. The air handler and humidifier appear to be of recent vintage, while the air cleaner appears to be of older vintage. The wall thermostat for this system is located on the west wall near the return grille beneath the stair to the second floor.

System 4 serves the jury rooms on the second floor. The equipment includes a Radco model FA4ANF024 air handler of nominal 2 ton cooling with 10 kW electric heater and Space-Gard model 2200 high efficiency air cleaner. The air handler appears to be of fairly recent vintage. The wall thermostat for this system is located in the east jury room. Supply and return ducts from this air handler are routed through the attic to linear slot supply and return registers located along the west and east walls of the respective room.

All four of the aforementioned air handlers are controlled by Honeywell electronic programmable wall thermostats. Condensate from AHU-1, -2 and -3 drain to a floor-mounted condensate pump unit in the basement. The drain line for condensate from AHU-4 and its secondary drain pan extend from the attic down through the building and appear to enter the southwest corner of the basement mechanical room where it combines with the condensate drain lines for AHU-1, -2 and -3. The condensate lines then discharge into the service sink in the basement mechanical room.

Outdoor condensing units for the four air handlers are located on the north side of the building to the west of the courthouse (see the building labeled with #2 on Figure 22). The refrigerant piping and electrical power associated with the mechanical systems are routed underground in a PVC pipe from the courthouse to the north side of this 1835 outbuilding. The outdoor units are listed below and appear to correspond to the noted air handlers:

- Lennox model 14HPX-030, nominal 2-1/2 tons (AHU-1)
- (2) Lennox model 14HPX-042, nominal 3-1/2 tons (AHU-2 and -3)
- Carrier model 38YCC024340, nominal 2 tons (AHU-4)

An outside air duct extends from one of the crawlspace vents in the west exterior wall into the basement mechanical room closet that houses air handlers 1 through 3. There is no means, such as a motorized damper, to close the duct when the building is unoccupied.

The mechanical system also includes a series of additional equipment. Portable electric dehumidifiers are present in the basement mechanical room and storage rooms, presumably to mitigate high humidity in this floor level. Several apparently inoperable Broan model 675 wall exhaust fans are located in the basement to exhaust air from the three storage rooms along the east wall into the crawlspace beneath the ground floor. Lastly, a ceiling fan-light exhausts the active and former basement bathrooms.

STRUCTURAL SYSTEMS

The Fluvanna County Historic Courthouse is a loadbearing masonry structure with wood framing for the second floor and wood trusses to support the roof (Figure 56). The exterior brick masonry walls are supported on a rough-faced ashlar stone foundation. The original specifications indicate the stone footings are located 27″ below grade. This depth can be confirmed via an access hatch under the interior basement stair. The 1977 renovation added a basement within the existing building footprint requiring extensive excavation and the removal of the ground floor of the building. The basement has a concrete slab-on-grade and reinforced concrete block retaining walls at the perimeter. Four brick columns finished with stucco support the portico on the south elevation. Stucco-clad brick pilasters are spaced evenly across the west, north, and, south walls. The south exterior wall is four wythes thick while the west, north, and east brick masonry walls are three wythes. All walls are laid in Flemish bond. The south wall reduces from four wythes to three above where the portico ceiling framing is supported by the masonry. All wall openings have stone lintels and sills.

The slate roof is fastened to 1″ thick wood decking which is supported by wood rafters measuring 3 ¾″ by 3 ¾″ and spaced at 24″ on center. The rafters are attached to a 2″ by 4″ wood ridge board and are notched where supported by purlins, measuring 3 ½″ by 6″. The purlins are located at the midpoint of each sloped side of the gable roof. A continuous ribbon board carries the end of

Figure 56. Aerial view of building from northeast

Figure 57. View of roof structure with repaired truss in foreground

the rafters at the cornice. The rafters have a birdsmouth notch where they rest upon the ribbon board. The roof assembly is supported by seven king post wood trusses spaced at 7′-8″ on center (Figure 57 and 58). The vertical member at the center of the truss is called the king post. For these trusses, the king post measures 10 ½″ by 5″, and it is notched down to 6″ by 5″ just above the wood-pinned connection to the web member. One king post was repaired recently due to failure caused by a lightning strike. This member has been supplemented with a steel plate connecting the historic remaining member to a spliced-in replacement member. The web members of the typical truss measure 5″ by 5″ and are attached to the king post with a mortise joint with wood pins located approximately 14″ above the bottom chord. The web member extends at an angle to the top chord of the truss, where it also a has a mortise joint with wood pins at an approximate

Figure 58. Detailed view of roof structure at southeast corner of portico

Figure 59. Detailed view of fabrication markings on roof trusses for use in assembly

lateral dimension of 7′-5″. The top chord of the truss measures 5″ by 6 ½″ and it attaches to the king post with a mortise joint with wood pins, similar to the web member. The top chord is notched where it supports the purlins and there are limited instances of steel bolts to reinforce the connection of multiple members. The bottom chord of the truss measures 5″ by 11″. The ceiling joists measure 3″ by 3″ and are attached to the underside of the bottom chord with spikes at a spacing of 16″ on center. All members of the wood trusses were marked with notches after fabrication to indicate their intended assembly pattern in the field (Figure 59). At the portico, wood joists carry a plaster-on-lath ceiling to the entablature framing supported by the columns.

The floor assembly of the ground floor courtroom was extensively modified in order to accommodate the basement expansion. The south end of the courtroom has brick paving laid on metal decking supported by 12″ deep open web steel joints spaced at 24″ on center. The raised floor at the north end of the courtroom consists of 1″ thick wood boards varying between 4″ and 6″ in width on 2x12 wood joists at 16″ on center. The floorboards were originally tongue-and-groove, but the tongues appear to have been cut during the removal for the 1977 renovation. Numerous abandoned nail holes are present in the floorboards. The wood joists run east-to-west and are supported at their midspan by a large, square wood beam which appears to be an historic, and potentially original, structural member. At the perimeter, the joists are supported by masonry walls. The large wood beam is now supported along its length by 3 5/8″ diameter steel posts in the rooms along the east side of the basement hallway, an alteration from the 1977 renovation (Figure 60).

Figure 60. View of basement steel pipe columns. The columns support the historic wood beam.

The wood stairs to the second floor are supported on wood framing at each side wall of the courtroom. The floor framing for the second-floor gallery is supported on two bored-out hollow wood columns situated near the bar. No interior structural member of the wood columns was observed. A wood-framed wall bounds the north side of the second-floor jury rooms.

A metal stair is located at the north end of the courtroom and extends down to the basement. It is supported by reinforced concrete masonry walls at its sides. The basement structure consists of concrete block interior and exterior walls, the latter of which is fully reinforced and also serves as a retaining wall. The floor is a concrete slab-on-grade.

CONDITION ASSESSMENT

Figure 61. JMAP and Train Architects performing assessment fieldwork

INTRODUCTION

This chapter provides the assessment summary of the existing condition for the architectural, structural, and mechanical systems. As noted earlier in this report, the plumbing, electrical, and AV systems were not included in the scope of this report. These summaries are intended as an overview companion for the more detailed discussion of key issues and inventory of conditions which follow.

APPROACH

The architectural assessment of the Fluvanna County Historic Courthouse was performed by Andrew Marshall, RA, with supervision by John Mott, FAIA, of JMAP on March 31 and April 1, 2022. The structural assessment was performed by David Linton, PE, of Linton Engineering and the mechanical assessment was performed by Bob Crowell, PE, of 2RW; both occurred on April 1, 2022. All exterior assessments were performed from grade with the assistance of binoculars. Ladders were used to access the upper exterior wall and the attic from the interior. The roof was surveyed via drone photography. Finish removals for paint and mortar samples were executed by JMAP senior architectural conservator Amanda Edwards, PA-AICP. Beyond this sampling, no destructive testing was performed as a part of this assessment.

ARCHITECTURAL ASSESSMENT SUMMARY

EXTERIOR

The exterior of the building is generally in good-to-fair condition. Several conditions present issues which will cause greater deterioration if not addressed in the near-term. A number of other issues require attention in the mid-term as well.

- The most visible issue at the building is the deteriorated state of the existing finish on the four stuccoed columns at the front of the building. The cracking outer finish mars the front elevation. Similar finish issues occur on the stuccoed pilasters on all elevations to varying degrees. Additional investigation of the stucco is needed to confirm the composition as well as determine the extent of alteration required to prevent the condition from worsening or reoccurring.

- The roof of the building requires immediate near-term work to address active water infiltration. Drone photography indicates that numerous slate shingles are damaged or missing. In some locations, daylight is visible through the roof inside the attic, including one location where the wood decking boards are fully visible. Gaps at the flashing and various holes at the metal bell enclosure allow water to infiltrate the exterior envelope. The enclosure also displays signs of heavy corrosion. The design of the original bell enclosure, or steeple as it is called in archival records, is not known. Additional research may provide insight on this matter. Regardless, the deficiencies at the enclosure are contributing to the pressing issues with the roofing system.

- The painted finish across all elevations is deteriorated and requires refinishing to protect the wood elements comprising the openings and entablature. The deteriorated paint has also stained the masonry surfaces directly below the wood shutters. The paint analysis indicates that the doors and the shutters have paint history extant under their modern layers. Care should be taken with refinishing these elements to keep some extent of this paint history intact. Meanwhile, the historic paint layers appear to have been removed at the entablature, windows, and wood tympanum, leaving only modern paints. The sanded paint finishes indicated in the original specifications were not found during the paint analysis. See the paint analysis in Appendix B for more information.

- The exterior masonry is generally in good condition, but presents potentially significant future challenges. There is a limited number of open joints and a small number of cracked bricks across all facades. Despite the lack of widespread erosion, the historic mortar is soft enough to remove easily by hand in many places. The softness of the mortar is a concern due to the potential for erosion, but it does not appear to be producing negative secondhand effects to the brick masonry or interior finishes. Obtaining a mortar that matches this original composition will be difficult and this goal presents a complex series of potential approaches to repointing. It is of utmost important that future repointing be completed with extreme care to use an appropriate mortar mixture while focusing only on those localized areas which are in clear need of repair. See Appendix B for more information on the mortar analysis completed for this report.

- The windows, shutters, and doors typically display deteriorated paint finish. The wood substrate of windows and doors generally appear to be in good condition with a limited number of damaged or missing components. The shutters exhibit more significant issues with separating joints, racking, and wood deterioration. All windows, shutters, and doors require restoration in the near-to-medium-term to address these issues and to mitigate the potential for more extensive deterioration over the long term.

Various other elements require repair or restoration in the coming years. Refer to full condition inventory for additional information.

INTERIOR

The interior of the Fluvanna County Historic Courthouse is in good-to-fair condition generally. There are a few issues which require immediate intervention, including water infiltration at the courtroom ceiling and wall damage adjacent to the east doors. There are also issues which have negatively impacted the interior in significant ways which, although they do not represent ongoing deterioration, must be addressed in the medium-to-long-term.

- A roof leak at the bell rope at the roof level has caused deterioration of various wood elements at the ceiling, floor, and underside of the second-floor gallery. Wood rot and finish deterioration is evident. Preventing further water infiltration by sealing the opening at the bell rope should occur immediately. Repairs to the wood should be performed in the near-to-mid terms in concert with the finish analysis.

- A significant medium-term preservation issue is the existing wallboard finish in the courtroom. The heavy damage near the east doors requires near term repairs and offers an opportunity to investigate the existing assembly in more detail and to better understand the condition of the historic plaster. The interior surface of the perimeter walls has painted plasterboard that was installed over the earlier plaster wall finish. This modern finish has negatively impacted the relationship between the wall surface and the surface of the wood trim pieces. The trim elements are intended to stand proud of the wall, but the existing condition has caused the surface of the wall to become essentially flush with the trim. Further investigation is necessary to review the wall assembly and condition of historic plaster. Also, joints between wallboards have separated in several locations, creating unsightly joint lines throughout the courtroom.

- The interior faux-wood grain paint finish is failing at various locations on the interior. The paint issues include cracking, areas of poor execution, and general wear and tear. Prior to repainting, additional investigation will be necessary to confirm a paint scheme for repainting. The 1977 renovation included paint scrapings performed in search of learning the original color scheme. The architects selected the faux-grained finish based on visual cues from the rudimentary analysis and because the scheme was used at Cocke's Bremo mansion. Due to the major technological advances in paint analysis, a new analysis would be expected to provide significantly greater insight into the genuine paint history. The findings from this analysis would be an essential guide for future repainting efforts.

- Accessibility presents a design and access challenge to the interior of the courthouse. Currently, an accessible route is provided from the exterior to the main courtroom space. However, the extant removable ramp that was installed to access to the raised court floor level creates an undesirable tripping hazard for those seated at the bench seating. More plainly, the ramp inhibits safe egress from the bench seating. Further, the ramp lacks a wheel stop along its edge. From a design perspective, the ramp is an unfortunate addition to the main view of the courtroom. Removal of the ramp, however, would leave the significant balance of the courtroom floor inaccessible. Additional design investigation may offer insight into how to balance these competing requirements and could suggest a preferred ramp location and design.

- There are a couple of issues with railings inside the building. The second-floor gallery has a wood handrail which flexes upon moderate pressure. Although the existing building code will likely allow the existing condition to remain, structural improvements may be desirable or could be required by a building official. Also, the basement stair railing is mounted at an improper height and lacks the sufficient extension at the base of the stair.

- The basement is generally in fair condition overall with some items of concern. The high humidity at this level must be addressed. This issue is discussed further in the mechanical section of this report. The basement floor, wall, and ceiling finishes are dated and display some minor wear and tear. However, given the back of house nature of this floor, near-term repairs are not necessary. The long-term programming for the basement should be reviewed prior to any repairs. If the basement will continue to serve as storage or other utilitarian use, then the space can remain mostly as-is with some minor repairs.

The interior presents a number of other issues in which require attention. Refer to full condition inventory in the Treatment Recommendations section of this report for additional information.

STRUCTURAL ASSESSMENT SUMMARY

The scope of work for the structural system condition assessment was directed by Fluvanna County to focus on the roof structural system so as to address recently repaired damage and any other potential issues with the roof. Refer to the architectural assessment for issues related to exterior masonry conditions.

The overall condition of the roof structure is good with a few notable exceptions connected to water penetration at specific areas.

- The primary area of concern occurs at the chimney penetration locations through the roof. At three of the four chimney penetrations, the rafters flanking the chimney have rotted to the extent that the ends of the rafters are no longer supported on the adjacent exterior wall. Additionally, the mortar in the chimney has severely deteriorated and is in need of full depth repointing.

- The second area of concern occurs at the cupola. Water has penetrated through the roof and traveled down the bell enclosure structure to where it has rotted the support structure at the attic level. The connection of the bell enclosure support post to the adjacent roof structure has also rotted. The most structurally significant damage has occurred where the top half of the bottom chord of one of the trusses has rotted where it supports the bell enclosure beam.

MECHANICAL ASSESSMENT SUMMARY

Generally, the equipment components appear in fair-to-good condition. However, there are deficiencies with the mechanical systems which must be addressed in the near- to mid-term to mitigate humidity issues in the basement and to comply with the mechanical code.

- There is a lack of permanent means for controlling the humidity in the basement, which is evident by conditions in the basement and made clear by the use of plug-in portable dehumidifiers. A permanent means for effectively controlling the humidity level in the basement is necessary. The basement is currently used to store paper records and other important county registrar equipment which may be susceptible to issues stemming from high humidity.

- A heat recovery ventilator (HRV) connected to basement air handler AH-1 is reported to be non-functional. Therefore, the occupied spaces in the basement are not receiving outdoor air for occupants as required by current building codes. This arrangement potentially increases the build-up of humidity in the basement. The basement humidity is also increased by the lack of operability of the wall exhaust fans on the east wall. The air intake duct in the west exterior wall also lacks the means to stop the flow of outdoor air into the building when the building is unoccupied. Several dehumidifiers indicate that they have full tanks and require emptying, suggesting that additional ongoing maintenance is necessary to address the humid conditions in the near term.

- A part of the mechanical assessment included determining if the active use of the systems contributed to deterioration of the historic building fabric. There is no clear evidence that the active use of the mechanical systems are the cause of any damage to the building. The systems are not configured to pull moisture into the building, nor do they appear to be creating any otherwise harmful condition to the historic fabric. As noted above, however, it is the inherent limitations of the systems, rather than their active use, which are having a negative impact on the building.

TREATMENT RECOMMENDATIONS

INTRODUCTION

This chapter provides an overview of treatment, the historic preservation goals for the building, followed by an inventory of the existing issues and recommended repairs. These first two items include key criteria, such as standards, regulations, and stated county goals, that must be used to guide the careful management of this historic property. These passages should serve as a starting point for any alterations to the building and site. Following those items is the inventory which includes description of the existing condition, recommended repairs, and the quantity of repairs required.

TREATMENT OVERVIEW

The Secretary of Interior's Standards for Treatment of Historic Properties guides historic preservation professionals in their development of treatment recommendations for historic properties. The recommendations included in the report are intended to pursue the lightest impact alteration necessary while protecting the historic fabric of the building. All alterations performed on the building should be pursued within this spirit. In addition, all work must comply with the Virginia Construction Code, Virginia Existing Construction Code, and all other applicable regulations.

The proposed recommendations will require additional coordination with preservation professionals, trades, and contractors to confirm a restoration or rehabilitation approach prior to execution. It is important that qualified individuals oversee and perform the design and construction work on this historic property to minimize the potential for unforeseen or irreversible damage to the building's historic character and integrity. For more information and guidance on the regulations and guidelines affecting the work and additional insight onto how the work should be executed, refer to the Requirements of Work section later in this report.

MANAGEMENT OF THE HISTORIC BUILDING AND SITE

The Fluvanna County Historic Courthouse is recognized as a significant structure for its architectural design and its connection to a historical figure – John Hartwell Cocke. In addition to its wider acknowledgement, this historic courthouse is a nationally recognized work of architecture and an iconic building for Palmyra and Fluvanna County. The National Register-listed historic district includes the courthouse building and the four historic buildings to its west, north, and east. The court square site, including the surrounding buildings, the boundary retaining wall, and other landscape features, as well as the village of Palmyra are historic elements which are critical to the historic context of the courthouse and its setting. Additional research and assessment of the court square site are recommended to preserve these elements. The courthouse and its surrounding context comprise a series of valuable resources and it will require a determined level of care and attention to preserve the historic integrity of this important architectural icon.

Prior to alterations of either the building or the site:

- The county should engage with the Fluvanna Historical Society (FHS) to review any proposed changes.
- The county should coordinate alterations with all necessary regulatory agencies, including Virginia Department of Historic Resources, during planning and design stages.
- All changes to this historic building and site should be undertaken with great care so as not to diminish the integrity of the numerous historic resources at court square.
- It is strongly recommended to engage historic preservation professionals, including architects and conservators, to design and oversee these alterations to facilitate the process and provide the necessary expertise.
- It is also very important to hire skilled and experienced tradespeople and contractors in the execution of the work.

HISTORIC PRESERVATION OBJECTIVES

Due to the complexity of connected issues on a historic building, the goals for the preservation of a historic building should be outlined prior to the commencement of work and adhered to, or updated, as items are successfully completed or new challenges arise.

- **Collaboration of the stakeholders of this historic building is essential.**

  Protection of this iconic building will require a concerted and coordinated effort by the county leadership, the county public works department, and the FHS. These efforts will involve coordinated strategic planning, funding of design and construction projects, and the ongoing maintenance and monitoring of the existing fabric. Careful and sensitive maintenance is central to this effort. Before acting on any findings, it is important for the stakeholders to work together to determine an approach that both protects the building and solves the corresponding deficiency.

- **All work should pursue a preservation approach.**

  The National Park Service defines four approaches to treatment of historic properties and has standards and guidelines for each approach. The four approaches are: preservation, rehabilitation, restoration, and reconstruction. Preservation is defined as "the maintenance and repair of existing historic materials and retention of a property's form as it has evolved over time." This approach acknowledges the array of changes over time and does not seek to restore the building to a specific period of time. Any alterations to the building must respect not only the materials themselves, but the original design intent of the building. The recommendations of this report have been developed to comply with this approach.

- **The building will continue its present use.**

  The former courthouse is intended to continue its service as a public assembly hall and historic site. The building also currently serves as a storage space for the county and FHS, although this is a secondary use of the building. Continuing the present function of the building will avoid the need for significant changes to accommodate a change in use as is common with many historic buildings. This current use of the building may require minor improvements, but it is expected that any detrimental effects can be mitigated via careful design and construction efforts.

- **Work shall be executed efficiently and economically.**

  It is recommended that the recommended treatments be undertaken in consolidated projects which allow for holistic treatment rather than piecemeal work. This will allow for the resolution of any unforeseen conditions which arise and the coordination of various treatments across the building. Larger construction projects are more cost efficient and also limit the disturbance to the functioning of the building to smaller windows of time.

KEY ISSUES

Below is a series of key issues which present the greatest urgency, most significant intervention, or impact primary character-defining features. A description is provided of the existing condition along with approaches to treatment of the condition.

- Stucco at columns and pilasters
- Roofing system
- Metal bell enclosure
- Exterior painted woodwork
- Windows, shutters, and doors
- Brick masonry
- Basement humidity
- Interior paint finishes
- Interior wall finish in courtroom
- Interior accessible ramp
- Gallery handrail

Stucco at columns and pilasters

Columns exist on the front of the building with pilasters located on the side and rear walls. Based on the county's testing, the front columns are brick covered with stucco, also known as plaster; the two terms will be used interchangeably in this discussion. The pilasters are undoubtedly brick covered with stucco. The condition of the paint on the front columns is much worse than on the pilasters, possibly because of greater exposure to the elements and lack of shared adjacent surfaces to transfer moisture.

Regarding the condition of the columns and, to a lesser extent, the pilasters, the four questions are: 1) what is the current plaster material and finish, 2) what was the plaster material and finish applied to the brick historically, 3) what are the materials applied to it now, and 4) what treatment is recommended to correct the current appearance.

In the nineteenth century, plasterers used lime plaster. It was made from four ingredients: lime, aggregate, fiber, and water. In Virginia, the lime came from oyster shells or ground-and-heated limestone, the aggregate was sand, and the fiber came from animal hair, usually cattle or hogs. Usually lime plaster was installed using three coats – scratch, brown, and finish, in order of application. The first two coats were about 3/8 inches thick with a finish coat of about 1/8 inch. However, this is when it was applied over wood lath. When installed over brick the scratch and brown coats were often combined with a thickness closer to 3/4 inch. Following installation, wetting caused by rain followed by drying cycles would cause the plaster to deteriorate, often necessitating the periodic replacement of plaster as part of building maintenance.

The question is not so much whether the stucco on the columns is the original plaster or a replacement plaster, but whether it is lime plaster or was replaced at some point in time with cement plaster, the use of which became prevalent in the twentieth century. Lime plaster is breathable and allows the evaporation of moisture in the brick. Cement plaster, on the other hand, does not breathe and traps moisture in the brick, resulting in deterioration of the brick. In the case of the Fluvanna County Historic Courthouse moisture could enter the brick either through the surface or by wicking up from the stone surface on which the columns were set. Lime plaster is flexible, while the brittle nature of cement plaster often results in cracking.

Identification of lime plaster can often be determined by the presence of the animal hair. It does not seem to appear in the photos of the test holes in the columns provided by the county. This may be the result of the method used to drill the holes which cut off the hair. The first step in resolving the question about the type of plaster on the columns and pilasters is to probe the edge of the hole to dislodge some plaster in hopes of finding the hair. If this fails, chemical testing is recommended.

The composition of the historic stucco and the current stucco must be determined before repairs can be completed. Historically, paint or limewash (whitewash) was applied as the finish. In some instances, sand was applied with the paint to provide a stone-like texture and color. The paint analysis for the building was unable to detect any of the historic paint or whitewash layers on the plaster of the columns/pilasters. The first discernable paint color was when the first layer of modern paint was applied. This could be because the historic limewash was allowed to wear down before a new coat was applied. Since the application of plaster over the brick was to create the appearance of freestone, the assumption is that the historic paint or limewash was sanded and was colored to match the texture and color of the marble column capitals.

Analysis of the current paint coating is not particularly important as its condition has deteriorated to the point that it should be stripped and replaced. The appearance of the installation suggests that the current coating is a non-breathable type of coating which is trapping moisture within the column resulting in its extensive failure. The specifications for the 1970s work called for the columns and pilasters to be cleaned and then to have a sealer applied. Two sealers were specified, but Don Swofford, a Charlottesville architect who worked for Grigg, Wood & Browne at the time, says that a sealer was not applied. According to Mr. Swofford, the surface of the stucco was scraped and that a surface conditioner was applied before they were painted. According to the bid drawings, a sanded paint was applied to the columns and pilasters. Pictures from subsequent years show that a paint color matching the stone capitals was applied during this project.

The recommended course of action is as follows:

1. Determine if the existing stucco is lime stucco or cement stucco.
2. If the existing stucco turns out to be Portland cement stucco, as is assumed, then it should be removed and replaced with lime plaster. First, the paint must be removed. Next the columns are to be misted over a lengthy period to soften the stucco, followed by hand

removal across a series of layers down to the face of the brick. This process protects the brick substrate from damage during removal.

3. If it turns out to be lime stucco, verify that the finish coat is lime as well rather than some type of waterproof coating that was installed over the old base coats.
4. Assuming that the face coat is lime, totally remove the existing paint using a stripper, such as Ready-Strip Pro, and patch all deteriorated or damaged locations in the plaster including the test holes drilled by the county in the rear of the second column from the east.
5. Test clean selected and unobtrusive areas of the freestone capitals to facilitate paint color selection.
6. Apply a breathable paint coating with a sanded additive with a color similar to that of the freestone column capitals.

Roofing system

With the exception of patches of replacement shingles, the existing slate roof is likely original to the building. The slate sourced from Buckingham County, Virginia, for use on the building is renowned for its quality. A Buckingham slate roof is estimated to last 175 years on average, although many have survived longer. Any remaining original slate at the 190-year-old historic courthouse has now exceeded that average lifespan. A large number of these aged slate shingles display signs of failure. Many have cracks along their lower edge or near the fastener location, with many other shingles are displaced or missing. The ongoing failure of the slate shingles presents an unsafe conditon in which several slate fragments are loose and appear likely to fall from the roof. This condition requires urgent remediation.

The overall age of the roofing system and the existing damage are key considerations in determining if the roof system is close to the end of its useful life. The assessment effort of this report relied upon visual analysis, primarily drone photography, to assess the roof condition. A closer inspection of the balance of the roof shingles utilizing a man lift would offer further insight.

A full roof replacement would provide the longest term solution. If more than 25% of the roof displays deterioration, a roof replacement would likely be more cost effective than extensive repairs. The visual assessment of the roof estimates a percentage which is below but close to this threshold, and closer analysis may prove to increase the percentage. A much greater extent of historic fabric would be removed in a full roof replacement. Several other components of the roof are demonstrated to be beyond its lifespan, including the metal flashings and the metal bell enclosure (discussed below). During a roof replacement, all existing shingles should be removed and assessed. Those shingles which are in good condition could be reinstalled rather than replaced, or potentially stored for use in future repairs. In the event of this full removal, the underlying wood roof decking could be examined, documented, and repaired in its entirety as a part of the project.

In lieu of the more invasive full replacement, the roof could be repaired with new metal flashings and replacement shingles installed where needed so as to avoid the much greater cost of the larger project. However, if the extent of repairs is signficiant enough, no such savings would be realized given the age of the roof. A repair approach will require a greater ongoing maintenance effort. Also, patching the roof would not afford the same opportunity for substantive repair of the wood decking.

With its exposure to the elements, the roof is the most critical element in the preservation of a historic building and must be addressed in the near term. Regardless of approach selected, all replacement materials should be provided in-kind to match the current design.

The recommended course of action is as follows:

1. Immediately patch and repair roof areas at exposed wood decking. The new shingles should be Buckingham County slate and match the existing historic shingles in dimension, texture, and weathered color.
2. Slide new shingles under courses above and fasten with copper nail at vertical joint. Install copper sheeting above nail hole under shingles to prevent water penetration at new hole.
3. Immediately remove all loose pieces of slate from surface of roof.
4. During repairs, perform assessment of slate shingles to determine integrity of typical shingle. Determine if fasteners or slates themselves are failing. Apply pressure with hand to individual slates. Those in good condition will remain firm, while deteriorated slates will convey a brittleness and crack. Sound displaced and damaged shingles to determine integrity.
5. Assuming balance of deteriorated shingles is less than 25%, remove and replace only damaged tiles. Where two or more adjacent tiles are damaged, create a pyramid replacement area with copper bib flashing at top course only.
6. Perform repair or replacement efforts in concert with installation of new copper flashings at ridge and alterations to metal bell enclosure. Coordinate flashing materials at all locations to avoid galvanic corrosion.
7. Assuming the extent of damage exceeds 25% of roof area, remove and replace slate roofing. Provide temporary cover. Salvage tiles in good condition and reinstall or store for future repairs. The new shingles should be Buckingham County slate and match the existing historic shingles in dimension, texture, and weathered color.
8. During removal of large areas of damaged tiles, assess condition of visible areas of roof decking from above.

Metal Bell Enclosure

A sheet metal bell enclosure tops the roof with a bent metal sheet creating a hood over a historic bell. The open ends of the hood are filled with perforated metal sheets. The enclosure displays extensive corrosion and currently allows water into the building at the skyfacing opening for the bell rope. These issues have caused rot at the supporting wood structure in the attic and damaged wood finishes in the courtroom ceiling. Repairs are necessary in the near term to stop the leaks and prevent further deterioration paired with efforts to improve the existing construction.

The construction date of the enclosure itself is not known. The earliest image confirming its construction dates to 1957. A bell was installed at the building soon after the completion of the original building and the attic wood framing for enclosure appears to date to the original construction as well, suggesting that the footprint size of the enclosure is original. Additional research may provide insight. It is believed that the bell dates to the early days of the building, but the bell should be examined as a part of any repair work to attempt to confirm this information. Without the discovery of evidence to the contrary, the design of any replacement enclosure should match the existing enclosure in form and material.

The corroded elements must be surveyed via man lift to confirm the extent of deterioration. Drone photography displays extensive corrosion on various sheet metals as well as staining on the roof and the sheet metal flashing will require removal and replacement. The corrosion appears to be the result of deteriorated paint finish and galvanic reaction between dissimilar metals. Ferrous metals corrode (rust) when exposed to oxygen in the presence of moisture. These materials are generally protected by paint coating systems formulated for ferrous metal substrates. Galvanic reaction of dissimilar metals in proximity, such as copper and iron, will occur even if the metals are separated as rainwater can transfer the chemical reaction downstream between the metals.

Urgent spot repairs and waterproofing of the existing bell rope opening is necessary in the short term. These efforts paired with the replacement of the most deteriorated elements could serve as an alternative short-term measure. The extent of corrosion and quality of existing materials suggest building a new painted sheet metal enclosure would better address the water infiltration issues and extensive finish deterioration. If possible, a new attic vent should be provided in the replacement enclosure to help prevent humidity build-up in the attic.

The recommended course of action is as follows:

1. Immediately install temporary gasket at bell rope opening to prevent water intrusion.
2. Survey bell to confirm age and assess condition to determine if restoration is needed.
3. Determine if original design is known. Develop a design for the enclosure through additional research and schematic design.
4. Remove all metal elements, including roof panels, sheet metal flashings, and perforated metal sheeting, and wood bell mounting boards. Determine if roof panels can be salvaged and refinished.
5. Assess condition of all existing wood framing during removal. Perform repairs as necessary.
6. Protect bell during construction. Restore bell and mounting frame.

7. At open ends, install bird netting to prevent roosting as opposed to installing new perforated metal sheets at open side ends. Provide in-kind replacement in all other instances. Coordinate metals used with new flashing noted in roofing recommendations.
8. Perform structural repairs at support framing. Remove and replace in-kind two wood framing members—one post supporting the enclosure and a horizontal support member. At bottom truss chord at adjacent king post truss remove 12” of rotted wood and sister on each side.

Exterior Painted Woodwork

The painted finish on the exterior woodwork is deteriorated and appears to have been applied onto a surface that was not sufficiently prepared. Cracking paint and uneven surfaces demonstrate the present issues. These conditions should be addressed to protect the wood substrate from further deterioration and to resolve that deterioratation already occurring in some localized areas.

As a part of this report, the exterior painted wood surfaces were sampled and analyzed to document the paint history of the building. The paint analysis revealed the following colors on the wood trim, from newest to oldest: light gray, pinkish taupe, and white. The original specifications called for a sanded paint finish, but this finish was not found during the analysis. The findings suggest that the wood trim was stripped at some point in the history of the building. Meanwhile, the doors have a faux wood-grained paint finish that likely precedes the application of white paint on all wood surfaces. The sanded paint indicated in the original specifications was to mimic the appearance of freestone, the type of fine-grained sandstone used for the column capitals. This freestone color would have harmonized with the faux-graining found at the door. Performing small areas of cleaning on the column capitals would offer the ability to determine the true color of the stone and to consider potential color matches for the new sanded paint color finish of the exterior wood trim, including entablature, cornice, and tympanum. The wood windows and doors should be returned to their faux graining painted finish that is expected to have been coincident with the sanded paint finish.

The application of a sanded paint finish requires specialized experience and has a higher initial installation cost. However, sanded paint has lifespan of up to twenty years, or double the typical ten-year expected longevity for a high-quality exterior paint. Sanded paint is created by the blowing of sand onto the freshly painted surface. The incorporation of sand creates a more durable exterior coating with a stone-like appearance. It was employed during the period of the Fluvanna County Courthouse when painted wood and stone were used in close proximity or to stand-in for stone at a much cheaper cost. Although a much earlier building, George Washington’s Mount Vernon in Fairfax County, Virginia, is perhaps the most well-known example of sanded paint.

The use of sanded paint also requires a different approach to maintenance of the exterior painting. As layers of paint accumulate on a surface, the weight of the layers of paint will eventually cause delamination from the substrate and lead to paint failure. With the addition of the sand into painted finish, weight becomes an issue more quickly when using sanded paint. As such, the sanded paint will require stripping, rather than the typical scraping and sanding, after its twenty-year lifespan to prevent the delamination from occurring.

The recommended course of action is as follows:

1. Develop sanded paint specification. Perform test panels with different sands and application techniques to find the best mimic for the freestone finish indicated in the original specification. Review available local sources for sand, the original was likely a natural sand from a nearby river.
2. Scrape deteriorated paint at all wood surfaces. Avoid use of damaging abrasive removal treatments executed via power tools, waterblasting, or sandblasting.
3. Strip wood surfaces down to bare wood at all locations. Use environmentally friendly chemical stripper such as Ready-Strip Pro. Protect adjacent surfaces from staining.
4. Make repairs to woodwork. Remove rotted elements and provide wood dutchmen in larger holes and sections of deterioration. Use same wood species for repairs.
5. Treat all parts of new and existing wood with wood preservative.
6. Prime bare wood surface with 48 hours. Use exterior oil-based wood primer.
7. Apply two coats of breathable exterior paint as soon as primer is fully dry. Sand lightly between all coats. Finish coats and primer should be sourced from same paint manufacturer and be fully compatible.
8. Caulk wood joints prior to topcoat of exterior paint.
9. Apply tack coat for sanded finish in a thin to moderate wet-film thickness with a brush or roller and allow time to dry until sheen turns to a matte.
10. Apply full sand coat of paint in a moderate to heavy wet-film thickness without creating curtains in surface of paint.
11. Apply sand by blowing technique to dust sand lightly onto wet paint in successive areas.

Windows, Shutters, and Doors

The painted wood windows, shutters, and doors display a range of conditions. Many shutters are in poor condition with racking creating separation between components. Wood rot and heavy surface deterioration is also occurring at the shutters. The windows are in fair-to-good condition but display extensive finish deterioration. A number of window muntins are damaged or missing. The doors have areas of rot and finish deterioration. The hardware at all exterior doors requires repairs as well.

With painted wood elements it can be difficult to determine the full extent of repairs required until the painted finish has been removed. The peeling and cracking paint can often suggest more damage than is actually present in the substrate. The condition assessment found very few areas of extensive deterioration of the wood components at the windows and doors. It appears likely that repairs will be moderate and localized in nature. However, the deterioration of painted surfaces and those individual damaged areas present significant potential for future damage if not addressed in the medium term.

The shutters will require more extensive repairs. In many cases, the rails and stiles of the shutters are separating and racking. The shutters have mounting hardware set into the masonry at the window jamb and shutter dogs, which hold the shutters in the open position, mounted into the face of the masonry wall. The finish has typically deteriorated on these elements and several appear to have become loose in their mountings. Repair and refinishing of the shutters and shutter hardware is recommended and only shutters which are totally beyond repair should be replaced.

The paint analysis performed as a part of this project provides insight into the original paint scheme. The findings suggest a faux-grained paint finish was used on the exterior doors. It is likely that the window sashes and wood surrounds at the doors and windows would have matched the faux-grained doors. The shutters were likely a very dark green almost black color to create a complimentary contrasting color. Additional interior paint analysis is necessary to determine the original interior finish. See below for more information.

The recommended course of action is as follows:

1. Remove wood doors, window sashes, and shutters to allow for shop restoration work. Provide weathertight temporary infill at all openings.
2. Remove glazing putty and glass panes at window sashes.
3. Remove perimeter sealant at all window and door frames.
4. Assess condition of shutter hardware. Repair and/or reinstall as required.
5. Scrape deteriorated painted surface at all wood surfaces, including in-situ window and door frames as well. Avoid use of damaging abrasive removal treatments applied via power tools, waterblasting, or sandblasting.
6. Strip wood surfaces down to bare wood at all locations, excepting the exterior wood doors where the intact paint history should be conserved. Use environmentally friendly chemical stripper such as Ready-Strip Pro. Protect adjacent surfaces from staining.
7. Make in-kind repairs to window sashes, door panels, shutters, and frames. Remove rotted elements. Make repairs with epoxy at surface damage and provide wood dutchmen in larger holes and sections of deterioration. Match existing wood species for repairs. Provide missing elements.
8. Treat all parts of new and existing wood with wood preservative.
9. Prime bare wood surface with 48 hours. Use exterior oil-based wood primer.
10. Apply two coats of breathable exterior paint as soon as primer is fully dry. Sand lightly between all coats. Finish coats and primer should be sourced from same paint manufacturer and be fully compatible.
11. Caulk wood joints prior to topcoat of exterior paint.

12. Reinstall restored doors, windows, and shutters.
13. Provide perimeter sealant at all windows and doors.

Masonry Repointing and Repair

The building has a fair number of openings in the exterior masonry walls where mortar has eroded or cracks have occurred in the masonry units. Open masonry joints present an avenue for water infiltration into the building envelope. Under the effects of age and weathering, all masonry joints will eventually deteriorate and require replacement. Provided the mortar is installed properly and is compatible with the specific masonry units, repointing mortars may remain viable for up to 50 years. Material incompatibility and installation errors will shorten the lifespan of any joint material, as will excessive exposure to moisture and freeze-thaw cycling.

The historic mortar is comprised of calcined clay, lime, and sand. This composition is soft compared to lime-based mortars and requires greater care in repointing, as commonly available modern mortars will have much greater strength than the original mortar and the bricks themselves. Previous repointing efforts have employed cementitious mortars that do not match the color, strength, and installation technique of the original mortar. Such repointing can cause water to migrate through the masonry itself instead of mortar joints and thereby increase the potential for deterioration via spalling or staining. However, the condition assessment of the building does not suggest that these mortars present an active threat and may be maintained with routine monitoring. Future repointing efforts should consider the extent of intervention, potential for deterioration, and aesthetics of these repointed mortar joints to determine if removing the cement-based mortar is desirable.

Replicating the historic mortar precisely will be very difficult. The use of calcined clay in mortar mixtures today is not common. Locating the matching raw materials and preparing them with the same processes are the biggest challenges to the inclusion of clay in the mortar. However, other more readily available mortars may be appropriate, such as a natural hydraulic lime (NHL). This would create a stronger mortar and therefore must be done with great care and requires further investigation. An examination of the permeability of the existing mortar would offer important insight into the design and specifications of a future repointing mortar. It may also be useful to perform additional tests on the strength of the bricks themselves before repointing with a harder mortar. Refer to mortar analysis in Appendix B for more information.

The recommended course of action is as follows:

1. Perform permeability test. Use RILEM tube and water on existing mortar joints to measure rate of water penentration through mortar joints over time.
2. Use materials analyses to develop mortar specification for future repointing.
3. Select mock-up areas for repointing with different mortar mixtures to confirm a matching appearance to historic mortar and tooling techniques.

4. Perform localized repointing only at open masonry joints and areas of mortar erosion.
5. Remove existing deteriorated mortar from joint in a depth at least 2.5 times the width of the joint. Removal should be performed with hand tools and with great care by an experienced mason to avoid damaging the historic masonry.
6. Remove cracked bricks and mortar on all sides of each unit. Salvage bricks from other locations on building, potentially the attic side of the north tympanum, for reinstallation at removed brick locations.
7. With brick surfaces clean of mortar, rinse joints with water to remove debris.
8. Mist masonry with water for a few hours prior to repointing.
9. Install salvaged bricks where cracked units were previously removed.
10. Apply repointing mortar when joint is damp with no standing water. Fill via successive layers of approximately ¼" in depth. Apply next layer when previous layer has reached thumb-print hardness.
11. Tool joints to match historic technique when mortar is at appropriate stage of curing. Install red-tinted penciled joint.
12. Cover repointed joints and mist with water regularly for two days.
13. Perform annual monitoring of previous repointing efforts to determine if they are damaging the masonry assembly.

Basement Humidity

The basement has high humidity and the mechanical system lacks the capabilities to address the issue. Previous stop gap solutions, including the use of portable dehumidifiers, are an attempt to mitigate the humidity. However, the dehumidifiers require active maintenance to empty the buckets for all units. The current air handlers are outdated and are not capable of addressing the issue in their current configuration. This issue requires near-to-medium term attention to improve the conditioning in the building and to prevent the increased potential for damage to historic elements.

Humidity must be addressed for a number of reasons. It fosters the growth of mold on surfaces. The extended presence of moisture can produce rot in the wood members of the building. Other aesthetic issues such as unsightly staining and musty smells can create spaces which are undesirable to occupy. Also, rooms with high humidity also make poor long-term storage areas with the potential to negatively impact paper and other sensitive equipment held in the basement.

The best method to address the build-up of humidity is through a series of HVAC improvements. The existing units should be thoroughly tested to confirm that the system is indeed not able to control the humidity in the basement. The findings from the condition assessment suggest that further action will be necessary. Currently, the basement does not have controlled introduction and ability to condition outside air. A new energy recovery unit (ERU) would treat outside air before it enters the space allowing improved management of the humidity.

The recommended course of treatment is as follows:

1. Immediately begin regular maintenance effort to monitor and empty the dehumidifier buckets.
2. Thoroughly test and monitor the humidifiers and controls at the basement air handlers to confirm the system is not managing humidity to meet needs.
3. If existing system is not capable of mitigating existing levels of humidity, discuss storage goals and requirements with county registrar's long-term use of basement to develop parameters for mechanical design project.
4. Install backdraft damper in existing exhaust duct to prevent air infiltration.
5. Remove inoperable fans in basement walls. Provide removable access panel in existing opening.
6. Determine extent of improvement of humidity control by above improvements. If further remediation is necessary, install ducted dehumidifier and associated interior ductwork to serve the basement. Provide exhaust fan to remove heat from dehumidier. Locate exterior louvers at existing vent openings in foundation wall. Limit ability to see new louvers from exterior.
7. Coordinate improvements with recommended replacement of air handlers beyond their useful lifespan.

Interior wallboard finish in courtroom

For the majority of the historic courtroom walls, modern wallboard has been applied over the historic plaster. It is obvious that the plaster wall finish was not removed prior to the application of wallboard because the wood trim at the base and windows, which would have been applied over the plaster, is now nearly flush with the trim. In addition, near the east doors there is a deteriorated section of wallboard which allows one to see a glimpse of the plaster and lath.

There is no record indicating when this action was taken or what prompted it. It was not part of the 1970s work. At least it is not indicated on the Griggs, Wood, & Browne drawings and, during a meeting with Don Swofford, a Charlottesville architect who worked for the firm when the 1970s work was done, he verified that it was not part of their work. He did, however, think that it was done as part of the same project that included construction of the exterior accessible ramp completed ca. 1985 by another firm.

The only logical assumption for why it was done was that there was some problem with the plaster. This is reinforced by the fact that the wallboard is located on all exterior walls of the courtroom wall. It would seem that the wallboard was applied to hide the plaster problem; a cheaper alternative than repairing the plaster. The question, of course, is whether this was a case of simply treating the symptoms or if the cause of the plaster problem was treated as well.

The recommended course of action is as follows:

1. Remove a section of wallboard in a location with significant deterioration which already requires repair. The section should be large enough to allow a good look at the face of the plaster. It is assumed that when the wallboard section is removed much of the plaster behind it may fall off.
2. Determine the cause of whatever caused the wallboard to be installed and verify that it has been corrected. If not, provide testing and investigation as necessary,
3. Remove all wallboard, determine how much of the historic plaster is damaged, and remove all plaster that is loose, friable, bubbled, crumbling, or otherwise deteriorated or unsuitable to remain. Repair any plaster that is solid, well adhered to the lath, and only exhibits cracks.
4. Perform paint analysis on the historic plaster to determine historic interior finishes for future painting.
5. Where plaster is removed, leave the wood lath in place, removing any that is damaged and will interfere with the new plaster.
6. Install galvanized diamond-mesh expanded metal lath (2.5 pounds per square yard) over the wood lath.
7. Where plaster is to be applied over existing exposed wood lath, clean the wood lath completely to remove all remains of original plaster.
8. Wet the lath thoroughly the day prior to installing plaster to prevent dry wood from pulling moisture out of the plaster. Wet lath sufficiently to permit the wood to swell and then reach a suitable condition ideal for plaster application. On the day when plaster is to be installed again wet the lath approximately two hours before beginning plaster application.
9. Install three coats (scratch, brown, and finish) of pre-mixed lime plaster consisting of natural hydraulic lime and natural sand. A typical manufacturer is Limeworks, located in Bucks County, Pennsylvania. Wait ten days to two weeks between coats to allow the newly applied one to dry. Where the new plaster meets existing plaster apply bonding agent to the existing plaster prior to installing new plaster.
10. Allow the plaster to dry at least two weeks before painting. Waiting four weeks is better. Confirm paint color with paint analysis findings.

Interior Painted Finishes

The interior painted surfaces include woodwork, plaster, and wallboard. The woodwork includes the bar, columns, trims, ceiling boards, doors, shelving, and mantelpieces. The first-floor base trim and all woodwork in the second-floor jury rooms are painted a single solid color, either light yellow or burgundy. The vast majority of the interior woodwork surfaces in the courtroom are finished with a faux-graining, including the doors, windows, and railings at the stairs, bar, judge's and jury box. The painted interior finishes display a range of finish deterioration issues. Most of the deficiencies stem from the age of the finishes and general wear and tear. Cracking in the faux-grained paint, separating joints in wallboard, and damaged surfaces require refinishing in the near-to-medium terms to improve the interior appearance.

Before painting a historic interior, more information is necessary to understand the historic scheme. According to Don Swofford, architect for the 1977 renovation, the faux-grained finish on the woodwork was designed to mimic John Hartwell Cocke's Bremo. The use of painted faux-graining was a common approach to finishing wood surfaces during the period. However, the original specifications indicate that the interior woodwork was to be painted to imitate stone. Although possible, it appears unlikely that additional research will provide any more detailed insight into the original finish. The 1977 project included an analysis where the surface was scraped to remove layers of paint. The project did not fully remove or strip the interior surfaces, suggesting that some extent of historic paint remains on a number of surfaces. Contemporary paint analysis techniques offer a significantly greater capability to understand historic paint schemes. An interior paint analysis of all historic painted surfaces is recommended to confirm the original design.

The interior paints are a significant contributor to the character of a historic interior. All existing interior paint finishes date to the 1977 renovation or later and they exhibit a number of deficient conditions. The faux-graining presents the additional challenge in that it cannot be easily touched up or repaired given its composition. The other surfaces could be touched up in the near term to the extent desired. It is recommended to fully repaint the interior after careful consideration of the historic schemes and restoration of the plaster in the courtroom. Depending on the paint analysis findings, there is a wide range of paint types, techniques, finishes, and surface treatment that may be recommended for use. So as to avoid confusion with the array of potential approaches, those methodologies and specifications should be developed in detail as a part of a future design project.

The recommended course of action is as follows:

1. Perform interior paint analysis and hazardous materials survey of all historic surfaces throughout ground and upper floors.
2. Develop full building interior paint scheme and specifications based on findings.
3. Coordinate work with wallboard removal and plaster installation and repair as noted above.
4. Depending on approach selected, prepare surfaces for application of new paint.
5. Apply paint using techniques and in the layers required to match the historic paint scheme.

<u>Interior Accessible Ramp</u>

A temporary ramp is currently used to create an accessible route from the lower brick floor to the raised wood floor of the courtroom. It is flanked by wood benches on each side and it occupies much of the aisle. The ramp creates a tripping hazard for occupants egressing from the benches. In addition, the ramp lacks features such as a wheel stop or handrails so as to provide a safe accessible route between the levels. Bright-colored tape is used to mark the floor level change on the carpeted nosing at the raised floor and the end of the ramp. Lastly, the ramp mars the principal interior view of the courtroom upon entry to the building.

Although the current arrangement provides a compliant and direct accessible route to the raised courtroom floor, it creates several undesirable conditions. The building has limited alternative solutions to provide an accessible route. The preferred alternative to the existing approach is to move the ramp to one side of the courtroom as opposed to occupying the center aisle. Placing the ramp along the wall would allow for additional protections to be added, including a wheel stop and handrails, and it would restore a key interior view from the front door down the center of courtroom. This solution would incur additional work to shorten the non-historic benches on one side to accommodate the new side aisle. As the raised floor is blocked off from access due to the 1977 bar design, a hidden gate would need to be added to the bar to provide an accessible path to the main courtroom area. The current bar is not the original fabric nor is it in the original location. If the proposed alternative accessible route is adopted, restoring the bar location in lieu of creating the hidden gate should be considered during the design project.

Another approach would include keeping the central location while integrating the ramp into the raised floor of bar area and moving it forward. This solution would require the removal of the original wood floorboards to install the ramp and will impact the central view of the courtroom. It would eliminate the ramp's tripping hazard and provide a wheel stop along its edges. This approach is not recommended due to its damage of the historic wood flooring and intrusion on the original design.

Lastly, another alternative could include the removal of the ramp and the provision of interpretive panels or interactive screens at the edge of the raised wood floor to allow those unable to traverse the change in level to understand the courtroom space through images and text. This approach would reduce the existing level of accessibility, while eliminating the modern intervention of the ramp. A portable, removable ramp similar to the current, but lighter and more mobile could be provided in lieu of the existing ramp to allow for an accessible route for particular events.

The recommended course of action is as follows:

1. Determine the approach to accessibility in the building and develop a ramp design. Review and confirm approach with code official.
2. Assuming desire is to maintain existing level of accessibility, remove existing temporary ramp.
3. Modify non-historic wood benches on one side of courtroom to shorten length by approximately 4'-0".
4. Construct reversible, but permanent, wood ramp with 1:12 slope constructed with wood

ramp and handrails at each side.
5. Modify existing bar railing to install swinging gate that can be easily operated and utilizes existing wood components.

Gallery Handrail

The upper level gallery handrail is a wood railing that consists of one handrail supported on narrow rectangular wood balusters which are set into the wood floor. This assembly lacks the structural capacity to comply with current building code standards for new construction. However, given its historic nature, the extant handrail may be determined to comply with the applicable building code for existing buildings by a building official. Even if it is deemed compliant, the handrail presents a potentially unsafe condition at present due to its lack of rigidity under pressure.

The current condition should be reviewed with the county building official to confirm it is not deemed to be an unsafe condition. If the condition is considered to be unsafe, then potential options include structural reinforcement or controlling public access to the gallery. Structural reinforcement will likely take the form of vertical steel plates which reinforce the wood railing and fasten into the floor structure. The steel plates would be clearly visible and would not be a sensitive treatment for the historic railing. Alternatives which focus on limiting public access to this area would be recommended over reinforcement. Review the ability to use docents to monitor the public access of the upper gallery. Also, the use of ropes or other barrier to prevent public access to the full width of the upper gallery could potentially be deemed satisfactory for any concerns regarding the historic railing.

The recommended course of action is as follows:

1. Review existing railing with county building official for code compliance.
2. If railing is deemed compliant, no work is necessary. Care should be taken monitor public use of gallery to the extent possible. Post small permanent signage at railing to inform visitors of level of recommended care. Avoid use of temporary ad hoc postings.
3. If railing is deemed non-compliant, review requirements for public access to gallery and second floor with code official. Determine extent of limitations on public access to upper gallery.
4. If public access requires monitoring, provide docent at select times to allow public access.
5. If public access is not possible to second floor without improvements, provide rope at top of stairs on each side of courtroom.
6. If full public access is desired and requires reinforcement to comply, install structural reinforcement. Coordinate design to limit visibility of reinforcement from courtroom to the extent possible.

ARCHITECTURAL

All conditions are identified by an alphanumeric code on the architectural condition assessment drawings in Appendix A.

EXTERIOR

GENERAL

CODE	PHOTOGRAPH	CONDITION/REPAIR	QUANTITY
G.1	N/A	There is no current analysis of the existing building for the presence of hazardous materials, such as lead-based paint and asbestos-containing material. No such analysis was not performed as a part of this project. Perform hazardous material survey to determine if lead-based paint, asbestos-containing materials, or other hazardous materials are present at the building. Survey should be completed before repairs are undertaken to allow for abatement of any hazardous materials in concert with associated work.	Full building (interior and exterior)
G.2		The building does not currently have lightning protection and was recently damaged by an apparent lighting strike. Provide lighting protection system to mitigate potential for future damage.	Full building lighting protection system

MASONRY

CODE	PHOTOGRAPH	CONDITION/REPAIR	QUANTITY
MB.1		Open mortar joints and mortar deterioration occur on all elevations. Repoint open brick masonry joints with recommended mortar mixture using techniques to match original mortar joints. See further discussion in Key Issues section.	125 SF
MB.2		Stairstep cracks occur in the mortar joints extending from the heads of many windows and door openings. Repoint localized areas identified on drawings, refer to MB.1 for repair and quantity.	See MB.1
MB.3		Brick masonry units are cracked in several locations. This issue occurs with greatest frequency at the window lintel bearing points and near the south doors. Remove cracked brick unit. Provide matching brick unit and install in concert with wall repointing.	8 brick units
MB.4		Existing brick unit appears to be displaced from masonry assembly. Remove and reset displaced brick unit.	1 brick unit

MB.5		Biological growth is occurring at localized areas of the exterior masonry, typically along the base of the building, and causing staining on the exterior facade. Remove biological growth and staining with architectural anti-microbial biocide. Use gentlest means possible.	400 SF
MB.6		There are holes in the brick masonry, apparently made by anchors in a small number of locations. Repair holes in masonry wall with compatible color-matched patching mortar.	3 locations
MB.7		Deteriorated paint from an adjacent painted surface has stained the masonry walls. Remove paint staining from surface of masonry walls. Perform tests on masonry and pursue the gentlest effective method.	80 SF
MB.8		Overpaint is present on masonry surfaces directly adjacent to painted surfaces. Remove overpaint on brick surfaces using the gentlest effective method.	160 LF

MB.9		Existing exterior surfaces display soiling in localized areas. Clean localized staining from exterior walls. Preferred cleaning approach is hand-washing with mild detergent with care to be taken at mortar joints to minimize damage and erosion. A low-pressure water wash of less than 400 psi may be utilized in lieu of hand washing after testing a small area to determine impact to historic materials.	250 SF
MB.10		The masonry walls at the existing sham windows are hidden behind wood shutters and were not assessed. Remove wood shutters at sham windows and assess masonry walls. Perform work in concert with shutter restoration.	3 locations
MB.11		Existing brick paved walking surface at accessible ramp on east side of the building displays signs of settlement and open mortar joints. Remove brick pavers and reset at landing to resolve settling. Repoint 100% of brick walking surface and ramp walls.	120 SF

MB.12		At top of existing chimney, the sloping mortar cap abuts the copper flue cap. This condition has led to deterioration of mortar. Remove chimney cap. Provide new copper chimney cap to cover, rather than abut, a new sloping mortar cap at top corbel.	4 locations @ 8 LF each
MS.1		Stone stairs at front portico display extensive mortar deterioration and numerous open joints. Repoint stone foundation wall and match existing mortar in color and composition.	125 SF
MS.2		Existing stone and concrete stairs display discoloration and staining. Remove paint and staining from stone stairs and bottom concrete step. Perform tests on masonry and pursue the gentlest effective method.	125 SF
MS.3		The sky-facing sides of several of the stone capitals have graffiti and various surfaces are stained. Remove paint and clean stains on stone capitals. Removal of all stains is not the intended goal. Clean surface with mild detergent and gentle water wash to remove surface dirt.	18 locations

CONCRETE

CODE	PHOTOGRAPH	CONDITION/REPAIR	QUANTITY
C.1		Areas of existing concrete gutter at perimeter of building have extensive cracking. Remove cracked concrete at gutter. Provide replacement concrete to match the remaining portions in profile and color.	30 LF
C.2		Existing concrete stair displays deterioration and lacks a handrail. Remove concrete stair. Provide new concrete stair that spans over existing gutter. Review requirement for landing at exterior side of door with code official. Stair is to have code-compliant tread depth and riser height. Provide code-compliant painted metal handrail on both sides of stair. Do not fasten handrail to face of historic building.	1 stair with 4 risers / 10 LF of handrail
C.3		Existing concrete element has cracks. Remove loose concrete at existing crack. Prepare joint and provide cementitious filler to match color of existing concrete.	8 LF

STUCCO/PLASTER

CODE	PHOTOGRAPH	CONDITION/REPAIR	QUANTITY
ST.1		Existing stucco surface at all columns and pilasters display extensive delamination of paint and finish stucco coat. Perform selective removal of stucco at columns to determine to confirm binder. Complete petrographic analysis to determine composition of stucco. This analysis will determine if a lime mortar was used. An inappropriate material such as Portland cement may have been used, leading to the finish issues. It may be necessary to remove the existing stucco from columns and pilasters to the brick substrate. If the composition of the stucco is appropriate, the issues may stem from application of the modern paint coating. To resolve this issue, remove paint and finish surface with breathable paint.	Small area of selective removals and petrographic analysis of existing stucco. Surface prep and repainting of all columns and pilasters.
ST.2		Existing portico stucco ceiling displays finish deterioration and localized areas of cracking. Gently sound damaged areas of stucco ceiling surfaces to determine extent of delamination. Remove loose or damaged areas of stucco. Prepare wood lath substrate to allow for sufficient bond with new stucco. Saturate wood lath with water in advance. Provide new stucco surface that matches composition and texture of existing stucco. Paint 100% of ceiling using breathable paint.	230 SF of repainting / 20 SF of repair

WOOD

CODE	PHOTOGRAPH	CONDITION/REPAIR	QUANTITY
WD.1		Existing wood cornice board has a split end. Strip finish from damaged portion of wood cornice board. Remove rotted portions of wood and provide wood dutchman or epoxy repairs.	6 LF
WD.2		Existing wood cornice, pediment, and tympanum display varying degrees of failure of the existing painted finish. Since much of paint history was previously removed from these areas, scrape strip 100% of deteriorated paint finish. Assess wood substrate. Repair minor surface damage. Remove rotted elements and provide wood dutchman. Prepare wood surface for new sanded paint finish per original design. Repaint.	1,500 SF of repainting / 25 LF of repairs
WD.3		Existing wood bench displays finish deterioration. Prepare and repaint all surfaces of exterior wood bench.	3 benches at 30 LF combined

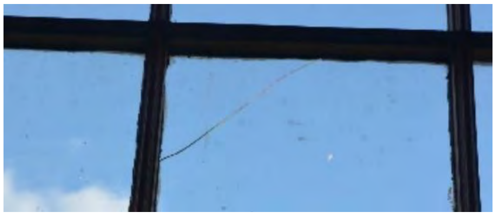
METAL

CODE	PHOTOGRAPH	CONDITION/REPAIR	QUANTITY
MT.1		Existing metal access door displays deterioration. Remove metal access door at pilaster. Provide new painted metal access door in existing opening.	1 location

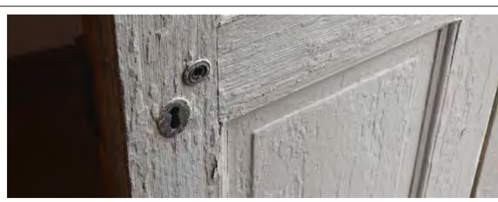
MT.2		The sheet metal bell enclosure displays corrosion and finish deterioration. The existing roof opening for the bell rope is allowing water to migrate into the building. Remove corroded sheet metal bell enclosure. Provide new enclosure. Determine design of new enclosure. Assess bell and mounting. Determine ability to reuse roof panels. Include attic vent and metal roof flashing at base of new enclosure. Provide flashing and sealant to create weatherproof opening for bell rope at horizontal metal surface.	1 location (approx. 20 SF footprint)
MT.3		The existing crawlspace vents have a series of mismatched screens which are in varied condition. Debris is entering crawlspace through vents. Remove metal screen. Provide new metal screen in existing opening set back from face of masonry.	10 locations
MT.4		Finish on existing metal railing is deteriorated. Prepare surface of metal handrail. Repaint.	2 locations @ 100 LF total
MT.5		Existing metal element displays corrosion. Remove corrosion from surface of metal element. Repair surface deterioration. Paint.	4 LF

WINDOWS

CODE	PHOTOGRAPH	CONDITION/REPAIR	QUANTITY
W.1		Existing wood windows display finish and substrate deterioration at various components. Restore 100% of wood windows. Remove window sashes. Remove glazing putty and glass. Label and store glass for future reinstallation. Strip paint. Remove rotted wood from sash and frames. Remove perimeter sealant. Provide epoxy patch for all surface repairs and wood dutchman for rotted sections. Reglaze sash. Paint all sides of frame, sill, and sash. Reinstall sash. Provide perimeter sealant.	8 double-hung windows @ 25 SF each / 10 casement windows @ 15 SF each / 4 transoms @ 10 SF each
W.2		Existing wood shutters display finish deterioration and apparent signs of wood rot. Restore wood shutters. Remove all painted wood shutters. Repair shutter hardware and secure any loose shutter dogs. Strip paint. Remove rotted wood. Provide epoxy patch for all surface repairs and wood dutchman for rotted elements. Paint all sides of shutters and hardware. Reinstall shutters.	10 locations @ 25 SF each, 10 locations @ 15 SF each
W.3		Wiring is routed through a wood window sash. Assess need for wiring. Reroute wiring and repair hole at wood window sash.	1 location

W.4		Existing glass pane is broken. Remove cracked glass pane. Provide glass pane in existing window.	1 location

DOORS

CODE	PHOTOGRAPH	CONDITION/REPAIR	QUANTITY
D.1		Existing wood doors display finish and substrate deterioration at various elements. Restore wood doors. Remove wood doors. Repair door hardware to improve operability and latching. Remove deteriorated paint from door and frame. Remove rotted wood. Provide epoxy patch for all surface repairs and wood dutchman for rotted elements. Do not strip full surface of doors. Scrape and sand surface to prepare for new finish and paint all sides of door and frame. Reinstall door.	6 doors / Assume replacement of rotted bottom rail at 2 locations and 30 LF of wood door panel molding.
D.2		Existing door sweep is damaged and beyond useful life. Remove and replace door sweep.	3 paired doors
D.3		Door is missing exterior knob. Restore door hardware and provide new door knob for existing hardware.	1 location

D.4		Existing wood threshold displays signs of deterioration. Repair rotted portions at existing wood threshold with epoxy repair.	2 locations
D.5		Door stop is not securely installed at wood base trim. Remove and reinstall door stop. Repair and refinish wood base trim.	1 location

ROOF

CODE	PHOTOGRAPH	CONDITION/REPAIR	QUANTITY
R.1		The slate roof has many broken and missing shingles. Remove broken slate shingles. Inspect decking substrate to determine integrity. Repair decking. Provide in-kind slate shingle replacement, matching color, texture, and size.	175 shingles
R.2		Existing slate roof shingles are stained from corrosion at bell enclosure. Clean ferrous stains from slate shingles. Review cleaning methods. Complete tests to determine impact on adjacent fabric, including downstream surfaces, before full cleaning. Use gentlest effective method.	200 SF

R.3		Ridge flashing displays finish deterioration and damaged joints between sections. Remove and replace 100% of painted metal ridge flashing. Coordinate with new bell enclosure to avoid galvanic reaction between metals.	75 LF
R.4		Existing chimney flue is not covered and allows rain and debris to enter flue. Provide copper rain cap at opening and weatherproof seal and flashing between piping and opening in chimney cap.	2 locations
R.5		Slate shingles are missing and wood roof sheathing is exposed. Immediately install shingles to cover location of exposed roof structure and address water infiltration at bell rope opening.	1 location
R.6		Portions of broken shingles are loose and unattached. In the immediate near term, perform aerial lift survey Remove all unattached full shingles and portions of shingles from surface of roof.	Full roof

OTHER

CODE	PHOTOGRAPH	CONDITION/REPAIR	QUANTITY
O.1		Paving at north side of building has settled, opening a mortar joint and creating a hole adjacent to brick-paved walk. Repoint joint along building at walk. Monitor joint to determine if settlement is active. Provide compacted fill to create level surface up to existing brick paving.	1 instance @ 8 SF
O.2		Various types of wiring are mounted to the exterior face of the building. See red highlight line for reference. Determine if wiring is in active service. Reroute surface wiring and remove mounting accessories. Repair surface as necessary. Provide concealed interior wiring.	2 instances
O.3		The exterior grade has settled at the face of masonry accessible ramp, revealing the concrete block foundation wall. Regrade planting bed at brick ramp to obscure concrete block foundation wall and create positive slope away from building.	1 location of approx. 40 SF
O.4		Debris has collected in basement areaway and soiling has occurred on the stair retaining walls. Clean areaway and basement stair of all dirt and debris.	60 SF

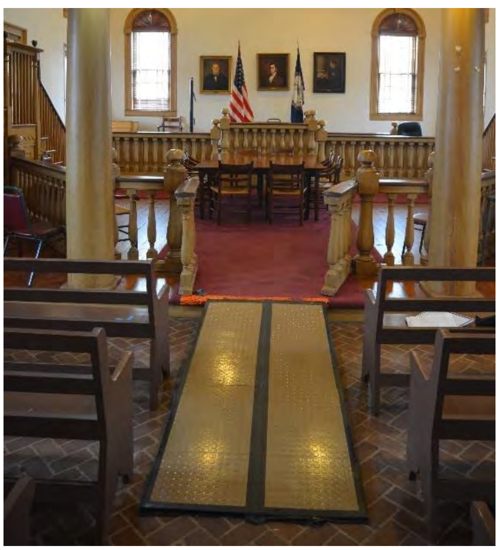
O.5		There is a bird nest on the horizontal surface of a column capital. As a part of full exterior cleaning, remove bird nests while avoiding harm to any birds in the nest.	1 location

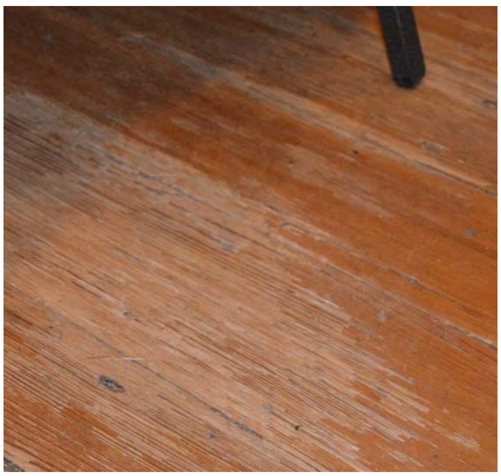
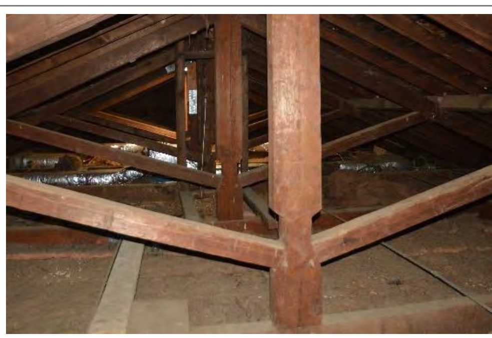
INTERIOR
GENERAL

CODE	PHOTOGRAPH	CONDITION/REPAIR	QUANTITY
GI.1		The interior of the building has a minor extent of debris and soiling throughout, especially the basement and upper levels. Clean all interior spaces to remove debris and soiling.	2,500 SF
GI.2		There is a ladybug infestation in the second-floor jury rooms and a wasp infestation in the attic. Although not harmful to the building, it is recommended to remove these infestations. Address ladybug infestation via vacuum removal, installation of natural or chemical repellent, and/or traps. Perform removal after exterior repairs to prevent future reinfestation. Remove wasp nests from attic and fill openings with appropriate material to prevent additional infiltration.	Upper floor and attic area

FLOOR

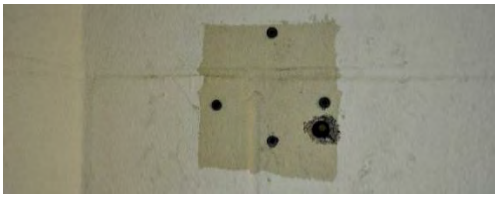
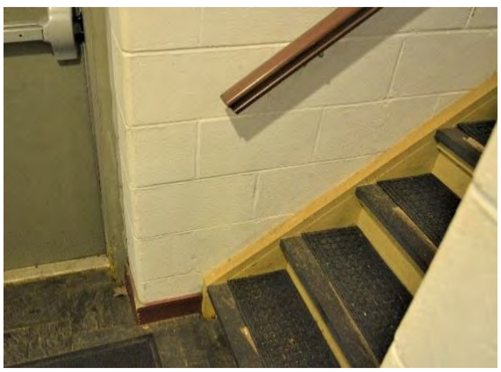
CODE	PHOTOGRAPH	CONDITION/REPAIR	QUANTITY
F.1		Existing vinyl wall base is damaged and aged. Provide new vinyl wall base.	270 LF

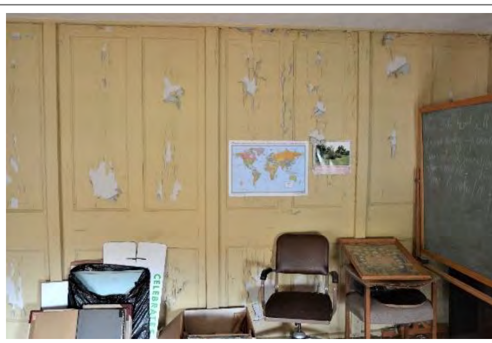
F.2		Existing vinyl composition tile (VCT) flooring displays minor discoloration due to age. Despite discoloration, floor tile is in good condition. As basement is expected to remain back-of-house space, maintain existing flooring and apply protective coating.	780 SF
F.3		Dehumidifier drain line is taped to floor from registrar's storage room to floor drain in mechanical room. Provide heavy duty protector for condensate line until mechanical upgrades are completed in basement.	1 location at 6 LF
F.4		Removeable ramp from brick floor to upper wood floor creates a tripping hazard at wood bench seating and lacks a raised edge or barrier along edge to mitigate fall potential. Remove temporary ramp. Install fixed ramp with handrail at side wall of courtroom. Shorten benches to accommodate ramp location. Modify existing bar to install swinging gate to provide permanent accessible path.	1 ramp @ 7 LF, modify three benches to shorten in length, install 3'-0" wide clear swing gate in existing bar
F.5		Stair tread covers do not fit the width of the basement stair treads. Provide broadloom carpet stair runner down center of stair.	20 LF

F.6		Broadloom carpet covers a significant portion of the wood floor, preventing the ability to assess its condition. Remove carpet to allow for floor refinishing in courtroom, stairs, and gallery. Provide new broadloom carpet at stairs and gallery to protect stair surface from wear and to maximize safety. Return main courtroom floor to exposed wood flooring.	600 SF of carpet removal / 350 SF of new carpet on stairs and gallery
F.7		Wood flooring has localized surface damage and gaps between floorboards. Repair and sand area of floor damage. Prepare surface for new flooring finish. Fill gaps measuring ¼" or more with wood matching in species and graining. Provide new clear high-traffic coating on restored wood floor. Provide foot pads on all furniture.	50 SF of damage / 1600 SF of refinishing
F.8		The brick hearths in the jury rooms have several broken bricks. Remove broken bricks. Prepare substrate and reset salvageable units. Replace heavily damaged units with salvaged bricks. Consider removal of the infill panels in each room to restore fireplace.	10 units / 2 infill panels
F.9		Attic lacks a walking surface to permit maintenance access across length. Install 4'-0" wide by ¾" thick plywood decking on existing ceiling joists to create maintenance access path to full length of attic.	200 SF

WALLS

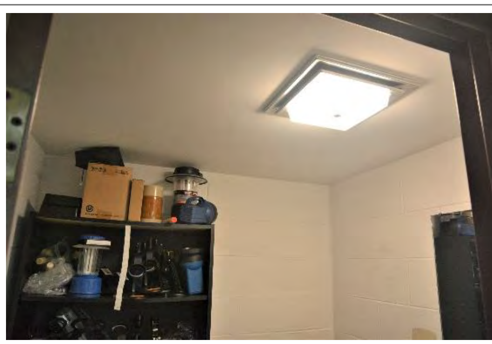
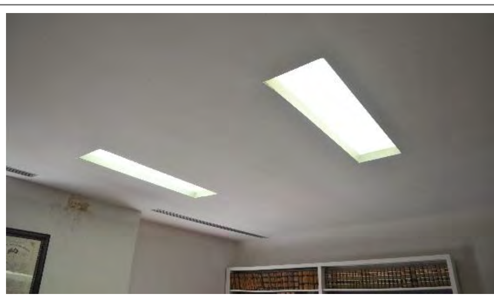
CODE	PHOTOGRAPH	CONDITION/REPAIR	QUANTITY
WA.1		Painted wood graining finish displays deterioration and localized areas of poor execution. Perform interior paint analysis. Remove deteriorated paint finish on all wood surfaces. Prepare surface and repaint 100% of woodwork in courtroom and jury rooms per findings of analysis.	600 SF
WA.2		Existing courtroom walls have a layer of plasterboard installed over the historic plaster finish. This alteration has negatively impacted the relationship of between the surface of the wall and the surface of the wood trim pieces. Selectively remove 5′-0″ x 5′-0″ area of deteriorated wall finish. Assess condition of plaster and masonry substrate. Determine impact of removal of interior wallboard finish on all courtroom walls to restore original design detailing.	25 SF
WA.3		Existing plaster board and plaster wall finish has gaps along joints and localized areas of deterioration. Repair damaged areas of wallboard and plaster finish. Paint 100% of walls. Alternate approach includes removal of all existing wall finish applied on top of historic plaster and repair/replacement of plaster wall finish.	6000 SF of painting / 150 SF of repairs Alternate: Remove applied wall board in courtroom and repair/ replace plaster.

WA.4		Metal fasteners are installed in face of concrete block wall. Remove metal fasteners. Patch wall with mortar. Paint wall.	5 locations
WA.5		Interior face of brick tympanum on north wall exhibits extensive deterioration of mortar joints and brick displacement. Repoint 100% of interior side of brick tympanum with recommended mortar mixture. Reset displaced brick units.	100 SF
WA.6		The basement stair handrail does not meet code due to low mounting height and lack of extension at bottom landing. Remove and replace existing basement stair handrail. Relocate light switches at basement landing to accommodate raised handrail.	1 location
WA.7		Debris is entering crawlspace area through exterior vents. Remove wall-mounted vents and fans. Inspect crawlspace. Remove debris. Provide vents.	5 locations
WA.8		Wood paneling at gallery beam is cracked and displays rot. Remove approximately 30” long portion of deteriorated wood paneling and pulley at gallery support beam. Remove wood paneling members in their entirety back to nearest joint. Do not cut wood to remove. Examine substrate to determine extent of damage. Remove any areas of wood rot and repair surface damage with epoxy. Reinstall paneling. Paint.	5 SF

WA.9		Modesty panels were installed on rear side of balustrade at raised judge and jury box in previous renovation. Remove modesty panels and patch and paint wood at fastener locations.	25 LF
WA.10		Wood columns have checks, or cracks, along full height. Wide gaps are present where filler previously installed in checks has failed. Monitor columns throughout year. Determine if repair is desired per findings. Remove sealant fill at checks in hollow bored wood columns. Fill checks. For narrow checks (less than 1/8") use epoxy paste filler. For checks larger than 1/8," install a narrow, tapered slat of pine into crack during dry season. Apply adhesive and drive slat into the check with light taps from hammer. Once glue dries, trim excess glue and slat. Repaint column.	25 LF
WA.11		Surface of wood column is damaged. Repair damaged surface. Refinish column.	2 locations @ 1 SF each
WA.12		Paint finish on operable wood partition is heavily deteriorated. Remove deteriorated paint finish from operable wood partition on all sides. Repaint. Consider restoring operability to wood panels.	150 SF

WA.13		Window trim is damaged or displays finish deterioration. Repair wood window trim. Coordinate refinishing with item WA.1.	4 SF total
WA.14		Wood door jamb trim and surface of door has surface scars from previous hinge location and wear and tear. Install wood patches to eliminate signs of scars. Repair surface of door. Repaint trim and door.	5 SF total
WA.15		Concrete block walls in basement have areas of finish deterioration and staining. Repaint 100% of concrete block walls.	1750 SF
WA.16	N/A	Historic paint interior schemes are not documented. Perform paint analysis on historic interior wood and plaster surfaces to confirm the original color scheme.	All historic interior surfaces

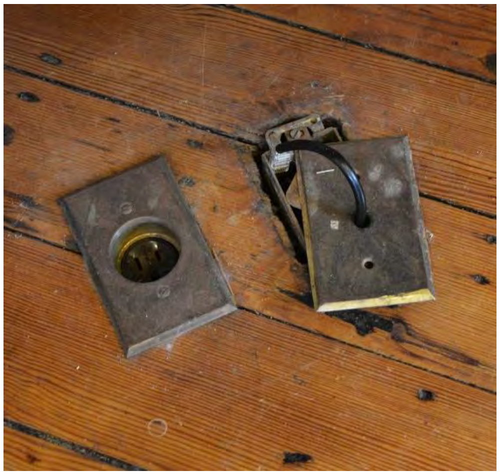
CEILING

CODE	PHOTOGRAPH	CONDITION/REPAIR	QUANTITY
CL.1		The basement mechanical room ceiling is damaged. Remove damaged metal lath and plaster in mechanical closet. Provide new ceiling in entire mechanical closet.	40 SF
CL.2		The painted wood board ceiling exhibits minor finish deterioration and several boards have become unfastened over time Refasten loose ceiling boards and cornice trim. Prepare and repaint 100% of painted wood board ceiling and cornice trim. Coordinate painting with paint analysis findings.	1000 SF of repainting / Assume refastening of 15 ceiling/trim boards
CL.3		Localized areas of gypsum wallboard ceiling display minor finish deterioration. Patch damaged area of gypsum wallboard ceiling. Prepare and paint 100% of gypsum ceiling.	750 SF of painting / 20 SF of repairs
CL.4		Localized areas of plaster ceiling display minor finish deterioration. Prepare and paint 100% of plaster ceiling. Perform work in concert with plaster repairs in item CL.5.	950 SF

CL.5		Localized areas of textured plaster ceiling display moderate water damage. Repair damaged locations. Paint 100% of ceiling. Consider replacement of textured ceiling finish with smooth ceiling finish. Coordinate work with item CL.4.	275 SF of painting / 30 SF of repairs
CL.6		Mold is present on the surface of the wood trim at the gallery beam. Clean painted surface to remove mold. Coordinate mold removal with WA.8.	10 LF
CL.7		Wood board at bell rope displays signs of rot and deterioration. Remove and repair deteriorated wood ceiling board. Remove rotted wood and repair with epoxy. Repaint wood board and reinstall.	2 SF of repairs
CL.8		Existing fiberglass attic insulation located in the joist bays above the upper floor ceiling appears to be soiled and deteriorated due to the presence of moisture infiltration. Remove and replace 100% of fiberglass insulation.	1500 SF

OTHER

CODE	PHOTOGRAPH	CONDITION/REPAIR	QUANTITY
OI.1		Existing Venetian blinds do not operate with ease and display signs of soiling and age. Remove and replace Venetian blinds.	18 locations
OI.2		Wood balustrade at upper gallery flexes under light pressure and does not meet current code requirements for structural integrity Depending upon level of alteration in future restoration efforts, the handrail may need to be reinforced. If reinforcement is required, design improvements to minimize visual intrusion.	1 location of 25 LF
OI.3		Existing wood stair baluster is loose. Provide wood glue and/or tack to fix baluster in place.	2 locations
OI.4		Wood benches and jury room wood shelves display minor finish deterioration and damage. Paint 100% of wood benches and jury room shelves.	65 SF of shelf painting / 135 LF of bench painting

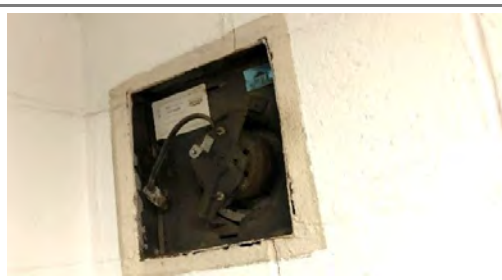
OI.5		Assessment of the electrical and A/V systems were not included in the scope of this project. Complete review and assessment of electrical and A/V systems. Review potential to update all lighting, electrical, and A/V systems as required. Review all floor receptacles in court room. Remove any nonfunctioning receptacles and provide blank off plate.	Full building
OI.6		Several dehumidifiers indicate that the buckets are full and require emptying. Until mechanical system upgrades occur, a routine maintenance schedule should be developed for the basement dehumidifiers.	6 units

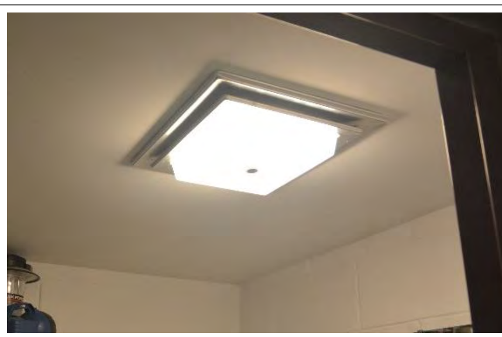
STRUCTURAL

CODE	PHOTOGRAPH	CONDITION/REPAIR	QUANTITY
S.1		Settlement has occurred at the second-floor gallery evidenced by the small gap at the shoe molding and the floor. Monitor gap at floor and base trim over time to determine if settlement is active.	N/A
S.2		The mortar at the chimneys in the attic displays extensive deterioration. Repoint 100% of three chimneys in attic.	30 SF
S.3		The roof rafters notched into the chimneys have rotted extensively at three of the four chimneys. Remove rotted wood and sister new member onto sound portions of existing member.	2 instances at 3 chimneys
S.4		Brick is missing at chimney in attic. Install salvaged brick in missing location. Coordinate with chimney repointing.	1 instance
S.5		Roof sheathing is rotted due to water infiltration. Replace rotted areas of wood. Coordinate repairs with roofing repairs.	25 SF

S.6		Post supporting bell enclosure is rotted at roof connection, at bottom of post, and at horizontal support member. Remove and replace bell support members to match existing member.	2 members of 15 LF total
S.7		Bottom truss chord beneath king post adjacent to bell enclosure location is rotted. Remove approx. 12” length of rotted wood and sister existing bottom chord on each side.	1 location

MECHANICAL

CODE	PHOTOGRAPH	CONDITION/REPAIR	QUANTITY
M.1		Typical air handler setup (AH-1 shown) with air cleaner at return, condensate drain to pump unit. Regular servicing and tune-ups of all (4) systems are recommended twice annually at season changes.	4 AHUs
M.2		Basement wall exhaust fans are of dated vintage and do not appear to be operative. Replace fans, wall switches, and existing open-ended outside air intake duct.	3 wall exhaust fans, 3 switches, and 15 LF of ductwork
M.3		Basement has build-up of humidity. Test all humidifiers and associated controls to confirm proper operation.	3 total
M.4		Existing thermostats require calibration. Calibrate existing thermostats to confirm accurate operation and ability to maintain desired indoor temperature conditions.	4 total

M.5		No outside air intake duct exists at attic AHU-4. Provide new energy recovery unit (ERU) to supply pre-conditioned / room temperature-and-humidity neutral outside air to the courtroom when Jury Rooms 1 and/or 2 are occupied. Include automatic digital controls to insure the ERU operates when occupants are present. Estimated capacity of 300 CFM.	2 ERUs, controls, and 35 LF of ductwork
M.6		Heat recovery ventilator (HRV) in the mechanical room is no longer operational. Replace defunct HRV with a new energy recovery unit (ERU) to provide exhaust and pre-conditioned room temperature-and-humidity neutral outside air to the occupied spaces. Provide automatic digital controls to insure the new ERU operates when occupants are present. Estimated capacity of 300 CFM.	1 ERU
M.7		Basement bathroom exhaust fans are aged. Replace bathroom exhaust fan/lights in 1 existing operating bathroom. Determine potential for unused bathrooms to return to active use. If so, replace fans.	1 bathroom exhaust fan

M.8		Basement humidity levels are excessive and damaging to paper documents. Portable dehumidifiers appear to be ineffective for mitigating this problem. Install a ducted dehumidifier and associated interior ductwork to serve the Basement level. This also may require an exhaust fan to remove the heat generated by the dehumidifier.	Provide 1 dehumidifier, humidistat with return/supply ductwork; 1 exhaust fan, associated exhaust duct and exterior louver

TREATMENT AND MAINTENANCE SCHEDULE

Introduction

This section of the report provides the recommended treatment and maintenance schedule for the Fluvanna County Historic Courthouse. As indicated on the Priority Matrix earlier in this report, the treatment recommendations are separated by priority as follows:

- Priority 1 – within one year
    - Urgent threats to building fabric
    - Investigation and testing required to develop the design for the Priority 2 and 3 repair and restoration projects
- Priority 2 – within three years
    - Improvements and repairs to the building's exterior envelope
- Priority 3 – within five years
    - Interior repairs
    - Minor exterior repairs

These efforts will require significant funding to execute as outlined. A rough order of magnitude cost estimate is included in Appendix A. The information gleaned from the additional investigations and tests will provide direction towards treatments which are referenced but not recommended at this time. The report and cost estimate should be updated with these additional findings. All items from the treatment recommendations section are sorted into the phases in the following pages. Refer to the condition assessment and treatment recommendations sections earlier in this report for additional context and information on these items.

All items within the treatment schedule should be completed as a part of a larger project overseen by historic preservation professionals, including architects and conservators, and executed by experienced contractors and skilled tradespeople. It is not recommended for this complex and difficult work be undertaken by the county public works department.

Following the phased treatment schedule is a maintenance schedule. Unlike the treatment recommendations, the work indicated within the maintenance schedule include items which are expected to be within the capacity of the public works department to execute internally or to manage with a local contractor. It is recommended that the county public works utilize this schedule for maintaining the building. Over time, the maintenance schedule should be updated to reflect any executed capital improvements and any issues which have arisen over time.

TREATMENT SCHEDULE

ARCHITECTURAL

EXTERIOR

Priority 1 – within one year

G.1 Perform hazardous materials survey to determine if lead-based paint, asbestos-containing materials, or other hazardous elements are present at the building. Survey should be complete before repairs are undertaken to allow for abatement of any hazardous materials in concert with associated work.

ST.1 Perform selective removal of stucco at columns to determine to confirm binder. Follow fieldwork with petrographic analysis to determine composition of stucco. This analysis will determine if a lime mortar was used. An inappropriate material such as Portland cement may have been used, leading to the finish issues *(see additional work in Priority 2).*

R.5 Immediately install shingles to cover location of exposed roof structure and address water infiltration at bell rope opening.

R.6 Perform aerial lift survey of roof. Remove all unattached full shingles and portions of shingles from surface of roof.

MB.1 Perform permeability testing of existing mortar joints *(see additional work in Priority 2)*

Priority 2 – within three years

G.2 Provide lightning protection system to mitigate potential for future damage.

ST.1 Depending on the findings of the stucco analysis, it may be necessary to remove the existing stucco from columns and pilasters to the brick substrate. If the composition of the stucco is appropriate, the issues may stem from application of the modern paint coating. To resolve this issue, remove paint and paint surface with stucco per mixture recommended by conservator.

MB.1 Repoint open brick masonry joints with recommended mortar mixture using techniques per original mortar joints.

MB.2 Repoint all stairstep crack locations identified on drawings with recommended mortar mixture using strike technique per original mortar joints.

MB.3 Remove cracked brick units. Provide matching brick units and install in concert with wall repointing.

MB.4 Reset displaced brick unit.

MB.5 Remove biological growth and staining with architectural anti-microbial biocide. Use gentlest means possible.

MB.6 Repoint holes in masonry wall with compatible color-matched patching mortar.

MB.7 Remove paint staining from surface of masonry walls. Perform tests on masonry and pursue the gentlest effective method.

MB.8 Remove overpaint on brick surfaces. Perform tests on masonry and pursue the gentlest effective method.

MB.9 Clean localized staining from exterior walls. Preferred cleaning approach is hand-washing with mild detergent with care to be taken at mortar joints to minimize damage and erosion. A low-pressure water wash of less than 400 psi may be utilized in lieu of hand washing after testing a small area to determine impact to historic materials.

MB.10 Remove wood shutters at sham windows and assess masonry walls. Perform removal and repair work in concert with shutter restoration.

MB.11 Remove brick pavers at accessible ramp and reset at landing to resolve settling. Repoint 100% of brick walking surface and ramp walls.

MB.12 Remove chimney cap. Provide new copper chimney cap to cover, rather than abut, a new sloping mortar cap at top corbel.

MS.1 Repoint stone foundation wall at front steps and match existing mortar in color and composition.

MS.2 Remove paint and staining from front entrance stone stairs and bottom concrete step. Perform tests on masonry and pursue the gentlest effective method.

MS.3 Remove paint and clean stains on stone capitals. Removal of all stains is not the intended goal. Clean surface with mild detergent and gentle water wash to remove surface dirt. Perform tests on masonry and pursue the gentlest effective method.

C.1 Remove cracked concrete at gutter. Provide replacement concrete to match existing to remain portions in profile and color.

C.2 Remove concrete stair. Provide new concrete stair that spans over existing gutter. Review requirement for landing at exterior side of door with code official. Stair is to have code-compliant painted metal handrail on both sides of stair. Do not fasten handrail to face of historic building.

C.3 Remove loose concrete at existing crack. Prepare joint and provide cementitious filler to match color of existing concrete.

ST.2 Gently sound damaged areas of stucco ceiling surfaces to determine extent of delamination. Remove loose or damaged areas of stucco. Prepare wood lath substrate to allow for sufficient bond with new stucco. Saturate wood lath with water in advance of repairs. Provide new stucco surface that matches composition and texture of existing stucco. Paint 100% of ceiling using breathable paint.

WD.1 Strip finish from damaged portion of wood cornice board. Remove rotted portions of wood and provide wood dutchman or epoxy repairs.

WD.2 Strip 100% of paint finish from cornice, pediment, and tympanum. Assess wood substrate. Repair wood with minor surface damage. Remove elements where rotted and provide wood dutchman. Prepare wood surface from new sanded paint per finish per original specifications. Repaint.

WD.3 Prepare surface and repaint all surfaces of exterior wood bench.

MT.1 Remove metal access door at pilaster. Provide new painted metal access door in existing opening.

MT.2 Remove corroded sheet metal bell enclosure. Provide new enclosure. Perform additional historical research to determine earliest design of enclosure or if a steeple preceded the current enclosure. Include attic vent and metal roof flashing at base of new enclosure. Provide flashing and sealant to create weatherproof opening for bell rope at horizontal metal surface.

MT.3 Remove metal screen at crawlspace vent. Provide new metal screen in existing opening set back from face of masonry.

MT.4 Prepare surface of metal handrail. Repaint.

MT.5 Remove corrosion from surface of metal element. Repair surface deterioration. Paint.

W.1 Restore 100% of wood windows. Remove window sashes. Remove glazing putty and glass. Label and store glass for future reinstallation. Strip paint. Remove rotted wood from sash and frames. Remove perimeter sealant. Provide epoxy patch for all surface repairs and wood dutchman for rotted sections. Reglaze sash. Paint all sides of frame, sill, and sash. Reinstall sash. Provide perimeter sealant.

W.2 Restore wood shutters. Remove all painted wood shutters. Repair shutter hardware and secure any loose shutter dogs. Strip paint. Remove rotted wood. Provide epoxy patch for all surface repairs and wood dutchman for rotted elements. Paint all sides of shutters and hardware. Reinstall shutters.

W.3 Assess need for wiring which is routed through window sash. Reroute wiring and repair hole at wood window sash.

W.4 Remove cracked glass pane. Provide glass pane in existing window.

D.1 Restore wood doors. First, remove wood doors. Repair door hardware to improve operability and latching. Remove deteriorated paint from door and frame. Remove rotted wood. Provide epoxy patch for all surface repairs and wood dutchman for rotted elements. Do not strip full surface of doors. Scrape and sand surface to prepare for new finish and paint all sides of door and frame. Reinstall door.

D.2 Remove and replace door sweep.

D.3 Restore door hardware and provide new door knob for existing hardware.

D.4 Repair rotted portions at existing wood threshold with epoxy repair.

R.1 Remove broken slate shingles. Inspect decking substrate to determine integrity. Repair decking. Provide in-kind slate shingle replacement, matching color, texture, and size.

R.2 Clean ferrous stains from slate shingles. Review cleaning methods. Complete tests to determine impact on adjacent fabric, including downstream surfaces, before full cleaning.

R.3 Remove and replace 100% of painted metal ridge flashing. Coordinate metal with new bell enclosure to avoid galvanic reaction between dissimilar metals.

R.4 Provide copper rain cap at opening and weatherproof seal and flashing between piping and opening in chimney cap.

O.1 Repoint joint along building at walk on north side of building. Monitor joint to determine if settlement is active. Provide compacted fill to create level surface up to existing brick paving.

O.2 Determine if wiring is in active service. Reroute surface wiring and remove mounting accessories. Repair surface as necessary. Provide concealed interior wiring.

O.3 Regrade planting bed at brick ramp to obscure concrete block foundation wall and create positive slope away from building.

O.4 Clean areaway and basement stair of all dirt and debris.

O.5 As a part of full exterior cleaning, remove bird nests while avoiding harm to any birds in the nest.

INTERIOR

Priority 1 – within one year

WA.2 Selectively remove 5′-0″ x 5′-0″ area of deteriorated wall finish. Assess condition of plaster and masonry substrate. Determine impact of removal of interior wallboard finish on all courtroom walls to restore original design detailing. See WA.3.

WA.16 Perform paint analysis on historic interior wood and plaster surfaces to confirm the original color scheme.

OI.2 Depending upon level of alteration in future restoration efforts, the gallery handrail may need to be reinforced. Review with county building inspector. If reinforcement is required, design improvements to minimize visual intrusion.

OI.5 Complete review and assessment of electrical and A/V systems. Review potential to update all lighting, electrical, and A/V systems as required. Review all floor receptacles in court room. Remove any nonfunctioning receptacles and provide blank off plate *(see additional work in Priority 3).*

Priority 3 – within five years

GI.1 Clean all interior spaces to remove debris and soiling.

GI.2 Address ladybug infestation via vacuum removal, installation of natural or chemical repellent, and/or traps. Perform removal after exterior repairs to prevent future reinfestation. Remove wasp nests from attic and fill openings with appropriate material to prevent additional infiltration.

D.5 Remove and reinstall door stop. Repair and refinish wood base trim.

F.1 Remove deteriorated existing vinyl wall base. Provide new vinyl wall base.

F.2 If basement is expected to remain back-of-house space, maintain existing flooring and apply protective coating.

F.3 Provide heavy duty protector for condensate line until mechanical upgrades are completed in basement.

F.4 Remove temporary ramp. Install fixed ramp with handrail along east side of courtroom. Shorten benches to accommodate ramp location. Modify existing bar to install swinging gate to provide permanent accessible path.

F.5 Provide broadloom carpet stair runner down center of stair to basement.

F.6 Remove carpet to allow for floor refinishing in courtroom, stairs, and gallery. Provide new broadloom carpet at stairs and gallery to protect stair surface from wear and to maximize safety. Return main courtroom floor to exposed wood flooring.

F.7 Repair and sand area of floor damage. Prepare surface for new flooring finish. Fill gaps measuring ¼" or more with wood matching in species and graining. Provide new clear high-traffic coating on restored wood floor. Provide foot pads on all furniture.

F.8 Remove broken bricks. Prepare substrate and reset salvageable units. Replace heavily damaged units with bricks salvaged from elsewhere on building. Consider removal of the infill panels in each room to restore fireplaces.

F.9 Install 4'-0" wide by ¾" thick plywood decking on existing ceiling joists to create maintenance access path to full length of attic.

WA.3 Repair damaged areas of wallboard and plaster finish. Paint 100% of walls. Alternate approach includes removal of all existing wall finish applied on top of historic plaster and repair/replacement of plaster wall finish.

WA.4 Remove metal fasteners in wall. Patch and paint wall.

WA.5 Repoint 100% of interior side of brick tympanum with recommended mortar mixture. Reset displaced brick units.

WA.6 Remove and replace existing basement stair handrail. Relocate light switches at basement landing to accommodate raised handrail.

WA.7 Remove basement wall-mounted vents and fans. Inspect crawlspace. Remove debris.

WA.8 Remove approximately 30″ long portion of deteriorated wood paneling and pulley at gallery support beam. Remove wood paneling members in their entirety back to nearest joint. Do not cut wood to remove. Examine substrate to determine extent of damage. Remove any areas of wood rot and repair surface damage with epoxy. Reinstall paneling. Paint.

WA.9 Remove modesty panels. Patch and paint wood at fastener locations.

WA.10 Remove sealant fill at checks in hollow bored wood columns. Fill checks. For narrow checks (less than 1/8″) use epoxy paste filler. For checks larger than 1/8,″ install a narrow, tapered slat of pine into crack during dry season. Apply adhesive to slat and drive slat into the check with light taps from hammer. Once glue dries, trim excess glue and slat. Repaint column.

WA.11 Repair damaged surface of wood column. Refinish column in coordination with interior refinishing.

WA.12 Remove deteriorated paint finish from operable wood partition on all sides. Repaint. Consider restoring operability to wood panels.

WA.13 Repair wood window trim. Coordinate refinishing with item WA.1.

WA.14 Install wood patches to eliminate signs of scars at second floor doors. Repair surface of door. Repaint trim and door.

WA.15 Repaint 100% of concrete block walls in basement.

CL.1 Remove damaged metal lath and plaster in mechanical closet. Provide new ceiling in entire mechanical closet.

CL.2 Refasten loose ceiling boards and cornice trim in courtroom. Prepare and repaint 100% of painted wood board ceiling and cornice trim. Coordinate painting with paint analysis findings.

CL.3 Patch damaged area of gypsum wallboard ceiling. Prepare and paint 100% of gypsum ceiling.

CL.4 Prepare and paint 100% of plaster ceiling. Perform work in concert with plaster repairs in item CL.5.

CL.5 Repair damaged locations of plaster. Paint 100% of ceiling. Consider replacement of textured ceiling finish with smooth ceiling finish. Coordinate work with item CL.4.

CL.6 Clean painted surface to remove mold. Coordinate mold removal with WA.8.

CL.7 Remove and repair deteriorated wood ceiling board. Remove rotted wood and repair board with epoxy. Repaint wood board and reinstall.

CL.8 Remove and replace 100% of fiberglass insulation in attic.

OI.1 Remove Venetian blinds. Replace in-kind.

OI.3 Provide wood glue and/or tack to fix baluster in place.

OI.4 Paint 100% of wood benches and jury room shelves.

OI.5 If determined necessary by electrical assessment, replace electrical and AV systems. Coordinate with electrical engineer.

OI.6 Until mechanical system upgrades occur, a routine maintenance schedule should be developed for the basement dehumidifiers.

STRUCTURAL

Priority 2 – within three years

S.2 Repoint 100% of three chimneys in attic.

S.3 Remove rotted wood at existing roof member. Sister new member onto sound portions of existing member.

S.4 Install salvaged brick in missing location in attic. Coordinate with chimney repointing.

S.5 Replace rotted areas of wood at roof framing. Coordinate repairs with roofing repairs.

S.6 Remove and replace bell support members to match existing member.

S.7 Remove approximately 12” length of rotted wood and sister new member onto existing bottom chord on each side of bell enclosure support.

Priority 3 – within five years

S.1 Monitor gap at floor and base trim over time to determine if settlement is active.

MECHANICAL

Priority 1 – within one year

M.1 Regular servicing and tune-ups of all (4) systems are recommended twice annually at season changes.

M.3 Test all humidifiers and associated controls to confirm proper operation.

M.4 Calibrate existing thermostats to confirm accurate operation and ability maintain desired indoor temperature conditions.

Priority 2 – within three years

M.2 Replace fans, wall switches, and existing open-ended outside air intake duct.

Priority 3 – within five years

M.5 Provide new energy recovery unit (ERU) to supply pre-conditioned / room temperature-and-humidity neutral outside air to the courtroom when second-floor jury rooms are occupied. Include automatic digital controls to ensure the ERU operates when occupants are present. Estimated capacity of 300 CFM.

M.6 Replace defunct HRV with a new energy recovery unit (ERU) to provide exhaust and pre-conditioned room temperature-and-humidity neutral outside air to the occupied spaces. Provide automatic digital controls to ensure the new ERU operates when occupants are present. Estimated capacity of 300 CFM.

M.7 Replace bathroom exhaust fan/lights in 1 existing operating bathroom. Determine potential for unused bathrooms to return to active use. If so, replace fans.

M.8 Install a ducted dehumidifier and associated interior ductwork to serve the Basement level. This also may require an exhaust fan to remove the heat generated by the dehumidifier.

MAINTENANCE SCHEDULE

As noted earlier in the introduction to this chapter, the following work is expected to be within the capacity of the county public works department to complete internally or to work with a local contractor to execute. Primarily these efforts involve monitoring key components of the building and typical maintenance and cleaning. The following list should serve as a starting point for the county staff with updates made as determined necessary over time.

Routine

- Monitor basement humidity and empty dehumidifiers.
- Clean exterior and interior floor drains as required.
- Check lamps on lighting fixtures. When lamps fail, replace and relamp with screw-in LED lamps with a color temperature between 3000-4000 K. Test and select one temperature, rather than mixing, for use within each space.
- Keep log and documentation of repairs and alterations performed.

Semi-annually

- Complete full interior cleaning.
- Service and tune-up of HVAC system timed at season changes.

Annually

- Inspect attic for active roof leaks and nesting of birds or vermin.
- Perform inspection and routine maintenance for mechanical, electrical, and plumbing systems.
- Review condition and operation of all exterior doors.
- Assess exterior walls for damage in masonry assembly.
- Assess condition of all windows.
- Inspect and clean all exterior floor drains.
- Review crawlspace vents for nesting and debris.
- Assess condition of interior face of all exterior walls.
- Review and revise maintenance schedule as necessary.
- Monitor draining at concrete gutters along side walls. Trim all vegetation to be two feet away from the building and relocate any plants or shrubs which are closer than two feet

away from wall. This keeps moisture away from open joints and cracks in the wall and reduces moisture within the foundation walls.

Every two years

- Inspect roof, bell enclosure, bell rope, entablature, and tympanums via aerial boom lift. If repairs are completed, frequency should be reduced.

Every ten years

- Revise historic structure report and historic preservation goals. Indicate all work performed, updating condition assessment and treatment recommendations, and noting any change in the historic preservation priorities.
- Assess condition of exterior paint on wood elements. If painting is needed, this effort should be completed by skilled tradespeople under the supervision of a historic preservation professional.
- Review soiling on exterior wall. Clean exterior with gentlest means possible as required.
- Assess condition of interior floor finish on wood courtroom floor. Refinish wood floor as required.
- Assess condition of interior paint. If painting is needed, this effort should be completed by skilled tradespeople under the supervision of a historic preservation professional.

REQUIREMENTS FOR TREATMENT AND WORK

Introduction

This project is subject to numerous laws and regulations which guide and control the use and treatment of the historic building. These requirements serve to protect the cultural resource while addressing issues of human safety, fire protection, energy conservation, abatement of hazardous materials, and accessibility.

The following entries outline those laws and regulations which have the most significant impacts on the consideration of treatment and work for the Fluvanna County Historic Courthouse. In addition, these guidelines and documents offer additional insight into treatment methods and approaches which are referenced in the historic structure report but not outlined in detail. Detailed treatment directions must be developed as a part of a design project in which the scope of work and extent of intervention has been confirmed.

Legislation and Regulatory Guidelines

Americans with Disabilities Act Accessibility Guidelines (ADA / ADAAG)
This law serves as the accessibility standards for this property. The standards provide guidance on accessibility requirements for existing buildings and alterations within existing buildings.

International Building Code (2018) and International Existing Building Code (2018)
The 2018 versions of these codes are applicable building codes for this project. As this an existing building, which is also a contributing resource for a National Register-listed site, the IEBC serves as the primary code with application of the IBC where referenced and as necessary.

International Mechanical Code (IMC)
The 2018 version of the IMC is applicable to this project. It establishes minimum regulations for mechanical systems using prescriptive and performance-related provisions. The IMC was developed with broad-based principles that make possible the use of new materials, methods and design.

International Plumbing Code (IPC)
The 2018 version of the IPC is applicable to this project. It provides minimum regulations for plumbing facilities and provides for the acceptance of new and innovative products, materials, and systems.

National Electrical Code (NEC)
The NEC is the pre-eminent electrical installation code in the United States. It is often adopted into law by states and local jurisdictions. The NEMA Field Representative Program advocates for the adoption of the most current edition of the NEC, with no state or local amendments, through participation in the code adoption process and collaboration with NEMA Member companies and other industry partners.

National Fire Protection Association's (NFPA) Standard for the Installation of Sprinkler Systems (NFPA-13)
NFPA-13 is the industry benchmark for design and installation of automatic fire sprinkler systems. Although it is unlikely that a sprinkler system will be required in any future renovation, the standard addresses sprinkler system design approaches, system installation, and component options to prevent fire deaths and property loss.

National Historic Preservation Act (NHPA)
This law and subsequent regulations mandate that public agencies receiving federal funding protect historic cultural resources. A major component to its administration is the Section 106 process, which requires federal agencies to review and determine the impact of any alterations to the resources. If an alteration is deemed to cause an adverse effect, the process will require the agency to provide some form of mitigation for the impact to the historic resource. Depending on the source of funding, this process may or may not apply in a future project.

The Secretary of Interior's Standards for Treatment of Historic Properties
These guidelines outline criteria for alterations to historic fabric. These standards establish hierarchies of treatment which seek the lowest level of intervention necessary to achieve a project's goals. Preservation of historic materials is a priority of the guidelines and all modern alterations should be reversible and minimize damage to the historic fabric.

Technical Guidelines

Preservation Brief 2: Repointing Mortar Joints in Historic Masonry Buildings
The National Park Service (NPS) provides a number of guides, referred to as Preservation Briefs, designed to guide practitioners and craftsman in their work on the historic built environment. Preservation Brief 2 focuses on the importance of maintaining masonry and preventing deterioration through the repointing of mortar joints. Proper repointing of historic masonry, including using appropriate materials and methods, is critical to maintaining the aesthetic appearance of the building, and in preventing physical damage to the masonry units.

Preservation Brief 9: The Repair of Historic Wooden Windows
NPS Preservation Brief 9 details the process of window treatment from evaluation of architectural significance to routine maintenance, stabilization, and replacement. The windows on many historic buildings are an important aspect of the architectural character of those buildings. The brief recommends the retention and repair of original windows wherever possible.

Preservation Brief 10: Exterior Paint Problems on Historic Woodwork
This brief identifies and describes common types of paint surface conditions and failures. It also recommends appropriate treatments for preparing exterior wood surfaces for repainting to ensure optimal adhesion and durability of the new paint. The recommendations outlined in this brief are cautious on paint removal because there is no completely safe and effective method of removing old paint from exterior woodwork. Removal of paint from woodwork will inevitably result in some loss to the wood and should be undertaken with great care.

Preservation Brief 18: Rehabilitating Interiors in Historic Buildings: Identifying and Preserving Character-Defining Elements
Brief 18 discusses the importance of floor plans, arrangement of spaces, finishes, and other features that may be individually or collectively important in defining the historic character of the building and the purpose for which it was constructed. The identification, retention, protection, and repair of historic interiors should be given prime consideration in every preservation project. Caution should be exercised in developing plans that would radically change character-defining spaces or that would obscure, damage or destroy interior features or finishes.

Preservation Brief 21: Repairing Historic Flat Plaster Walls and Ceilings
Brief 21 emphasizes the contribution of plaster walls and ceilings to the historic character of the interior. They should be left in place and repaired if at all possible. The approaches described stress repairs using wet plaster, and traditional materials and techniques that will best assist the preservation of historic plaster walls and ceilings—and their appearance.

Preservation Brief 22: The Preservation and Repair of Historic Stucco
Historic stucco is a character-defining feature and should be considered an important historic building material in its own right. While many eighteenth and nineteenth century buildings were stuccoed at the time of construction, others were stuccoed later for reasons of fashion or practicality. Brief 22 provides guidance for repairing historic stucco, including mixes and material specifications.

Preservation Brief 29: The Repair, Replacement and Maintenance of Historic Slate Roofs
Brief 29 specifically addresses historic slate roofs, detailing the critical aspects of repair and replacement for deteriorated and damaged slate. Slate roofs are a critical design feature of many historic buildings that cannot be duplicated using substitute materials. Slate roofs can, and should be, maintained and repaired to effectively extend their serviceable lives. When replacement is necessary, details contributing to the appearance of the roof should be retained. High quality slate is still available from reputable quarries and, while a significant investment, can be a cost-effective solution over the long term.

Preservation Brief 32: Making Historic Properties Accessible
With the passage of the Americans with Disabilities Act in 1990, access to properties open to the public is now a civil right. This Preservation Brief introduces the complex issue of providing accessibility at historic properties, and underscores the need to balance accessibility and historic preservation. It provides guidance on making historic properties accessible while preserving their historic character. Accessibility at historic properties can be achieved with careful planning, consultation, and sensitive design.

APPENDICES

APPENDIX A

CONSTRUCTION COST ESTIMATE

JOHN MILNER ASSOCIATES PRESERVATION/MTFA ARCHITECTURE, PLLC
FLUVANNA COUNTY HISTORIC COURTHOUSE
HISTORIC STRUCTURES REPORT
PALMYRA, VIRGINIA
ASSUMPTIONS, NOTES -

ICI #: 221128R2
Prep: mcf
Date: 6/17/2022
Revised: 8/27/2022

1 Information used in preparation of this Estimate includes:
A. John Milner Associates/MTFA Historic Structures Report dated 6/7/2022, received by ICI 6/8/2022.
B. John Milner Associates/MTFA updated Historic Structures Report dated 8/8/2022, received by ICI 8/9/2022.

2 The Project is based on the following gross / renovated building areas:

Basement	1,090	SF
Ground Floor	1,445	SF
Second Floor	740	SF
Total	**3,275**	SF

3 This Estimate is developed and documented according to the Historic Structures Report

4 This Estimate is based on Mid, 2022 construction unit prices. No escalation has been included. Once a construction period has been established the appropriate escalation factor, calculated to the mid point of Construction, based on 6% per year must be added.

5 This estimate is based on the following labor rates: Open Shop

6 No Overtime or Premium time work is included with the exception of any allowance indicated in the details.

7 The unit prices used in the estimate are a combined labor & material unit price, and are based on numerous sources, including our in-house data base developed during the completion of more than 300 estimates per year, feedback and reconciliations with contractors, subcontractors and suppliers, and nationally published databases such as RS Means, Walker, and Saylor.

8 The purpose of this estimate is to establish an Order of Magnitude Budget for the described work. Once more detailed Investigations and design have been completed, the Estimate should be revised and updated.

9 The additional project costs are indicated in the estimate. These are preliminary figures includes Permits, Engineering Fees, Architectural Fees, Legal Services, and Administrative Expenses. The rough order of magnitude figues are based on a percentage of construction costs.

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ORDER OF MAGNITUDE COST ESTIMATE SUMMARY BY PHASE

See following pages for detailed cost breakdown

Description	**Priority #1** within 1 Year	**Priority #2** within 3 Years	**Priority #3** within 5 Years
ESTIMATED CONSTRUCTION COST BY PHASE	$ 115,974	$ 502,382	$ 587,619
ESTIMATED ADDITIONAL PROJECT COSTS *(Rough Order of Magnitude Sum of Permits, Engineering Fees, Architectural Fees, Legal Services, and Administrative Costs)*	$ 17,396	$ 125,596	$ 146,905
TOTAL PROJECT COST BY PHASE	$ 133,370	$ 627,978	$ 734,524
TOTAL ESTIMATED COST FOR ALL PHASES			**$ 1,495,872**

ALTERNATES

The report proposes a series of alternate treatments dependent upon the findings of additional testing and investigation. The sums indicated below represents additional potential costs.

ALTERNATE CONSTRUCTION COST BY PHASE	$ -	$ 106,144	$ 468,563
ESTIMATED ADDITIONAL PROJECT COSTS	$ -	$ 26,536	$ 117,141
ESTIMATED PROJECT COSTS OF ALTERNATES BY PHASE	$ -	$ 132,680	$ 585,703
TOTAL ESTIMATED ADDITIONAL COST FOR ALTERNATES			**$ 718,383**

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HISTORIC STRUCTURES REPORT 6/17/2022
PALMYRA, VIRGINIA 8/27/2022

ORDER OF MAGNITUDE COST ESTIMATE

Account	Description	Quantity	Unit	Bare Unit Cost	Marked Up Unit Cost 1.53	Amount	Alternate
Note:	*Bare Unit costs is Subcontractor Costs. Marked Up Unit Costs includes allowances for Temporary Protection (5%), General Condition/Requirements (15%), Overhead & Profit (10%), and Design/Estimating Contingency (15%), Compounded.*						
	EXTERIOR						
	General Requirements						
G.1	Analysis of Exterior/Interior for Hazardous Materials	1	LS	$20,000.00	$30,600.00	$ 30,600	
	- Allow for Abatement					TBD	
G.2	Add Lightning Protection System	1	LS	15,000.00	22,950.00	22,950	
	Subtotal					**$ 53,550**	$ -
	Masonry						
--	Scaffold/Ladders/Access as Required	1	LS	$20,000.00	$30,600.00	$ 30,600	
MB.1	Analysis Mortar	1	LS	1,500.00	2,295.00	2,295	
	- Repoint Open Joints in Brick	125	SF	45.00	68.85	8,606	
MB.2	Repoint Crack Joints in Brick					Included Above	
MB.3	Replace Cracked Brick	8	EA	225.00	344.25	2,754	
MB.4	Remove & Reset Displace Brick	1	EA	350.00	535.50	536	
MB.5	Remove Biological Growth, Staining	400	SF	10.00	15.30	6,120	
MB.6	Repair Holes w/Colored Mortar Patch	3	EA	150.00	229.50	689	
MB.7	Remove Paint Stains	80	SF	20.00	30.60	2,448	
MB.8	Remove Overpaint Adjacent to Painted Surfaces	160	LF	15.00	22.95	3,672	
MB.9	Clean Localized Soiling, Staining	250	SF	5.00	7.65	1,913	
MB.10	Remove Sham Shutters, Assess/Repair Masonry	2	EA	500.00	765.00	1,530	
MB.11	Remove & Reset Brick Paving @ Ramp, Repoint Incl Wall	120	SF	50.00	76.50	9,180	
MB.12	Remove Chimney Cap, Repoint, Modify Cap	4	EA	750.00	1,147.50	4,590	
MS.1	Repoint Stone Foundation Walls	125	SF	30.00	45.90	5,738	
MS.2	Remove Staining, Paint @ Steps	125	SF	15.00	22.95	2,869	
MS.3	Clean Stains @ Stone Capitals	18	EA	275.00	420.75	7,574	
	Subtotal					**$ 91,112**	$ -
	Concrete						
C.1	Replace Concrete Gutter @ Perimeter	30	LF	$ 125.00	$ 191.25	$ 5,738	
C.2	Replace Concrete Steps, Metal Railing	1	EA	7,500.00	11,475.00	11,475	
C.3	Fill/Repair Crack in Concrete	8	LF	75.00	114.75	918	
	Subtotal					**$ 18,131**	$ -
	Stucco/Plaster						
ST.1	Investigate, Analysis of Column, Coatings	1	LS	$ 5,000.00	$ 7,650.00	$ 7,650	
	- Patch Stucco, Repaint Columns	1	LS	$14,250.00	21,802.50	21,803	
	Alternate - Allow For Repair, Rem & Repl of Stucco	1	LS	155,000.00	237,150.00		$ 237,150
	(4 Column @ 12,500, 14 Pilaster @ 7,500)						
ST.2	Patch Stucco (20sf), Repaint Stucco Ceiling @ Portico	230	SF	20.00	30.60	7,038	
	Subtotal					**$ 36,491**	**$ 237,150**
	Wood						
WD.1	Repair Damaged Cornice Board	6	LF	$ 125.00	$ 191.25	$ 1,148	
WD.2	Strip Paint, Repair (25lf) Repaint Wood Trim, Tympanum	1,500	SF	15.00	22.95	34,425	
WD.3	Prep & Paint Benches	30	LF	75.00	114.75	3,443	
	Subtotal					**$ 39,015**	$ -
	Metal						
MT.1	Remove & Replace Metal Access Door	1	EA	$ 1,850.00	$ 2,830.50	$ 2,831	
MT.2	Repl. Sht Mtl Bell Enclosure, Add Vent, Flashing, Sealant	1	EA	10,000.00	15,300.00	15,300	
MT.3	Replace Screens @ Crawl Space Vents	10	EA	325.00	325.00	3,250	
MT.4	Prep & Repaint Handrails	100	LF	25.00	25.00	2,500	
MT.5	Prep & Repaint Metal Elements	4	LF	75.00	75.00	300	
	Subtotal					**$ 24,181**	$ -
	Windows						
W.1	Repair, Restore, Paint Wood Windows, Transoms	345	SF	$ 175.00	$ 267.75	$ 92,374	
W.2	Repair, Restore, Paint Wood Shutters	400	SF	85.00	130.05	52,020	
W.3	Repair/Modify Window @ Wire Penetration	1	EA	250.00	382.50	383	

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Note:	*Bare Unit costs is Subcontractor Costs. Marked Up Unit Costs includes allowances for Temporary Protection (5%), General Condition/Requirements (15%), Overhead & Profit (10%), and Design/Estimating Contingency (15%), Compounded.*						
W.4	Replace Broken Glass Pane	1	EA	325.00	497.25	497	
	Subtotal					**$ 145,274**	$ -
	Doors						
D.1	Repair, Restore, Paint Wood Doors	6	EA	$ 1,450.00	$ 2,218.50	$ 13,311	
D.2	Replace Door Sweep	3	PR	300.00	459.00	1,377	
D.3	Replace Missing Door Knob	1	EA	650.00	994.50	995	
D.4	Repair Wood Threshold	2	EA	750.00	1,147.50	2,295	
D.5	Repair Door Stop	1	EA	250.00	382.50	383	
	Subtotal					**$ 18,360**	$ -
	Roof						
R.1	Replace Broken/Missing Slate, 100 sf Deck Repl.	175	EA	$ 200.00	$ 306.00	$ 53,550	
	Alternate - Complete Replacement of Slate Roofing	2,750	SF	55.00	84.15		$ 231,413
R.2	Clean Staining @ Slate	200	SF	10.00	15.30	3,060	
R.3	Remove/Replace Ridge Flashing	75	LF	175.00	267.75	20,081	
R.4	Provide Rain Cap @ Chimneys	2	EA	1,500.00	2,295.00	4,590	
R.5	Replace Missing, Slate, Repair Deck	1	EA	750.00	1,147.50	1,148	
R.6	Survey & Remove Loose, Unattached Shingles	1	LS	7,500.00	11,475.00	11,475	
	Subtotal					**$ 93,904**	**$ 231,413**
	Other						
O.1	Fill Hole Near Walk, Point Joint @ Building	1	EA	$ 500.00	$ 765.00	$ 765	
O.2	Remove Abandoned Wiring, Patch as Required	1	LS	2,000.00	3,060.00	3,060	
O.3	Regrade @ Ramp	40	SF	50.00	76.50	3,060	
O.4	Clean Areaway, Basement Stairs	60	SF	10.00	15.30	918	
O.5	Remove Bird Nest as Required	1	LS	500.00	765.00	765	
	Subtotal					**$ 8,568**	$ -
	TOTAL - ARCHITECTURAL EXTERIOR					**$ 528,583**	
	TOTAL - ARCHITECTURAL EXTERIOR ALTERNATES						**$ 468,563**
	ARCHITECTURAL - INTERIOR						
	General						
G.1	Clean Interior Debris & Soiling	1	LS	$ 2,500.00	$ 3,825.00	$ 3,825	
G.2	Repair/Treat for Insect/Bug Infestations	1	LS	3,500.00	5,355.00	5,355	
	Subtotal					**$ 9,180**	$ -
	Floor						
F.1	Replace Rubber Floor Base	270	LF	$ 4.00	$ 6.12	$ 1,652	
F.2	Refinish VCT Floor	780	SF	1.00	1.53	1,193	
F.3	Provide Heavy Duty Cover for Condensate Drain	1	LF	350.00	535.50	536	
F.4	Rem. Temp Ramp, Replace w/New Ramp, Rail/Gate, Shorten Benches	1	LS	13,500.00	20,655.00	20,655	
F.5	Provide Carpet Stair Runners	20	LF	65.00	99.45	1,989	
F.6	Rem Carpet (600 sf), Repl Carpet (350sf), Refinish (250sf)	350	SF	12.50	19.13	6,694	
F.7	Repair Wood Floor (50sf), Refinish	1,600	SF	7.50	11.48	18,360	
F.8	Repair/Replace Brick Floor @ Hearth	10	EA	225.00	344.25	3,443	
F.9	Provide Attic Access Walk	200	SF	15.00	22.95	4,590	
	Subtotal					**$ 59,112**	$ -
	Walls						
WA.1	Survey, Analysis Wood Graining, Repaint w Solid Color	600	SF	$ 10.00	$ 15.30	$ 9,180	
	Alternate - Prep & Refinish Wood Graining Finish	600	SF	20.00	30.60		$ 18,360
WA.2	Remove & Replace Damaged Plaster	25	SF	50.00	76.50	1,913	
WA.3	Repair Plaster/Wallboard, 200 sf Plaster Repair, Paint	3,600	SF	10.00	15.30	55,080	
	Alternate - Rem Wallbrd, Repl Plaster/Lath, Paint 3600sf	1,275	SF	45.00	68.85		$ 87,784
WA.4	Remove Fasteners @ CMU Walls, Patch	5	EA	120.00	183.60	918	
WA.5	Repoint Interior of Brick Tympanum, Reset Displaced	100	SF	60.00	91.80	9,180	

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PALMYRA, VIRGINIA 8/27/2022

ORDER OF MAGNITUDE COST ESTIMATE

Account	Description	Quantity	Unit	Bare Unit Cost	Marked Up Unit Cost 1.53	Amount	Alternate
Note:	*Bare Unit costs is Subcontractor Costs. Marked Up Unit Costs includes allowances for Temporary Protection (5%), General Condition/Requirements (15%), Overhead & Profit (10%), and Design/Estimating Contingency (15%), Compounded.*						
WA.6	Replace Basement Rail, Relocate Light Switch	1	EA	3,500.00	5,355.00	5,355	
WA.7	Inspect Crawlspace, Remove Debris	5	EA	200.00	306.00	1,530	
WA.8	Repair Damaged Wood Balcony Paneling	5	SF	250.00	382.50	1,913	
WA.9	Remove Modesty Panel, Restore Balustrade	25	LF	100.00	153.00	3,825	
WA.10	Repair Checks in Columns, Refinish	25	LF	150.00	229.50	5,738	
WA.11	Repair Surface Damage @ Columns, Refinish	2	EA	750.00	1,147.50	2,295	
WA.12	Refinish Operable Wood Panels, Restore Operation	150	SF	75.00	114.75	17,213	
WA.13	Repair Window Trim	4	SF	120.00	183.60	734	
WA.14	Repair Door Trim	5	SF	120.00	183.60	918	
WA.15	Paint Conc. Block Walls	1,750	SF	1.50	2.30	4,016	
WA.16	Historical Paint Analysis	1	LS	10,000.00	15,300.00	15,300	
	Subtotal					**$ 135,107**	**$ 106,144**
	Ceiling						
CL.1	Replace Plaster Ceiling @ Mechanical Room	40	SF	$ 35.00	$ 53.55	$ 2,142	
CL.2	Refasten Loose Boards, Prep & Paint Wood Ceiling	1,000	SF	5.00	7.65	7,650	
CL.3	Patch Gyp. Bd. Ceiling (20sf), Prep & Paint	750	SF	3.50	5.36	4,016	
CL.4	Prep & Paint Plaster Ceiling	950	SF	2.00	3.06	2,907	
CL.5	Repair Textured Plaster (30sf), Prep & Paint	275	SF	5.00	7.65	2,104	
CL.6	Clean Mold @ Gallery Beam	10	LF	35.00	53.55	536	
CL.7	Replace Damaged Wood Ceiling, Replace	2	SF	175.00	267.75	536	
CL.8	Replace Insulation @ Attic	1,500	SF	6.00	9.18	13,770	
	Subtotal					**$ 33,660**	**$ -**
	Other						
OI.1	Remove & Replace Blinds	18	EA	$ 1,250.00	$ 1,912.50	$ 34,425	
OI.2	Investigate Balcony Balustrade	1	LS	2,500.00	3,825.00	3,825	
	- Reinforce/Repair Balcony Balustrade	25	LF	250.00	382.50	9,563	
OI.3	Repair/Glue Loose Baluster @ Stairs	2	EA	175.00	267.75	536	
OI.4	Refinish/Paint Wood Benches (135lf), Shelves (65sf)	1	LS	10,000.00	15,300.00	15,300	
OI.5	Review & Assess Electrical, A/V Systems	1	LS	15,000.00	22,950.00	22,950	
	- Allowance for full replacement of both systems	1	LS	146,000.00	223,380.00	223,380	
OI.6	Maintain Dehumidifiers				-	By Others	
	Subtotal					**$ 309,978**	**$ -**
	TOTAL - ARCHITECTURAL INTERIOR					**$ 547,036**	
	TOTAL - ARCHITECTURAL INTERIOR ALTERNATES						**$ 106,144**
	STRUCTURAL						
	Ceiling						
S.1	Monitor Gap @ 2nd Floor Gallery	1	LS	$ 1,000.00	$ 1,530.00	1,530	
S.2	Repoint Joints @ Chimneys in Attic	30	SF	45.00	69	2,066	
S.3	Repair Rotted Rafters @ Chimneys	3	Loc	1,200.00	1,836.00	5,508	
S.4	Replace Missing Brick @ Attic Chimney	1	EA	350.00	535.50	536	
S.5	Replace Rotted Roof Deck	25	SF	50.00	76.50	1,913	
S.6	Replace Bell Support Members	15	LF	225.00	344.25	5,164	
S.7	Repair/Sister Chord @ Kingpost	1	EA	1,200.00	1,836.00	1,836	
	Subtotal					**$ 18,551**	
	TOTAL - STRUCTURAL					**$ 18,551**	**$ -**
	MECHANICAL						
	Mechanical						
M.1	Service, Tune-up AHU's	4	EA	$ 2,500.00	$ 3,825.00	$ 15,300	
M.2	Replace Basement Wall Exhaust Fans, Switch, Duct	3	EA	2,250.00	3,442.50	10,328	
M.3	Test/Repair Humidifiers	3	EA	500.00	765.00	2,295	
M.4	Recalibrate Thermostats	4	EA	200.00	306.00	1,224	
M.5	Provide ERU @ Attic	2	EA	15,000.00	22,950.00	45,900	

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ORDER OF MAGNITUDE COST ESTIMATE

Account	Description	Quantity	Unit	Bare Unit Cost	Marked Up Unit Cost 1.53	Amount	Alternate
Note:	*Bare Unit costs is Subcontractor Costs. Marked Up Unit Costs includes allowances for Temporary Protection (5%), General Condition/Requirements (15%), Overhead & Profit (10%), and Design/Estimating Contingency (15%), Compounded.*						
M.6	Replace Basement HRV	1	EA	8,500.00	13,005.00	13,005	
M.7	Replace Bathroom Exhaust Fan/Light	1	EA	1,500.00	2,295.00	2,295	
M.8	Add Ductwork, Dehumidifier, Fan @ Bsmt.	935	SF	15.00	22.95	21,458	
	Subtotal					**$ 111,805**	
	TOTAL - MECHANICAL					**$ 111,805**	$ -

TOTAL ESTIMATED CONSTRUCTION COST FOR BASE BID	**$ 1,205,975**	
TOTAL ESTIMATED CONSTRUCTION COST FOR ALL POTENTIAL ALTERNATES		**$ 574,706**

APPENDIX B

MATERIALS ANALYSES REPORTS

MATERIALS ANALYSIS

Scope of Analysis

Materials analysis for the Fluvanna County Historic Courthouse Historic Structure Report included paint analysis of the exterior wood trim and stucco columns and mortar analysis of the historic mortar. John Milner Associates Preservation (JMAP) collected 30 paint samples and four mortar samples on April 1, 2022 either from grade or via ladder. There was no exterior access to the south tympanum but the conservators collected a sample through a gap in the wood siding from the attic. No additional materials analyses were performed as a part of this project.

Paint Analysis Overview

The team collected small paint samples utilizing a fine utility blade to cut through the layers of paint finish to the wood substrate. Each sample location was photographed with a digital field microscope and the corresponding sample number was noted on elevation drawings. The samples were processed in the laboratory by embedding paint chips in individual cubes of clear polyester resin. These cubes were cut with a microtome to reveal the full cross-section of the embedded paint sample. Each paint sample was examined using visible-light and UV-light microscopy at 20x, 40x and 100x magnification. All layers were color matched under the microscope using the Munsell color notation system.

JMAP's architectural conservator examined each paint sample under the microscope to identify at least five paint layers immediately above the wood or stucco substrate. This effort sought to color-match these layers across the samples and to organize the findings into recognizable paint schemes. A scheme spreadsheet, as well as the sample location drawings and photographs, is included in Appendix B3. The appendix also includes seriation sheets showing the color determinations for the initial five paint layers identified under the microscope. The findings suggest that only a few elements show historic paint, including the doors and shutters. The windows, entablature, and tympanum show only modern paints.

Paint Analysis Findings

The 30 paint samples revealed at least four color schemes for the exterior wood trim, doors, windows, and stucco columns. However, there was no evidence of the sanded paint mentioned in the original specifications as the treatment for the entablature. While some samples showed early paint history, there is not enough evidence to align the paint layers with specific points in time. Therefore, the information presented in the charts and seriation sheets in Appendix B4 is a comparison of the paint information found across the samples. For example, many samples included a benchmarking band of 5-7 coats of a grayish white paint followed by a modern pinkish taupe paint. With this benchmark series as a baseline, the conservator could then determine which paint layers were earlier or later in the common stratigraphy across the samples. A layer is considered modern paint post mid-20th century when the pigment is finely and evenly distributed and the coating is very even due to self-levelling paint technology.

The following paint schemes are arranged from oldest to newest.

<u>Scheme 1</u>

The doors show paint history prior to the benchmark series of white paint. The paint stratigraphy on the doors, with a strong wood-color yellow base and a series of reds, browns, and varnish, suggest the doors may have been faux-grained in an early period. The shutters also show early paint preceding a series of modern green paints. The earliest layer was black followed by an olive green. The original specifications indicated the shutters, or venetians, were to be painted green. It is possible the black was either actually a very dark green or it could have been a primer for the olive green. The specifications also called for the entablature to be sand painted to match the stone trim. No evidence of sanded paint was uncovered but sanded paint trim intended to mimic the freestone capitals for the entablature, tympanum, and door and window surrounds would have harmonized with faux-grained wood doors and dark green shutters.

<u>Scheme 2</u>

The paint evidence suggests a second scheme emerged where the wood trim, windows, and doors were all painted white while the shutters were painted a vibrant green. The many layers of white and green paint indicate this scheme

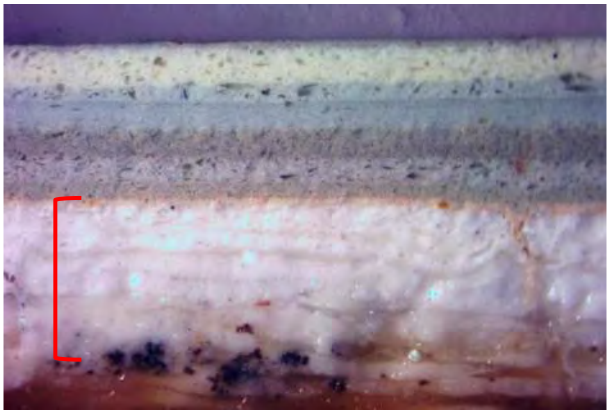


Figure B1. FP-07 with indicated benchmark series of creams followed by modern pinkish taupe layer

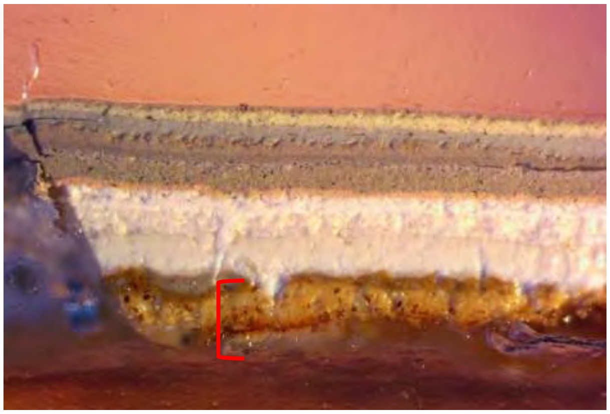


Figure B2. FP-09 showing possible graining of doors in Scheme 1 at indicated layers below benchmark series.

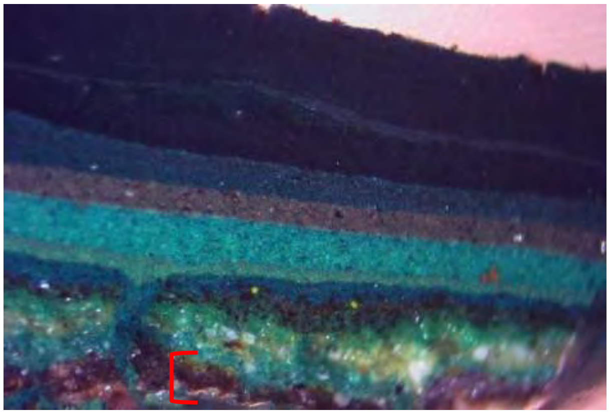


Figure B3. FP-23 showing possible black or very dark green shutters of Scheme 1 where indicated below modern layers.

was present for many repainting campaigns.

Scheme 3

The first layer of modern paint across the wood trim is a pinkish taupe color. Perhaps this color was intended to match the freestone color with its orange patina from natural iron in the stone. The pinkish taupe was applied to all wood trim including the windows and doors. The shutters, however, remained green.

Scheme 4

Modern paints, including the current paint colors at the courthouse, reflect a trend toward light grays for the wood trim and bluish-green color for the shutters. The modern colors from this scheme were the only paint colors found on the columns.

MORTAR ANALYSIS

JMAP extracted four mortar samples and compared them under a microscope to determine which sample represented the oldest mortar. The sample from the south masonry wall taken from the attic had the most integrity and appeared similar to the other samples extracted on the exterior. This sample, FM-01, was sent out to a qualified laboratory for more advanced microscopy following ASTM C1324 standard testing method for petrographic analysis of the mortar composition. The full petrographic analysis is included on page follows the summary of findings and recommendations in this appendix.

Figure B9. Mortar sample FM-01 and location from south elevation brick wall exposed in attic.

FINDINGS

The mortar sample (FM-01) selected for analysis was a bedding mortar found on the portion of the south brick elevation that extends into the attic space. This mortar was similar in color and binder to pointing mortar samples FM-02 and FM-03. This indicates the same mortar was likely used for both pointing and bedding mortars. However, pointing mortar sample FM-02 also had a reddish lime coating on the surface of the joint. It is possible that the pointing mortar was refined with a red-tinted lime penciling to further weatherproof the mortar and to straighten the appearance of the joints against the hand-molded bricks.

The petrographic analysis determined the components in the mortar include calcined clay, lime, and sand. The analyst confirmed the presence of calcined clay due to the percentages of silica and alumina in the binder and due to abnormalities in the paste under polarized light. The clay in the binder is a calcined clay, burned to impart hydraulicity to the mortar as a pozzolan. This additive would allow the mortar set up in moist environments, not just in air. It also imparted some waterproofing to the mortar. The lime component of the mortar was found to be dolomitic lime and measured at about 10% of the binder. The sand component was measured at about 75%, which leaves about 15% of the binder for the calcined clay. This would suggest the lime and clay were added in almost equal parts to the sand. The sand is a very fine sand that is finer than modern ASTM standards. The sand is siliceous with quartz, quartzite, feldspar, with a trace amount of mica and clay. The source of the sand is unknown.

Calcined clay mortars were used in Europe and in the United States around the time that engineers were understanding the properties of natural cements made from clay-rich limestones. It was known that clay with alumina, when burned to the right temperature (not too hot), would improve the performance of the lime mortar by allowing for quicker set up in air and moisture and impart better performance for water infiltration. At the same time, if confirmed that a thin lime penciling was used on the face of the mortar, this would also suggest that the builders had an understanding of waterproofing the joints. In short, the calcined clay mortar would set faster than pure lime mortar, it would improve the performance of the mortar, and the lime penciling would waterproof the joint and neaten the appearance of the joint.

There are many options for a repointing mortar depending on the level of restoration that is desired. One option is to replicate the clay mortar with a lime-penciled joint. This would require finding the right clay (equal parts silica and alumina), burning it at the right temperature for optimal chemical reaction, and mixing it with a dolomitic lime and fine sand. Another option would be to mimic the hydraulic components of the mortar with a feeble natural hydraulic lime (NHL) and forgo the clay. NHLs are more readily available and have a long track record of performance. JMAP recommends testing the permeability of the existing mortar to specify the right strength of NHL. Much more research is required beyond the limits of this project to understand the use of calcined clay mortars in Virginia and to examine recipes that others have used for replication.

Recommendation from the petrographic analysis report for an NHL mortar:

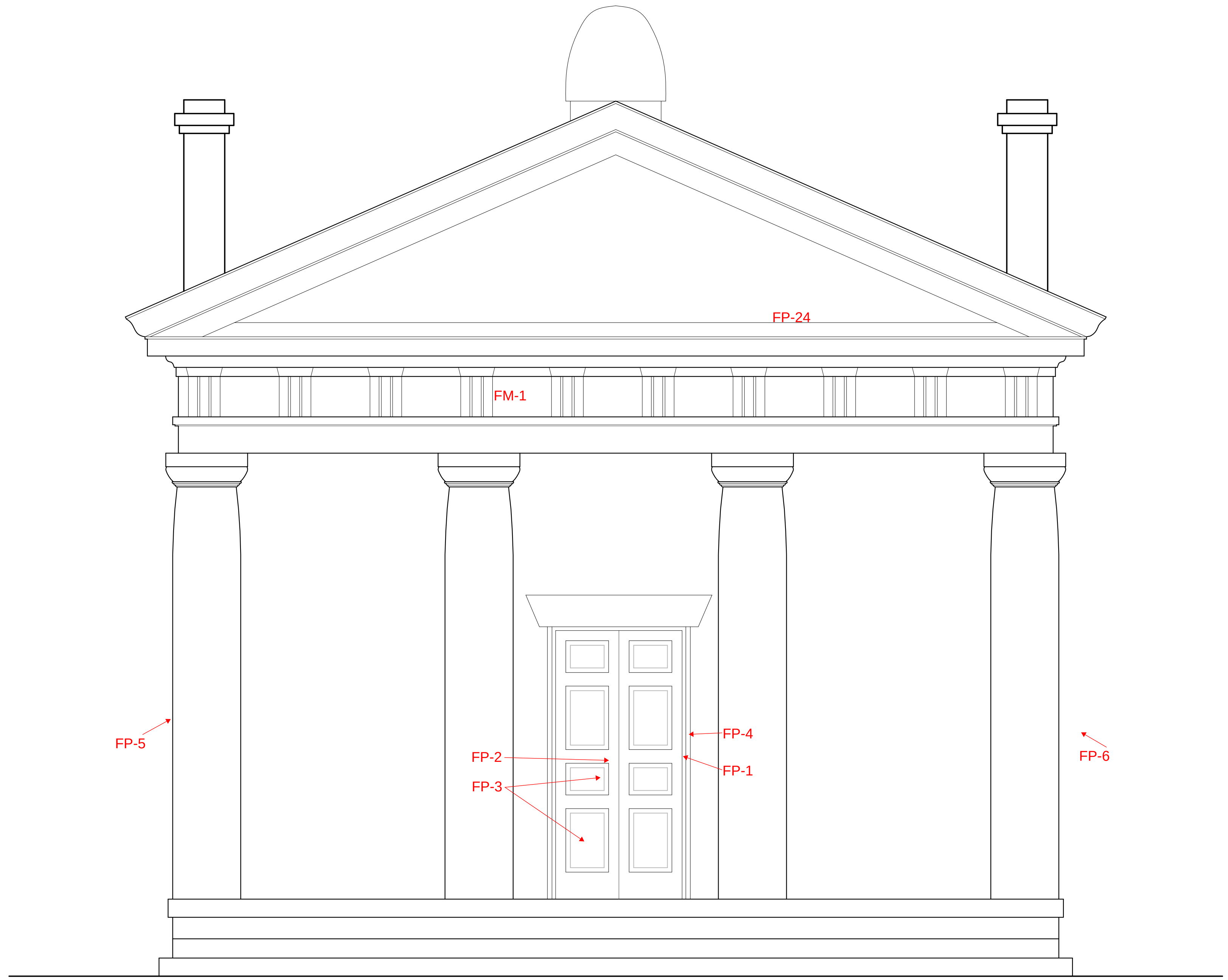
Main Mortar	Mortar Type	Estimated Proportions of Main Mortar	Potential Recommendations For Repointing Mortar
Bedding mortar from attic	Dolomitic lime and calcined clay binders and siliceous sand	Maximum 1-part dolomitic lime to 3½-part sand but a calcined clay component was also added with lime to improve the overall strength of mortar from lime-calcined clay pozzolanic reactions	NHL 3.5 or NHL 5 binder and silica sand at 1-part binder to 2 to maximum 3-part sand by volume

Fluvanna Courthouse Paint Analysis Schemes

Sample Number	Substrate	Location	Scheme 1	Scheme 2	Scheme 3	Scheme 4
			Doors - Potential Faux Graining	**Doors - Series of Whites and Creams**	**Doors - Modern Paint**	
FP01	Door Frame	South	*Layers not present*	Grayish White 10YR 9/1	Moderate Yellowish Pink 5YR 7/4	*Layers not processed*
FP02	Door Rail	South	Grayish White 10YR 9/1 Yellow 10YR 7/6 Red 7.5R 3/12 Yellow 10YR 7/6 Dark Brown 7.5YR 3/6 Brown Varnish 2.5YR 2/2	*Layers not processed*	*Layers not processed*	*Layers not processed*
FP03	Door Panel	South	Yellow 10YR 7/6 Reddish Gray 7.5YR 5/2 Yellowish Gray 10YR 5/1 Yellow 10YR 7/6 Brown Varnish 2.5YR 2/2 Dark Brown 7.5YR 3/6	*Layers not processed*	*Layers not processed*	*Layers not processed*
FP04	Door Frame Bead	South	*Layers not present* Brown Varnish 2.5YR 2/2	Grayish White 10YR 9/1	Moderate Yellowish Pink 5YR 7/4	*Layers not processed*
FP07	Door Frame	West	*Layers not present*	Grayish White 10YR 9/1	Moderate Yellowish Pink 5YR 7/4	*Layers not processed*
FP08	Door Frame Bead	West	*Layers not present*	Grayish White 10YR 9/1	Moderate Yellowish Pink 5YR 7/4	*Layers not processed*
FP09	Door Rail	West	*Layers not present* Red 7.5R 3/12 Yellow 10YR 7/6 Reddish Gray 7.5YR 5/2 Yellowish Gray 10YR 5/1	Grayish White 10YR 9/1	Moderate Yellowish Pink 5YR 7/4	*Layers not processed*
FP10	Door Panel	West	*Layers not present* Yellow 10YR 7/6 Reddish Gray 7.5YR 5/2 Yellowish Gray 10YR 5/1	Grayish White 10YR 9/1	Moderate Yellowish Pink 5YR 7/4	*Layers not processed*
FP25	Door Stile	West	*Layers not present* Yellow 10YR 7/6 Grayish Blue 5PB 6/2	Grayish White 10YR 9/1	Moderate Yellowish Pink 5YR 7/4	*Layers not processed*
FP26	Transom Bar	West	*Layers not present*	*Layers not present*	*Layers not present*	Yellowish Gray 5Y 6/1
FP27	Transom Sash	West	*Layers not present* Yellow 10YR 7/6	Grayish White 10YR 9/1	Grayish White 10YR 9/1	Yellowish Gray 5Y 6/1
			Windows - Early paint scheme not found	**Windows - Series of Whites and Creams (Sim. To Door)**	**Windows - Modern Paint**	
FP11	Window Frame Bead	West	*Layers not present*	Grayish White 10YR 9/1	Moderate Yellowish Pink 5YR 7/4	*Layers not processed*
FP12	Window Sash	West	*Layers not present*	Grayish White 10YR 9/1	*Layers not present*	Neutral Gray N 8.75 Yellowish Gray 5Y 6/1
FP14	Window Frame Bead	North	*Layers not present*	Grayish White 10YR 9/1	Moderate Yellowish Pink 5YR 7/4	*Layers not processed*
FP15	Window Sill	North	*Layers not present*	Grayish White 10YR 9/1	Moderate Yellowish Pink 5YR 7/4	*Layers not processed*
FP16	Window Sash	East	*Layers not present*	*Layers not present*	*Layers not present*	Neutral Gray N 8.75 Yellowish Gray 5Y 6/1
FP17	Window Frame	East	*Layers not present*	*Layers not present*	*Layers not present*	Yellowish Gray 10YR 6/1 Neutral Gray N 8.75 Yellowish Gray 5Y 6/1
FP21	Window Frame	Upper East	*Layers not present*	Grayish White 10YR 9/1	Moderate Yellowish Pink 5YR 7/4	*Layers not processed*
FP22	Window Sash	Upper East	*Layers not present*	Grayish White 10YR 9/1	Moderate Yellowish Pink 5YR 7/4	*Layers not processed*
FP29	Window Sash	North	*Layers not present*	*Layers not present*	*Layers not present*	Yellowish Gray 10YR 6/1 Neutral Gray N 8.75 Yellowish Gray 5Y 6/1
			Shutters - Oilve Green	**Shutters - Series of Greens**	**Shutters - Modern Paint**	
FP13	Window Shutter	West	*Layers not present*	White N 9.0 Yellowish Green 2.5G 3/6 Bluish Green 10G 2/4	Dark Yellowish Green 10GY 2/2	Bluish Green 10G 2/4
FP30	Window Shutter	North	*Layers not present*	Deep Green 7.5G 2/4 Black N 1.0	Bluish Green 10G 2/2 Grayish Black N 2.0	Bluish Green 10G 2/4
FP23	Window Shutter	Shutter	Black N 1.0 Olive Green 2.5GY 2/2	Deep Green 7.5G 2/4 Olive Green 2.5GY 2/2 Yellowish Green 2.5G 3/6		Bluish Green 10G 2/4
			Trim- Early Paint Scheme Not Found	**Trim - Series of Whites and Creams**	**Trim- Modern Paint**	
FP18	Trim - Entablature	East	*Layers not present*	Grayish White 10YR 9/1	Moderate Yellowish Pink 5YR 7/4	*Layers not processed*
FP19	Trim- Metope	East	*Layers not present*	Grayish White 10YR 9/1	Moderate Yellowish Pink 5YR 7/4	*Layers not processed*
FP20	Trim- Triglyph	East	*Layers not present*	Grayish White 10YR 9/1	Moderate Yellowish Pink 5YR 7/4	*Layers not processed*
FP24	Trim- Tympanum	South	*Layers not present*	*Layers not present*	*Layers not present*	Pinkish White 2.5Y 8/2 Yellowish Gray 10YR 6/1
FP28	Trim- Soffit	South	*Layers not present*	Grayish White 10YR 9/1	Moderate Yellowish Pink 5YR 7/4	*Layers not processed*
			Column - Early Paint Scheme Not Found	**Column - Middle Scheme Not Found**	**Column - Modern Paint**	
FP05	Column	South	*Layers not present*	*Layers not present*	*Layers not present*	Yellowish Gray 10YR 6/1 Neutral Gray N 8.75 Yellowish Gray 5Y 6/1
FP06	Column	South	*Layers not present+D30:I37*	*Layers not present* Neutral Gray N 8.75	Moderate Yellowish Pink 5YR 7/4	Yellowish Gray 5Y 6/1 Pinkish White 2.5Y 8/2 Yellowish Gray 5Y 6/1

Fluvanna County Courthouse Paint Samples

Sample Number	Substrate	Location	First Layer	RGB	Name	Preliminary Observations
FP01	Door Frame	South Door	10YR 9/1	234,226,213	Grayish White	Many layers of cream
FP02	Door Rail	South Door	10YR 9/1	234,226,213	Grayish White	1. Primer 2. Yellow 5. Glaze
FP03	Door Panel	South Door	10YR 7/6	209,167,104	Yellow	Appears to be the earliest color found across the samples for doors.
FP04	Door Frame Bead	South Door	2.5YR 2/2	64,44,39	Dark Grayish Reddish Brown	Trace glaze followed by many layers of cream.
FP05	Stucco	South Column	2.5Y 8/2	211,199,172	Pinkish White	Not original, modern.
FP06	Stucco	South Column	N 8.75	205,198,209	Neutral Gray	Not original, modern.
FP07	Door Frame	West Door	10YR 9/1	234,226,213	Grayish White	Many layers of cream. Appears to be bio-contaminated.
FP08	Door Frame Bead	West Door	10YR 9/1	234,226,213	Grayish White	Degraded sample appears to be same as FP08
FP09	Door Rail	West Door	10YR 7/6	209,167,104	Yellow	Has a trace of yellow/red like FP-2 before yellow layer.
FP10	Door Panel	West Door	10YR 7/6	209,167,104	Yellow	Yellow. Same as FP09
FP11	Window Frame Bead	West Window	10YR 9/1	234,226,213	Grayish White	Many layers of cream.
FP12	Window Sash	West Window	10YR 9/1	234,226,213	Grayish White	Many layers of cream.
FP13	Shutter	West Window	2.5G 3/6	8,83,50	Yellowish Green	Modern green paint.
FP14	Window Frame Bead	North Window	10YR 9/1	234,226,213	Grayish White	Many layers of cream.
FP15	Window Sill	North Window	10YR 9/1	234,226,213	Grayish White	Many layers of cream.
FP16	Window Sash	East Window	N 8.75	205,198,209	Neutral Gray	Modern whites and grays.
FP17	Window Frame	East Window	10YR 6/1	154,146,136	Gray	Modern whites and grays.
FP18	Entablature	East Elevation	10YR 9/1	234,226,213	Grayish White	Many layers of cream.
FP19	Metope	East Elevation	10YR 9/1	234,226,213	Grayish White	Many layers of cream.
FP20	Triglyph	East Elevation	10YR 9/1	234,226,213	Grayish White	Many layers of cream.
FP21	Window Frame	Upper East Window	10YR 9/1	234,226,213	Grayish White	Many layers of cream.
FP22	Window Sash	Upper East Window	10YR 9/1	234,226,213	Grayish White	Degraded sample appears to be same as FP21
FP23	Shutter	Upper East Window	N 1.0	30,28,30	Black	Black
FP24	Tympanum	South Elevation	2.5Y 8/2	211,199,172	Pinkish White	Cream, folowed by blues and grays, all modern.
FP25	Door Stile	West Door	10YR 7/6	209,167,104	Yellow	Yellow. Same as FP09
FP26	Transom Bar	West Door	5Y 6/1	151,147,134	Yellowish Gray	Light Gray, modern.
FP27	Transom Sash	West Door	10YR 7/6	209,167,104	Yellow	Yellow followed by many layers of cream.
FP28	Soffit Panel Frame	South Porch	10YR 9/1	234,226,213	Grayish White	Many layers of cream.
FP29	Window Sash	North Window	10YR 6/1	154,146,136	Gray	Gray, modern.
FP30	Window Shutter	North Window	7.5G 2/4	13,56,44	Deep Green	Green, modern.



Exterior Elevation - South
Scale: $\frac{3}{16}$" = 1'-0"

Fluvanna County Courthouse

0 2'8" 5'4" 10'8" 21'4" 42'8" 85'4"

28 March 2022

Palmyra, Virginia

JOHN MILNER ASSOCIATES
Preservation • a division of MTFA
Train Architects

Exterior Elevation - West
Scale: $\frac{3}{16}$" = 1'-0"

Fluvanna County Courthouse

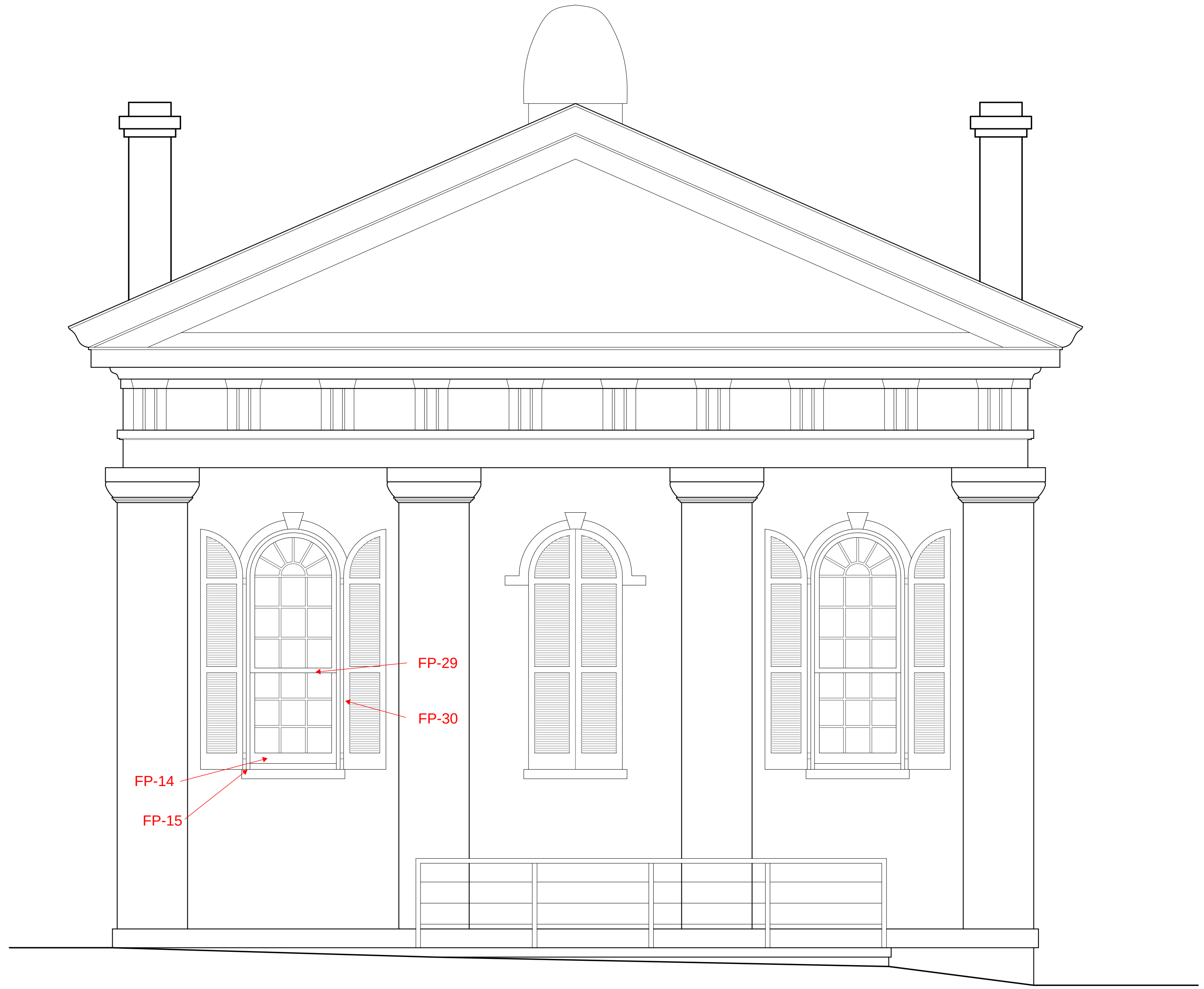
0 2'8" 5'4" 10'8" 21'4" 42'8" 85'4"

28 March 2022

Palmyra, Virginia

John Milner Associates
Preservation • a division of MTFA

Train Architects



Exterior Elevation - North
Scale: $\frac{3}{16}$" = 1'-0"

Fluvanna County Courthouse

0 2'8" 5'4" 10'8" 21'4" 42'8" 85'4"

28 March 2022

Palmyra, Virginia

John Milner Associates
Preservation • a division of MTFA

Train Architects

Exterior Elevation - East
Scale: $\frac{3}{16}$" = 1'-0"

Fluvanna County Courthouse

0 2'8" 5'4" 10'8" 21'4" 42'8" 85'4"

28 March 2022

Palmyra, Virginia

John Milner Associates
Preservation • a division of MTFA

Train Architects

Paint Seriation Study and Color Analysis

Project: Fluvanna Courthouse

Building Name: Courthouse **Location of Building:** Fluvanna, VA

Sample Number: FP-01 **Element Type:** Door Frame

Location of Sample: South Elevation

Photomicrograph: Prepared on 05/20/2022
(Visible Light: 40X Magnification)

Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood	++	
1.	Grayish White	++	10YR 9/1
2.	Grayish White	+	10YR 9/1
3.	Grayish White	-	10YR 9/1
4.	Dirt	-	
5.	Grayish White	+	10YR 9/1
6.	Grayish White	-	10YR 9/1
7.	Moderate Yellowish Pink	+	5YR 7/4
8.	Not Analyzed		

Technician: Amanda Edwards **Date:** 7/20/2022

Comments: The layers of grayish white paint followed by a thin layer of moderate yellowish pink is a benchmark sequence found in most of the samples. We do not have an exact timeline of schemes but we know the wood trim and doors were painted white in the early 20th century from photographs. The multiple layers suggest the trim was painted white for a number of years. We have identified this series as "Scheme 2" in our color chart. The UV glow of the white paints suggest oil binders.

Paint Seriation Study and Color Analysis

Project: Fluvanna Courthouse

Building Name: Courthouse **Location of Building:** Fluvanna, VA

Sample Number: FP-02 **Element Type:** Door Rail

Location of Sample: South Elevation

Photomicrograph: Prepared on 05/20/2022
(Visible Light: 100X Magnification)

Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood (not pictured)		
1.	Grayish White	-	10YR 9/1
2.	Yellow	+	10R 7/6
3.	Red	+	7.5R 3/12
4.	Yellow	+	10R 7/6
5.	Dark Brown	-	7.5YR 3/6
6.	Brown Varnish	-	2.5YR 2/2
7.	Not Analyzed		
8.	Not Analyzed		

Technician: Amanda Edwards **Date:** 7/20/2022

Comments: This sample show a different color scheme that seems to predate the white scheme found in other samples. This sample in combination FP03 and FP09 suggest the doors may have had a varnished faux-grained scheme at some point. The doors have a different paint stratigraphy than the wood trim. Exposure window in the paint may confirm/reveal what the graining looked like. This scheme is identified as "Scheme 1".

Paint Seriation Study and Color Analysis

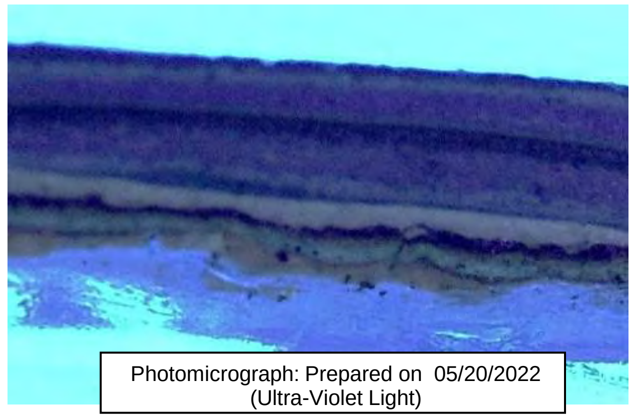
Project: Fluvanna Courthouse

Building Name: Courthouse | **Location of Building:** Fluvanna, VA

Sample Number: FP-03 | **Element Type:** Door Panel

Location of Sample: South Elevation

Photomicrograph: Prepared on 05/20/2022
(Visible Light: 100X Magnification)



Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood (not pictured)		
1.	Yellow	+	10YR 7/6
2.	Reddish Gray	--	7.5YR 5/2
3.	Yellowish Gray	-	10YR 5/1
4.	Yellow	-	10YR 7/6
5.	Brown Varnish	--	2.5YR 2/2
6.	Dark Brown	+	7.5 YR 3/6
7.	Not Analyzed		
8.	Not Analyzed		

Technician: Amanda Edwards **Date:** 7/20/2022

Comments: This sample, combined with FP02 nd FP09 suggest the doors may have had a varnished faux-grained scheme at some point. An exposure window in the paint may confirm/reveal what the graining looked like. This scheme is identified as "Scheme 1".

Paint Seriation Study and Color Analysis

Project:	Fluvanna Courthouse		
Building Name:	Courthouse	**Location of Building:**	Fluvanna, VA
Sample Number:	FP-04	**Element Type:**	Door Frame Bead
Location of Sample:	South Elevation		

Not Available

Not Available

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood		
1.	Trace Brown Varnish	-	2.5YR 2/2
2.	Grayish White	+	10YR 9/1
3.	Grayish White	+	10YR 9/1
4.	Grayish White	+	10YR 9/1
5.	Grayish White	+	10YR 9/1
6.	Dirt	-	
7.	Grayish White	+	10YR 9/1
8.	Grayish White	+	10YR 9/1
9.	Moderate Yellowish Pink	+	5YR 7/4

Technician: Amanda Edwards **Date:** 7/20/2022

Comments: This sample has a trace of varnish which indicates that the white scheme came after the varnished scheme. This sample helped us determine that the varnished layers may have predated the white scheme and may have been part of "Scheme 1"

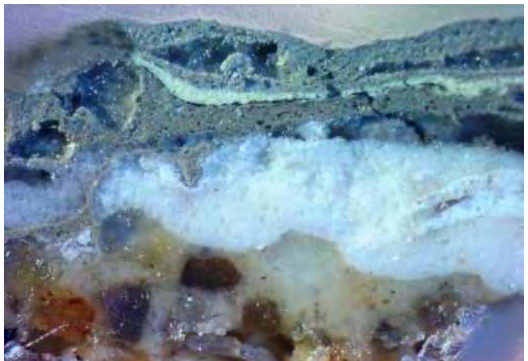
Paint Seriation Study and Color Analysis

Project: Fluvanna Courthouse

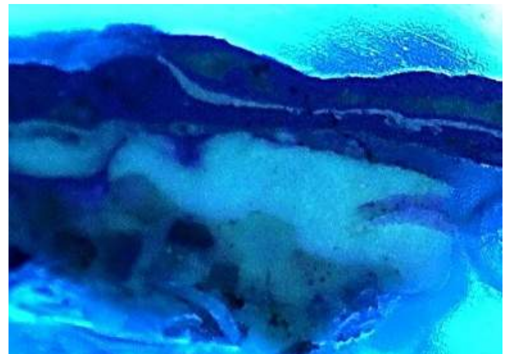
Building Name: Courthouse **Location of Building:** Fluvanna, VA

Sample Number: FP-05 **Element Type:** Column Stucco

Location of Sample: South Elevation



Photomicrograph: Prepared on 05/20/2022 (Visible Light: 40X Magnification)



Photomicrograph: Prepared on 05/20/2022 (Ultra-Violet Light)

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Stucco		
1.	Grayish White	+	10YR 9/1
2.	Skim Coat Plaster	+++	
3.	Yellowish Gray (possibly sanded)	+	5Y 6/1
4.	Grayish White	-	10YR 9/1
5.	Yellowish Gray	-	5Y 6/1
6.	Not Analyzed		
7.	Not Analyzed		
8.	Not Analyzed		
9.	Not Analyzed		

Technician: Amanda Edwards **Date:** 7/20/2022

Comments: These paint layers lay flat suggesting they are modern paints and do not represent the historic schemes. Modern paints are identified as "Scheme 3" in the color chart.

Paint Seriation Study and Color Analysis

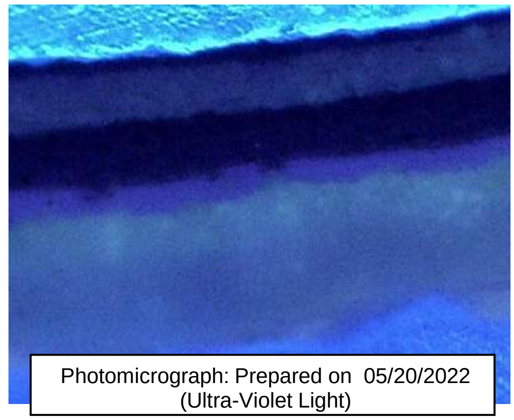
Project: Fluvanna Courthouse

Building Name: Courthouse **Location of Building:** Fluvanna, VA

Sample Number: FP-06 **Element Type:** Column Stucco

Location of Sample: South Elevation

Photomicrograph: Prepared on 05/20/2022
(Visible Light: 100X Magnification)



Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

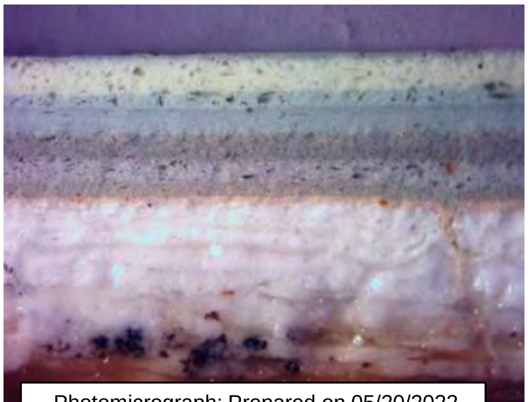
Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Stucco		
1.	White	+	N8.75
2.	Skim Coat Plaster	+++	
3.	White	+	N8.75
4.	Moderate Yellowish Pink	+	5YR 7/4
5.	Yellowish Gray	++	5Y 6/1
6.	Pinkish White	++	2.5Y 8/2
7.	Gray	-	10YR 6/1
8.	Not Analyzed		
9.	Not Analyzed		

Technician: Amanda Edwards **Date:** 7/20/2022

Comments: These paint layers lay flat suggesting they are modern paints and do not represent the historic schemes. Modern paints are identified as "Scheme 3" in the color chart.

Paint Seriation Study and Color Analysis

Project:	Fluvanna Courthouse		
Building Name:	Courthouse	**Location of Building:**	Fluvanna, VA
Sample Number:	FP-07	**Element Type:**	Door Frame
Location of Sample:	West Elevation		



Photomicrograph: Prepared on 05/20/2022
(Visible Light: 100X Magnification)

Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood		
1.	Grayish White	+	10YR 9/1
2.	Grayish White	+	10YR 9/1
3.	Grayish White	-	10YR 9/1
4.	Grayish White	-	10YR 9/1
5.	Grayish White	-	10YR 9/1
6.	Grayish White	-	10YR 9/1
7.	Grayish White	-	10YR 9/1
8.	Moderate Yellowish Pink	-	5YR 7/4

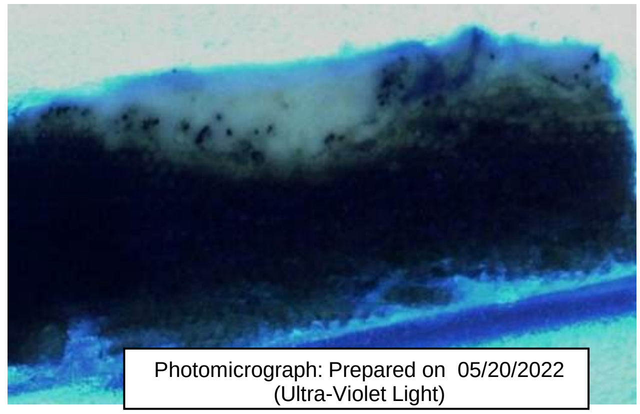
Technician: Amanda Edwards **Date:** 7/20/2022

Comments: This sample shows some degradation of the finish just above the wood which perhaps indicates the previous finish was sanded or removed. The many layers of white confirm "Scheme 2" in the color chart.

Paint Seriation Study and Color Analysis

Project:	Fluvanna Courthouse		
Building Name:	Courthouse	**Location of Building:**	Fluvanna, VA
Sample Number:	FP-08	**Element Type:**	Door Frame Bead
Location of Sample:	West Elevation		

Photomicrograph: Prepared on 05/20/2022
(Visible Light: 40X Magnification)



Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

int Seriation Chart

		Layer Thickness	Munsell No.
		++	10YR 9/1
		-	10YR 6/1
8.			

Technician:	Amanda Edwards	**Date:**	7/20/2022

Comments: This sample shows little paint history and and it not clear to what scheme the white paint belongs. The top layer of paint is a modern paint.

Paint Seriation Study and Color Analysis

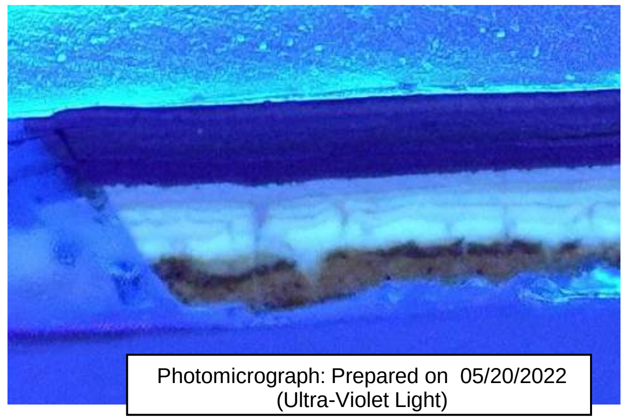
Project: Fluvanna Courthouse

Building Name: Courthouse | **Location of Building:** Fluvanna, VA

Sample Number: FP-09 | **Element Type:** Door Rail

Location of Sample: West Elevation

Photomicrograph: Prepared on 05/20/2022
(Visible Light: 40X Magnification)



Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood (not pictured)		
1.	Red	-	7.5R 3/12
2.	Yellow	++	10YR 7/6
3.	Reddish Gray	+	7.5YR 5/2
4.	Yellowish Gray	+	10YR 5/1
5.	Grayish White	+	10YR 9/1
6.	Grayish White	+	10YR 9/1
7.	Grayish White	-	10YR 9/1
8.	Grayish White	-	10YR 9/1
9	Grayish White	+	10YR 9/1
10	Moderate Yellowish Pink	-	5YR 7/4

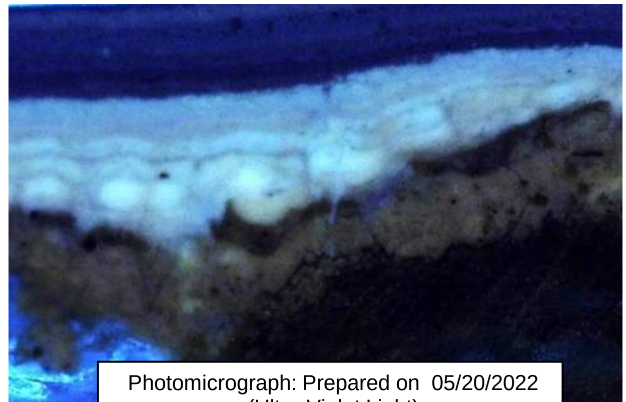
Technician: Amanda Edwards **Date:** 7/20/2022

Comments: This samples is one of the most complete samples for the doors. It clearly shows the yellow/red/browns of a potential faux grain (Scheme 1) below the many layers of white (Scheme 2) and the modern paints (Scheme 3).

Paint Seriation Study and Color Analysis

Project:	Fluvanna Courthouse		
Building Name:	Courthouse	**Location of Building:**	Fluvanna, VA
Sample Number:	FP-10	**Element Type:**	Door Panel
Location of Sample:	West Elevation		

Photomicrograph: Prepared on 05/20/2022
(Visible Light: 40X Magnification)



Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood		
1.	Yellow	++	10YR 7/6
2.	Reddish Gray	-	7.5YR 5/2
3.	Yellowish Gray	-	10YR 5/1
4.	Grayish White	+	10YR 9/1
5.	Grayish White	-	10YR 9/1
6.	Grayish White	-	10YR 9/1
7.	Grayish White	-	10YR 9/1
8.	Grayish White	-	10YR 9/1
9.	Moderate Yellowish Pink	-	5YR 7/4

Technician: Amanda Edwards **Date:** 7/20/2022

Comments: This samples is one of the most complete samples for the doors. It clearly shows the yellow/red/browns of a potential faux grain (Scheme 1) below the many layers of white (Scheme 2) and the modern paints (Scheme 3).

Paint Seriation Study and Color Analysis

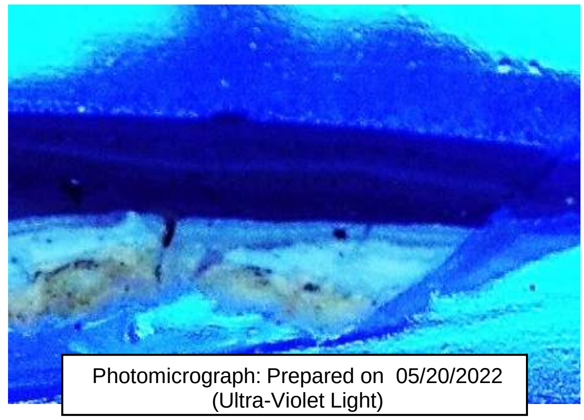
Project: Fluvanna Courthouse

Building Name: Courthouse | **Location of Building:** Fluvanna, VA

Sample Number: FP-11 | **Element Type:** Window Frame Bead

Location of Sample: West Elevation

Photomicrograph: Prepared on 05/20/2022
(Visible Light: 40X Magnification)



Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood (Not pictured)		
1.	Grayish White	+	10YR 9/1
2.	Grayish White	+	10YR 9/1
3.	Grayish White	-	10YR 9/1
4.	Grayish White	-	10YR 9/1
5.	Grayish White	-	10YR 9/1
6.	Moderate Yellowish Pink	-	5YR 7/4
7.	Not Analyzed		
8.	Not Analyzed		

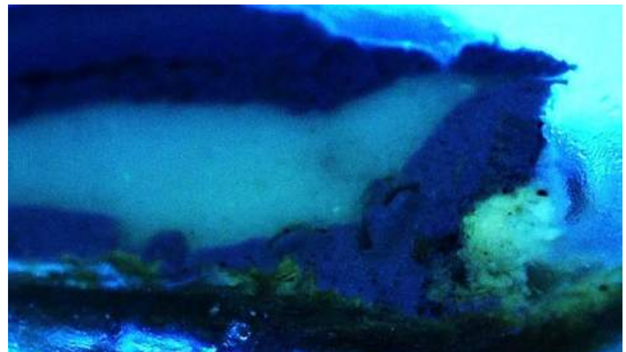
Technician: Amanda Edwards **Date:** 7/20/2022

Comments: The layers of grayish white paint followed by a thin layer of moderate yellowish pink is a benchmark sequence found in most of the samples. We do not have an exact timeline of schemes but we know the wood trim and doors were painted white in the early 20th century from photographs. The multiple layers suggest the trim was painted white for a number of years. We have identified this series as "Scheme 2" in our color chart. The UV glow of the white paints suggest oil binders.

Paint Seriation Study and Color Analysis

Project:	Fluvanna Courthouse		
Building Name:	Courthouse	**Location of Building:**	Fluvanna, VA
Sample Number:	FP-12	**Element Type:**	Window Sash
Location of Sample:	West Elevation		

Photomicrograph: Prepared on 05/20/2022
(Visible Light: 40X Magnification)



Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

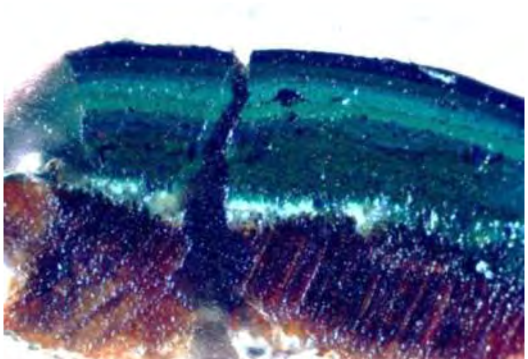
Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood		
1.	Grayish White	-	10YR 9/1
2.	Neutral Gray	+	N8.75
3.	Spackle	+++	
4.	Yellowish Gray	+	5Y6/1
5.	Neutral Gray	+	N8.75
6.	Not Analyzed		
7.	Not Analyzed		

Technician: Amanda Edwards **Date:** 7/20/2022

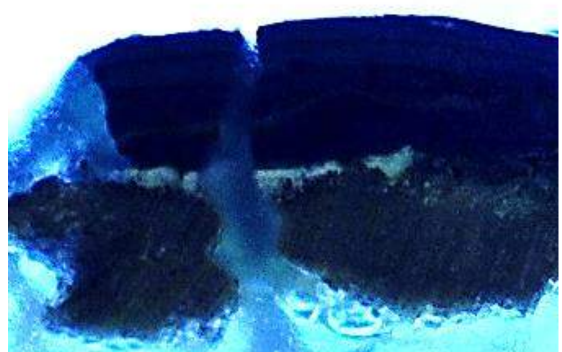
Comments: These paint layers lay flat suggesting they are modern paints and do not represent the historic schemes. Modern paints are identified as "Scheme 3" in the color chart.

Paint Seriation Study and Color Analysis

Project:	Fluvanna Courthouse		
Building Name:	Courthouse	**Location of Building:**	Fluvanna, VA
Sample Number:	FP-13	**Element Type:**	Shutter
Location of Sample:	West Elevation		



Photomicrograph: Prepared on 05/20/2022
(Visible Light: 40X Magnification)



Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood		
1.	White	+	N. 9.0
2.	Yellowish Green	-	2.5G 3/6
3.	Bluish Green	-	10G 2/4
4.	Dark Yellowish Green	+	10GY 2/2
5.	Dirt	-	
6.	Bluish Green	+	10G 2/4
7.	Bluish Green	+	10G 2/4
8.	Not Analyzed	-	

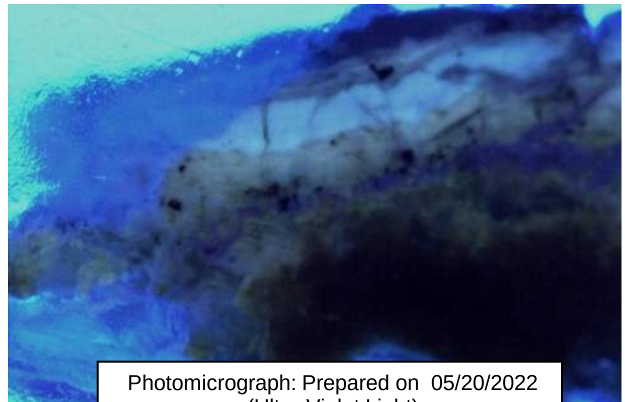
Technician: Amanda Edwards **Date:** 7/20/2022

Comments: This sample of the shutters seems to show a white primer layer before the first layer of green. The later layers that lay flat indicate modern paints. It is not clear if this sample shows historic paint schemes or not. The shutters appear to have been painted green for a significant amount of time.

Paint Seriation Study and Color Analysis

Project:	Fluvanna Courthouse		
Building Name:	Courthouse	**Location of Building:**	Fluvanna, VA
Sample Number:	FP-14	**Element Type:**	Window Frame Bead
Location of Sample:	North Elevation		

Photomicrograph: Prepared on 05/20/2022
(Visible Light: 40X Magnification)



Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood		
1.	Grayish White	+	10YR 9/1
2.	Grayish White	+	10YR 9/1
3.	Grayish White	-	10YR 9/1
4.	Grayish White	-	10YR 9/1
5.	Grayish White	-	10YR 9/1
6.	Grayish White	-	10YR 9/1
7.	Moderate Yellowish Pink	-	5YR 7/4
8.	Not Analyzed	-	

Technician: Amanda Edwards **Date:** 7/20/2022

Comments: The layers of grayish white paint followed by a thin layer of moderate yellowish pink is a benchmark sequence found in most of the samples. We do not have an exact timeline of schemes but we know the wood trim and doors were painted white in the early 20th century from photographs. The multiple layers suggest the trim was painted white for a number of years. We have identified this series as "Scheme 2" in our color chart. The UV glow of the white paints suggest oil binders.

Paint Seriation Study and Color Analysis

Project:	Fluvanna Courthouse		
Building Name:	Courthouse	**Location of Building:**	Fluvanna, VA
Sample Number:	FP-15	**Element Type:**	Window Sill
Location of Sample:	North Elevation		

Photomicrograph: Prepared on 05/20/2022
(Visible Light: 40X Magnification)

Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

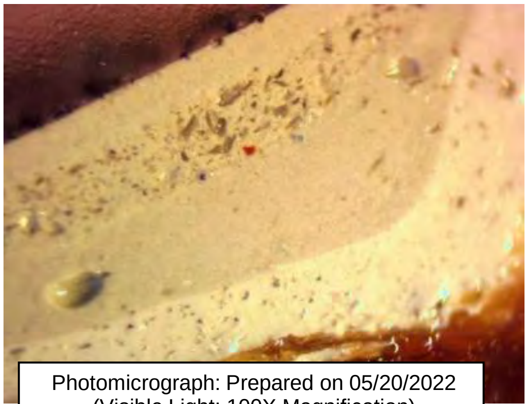
Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood		
1.	Grayish White	+	10YR 9/1
2.	Grayish White	-	10YR 9/1
3.	Grayish White	+	10YR 9/1
4.	Grayish White	+	10YR 9/1
5.	Grayish White	-	10YR 9/1
6.	Grayish White	-	10YR 9/1
7.	Grayish White	-	10YR 9/1
8.	Grayish White	++	10YR 9/1
9	Moderate Yellowish Pink	-	5YR 7/4

Technician: Amanda Edwards **Date:** 7/20/2022

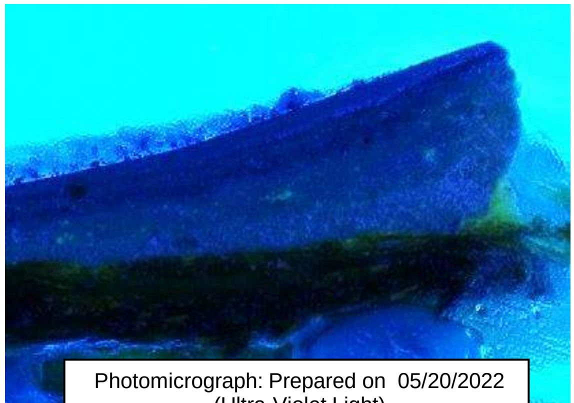
Comments: The layers of grayish white paint followed by a thin layer of moderate yellowish pink is a benchmark sequence found in most of the samples. We do not have an exact timeline of schemes but we know the wood trim and doors were painted white in the early 20th century from photographs. The multiple layers suggest the trim was painted white for a number of years. We have identified this series as "Scheme 2" in our color chart. The UV glow of the white paints suggest oil binders.

Paint Seriation Study and Color Analysis

Project:	Fluvanna Courthouse		
Building Name:	Courthouse	**Location of Building:**	Fluvanna, VA
Sample Number:	FP-16	**Element Type:**	Window Sash
Location of Sample:	East Elevation		



Photomicrograph: Prepared on 05/20/2022
(Visible Light: 100X Magnification)



Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

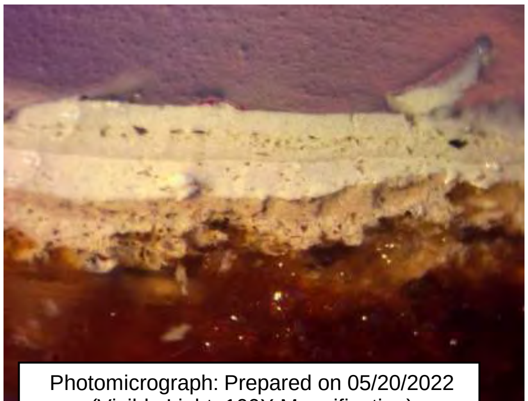
Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood		
1.	Neutral Gray	++	N8.75
2.	Yellowish Gray	+++	5Y 6/1
3.	Yellowish Gray	++	5Y 6/1
4.	Yellowish Gray	-	5Y 6/1
5.	Yellowish Gray	+	5Y 6/1

Technician: Amanda Edwards **Date:** 7/20/2022

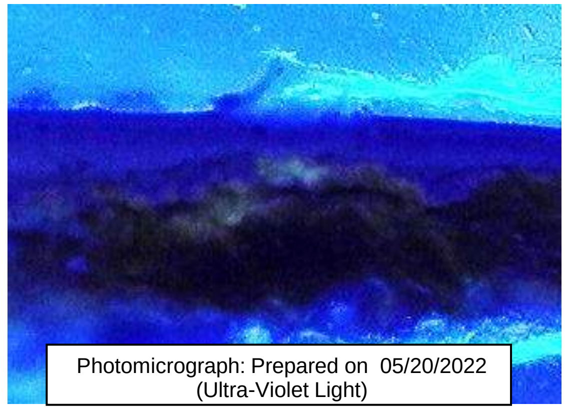
Comments: These paint layers lay flat suggesting they are modern paints and do not represent the historic schemes. Modern paints are identified as "Scheme 3" in the color chart.

Paint Seriation Study and Color Analysis

Project:	Fluvanna Courthouse		
Building Name:	Courthouse	**Location of Building:**	Fluvanna, VA
Sample Number:	FP-17	**Element Type:**	Window Frame
Location of Sample:	East Elevation		



Photomicrograph: Prepared on 05/20/2022
(Visible Light: 100X Magnification)



Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood		
1.	Yellowish Gray	++	10YR 6/1
2.	Neutral Gray	++	N 8.75
3.	Yellowish Gray	+	5Y 6/1
4.	Yellowish Gray	+	5Y 6/1

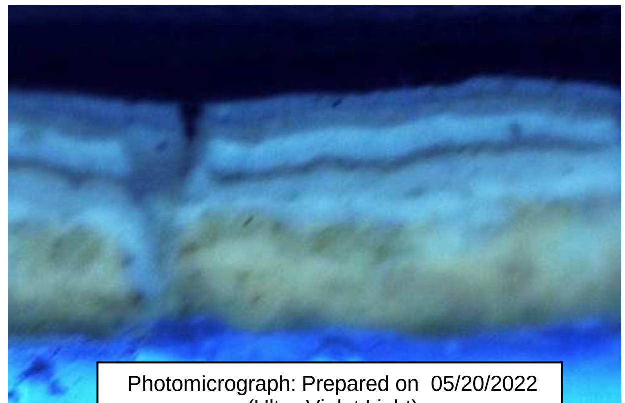
Technician: Amanda Edwards **Date:** 7/20/2022

Comments: These paint layers lay flat suggesting they are modern paints and do not represent the historic schemes. Modern paints are identified as "Scheme 3" in the color chart.

Paint Seriation Study and Color Analysis

Project:	Fluvanna Courthouse		
Building Name:	Courthouse	**Location of Building:**	Fluvanna, VA
Sample Number:	FP-18	**Element Type:**	Entablature
Location of Sample:	East Elevation		

Photomicrograph: Prepared on 05/20/2022
(Visible Light: 40X Magnification)



Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood		
1.	Grayish White	++	10YR 9/1
2.	Grayish White	-	10YR 9/1
3.	Grayish White	-	10YR 9/1
4.	Grayish White	-	10YR 9/1
5.	Grayish White	-	10YR 9/1
6.	Moderate Yellowish Pink	-	5YR 7/4
7.	Not Analyzed	-	
8.	Not Analyzed	-	

Technician: Amanda Edwards **Date:** 7/20/2022

Comments: The layers of grayish white paint followed by a thin layer of moderate yellowish pink is a benchmark sequence found in most of the samples. We do not have an exact timeline of schemes but we know the wood trim and doors were painted white in the early 20th century from photographs. The multiple layers suggest the trim was painted white for a number of years. We have identified this series as "Scheme 2" in our color chart. The UV glow of the white paints suggest oil binders.

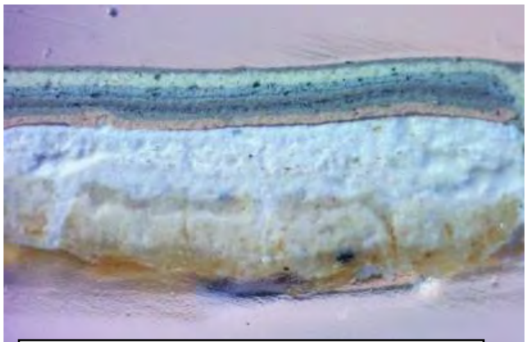
Paint Seriation Study and Color Analysis

Project: Fluvanna Courthouse

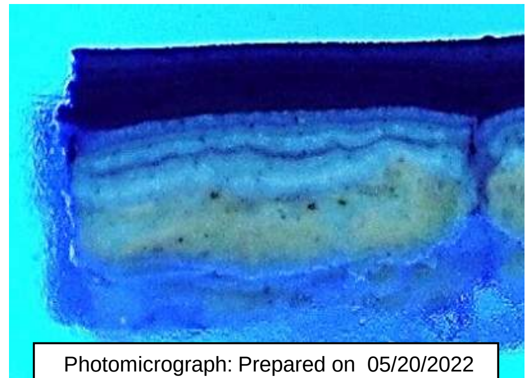
Building Name: Courthouse **Location of Building:** Fluvanna, VA

Sample Number: FP-19 **Element Type:** Entablature Metope

Location of Sample: East Elevation



Photomicrograph: Prepared on 05/20/2022
(Visible Light: 100X Magnification)



Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood (not pictured)		
1.	Grayish White	++	10YR 9/1
2.	Grayish White	-	10YR 9/1
3.	Grayish White	-	10YR 9/1
4.	Grayish White	-	10YR 9/1
5.	Grayish White	-	10YR 9/1
6.	Grayish White	-	10YR 9/1
7.	Grayish White	-	10YR 9/1
8.	Moderate Yellowish Pink	-	5YR 7/4

Technician: Amanda Edwards **Date:** 7/20/2022

Comments: The layers of grayish white paint followed by a thin layer of moderate yellowish pink is a benchmark sequence found in most of the samples. We do not have an exact timeline of schemes but we know the wood trim and doors were painted white in the early 20th century from photographs. The multiple layers suggest the trim was painted white for a number of years. We have identified this series as "Scheme 2" in our color chart. The UV glow of the white paints suggest oil binders.

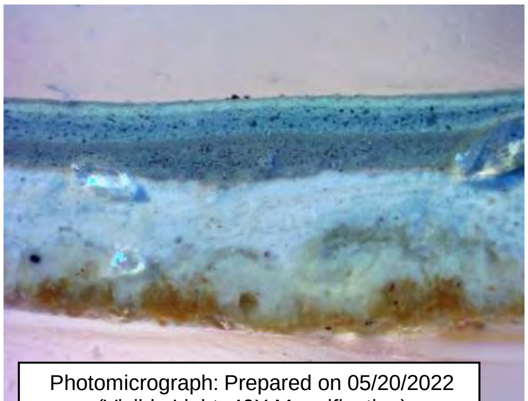
Paint Seriation Study and Color Analysis

Project: Fluvanna Courthouse

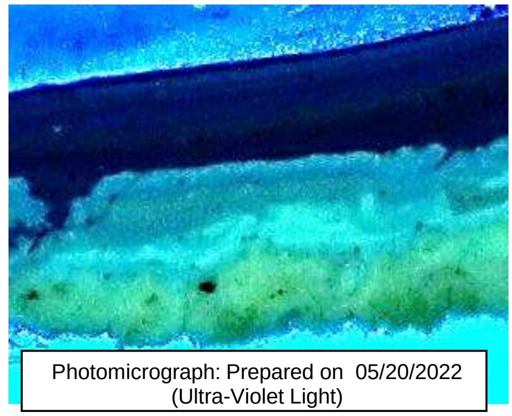
Building Name: Courthouse | **Location of Building:** Fluvanna, VA

Sample Number: FP-20 | **Element Type:** Entablature Triglyph

Location of Sample: East Elevation



Photomicrograph: Prepared on 05/20/2022
(Visible Light: 40X Magnification)



Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood (not pictured)		
1.	Grayish White	++	10YR 9/1
2.	Grayish White	-	10YR 9/1
3.	Grayish White	-	10YR 9/1
4.	Grayish White	-	10YR 9/1
5.	Grayish White	-	10YR 9/1
6.	Moderate Yellowish Pink	-	5YR 7/4
7.	Not Analyzed		
8.	Not Analyzed		

Technician: Amanda Edwards **Date:** 7/20/2022

Comments: The layers of grayish white paint followed by a thin layer of moderate yellowish pink is a benchmark sequence found in most of the samples. We do not have an exact timeline of schemes but we know the wood trim and doors were painted white in the early 20th century from photographs. The multiple layers suggest the trim was painted white for a number of years. We have identified this series as "Scheme 2" in our color chart. The UV glow of the white paints suggest oil binders.

Paint Seriation Study and Color Analysis

Project:	Fluvanna Courthouse		
Building Name:	Courthouse	**Location of Building:**	Fluvanna, VA
Sample Number:	FP-21	**Element Type:**	Upper Window Frame
Location of Sample:	East Elevation		

Photomicrograph: Prepared on 05/20/2022
(Visible Light: 40X Magnification)

Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood (not pictured)		
1.	Grayish White	++	10YR 9/1
2.	Grayish White	-	10YR 9/1
3.	Grayish White	-	10YR 9/1
4.	Grayish White	-	10YR 9/1
5.	Grayish White	-	10YR 9/1
6.	Grayish White	-	10YR 9/1
7.	Grayish White	-	10YR 9/1
8.	Moderate Yellowish Pink	-	5YR 7/4

Technician: Amanda Edwards **Date:** 7/20/2022

Comments: The layers of grayish white paint followed by a thin layer of moderate yellowish pink is a benchmark sequence found in most of the samples. We do not have an exact timeline of schemes but we know the wood trim and doors were painted white in the early 20th century from photographs. The multiple layers suggest the trim was painted white for a number of years. We have identified this series as "Scheme 2" in our color chart. The UV glow of the white paints suggest oil binders.

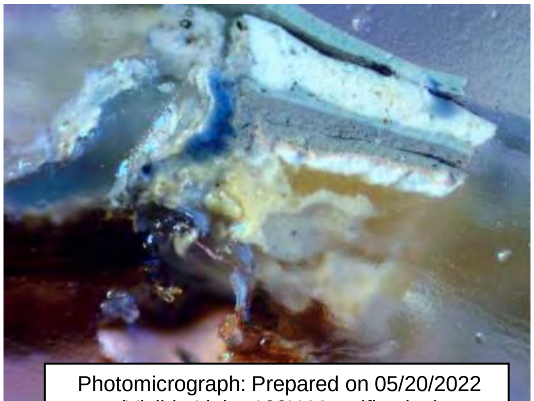
Paint Seriation Study and Color Analysis

Project: Fluvanna Courthouse

Building Name: Courthouse **Location of Building:** Fluvanna, VA

Sample Number: FP-22 **Element Type:** Upper Window Sash

Location of Sample: East Elevation



Photomicrograph: Prepared on 05/20/2022
(Visible Light: 100X Magnification)

Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood (not pictured)		
1.	Grayish White	++	10YR 9/1
2.	Grayish White	-	10YR 9/1
3.	Grayish White	-	10YR 9/1
4.	Grayish White	-	10YR 9/1
5.	Grayish White	-	10YR 9/1
6.	Grayish White	-	10YR 9/1
7.	Grayish White	-	10YR 9/1
8.	Moderate Yellowish Pink	-	5YR 7/4

Technician: Amanda Edwards **Date:** 7/20/2022

Comments: The layers of grayish white paint followed by a thin layer of moderate yellowish pink is a benchmark sequence found in most of the samples. We do not have an exact timeline of schemes but we know the wood trim and doors were painted white in the early 20th century from photographs. The multiple layers suggest the trim was painted white for a number of years. We have identified this series as "Scheme 2" in our color chart. The UV glow of the white paints suggest oil binders.

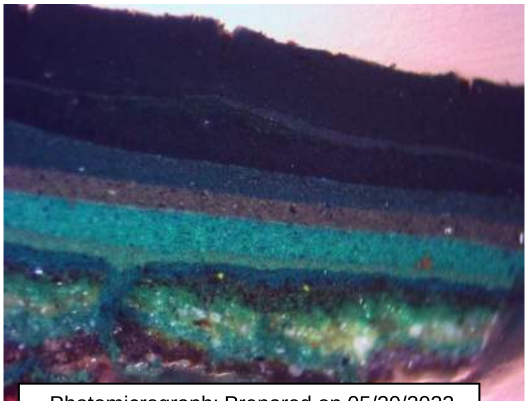
Paint Seriation Study and Color Analysis

Project: Fluvanna Courthouse

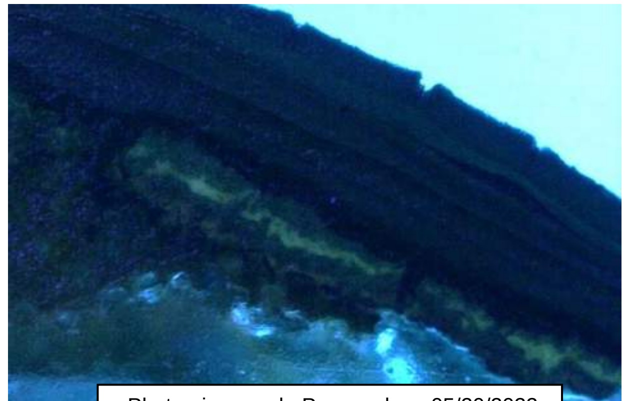
Building Name: Courthouse **Location of Building:** Fluvanna, VA

Sample Number: FP-23 **Element Type:** Upper Shutter

Location of Sample: East Elevation



Photomicrograph: Prepared on 05/20/2022
(Visible Light: 40X Magnification)



Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

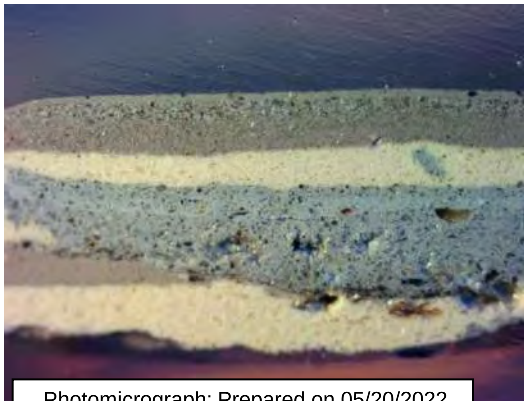
Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood (not pictured)		
1.	Black	-	N1.0
2.	Olive Green	-	2.5GY 2/2
3.	Deep Green	+	7.5G 2/4
4.	Olive Green	+	2.5GY 2/2
5.	Yellowish Green	+	2.5G 3./6
6.	Bluish Green	-	10G 2/4
7.	Not Analyzed		
8.	Not Analyzed		

Technician: Amanda Edwards **Date:** 7/20/2022

Comments: This sample of the shutter shows some historic paint layers that are earlier than the other shutter samples. The first layer is a very thin black line that was visible under the microscope. It is unclear if the black was the intended appearance or if it served as a primer. A very dark green was the dominant color in the paint history.

Paint Seriation Study and Color Analysis

Project:	Fluvanna Courthouse		
Building Name:	Courthouse	**Location of Building:**	Fluvanna, VA
Sample Number:	FP-24	**Element Type:**	Tympanum
Location of Sample:	South Elevation		



Photomicrograph: Prepared on 05/20/2022
(Visible Light: 40X Magnification)

Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood (not pictured)		
1.	Pinkish White	++	2.5Y 8/2
2.	Yellowish Gray	+	10YR 6/1
3.	Gray	++	5Y 6/1
4.	Gray	+	5Y 6/1
5.	Gray	-	5Y 6/1
6.	Pinkish White	++	2.5Y 8/2
7.	Not Analyzed		
8.	Not Analyzed		

Technician: Amanda Edwards **Date:** 7/20/2022

Comments: These paint layers lay flat suggesting they are modern paints and do not represent the historic schemes. Modern paints are identified as "Scheme 3" in the color chart.

Paint Seriation Study and Color Analysis

Project: Fluvanna Courthouse

Building Name: Courthouse — **Location of Building:** Fluvanna, VA

Sample Number: FP-25 — **Element Type:** Door Stile

Location of Sample: West Elevation

Photomicrograph: Prepared on 05/20/2022
(Visible Light: 40X Magnification)

Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

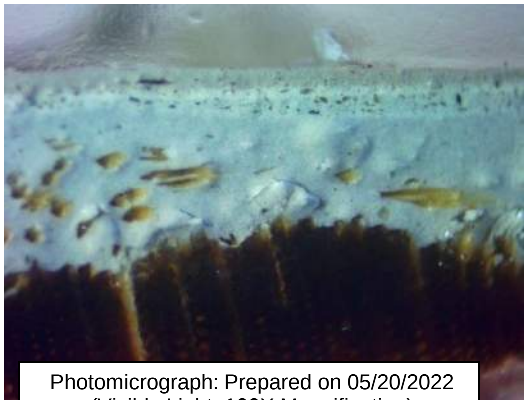
Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood (not pictured)		
1.	Yellow	++	10YR 7/6
2.	Grayish Blue	+	5PB 6/2
3.	Dirt	-	
4.	Grayish White	-	10YR 9/1
5.	Grayish White	-	10YR 9/1
6.	Grayish White	-	10YR 9/1
7.	Grayish White	-	10YR 9/1
8.	Grayish White	-	10YR 9/1
9	Grayish White	-	10YR 9/1
10	Moderate Yellowish Pink	-	5YR 7/4

Technician: Amanda Edwards — **Date:** 7/20/2022

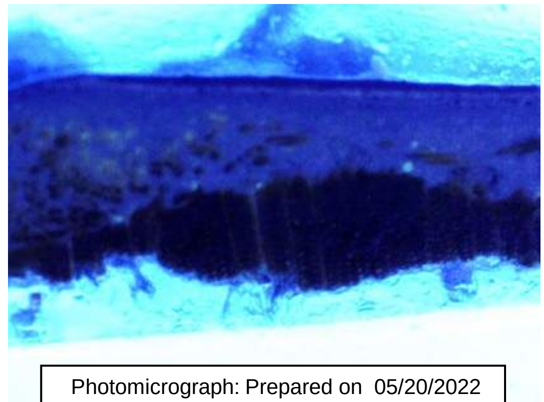
Comments: This sample has some of the early yellows and potential faux-grain identified as "Scheme 1." The blue layer is an outlier from all the samples and may represent an anomaly or a degradation of a white layer. The layers of grayish white paint followed by a thin layer of moderate yellowish pink is a benchmark sequence found in most of the samples. We do not have an exact timeline of schemes but we know the wood trim and doors were painted white in the early 20th century from photographs. The multiple layers suggest the trim was painted white for a number of years. We have identified this series as "Scheme 2" in our color chart. The UV glow of the white paints suggest oil binders.

Paint Seriation Study and Color Analysis

Project:	Fluvanna Courthouse		
Building Name:	Courthouse	**Location of Building:**	Fluvanna, VA
Sample Number:	FP-26	**Element Type:**	Transom Bar
Location of Sample:	West Elevation		



Photomicrograph: Prepared on 05/20/2022
(Visible Light: 100X Magnification)



Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood		
1.	Yellowish Gray	++++	5Y 6/1
2.	Gray	+	5GY 7/1
3.	White	-	5YR 8/1
4.	Gray	+	10YR 6/1

Technician: Amanda Edwards **Date:** 7/20/2022

Comments: These paint layers lay flat suggesting they are modern paints and do not represent the historic schemes. Modern paints are identified as "Scheme 3" in the color chart.

Paint Seriation Study and Color Analysis

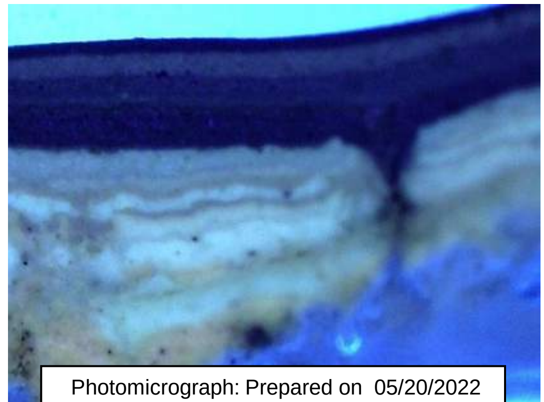
Project: Fluvanna Courthouse

Building Name: Courthouse | **Location of Building:** Fluvanna, VA

Sample Number: FP-27 | **Element Type:** Transom Sash

Location of Sample: West Elevation

Photomicrograph: Prepared on 05/20/2022
(Visible Light: 40X Magnification)



Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood		
1.	Yellow	-	10YR 7/6
2.	Grayish White	+	10YR 9/1
3.	Grayish White	+	10YR 9/1
4.	Grayish White	-	10YR 9/1
5.	Grayish White	-	10YR 9/1
6.	Grayish White	-	10YR 9/1
7.	Grayish White	-	10YR 9/1
8.	Grayish White	-	10YR 9/1
9.	Grayish White	-	10YR 9/1
10.	Grayish White	-	10YR 9/1
11.	Yellowish Gray	-	10YR 6/1

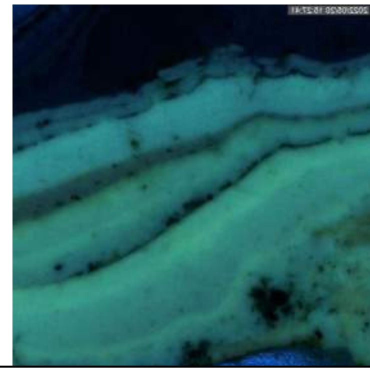
Technician: Amanda Edwards **Date:** 7/20/2022

Comments: This sample has some of the early yellows and potential faux-grain identified as "Scheme 1." The layers of grayish white paint is missing the thin layer of moderate yellowish pink that was part of the benchmark sequence found in most of the samples. We do not have an exact timeline of schemes but we know the wood trim and doors were painted white in the early 20th century from photographs. The multiple layers suggest the trim was painted white for a number of years. We have identified this series as "Scheme 2" in our color chart. The UV glow of the white paints suggest oil binders.

Paint Seriation Study and Color Analysis

Project:	Fluvanna Courthouse		
Building Name:	Courthouse	**Location of Building:**	Fluvanna, VA
Sample Number:	FP-28	**Element Type:**	Soffit Frame
Location of Sample:	South Porch		


Photomicrograph: Prepared on 05/20/2022
(Visible Light: 100X Magnification)


Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood		
1.	Grayish White	++	10YR 9/1
2.	Grayish White	-	10YR 9/1
3.	Grayish White	+	10YR 9/1
4.	Dirt	-	
5.	Grayish White	+	10YR 9/1
6.	Grayish White	+	10YR 9/1
7.	Dirt	-	
8.	Grayish White	-	10YR 9/1
9	Grayish White	-	10YR 9/1
10	Dirt	-	
11	Grayish White	-	10YR 9/1
12	Dirt	-	
13	Grayish White	-	10YR 9/1
14	Moderate Yellowish Pink	-	5YR 7/4

Technician: Amanda Edwards **Date:** 7/20/2022

Comments: The layers of grayish white paint followed by a thin layer of moderate yellowish pink is a benchmark sequence found in most of the samples. We do not have an exact timeline of schemes but we know the wood trim and doors were painted white in the early 20th century from photographs. The multiple layers suggest the trim was painted white for a number of years. We have identified this series as "Scheme 2" in our color chart. The UV glow of the white paints suggest oil binders.

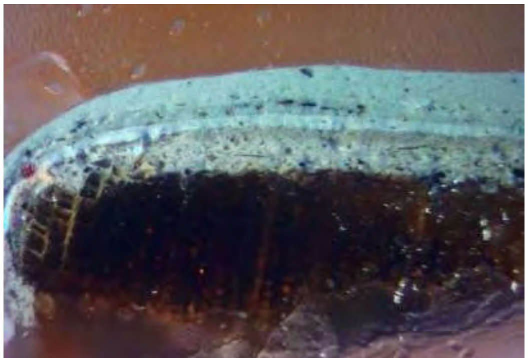
Paint Seriation Study and Color Analysis

Project: Fluvanna Courthouse

Building Name: Courthouse | **Location of Building:** Fluvanna, VA

Sample Number: FP-29 | **Element Type:** Window Sash

Location of Sample: North Elevation



Photomicrograph: Prepared on 05/20/2022
(Visible Light: 40X Magnification)

Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

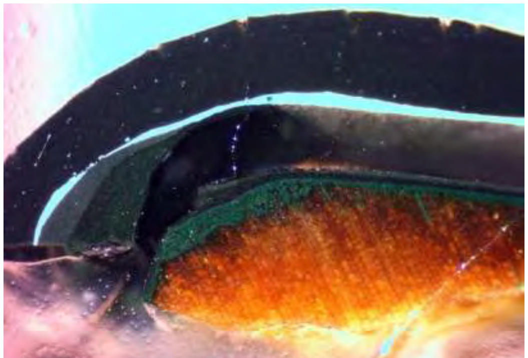
Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood		
1.	Gray	+	10YR 6/1
2.	Gray	+	10YR 6/1
3.	White	+	N9.0
4.	Yellowish Gray	+	5Y 6/1
5.	Yellowish Gray	+++	5Y 6/1

Technician: Amanda Edwards **Date:** 7/20/2022

Comments: These paint layers lay flat suggesting they are modern paints and do not represent the historic schemes. Modern paints are identified as "Scheme 3" in the color chart.

Paint Seriation Study and Color Analysis

Project:	Fluvanna Courthouse		
Building Name:	Courthouse	**Location of Building:**	Fluvanna, VA
Sample Number:	FP-30	**Element Type:**	Window Shutter
Location of Sample:	North Elevation		



Photomicrograph: Prepared on 05/20/2022
(Visible Light: 40X Magnification)

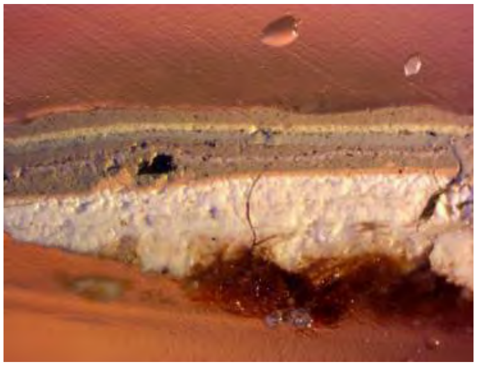
Photomicrograph: Prepared on 05/20/2022
(Ultra-Violet Light)

Paint Seriation Chart

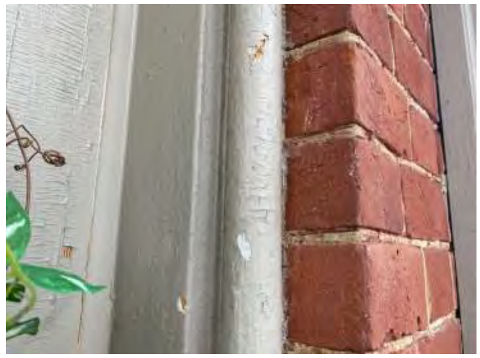
Layer No.	Descriptive Color Name	Layer Thickness	Munsell No.
Substrate:	Wood		
1.	Deep Green	+	7.5G 2/4
2.	Black	-	N 1.0
3.	Bluish Green	++	10G 2/2
4.	Grayish Black	-	N 2.0
5.	Bluish Green	+	10G 2/4
6.	White	+	N9.0
7.	Not Analyzed		
8.	Not Analyzed		

Technician: Amanda Edwards **Date:** 7/20/2022

Comments: Most of the paint layers in the sample lay flat suggesting modern paints. This sample confirms that the shutters have been painted green for a long period of time but does not provide information about earlier paint colors.

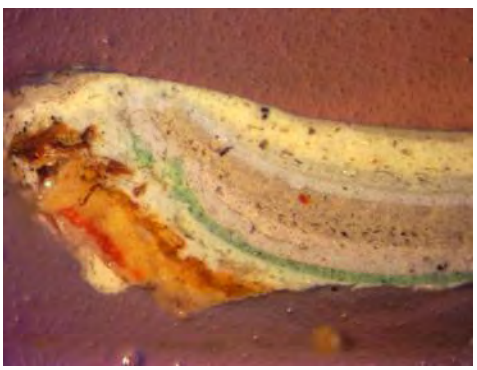


FP-01 40x i.bmp



FP-01 Sample.JPG

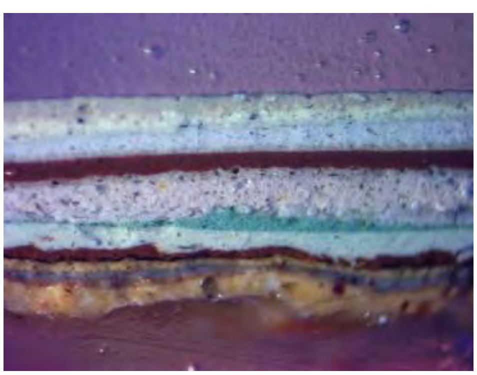
FP-01.JPG



Fp-02 100x ii.bmp

FP-02 Sample.JPG

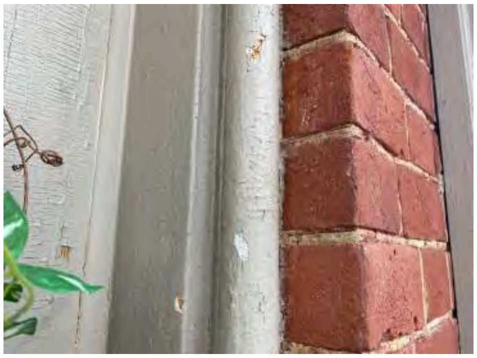
FP-02.JPG



FP-03 100x i.bmp

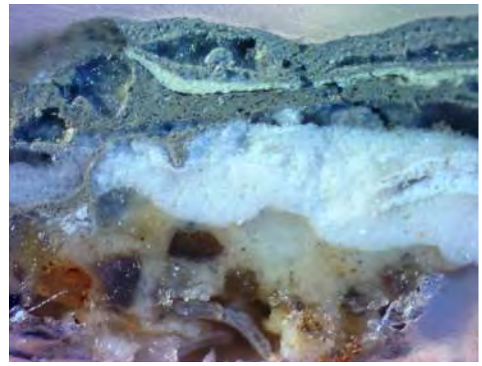
FP-03 Sample.JPG

FP-03.JPG

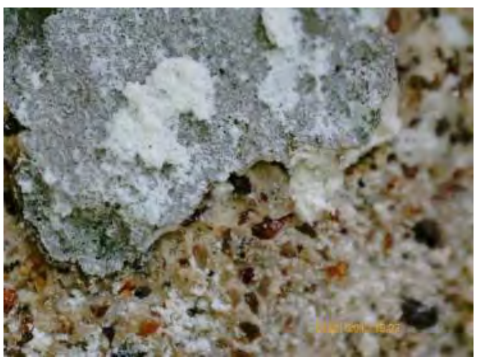


FP-04 Sample.JPG

FP-04.JPG



FP-05 40x ii.bmp



FP-05 Image.JPG

FP-05 Sample.JPG

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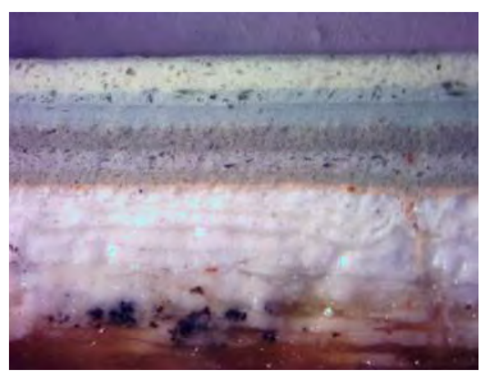

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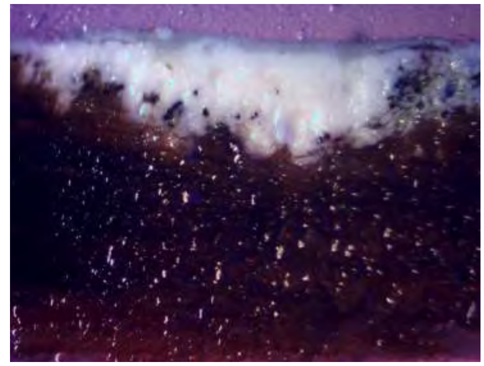

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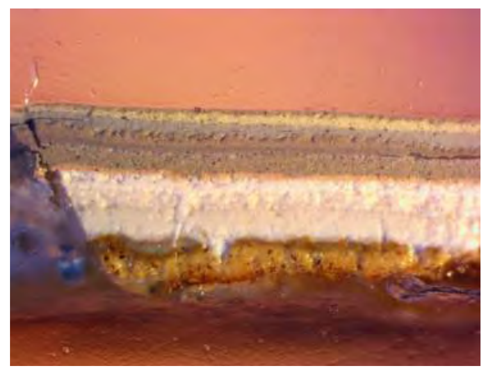

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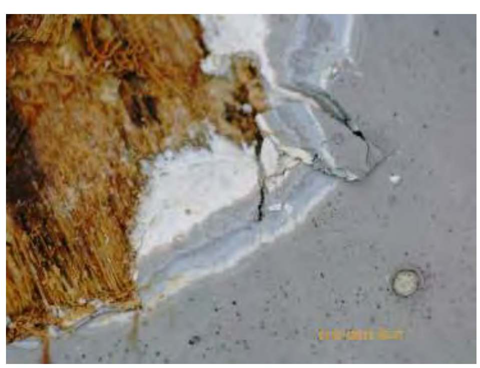

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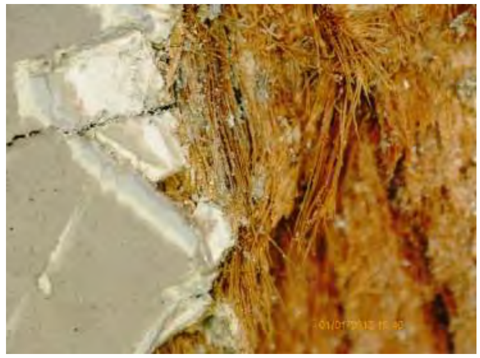

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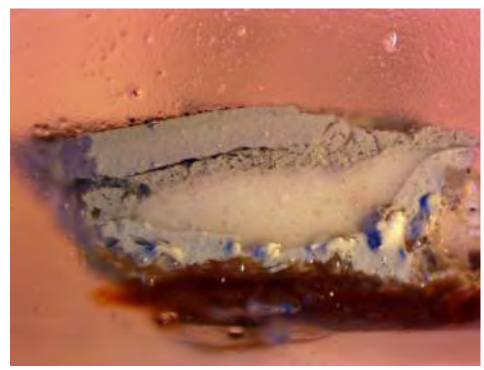

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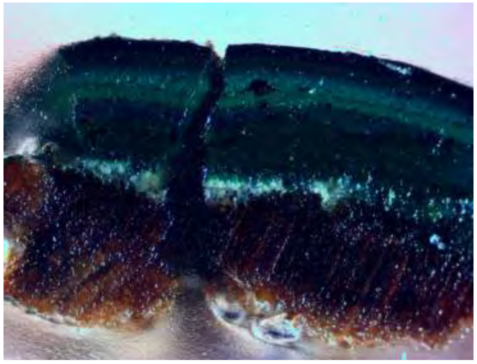

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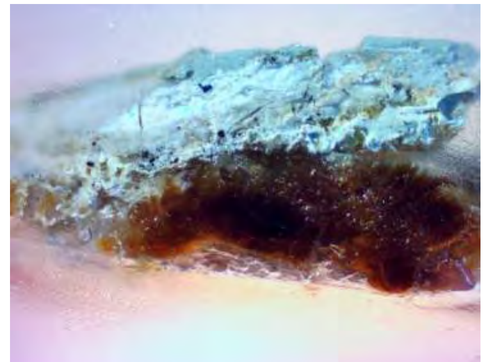

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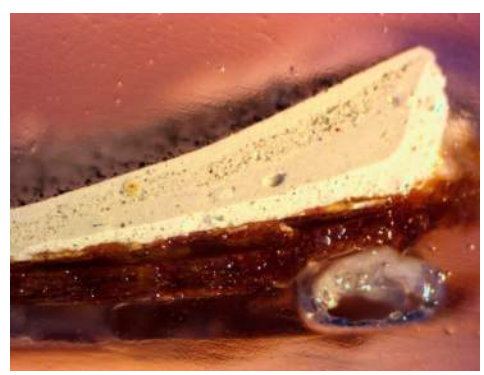

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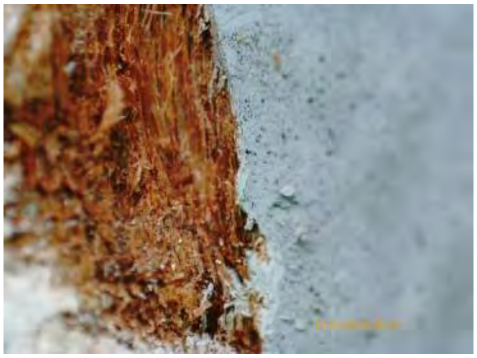

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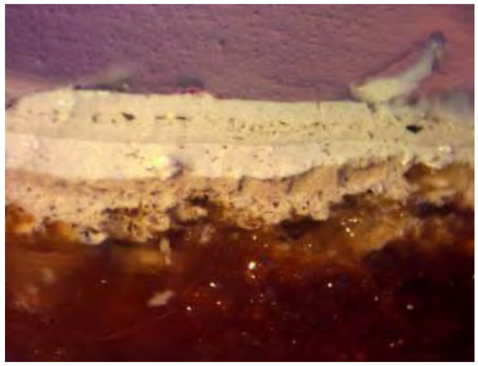

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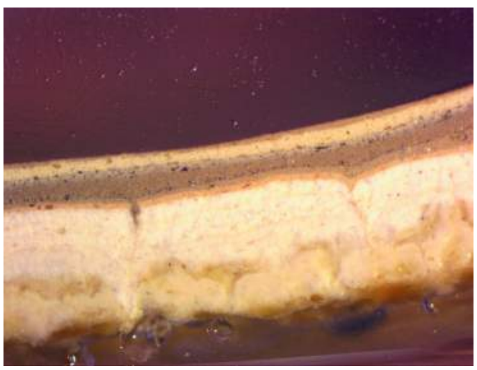

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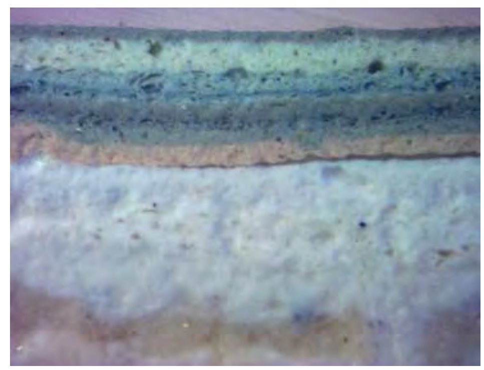

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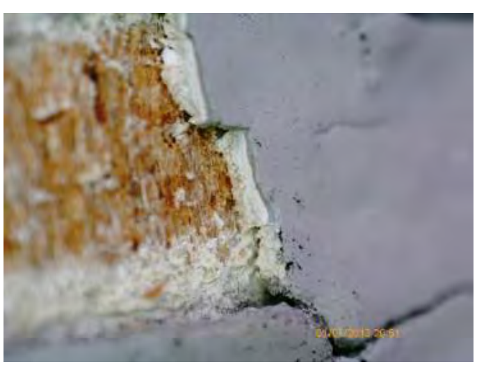

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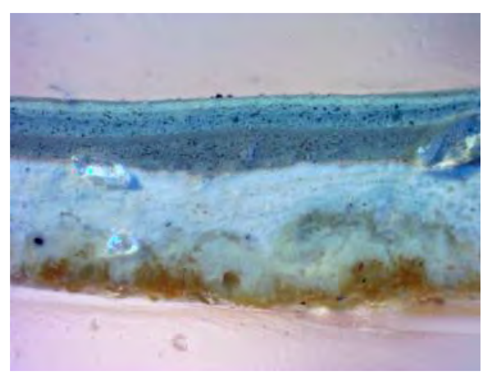

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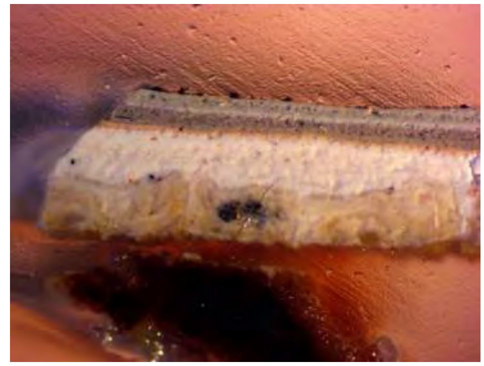

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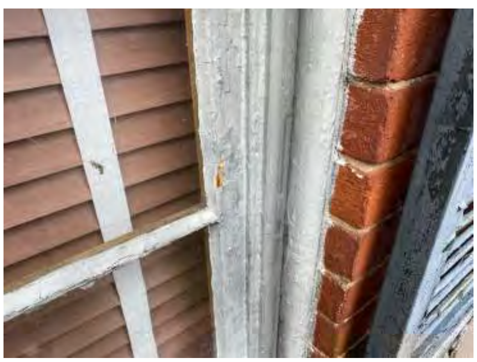

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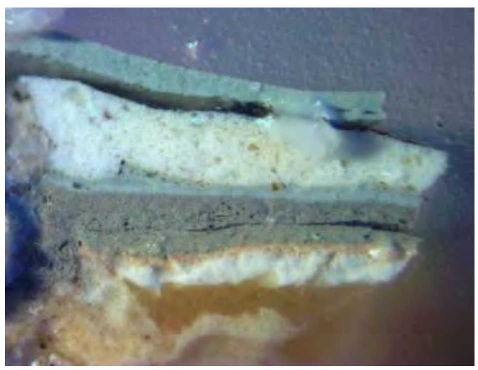

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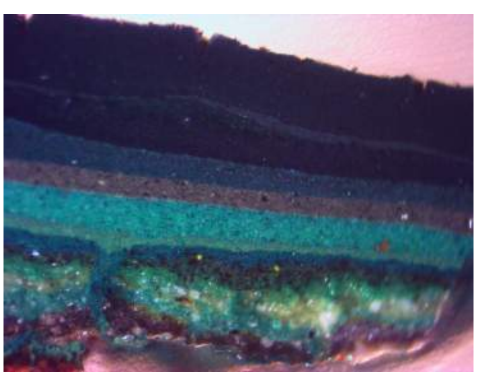

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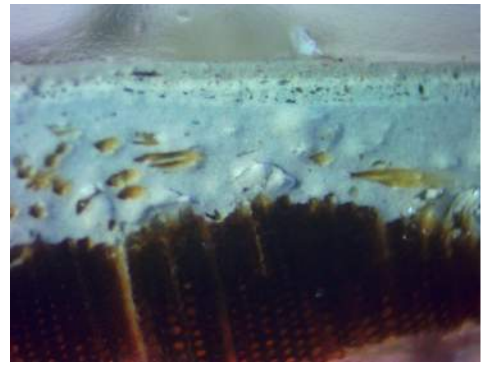

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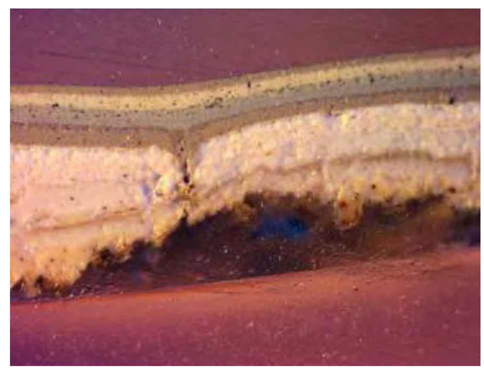

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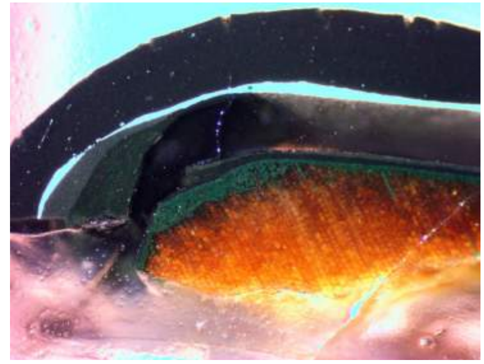

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CONSTRUCTION MATERIALS CONSULTANTS, INC.

Laboratory Investigation of An Early 19th Century (circa 1828) Masonry Mortar From Fluvanna County Courthouse In Palmyra, Virginia

Fluvanna County Courthouse
Palmyra, Virginia

Prepared for:
MTFA Architecture
Project No. 21044

June 07, 2022
CMC 0522132

Construction Materials Consultants, Inc.

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Greensburg, PA 15601 USA
Phone: 724-834-3551
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June 07, 2022

Amanda Edwards
MTFA Architecture
3200 Langston Blvd
Arlington, VA 22207

RE: FLUVANNA COUNTY COURTHOUSE, PALMYRA, VIRGINIA

Dear Ms. Edwards:

Construction Materials Consultants, Inc. (CMC) is pleased to provide the enclosed report on "Laboratory Investigation of an Early 19th Century (circa 1828) Masonry Mortar from Fluvanna County Courthouse in Palmyra, Virginia."

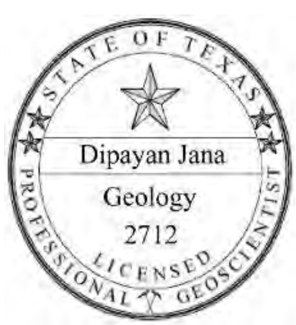
Results, opinions, and conclusions presented herein are based on the information and sample provided at the time of this investigation. We reserve the right to modify the report as additional information becomes available. Neither CMC nor its employees assume any obligation or liability for damages, including, but not limited to, consequential damages arising out of, or in conjunction with the use, or inability to use this resulting information.

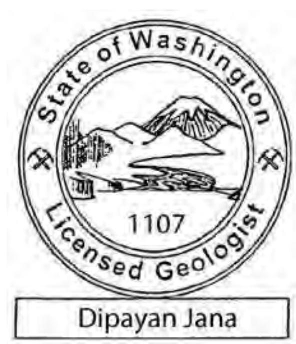
Please feel free to contact us with any additional questions. We look forward to providing our service again for your future projects.

Sincerely Yours,

CONSTRUCTION MATERIALS CONSULTANTS, INC.

Dipayan Jana, PG
President





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LABORATORY INVESTIGATION OF AN EARLY 19TH CENTURY (CIRCA 1828) MASONRY MORTAR FROM FLUVANNA COUNTY COURTHOUSE IN PALMYRA, VIRGINIA

EXECUTIVE SUMMARY

Built in 1828, Fluvanna County Courthouse is a two-story brick masonry building in the form of a tetrastyle Roman Doric temple located in the historic District of Fluvanna County in Palmyra, Virginia. As part of the renovation process, a bedding masonry mortar sample from the attic of the building was provided for detailed laboratory studies to determine the composition and condition of the mortar, and assessment of a suitable replacement mortar for restoration.

The mortar sample was examined by following the procedures of ASTM C 1324, "Standard Test Method for Examination and Analysis of Hardened Masonry Mortar," and the RILEM Test Methods, which include: (1) detailed optical microscopical examinations of as-received, lapped, and thin sectioned pieces of mortar with stereo-zoom microscope, and petrographic microscope to determine the type, condition, and composition of sand, binder, and overall mortar used; (2) scanning electron microscopy and energy-dispersive X-ray microanalyses (SEM-EDS) of interstitial paste fraction of mortar to ascertain the binder composition determined from optical microscopy; (3) extraction of acid-insoluble (e.g., siliceous) component of sand by acid (HCl) digestion, followed by sieve analyses of extracted sand to determine the grain-size distribution of mortar sand; (4) chemical (gravimetric) analyses to determine the soluble silica content from cold-acid digestion of mortar followed by hot-alkali digestion of the residue; (5) siliceous sand content from hydrochloric-acid insoluble residue content, (6) free and combined water and carbonate contents from loss on ignition at 110°C, 550°C, and 950°C respectively, (7) X-ray fluorescence spectroscopy (XRF) to determine chemical (oxide) composition of mortar, (8) X-ray diffraction (XRD) to determine the mineralogical composition, (9) thermal analysis to determine the hydrous, sulfate, and carbonate phases in the mortar as well as the binder composition, and (10) water-soluble chloride content in the filtrate after digesting mortar in deionized water. Based on all these comprehensive analyses, the overall conditions, extent of deterioration, and compositions of the mortar can be assessed, from which a suitable replacement mortar for the examined one can be evaluated.

Grain-size distribution of sand extracted from the mortar after hydrochloric acid digestion showed very fine size fractions of sand which are noticeably finer than the size distribution of modern masonry sand. Fineness modulus of sand determined to be only 0.62 with most of the size fractions concentrated in the less than 0.3 mm size. Particles are clear, light gray to off white to light brown, translucent, subangular to subrounded, mostly equidimensional, dense, hard, well-graded, well-distributed, nominal 1-mm in size, and present in sound conditions without any evidence of potentially deleterious reactions (e.g., alkali-aggregate reactions). Optical microscopy showed the sand consists of major amount of siliceous component of variably strained quartz, and subordinate amounts of quartzite, feldspar, and other siliceous and minor ferruginous components, and a trace amount of flaky mica and clay minerals. A trace amount of reddish brown siliceous and ferruginous grains depicting microstructures of silicified plate tissue fragments are found, which are judged not a part of sand but accidentally incorporated into the mortar during mixing and placement.

Optical microscopical examinations of the interstitial paste fraction shows many characteristic features of a historic lime mortar, e.g., numerous lumps of unmixed lime often showing internal shrinkage microcracks in coarser size lime lumps but the overall appearance shows a near-isotropic dark color in cross polarized light mode in a petrographic microscope, which is contrary to the high birefringence of a carbonated lime paste. Such near-isotropic nature of paste indicated the presence of another binder component along with lime, which has changed the overall optical properties of lime paste. The most common component, which does produce such near-isotropic appearance in optical properties is a calcined clay binder which participates in pozzolanic reaction with lime to produce calcium-magnesium-aluminum-silicate hydrate paste, which is optically more isotropic than a pure carbonated lime paste.

Further examination of paste in SEM-EDS has confirmed the lime-pozzolana reaction between the lime binder and an aluminosilicate binder, where latter candidate is best suited as a calcined clay component. Use of calcined clay with lime is common in many historic masonry structures whose application goes back to the Roman masonry structures where the aluminosilicate component added to provide pozzolanic reaction with calcitic lime binder was volcanic ash, or brick dust. The lime binder is found to be a dolomitic lime having appreciable amounts of calcium and magnesium oxides, often leaving relict microstructures of incompletely burnt dolomitic limestone raw feeds.

Despite having an aluminosilicate binder component added with lime, the overall microstructure of interstitial paste fraction was, however, still porous as opposed to an anticipated densification from lime-pozzolana reaction. Leaching of lime component from paste and magnesia component from many lime lumps has caused large variations in lime contents in paste and corresponding paste-equivalent cementation indices (after Eckel 1922) and so was the Ca/Mg ratios in various lime lumps.

Mortar is determined to be non-air-entrained, which is also not unusual for its reported early 19th century derivation.

X-ray diffraction (XRD) analysis of mortar showed the dominance of quartz from silica sand and subordinate calcite from paste along with some feldspar and clay minerals which are also found during optical microscopical examinations.

Chemical (gravimetric) analysis showed an acid-insoluble residue content of 73.5% which indicates contribution from the siliceous sand containing quartz, feldspar, and other silicate grains. Total silica content is determined to be 62.4% from XRF studies which indicates major contribution from siliceous sand and a portion from aluminosilicate binder component added as calcined clay. Loss on ignition at 110°C, 550°C, and 950°C correspond to free water, combined (hydrate) water, and degree of carbonation, respectively, with values of 1%, 2%, and 7%, respectively. Degree of carbonation of 7 percent is noticeably lower than the values (> 10%) commonly found for many historic lime, indicating lesser carbonation due to lesser amount of lime available after lime-pozzolana reaction for atmospheric carbonation.

Major element oxide composition of mortar from X-ray fluorescence spectroscopy (XRF) showed 62.4 percent silica, 5% alumina, 1.5% iron, 9.8% lime, 2.4% magnesia, <1% alkalis, and negligible sulfate. Lime and magnesia contents reflects addition of dolomitic lime binder whereas silica, alumina and iron oxide contents reflect addition of a second aluminosilicate binder.

Thermal analysis of mortar by TGA, DSC, and DTG showed losses in weights due to decompositions (loss of water and carbon dioxide) of various hydrous and carbonate phases, which are consistent with the results obtained from gravimetric mass losses from loss of free water (up to 120ºC), structural water (200 to 600ºC), and carbonation (600 to 950 ºC). TGA analysis has confirmed the presence of carbonated dolomitic lime from characteristic endothermic peaks (brucite indicates use of dolomitic lime), and mainly the fine-grained calcite from carbonated lime-pozzolana paste.

Therefore, results obtained from mineralogical (XRD), chemical (gravimetry), and thermal (TGA/DSC) analysis are all consistent with each other, all indicating use of a *dolomitic lime and a calcined clay binder and siliceous sand mortar* either as a lime-stabilized clay mortar, or as a binary calcined clay plus dolomitic lime mortar.

Water-soluble chloride analysis of filtrate from deionized water-digested mortar showed 463-ppm chloride, which was entered from the environment during its 180+ years of service despite its reported presence in an interior attic environment.

Since the mortar composition and components found are not typical of lime-only or cement-lime binders mix proportions of mortar are obtained from chemical analysis (gravimetry), and optical and scanning electron microscopy. A lime content of 11.8 percent is determined from the CO_2 content of mortar from loss on ignition at 950ºC. Considering lime to be a dolomitic lime, containing 41% CaO and 29% MgO, dolomitic lime content of mortar can be determined from bulk MgO content of mortar from XRF, which is 2.4 percent. A dolomitic lime content of 8.3% is obtained considering the MgO content in mortar and a dolomitic lime. Taking an average of these two calculated lime contents will provide a lime content of 10 percent. Since the sand is determined to be a siliceous type, sand content is determined from acid-insoluble residue content, which is 73.5 percent. Volumetric proportions of lime, and sand are calculated from corresponding dry densities of 40, and 80 lbs./ft^3, respectively. Volumetric proportions of lime-to-sand are thus calculated to be, 0.250-to-0.918. Therefore, the volumetric proportions of dolomitic lime, and sand are calculated to be about 1-part lime to 3½-part sand, which is not similar to any modern-day ASTM C 270 mortar but is very typical of many historic lime mortars. However, since the mortar is also determined to contain an aluminosilicate binder component as seen from near-isotropic nature of the paste in optical microscopy and aluminosilicate composition of binder along with Ca and Mg components in the paste from SEM-EDS studies, the estimated lime content is judged lower than calculated amount due to the presence of a second aluminosilicate binder, which is best judged to have been added as a calcined clay binder.

Based on the dolomitic lime, calcined clay, and siliceous sand components of mortar the following Table provides a suitable repointing mortar at the location of the examined mortar where a *hydraulic lime mortar* is suggested to provide the necessary improvement in strength and durability from hydration reaction of hydrated lime as has been achieved through pozzolanic reaction between lime and calcined clay. The end products of both types of reactions, i.e., the hydration of hydraulic lime and the lime-pozzolana reaction are similar, which are various forms of calcium-magnesium-aluminate-silicate-hydrate in paste. Moreover, both these reactions produce an overall densified microstructure compared to a rather porous microstructure from carbonation of lime binder. Many recent studies to unravel the secret of long-term durability of Roman mortars found formation of various calcium-magnesium-aluminate hydrate crystals in paste (e.g., stratlingite, $Ca_2Al_2SiO_7 \cdot 8H_2O$) that are responsible for enhancement in strength and durability of Roman mortars compared to their lime-only analogues.

Main Mortar	Mortar Type	Estimated Proportions of Main Mortar	Potential Recommendations For Repointing Mortar
Bedding mortar from attic	Dolomitic lime and calcined clay binders and siliceous sand	Maximum 1-part dolomitic lime to 3½-part sand but a calcined clay component was also added with lime to improve the overall strength of mortar from lime-calcined clay pozzolanic reactions	NHL 3.5 or NHL 5 binder and silica sand at 1-part binder to 2 to maximum 3-part sand by volume

Therefore, the examined historic mortar from early 19th century (circa 1828) is consistent with many historic lime mortars in having a dolomitic lime binder, which however also incorporated an aluminosilicate component with the addition of a second calcined clay component to provide an added strength and durability of mortar through pozzolanic reactions between calcined clay and dolomitic lime.

For selection of repointing mortar, the overall appearance of the final mortar would depend on a match on sand, which constitutes the dominant proportion of the mortar. Sand to be used should be (a) siliceous (quartz-based), (b) match in color to the color of sand in the examined mortar, (c) preferably be from similar sources, (d) be free of any debris, unsound, clay particles, or any potentially deleterious constituents such as mica or clay as found in the examined one, (e) conform to the size requirements of ASTM C 144 for masonry sand as opposed to use of very fine (< 1 mm size) sand found in the present mortar, which increases the water requirement of mortar mix, (f) not exceed maximum 3 times the sum of separate volumes of binder components, and (g) be durable. No pigment should be added to the pointing mortar. Use of Portland cement or Portland cement-based blended cement should be avoided. Initial rate of absorption (suction), and compressive strength of host stone masonry units are also important to determine the suitable mortar type, e.g., water retention properties (controlled by lime content) of mortar should be matched with the suction properties of masonry units. Due to atmospheric weathering and alterations, an exact match in color to the existing mortars may not be possible, which, even if possible, could alter in future due to continued atmospheric weathering in the presence of oxygen, moisture, and other elements during service.

INTRODUCTION

Fluvanna County Courthouse is a national historic building located in the historic District of Fluvanna County in Palmyra, Virginia. Built in 1828, the courthouse is a two-story brick masonry building in the form of a tetrastyle Roman Doric temple.

Figure 1: Fluvanna County Courthouse in Palmyra Virginia from where the mortar sample for present examination was collected.

As part of the renovation process of the courthouse, a bedding masonry mortar sample was collected from the south-facing wall in the attic and provided for detailed laboratory investigation.

The purpose of this investigation is detailed laboratory studies to determine the overall composition and condition of the mortar, and assessment of a suitable replacement mortar for restoration.

The sample was examined by following the procedures of ASTM C 1324, "Standard Test Method for Examination and Analysis of Hardened Masonry Mortar." Many details of the analytial procedures followed are provided in the Appendix I.

SAMPLE

Figure 2: Location of the bed joint (top photo) from where the tan-colored fragments of mortar sample (bottom photo) was collected.

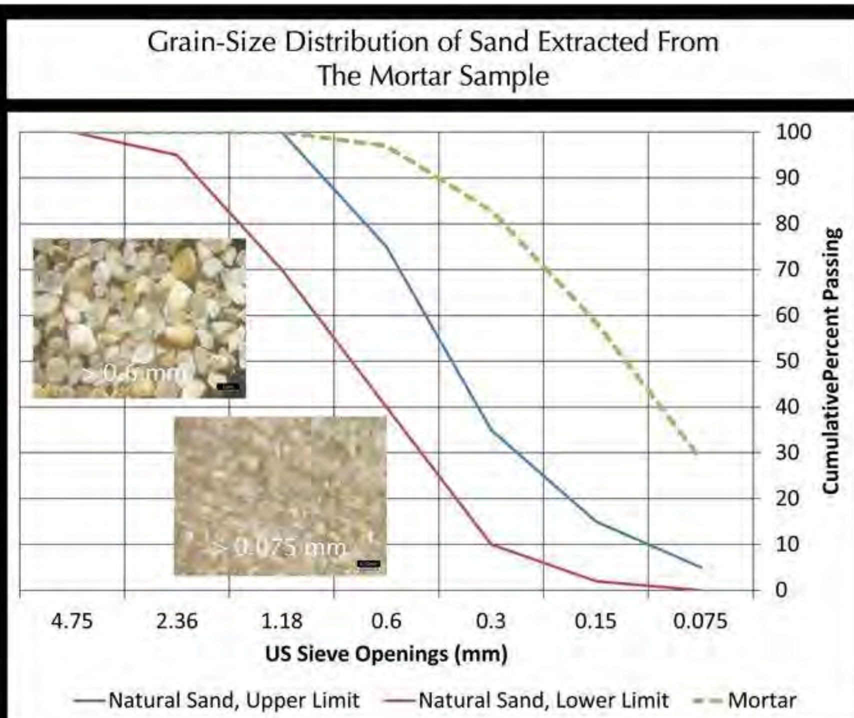
The mortar fragments are moderately hard to soft, where individual fragments are relarively intact.

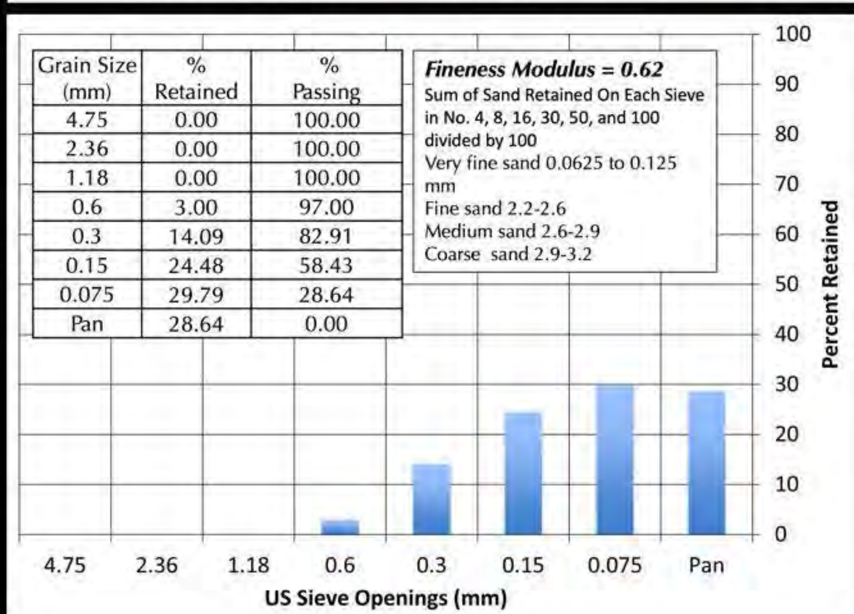
Total weight of the sample received is 47 grams where the largest fragment measures 40 × 26 × 16 mm.

A few fragments show white lumps of unmixed lime in the mortar immediately indicaring the presence of lime as a binder in the mortar.

RESULTS

Grain-size Distribution & Micrographs of Sand Extracted from Mortar





Grain Size (mm)	% Retained	% Passing
4.75	0.00	100.00
2.36	0.00	100.00
1.18	0.00	100.00
0.6	3.00	97.00
0.3	14.09	82.91
0.15	24.48	58.43
0.075	29.79	28.64
Pan	28.64	0.00

Fineness Modulus = 0.62
Sum of Sand Retained On Each Sieve in No. 4, 8, 16, 30, 50, and 100 divided by 100
Very fine sand 0.0625 to 0.125 mm
Fine sand 2.2-2.6
Medium sand 2.6-2.9
Coarse sand 2.9-3.2

Wentworth (1922) Grain Size Classification of Sand

Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand
1 to 2 mm	0.5 to 1 mm	0.25 to 0.5 mm	0.125 to 0.25 mm	0.0625 to 0.125 mm

Figure 3: Grain-size distribution of sand extracted from the mortar after hydrochloric acid digestion.

In the top plot, grain size distribution of sand is compared with the upper and lower limits of natural sand in ASTM C 144 (blue and red lines, respectively) showing overall noticeably finer grain size distribution of sand compared to the size distribution of modern ASTM C 144 masonry sand.

The bottom plot shows histogram of size distribution of sand, which again depict overall very fine grain size of sand where majority of size fractions are retained on US Sieve Nos. 50, 10, 200 and in the pan.

Inset Table shows the percent retained, and cumulative percent passing through each sieve.

Fineness modulus of sand is calculated to be 0.62 from the sum of cumulative percent retained on Sieves 4, 8, 16, 30, 50, and 100 divided by 100 where sand size is very fine as depicted from very low fineness modulus.

Next Figure 4 shows micrographs of dominant size fractions of sand particles retained on Nos. 30, 50, 100, and 200 sieves.

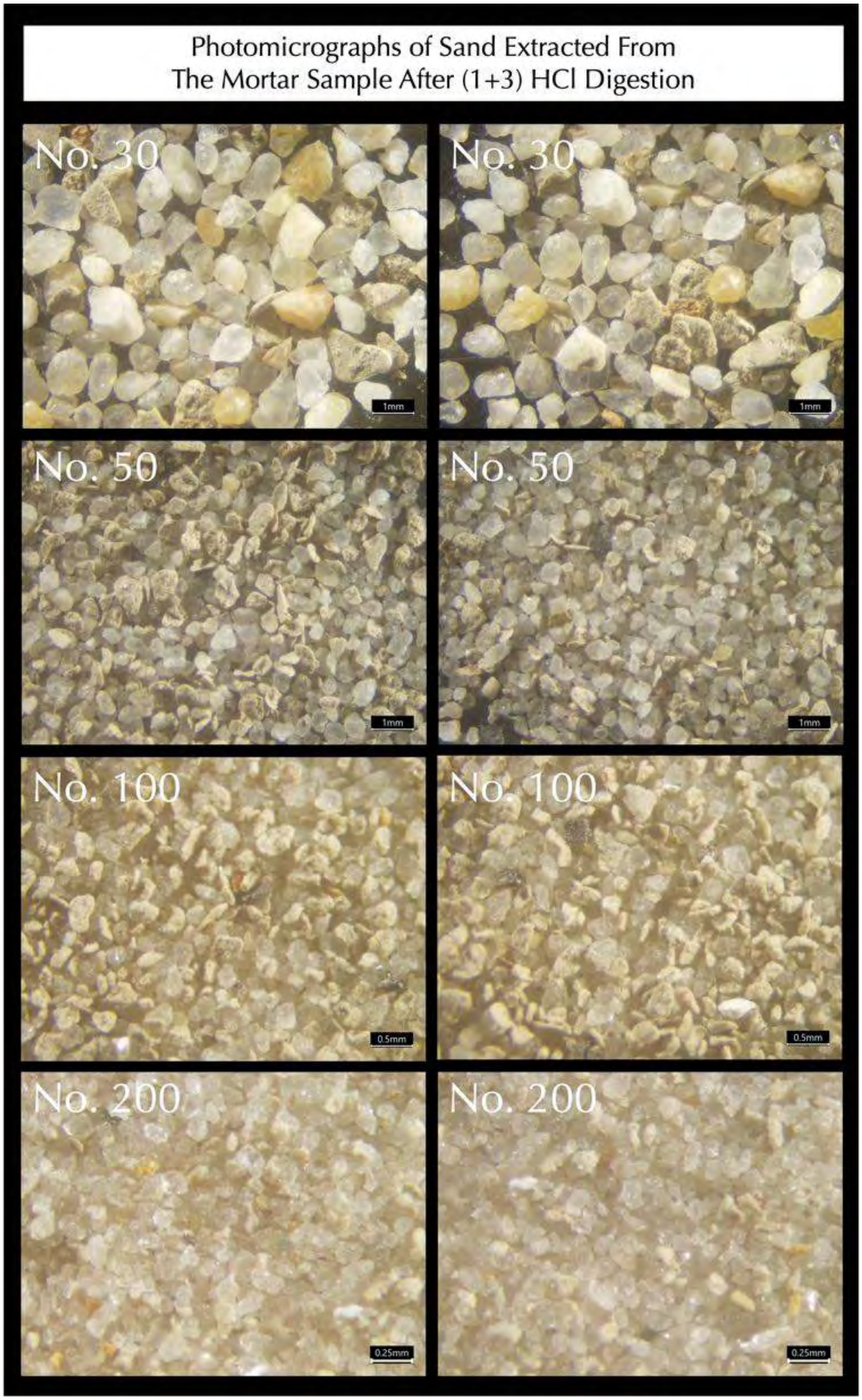


Figure 4: Micrographs of extracted sand from mortar retained on various sieves. Sand particles are off-white light to medium gray, and brown. Most sand particles are subangular to subrounded and equidimensional/equant in shape.

Lapped Section of Mortar

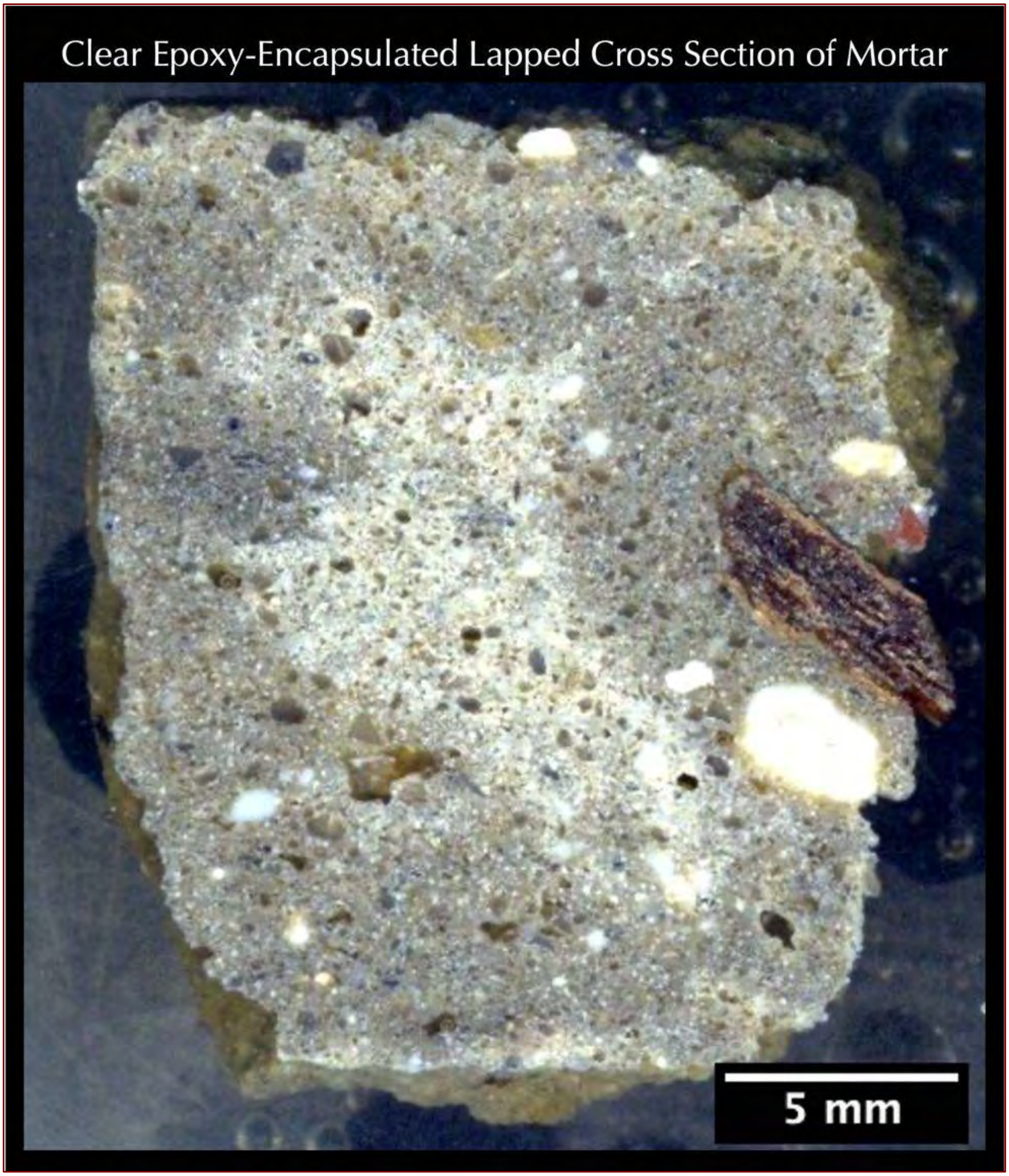


Figure 5: Clear epoxy-impregnated lapped cross section of a mortar fragment showing the size, shape, angularity, gradation, and distribution of sand particles, and interstitial paste fraction. Clear epoxy-impregnated lapped cross section of a mortar fragment showing the size, shape, angularity, gradation, and distribution of sand particles, and interstitial paste fraction. The color variation from lighter gray core to darker gray rim is due to incomplete depth of encapsulation of clear epoxy and does not necessarily indicate true color tones of mortar.

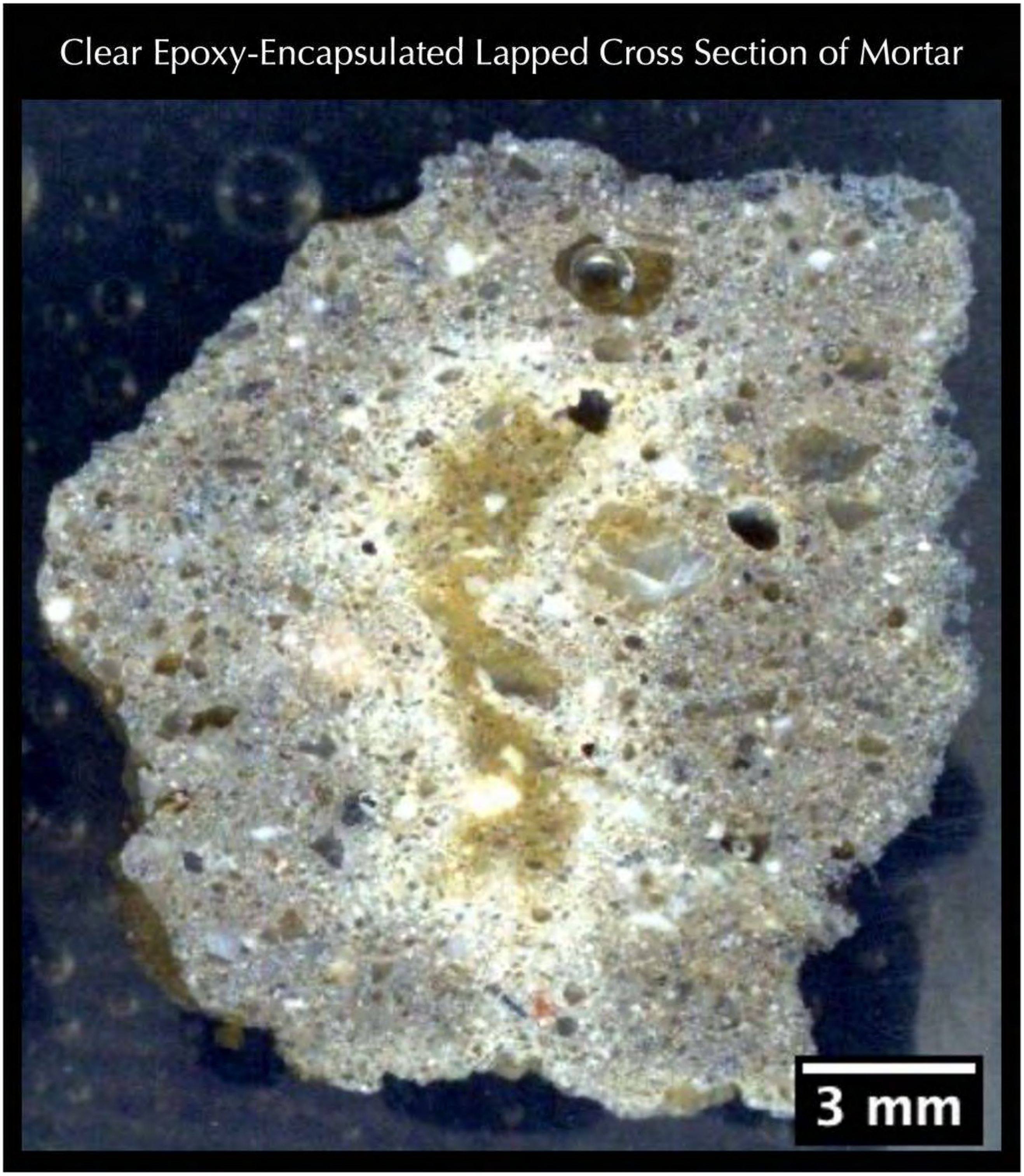


Figure 6: Clear epoxy-impregnated lapped cross section of a mortar fragment showing the size, shape, angularity, gradation, and distribution of sand particles, and interstitial paste fraction. The color variation from lighter gray core to darker gray rim is due to incomplete depth of encapsulation of clear epoxy and does not necessarily indicate true color tones of mortar.

Micrographs of Lapped Section of Mortar

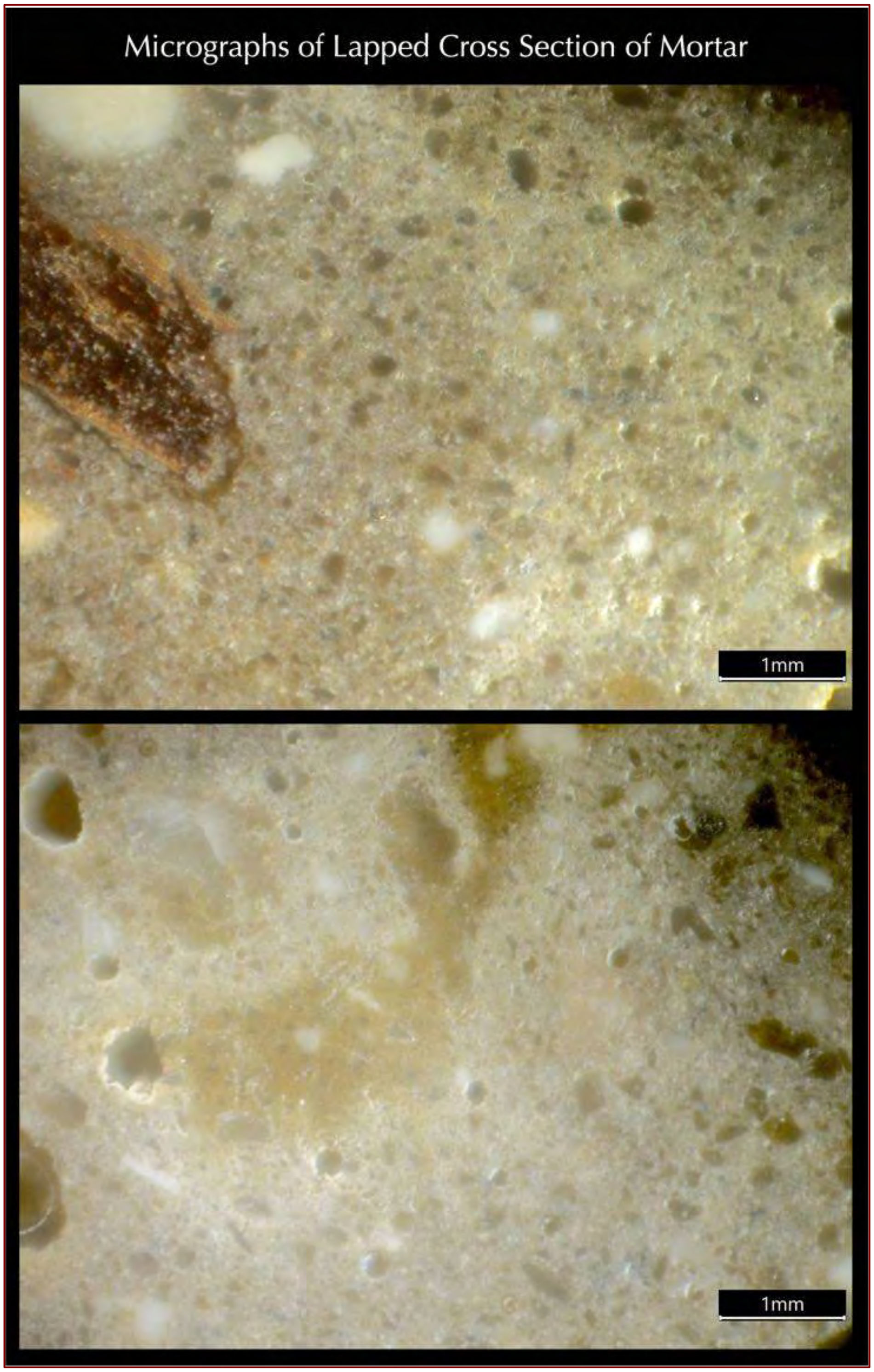


Figure 7: Micrographs of clear epoxy-impregnated cross section of mortar showing size, shape, angularity, gradation, and distribution of sand particles, where particles are variably colored, subangular to subrounded, equidimensional, well graded, and well-distributed. Notice the overall non-air-entrained nature of mortar, which is typical of historic mortars consistent with the reported early 19th century vintage.

Thin Section of Mortar

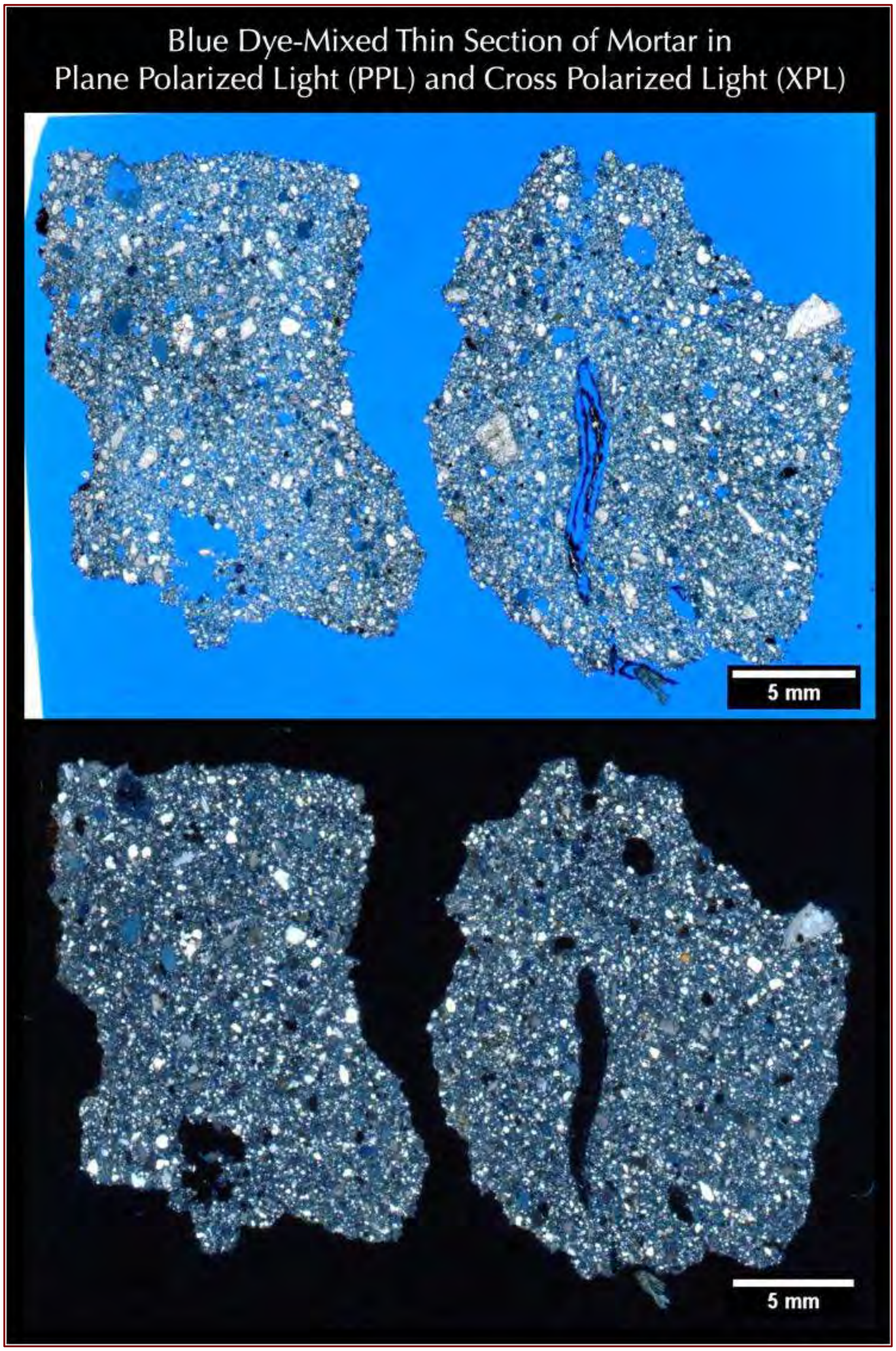


Figure 8: Blue dye-mixed low viscosity epoxy-impregnated thin section of mortar taken by using a flatbed film scanner, where thin section was scanned with a polarizing filter to generate the plane polarized light (PPL) view of mortar in the top photo, and with two perpendicular polarizing filers to generate the cross polarized light (XPL) view in the bottom photo. Both photos show the very fine (< 1 mm) sand grain size, shape, angularity, and distribution, and additionally interstitial pore and void spaces in mortar from blue epoxy in the top PPL photo.

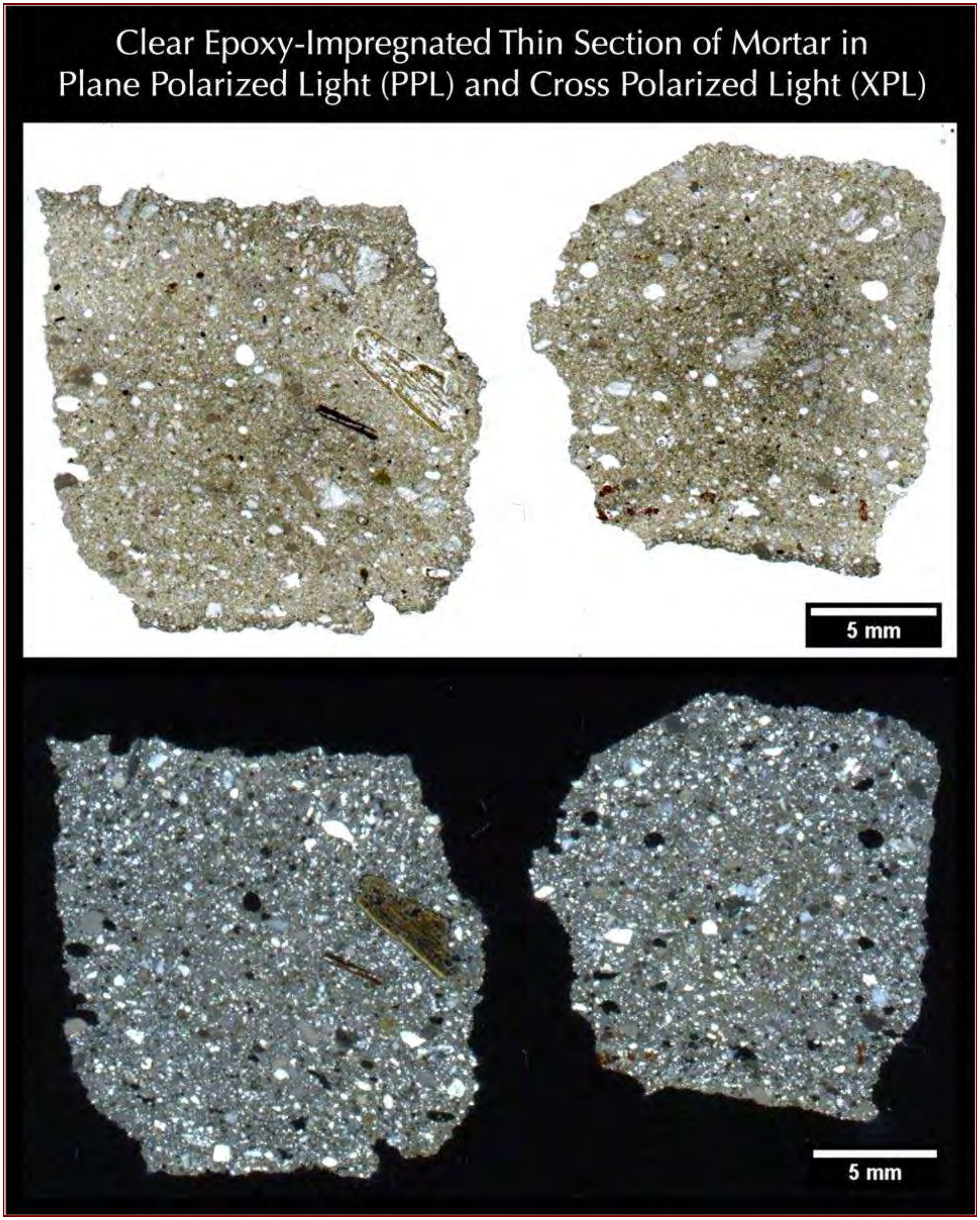


Figure 9: Clear, low viscosity epoxy-impregnated thin section of mortar taken by using a flatbed film scanner, where thin section was scanned with a polarizing filter to generate the plane polarized light (PPL) view of mortar in the top photo, and with two perpendicular polarizing filers to generate the cross polarized light (XPL) view in the bottom photo. Both photos show the very fine (< 1 mm) sand grain size, shape, angularity, and distribution. Notice a few plant fragments accidentally incorporated into the mortar during mixing and installation.

Micrographs of Thin Section of Mortar

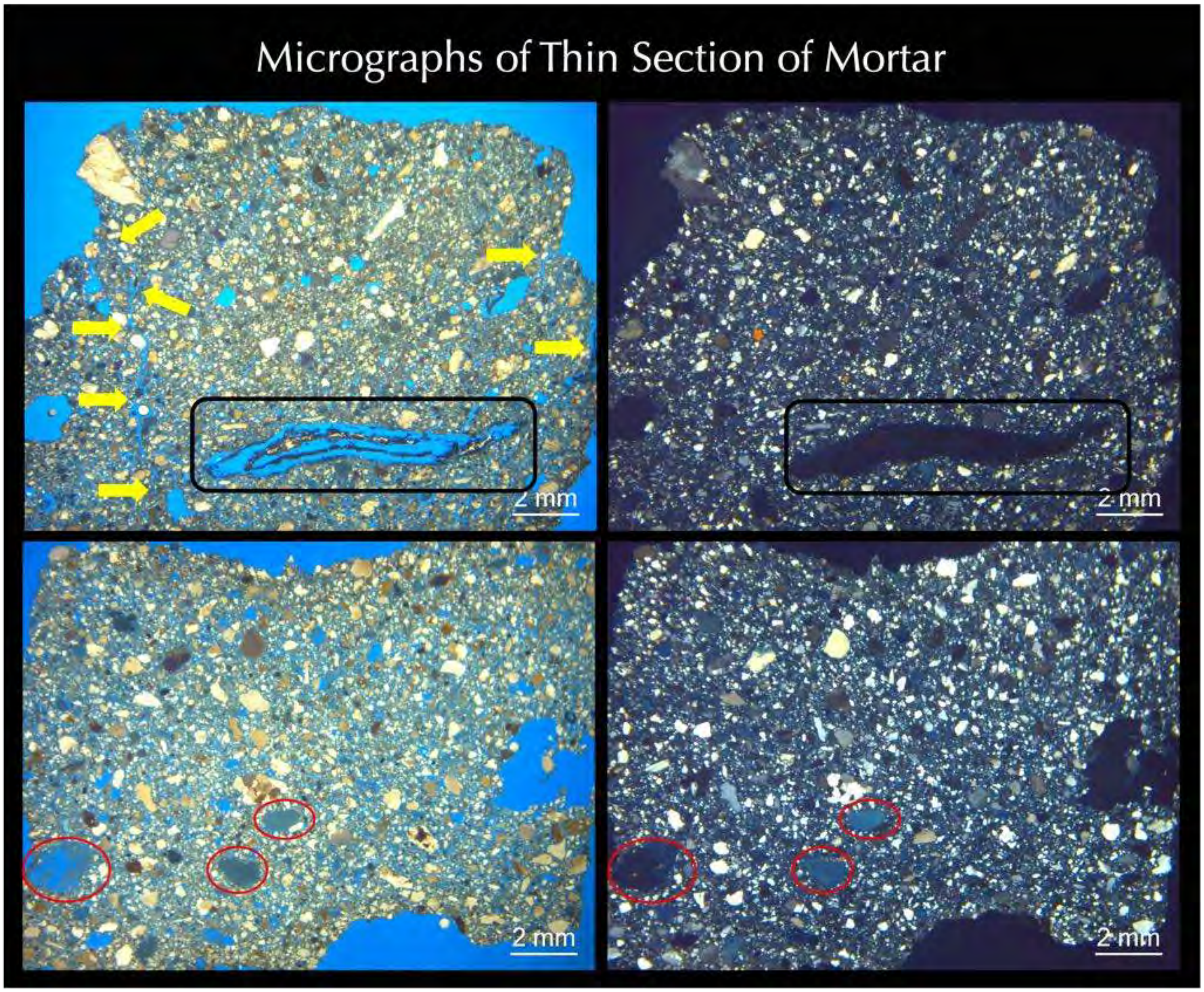


Figure 10: Micrographs of thin section of mortar taken at PPL (left column) and corresponding XPL (right column) modes in a transmitted-light stereo-zoom microscope with polarizing facility where PPL photos show the size, shape, angularity, gradation and distribution of sand particles as well as interstitial pore spaces and micrographs highlighted by the blue epoxy (yellow arrows highlight microcracks), whereas XPL photos show the overall siliceous composition of sand and dark near-isotropic nature of the interstitial paste fraction, as opposed to severely carbonated nature typical of many historic lime mortars, which indicates the presence of a component other than lime which has produced the dark near-isotropic appearance of the interstitial paste. A few unmixed lumps of lime are marked with red ellipses in the bottom row photos.

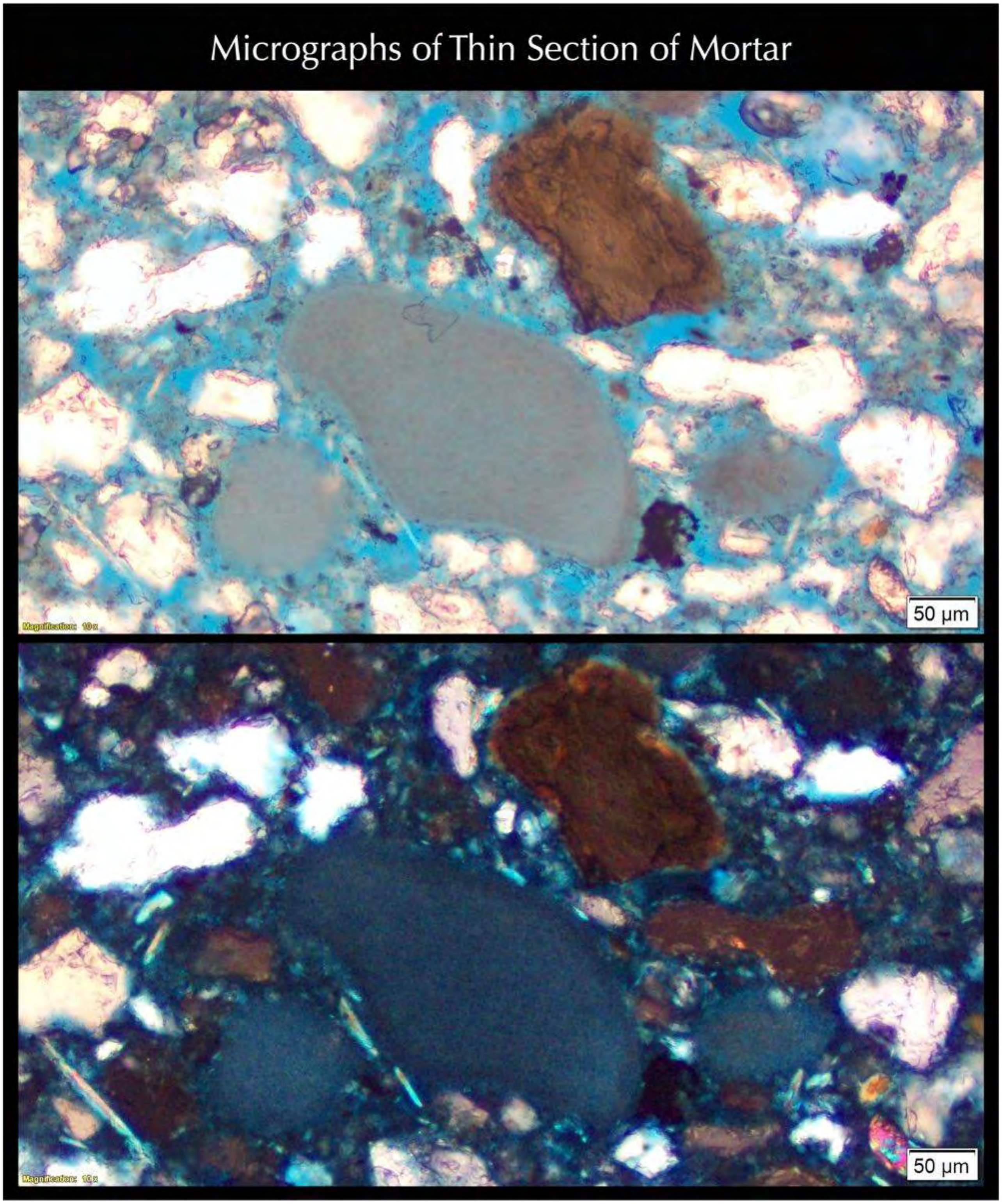


Figure 11: Micrographs of thin section of mortar showing: (a) very fine-grained, porous, carbonated to near-isotropic appearance of interstitial paste fraction; (b) subangular to subrounded, mostly equidimensional siliceous sand particles that are <1 mm in size, (c) some sheet-like flakes of mica and potential clay minerals, (d) a few lumps of unmixed lime that also shows a near-isotropic nature in XPL photo (bottom) as opposed to severely carbonated nature commonly found in lime lumps in many historic mortars, and (e) the non-air-entrained nature of mortar.

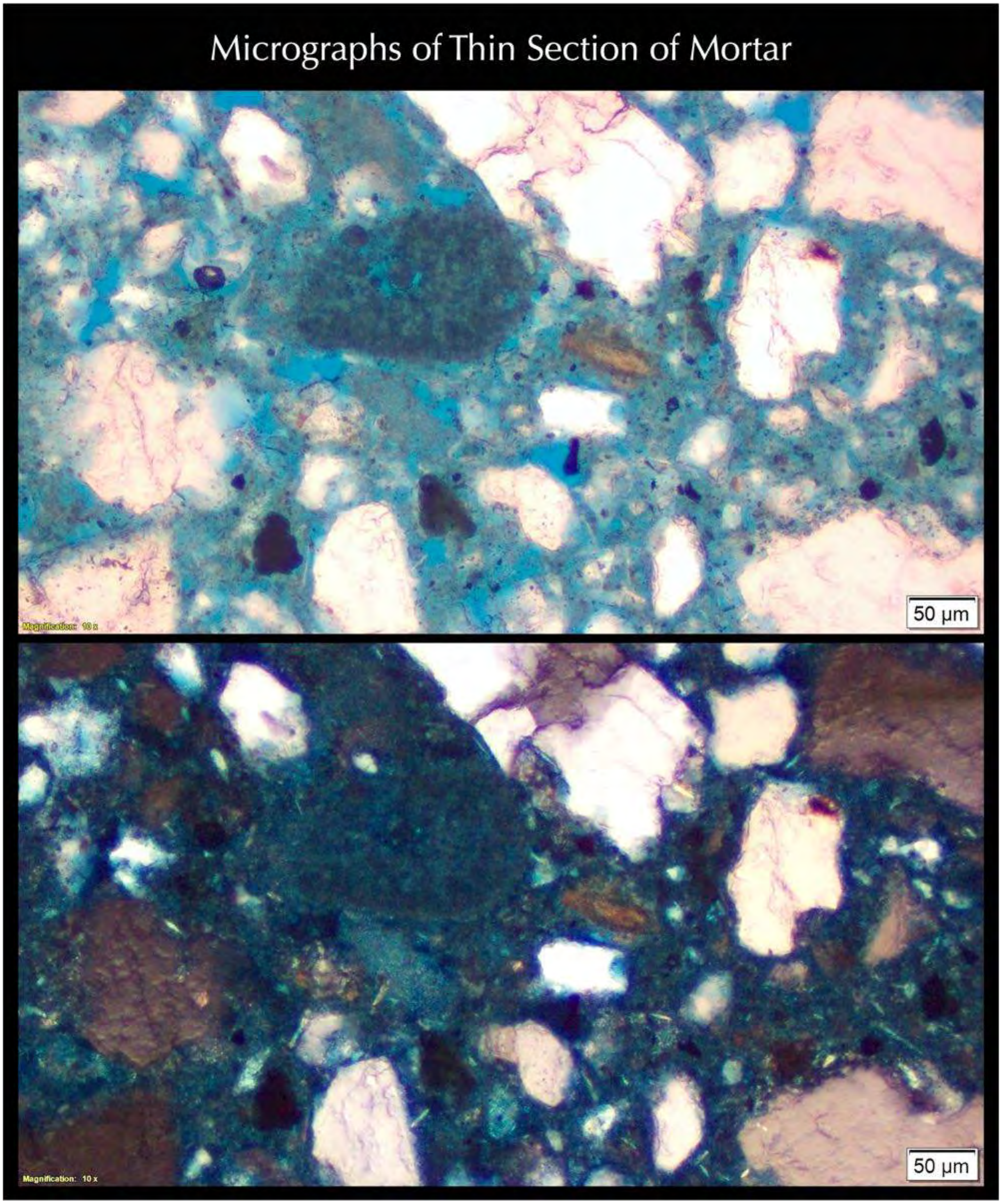


Figure 12: Micrographs of thin section of mortar showing: (a) very fine-grained, porous, carbonated to near-isotropic appearance of interstitial paste fraction; (b) subangular to subrounded, mostly equidimensional siliceous sand particles that are <1 mm in size, (c) some sheet-like flakes of mica and potential clay minerals, (d) a few lumps of unmixed lime that also shows a near-isotropic nature in XPL photo (bottom) as opposed to severely carbonated nature commonly found in lime lumps in many historic mortars, and (e) the non-air-entrained nature of mortar.

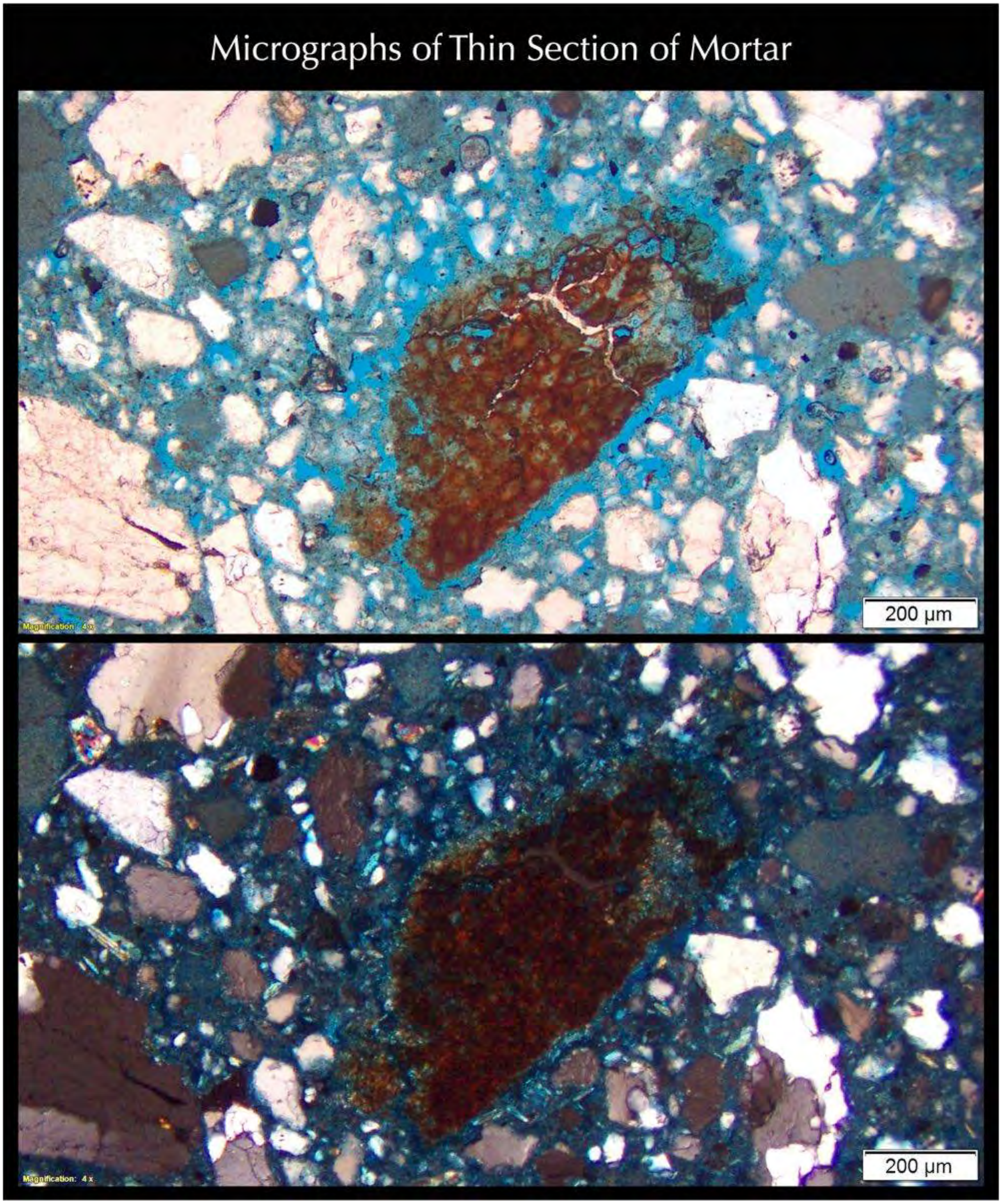


Figure 13: Micrographs of thin section of mortar showing: (a) very fine-grained, porous, carbonated to near-isotropic appearance of interstitial paste fraction; (b) subangular to subrounded, mostly equidimensional siliceous sand particles that are <1 mm in size, (c) some sheet-like flakes of mica and potential clay minerals, (d) a few lumps of unmixed lime, which also shows a near-isotropic nature in XPL photo (bottom) as opposed to severely carbonated nature commonly found in lime lumps in many historic mortars, and (e) the non-air-entrained nature of mortar. A reddish brown ferruginous silicified wood contaminant is seen at the center.

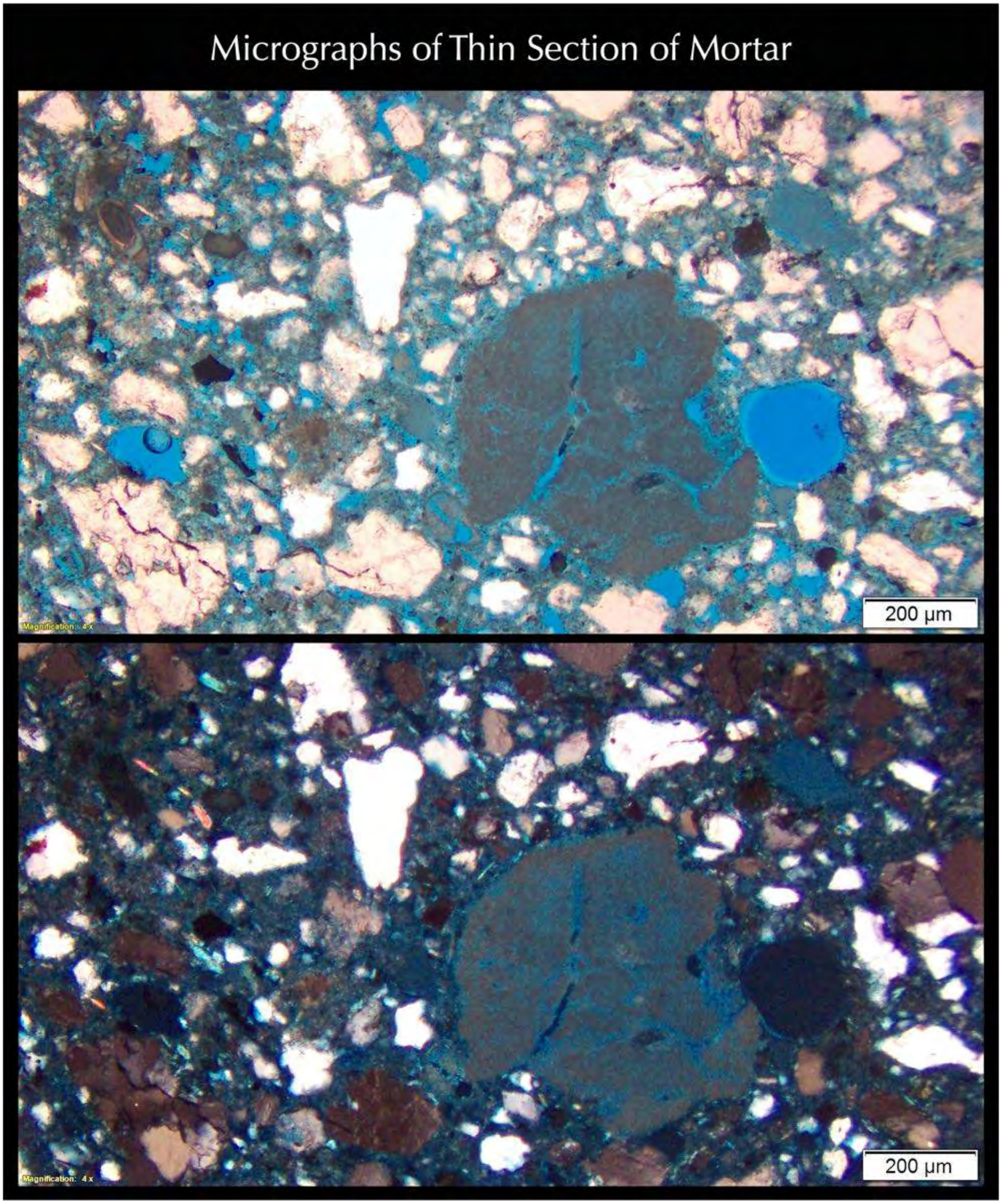


Figure 14: Micrographs of thin section of mortar showing: (a) very fine-grained, porous, carbonated to near-isotropic appearance of interstitial paste fraction; (b) subangular to subrounded, mostly equidimensional siliceous sand particles that are <1 mm in size, (c) some sheet-like flakes of mica and potential clay minerals, (d) a lump of unmixed lime at center, which shows characteristic shrinkage microcracks, and, a near-isotropic nature in XPL photo (bottom) as opposed to severely carbonated nature commonly found in lime lumps in many historic mortars, and (e) the non-air-entrained nature of mortar.

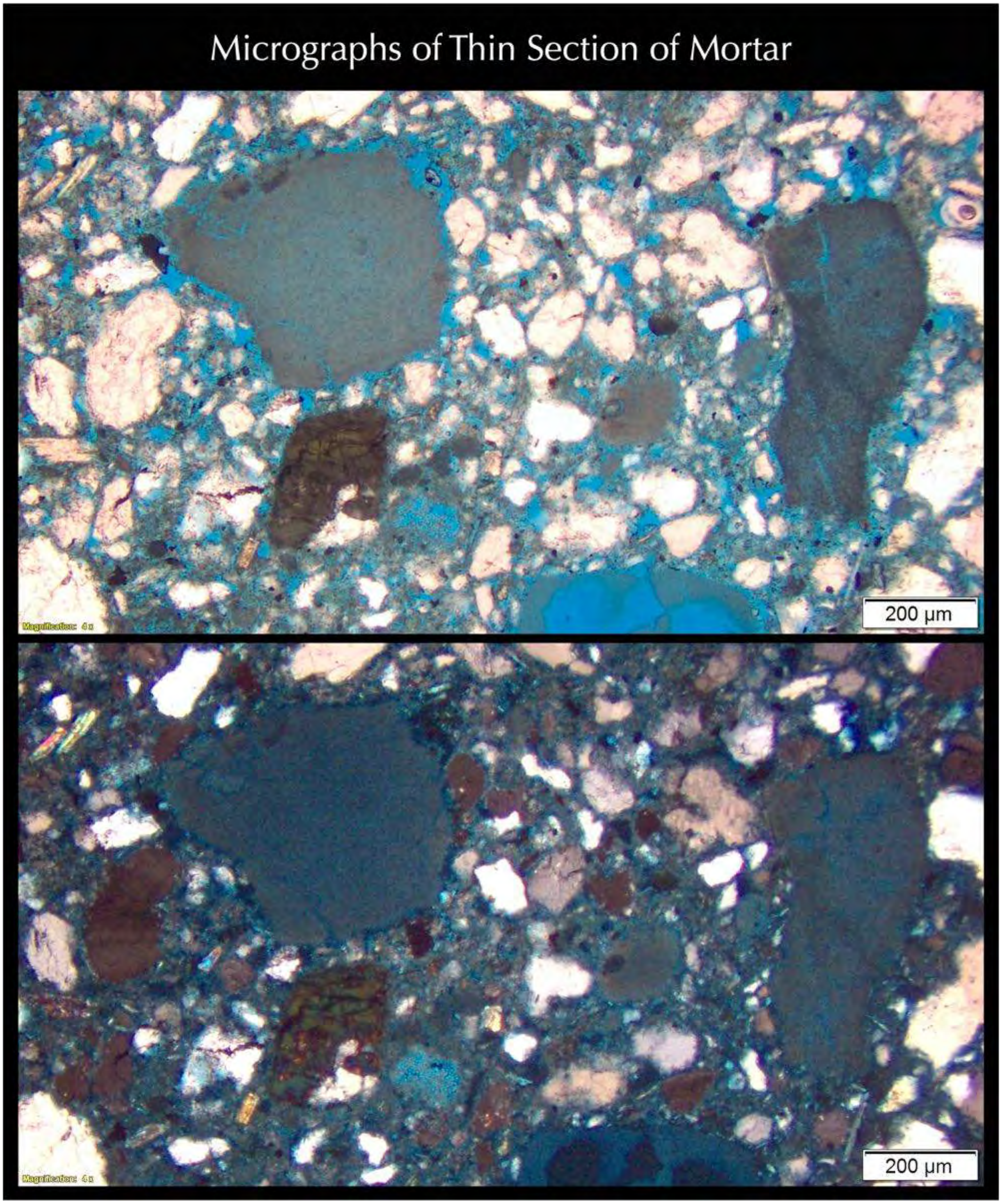


Figure 15: Micrographs of thin section of mortar showing: (a) very fine-grained, porous, carbonated to near-isotropic appearance of interstitial paste fraction; (b) subangular to subrounded, mostly equidimensional siliceous sand particles that are <1 mm in size, (c) some sheet-like flakes of mica and potential clay minerals, (d) a few lumps of unmixed lime, which also shows a near-isotropic nature in XPL photo (bottom) as opposed to severely carbonated nature commonly found in lime lumps in many historic mortars, and (e) the non-air-entrained nature of mortar.

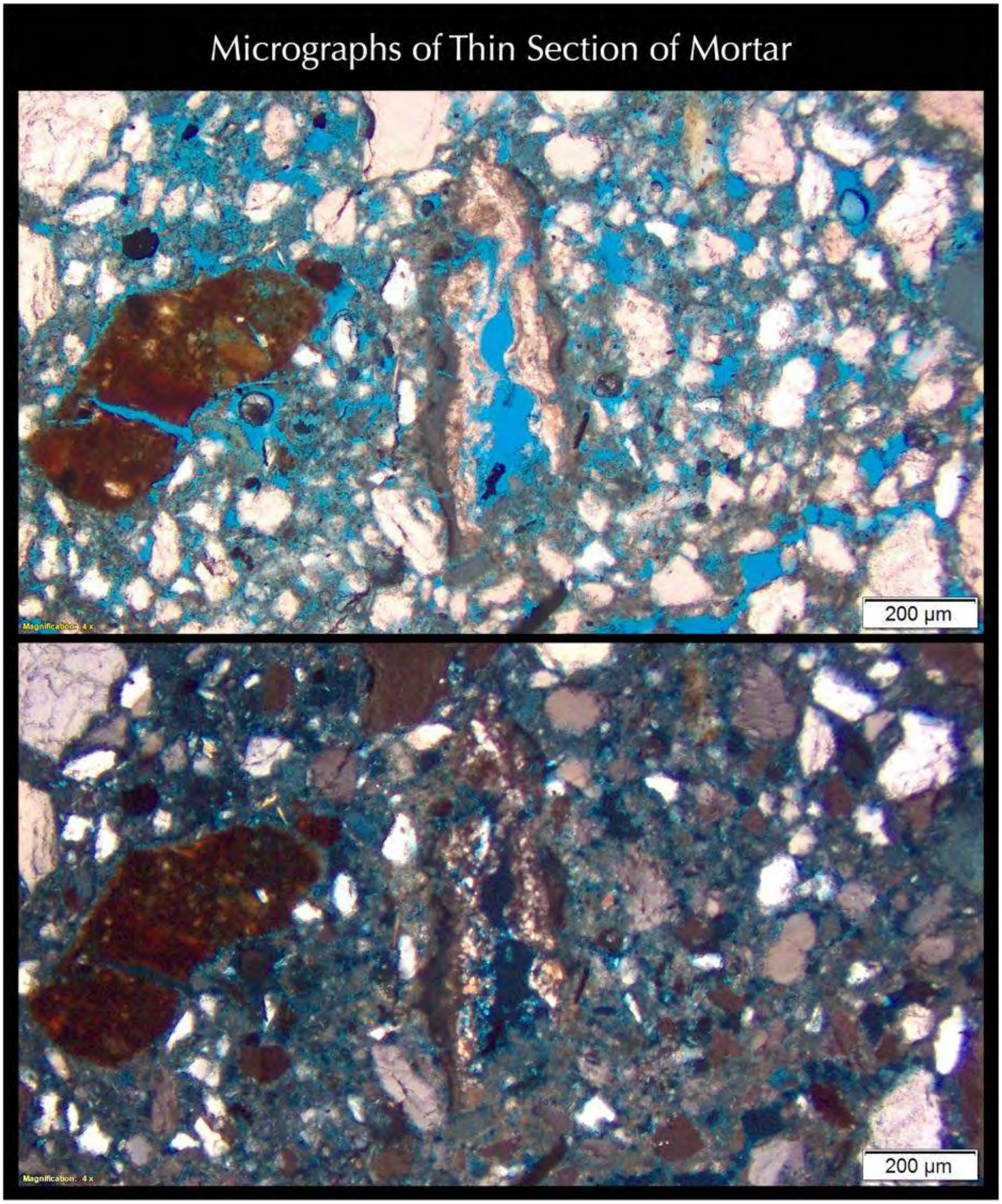


Figure 16: Micrographs of thin section of mortar showing: (a) very fine-grained, porous, carbonated to near-isotropic appearance of interstitial paste fraction; (b) subangular to subrounded, mostly equidimensional siliceous sand particles that are <1 mm in size, (c) some sheet-like flakes of mica and potential clay minerals, (d) a few lumps of unmixed lime, which also shows a near-isotropic nature in XPL photo (bottom) as opposed to severely carbonated nature commonly found in lime lumps in many historic mortars, and (e) the non-air-entrained nature of mortar. A reddish brown ferruginous silicified wood contaminant is seen at the left and center. A few porous areas and microcracks are highlighted by blue epoxy in the top PPL photo.

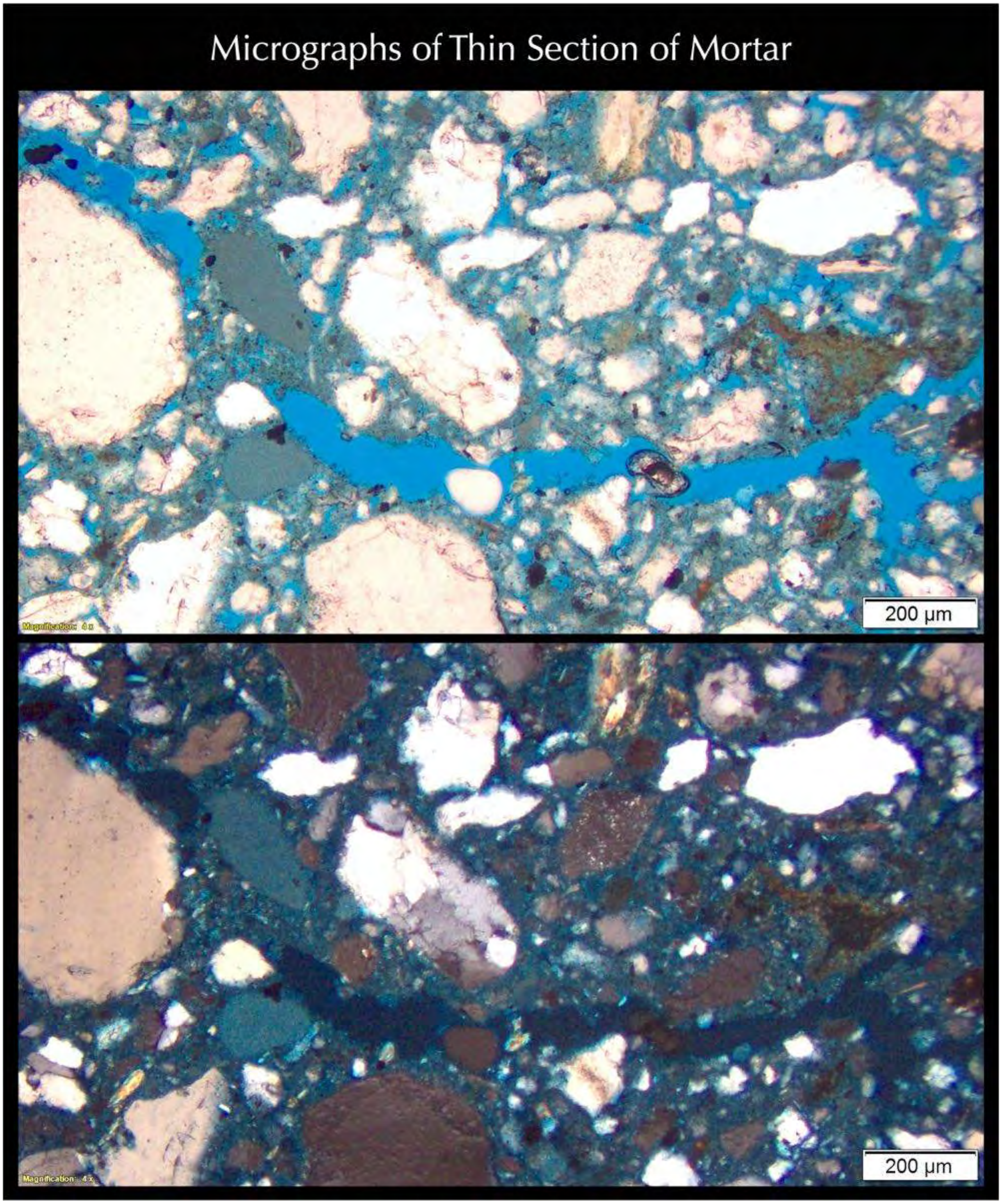


Figure 17: Micrographs of thin section of mortar showing: (a) very fine-grained, porous, carbonated to near-isotropic appearance of interstitial paste fraction; (b) subangular to subrounded, mostly equidimensional siliceous sand particles that are <1 mm in size, (c) some sheet-like flakes of mica and potential clay minerals, (d) a few lumps of unmixed lime, which also shows a near-isotropic nature in XPL photo (bottom) as opposed to severely carbonated nature commonly found in lime lumps in many historic mortars, and (e) the non-air-entrained nature of mortar. A microcrack is highlighted by blue epoxy in the top PPL photo.

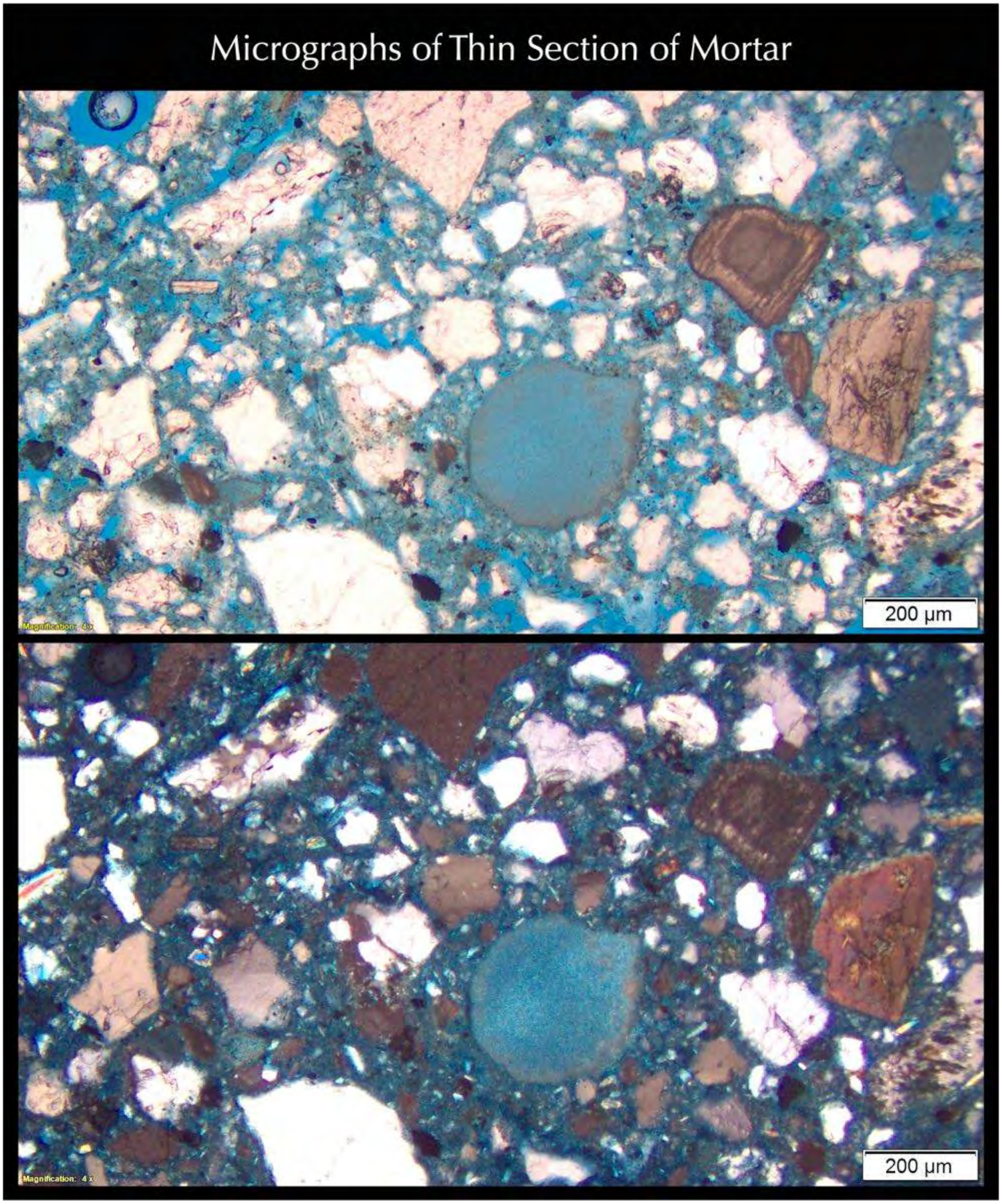


Figure 18: Micrographs of thin section of mortar showing: (a) very fine-grained, porous, carbonated to near-isotropic appearance of interstitial paste fraction; (b) subangular to subrounded, mostly equidimensional siliceous sand particles that are <1 mm in size, (c) some sheet-like flakes of mica and potential clay minerals, (d) a few lumps of unmixed lime, which also shows a near-isotropic nature in XPL photo (bottom) as opposed to severely carbonated nature commonly found in lime lumps in many historic mortars, and (e) the non-air-entrained nature of mortar.

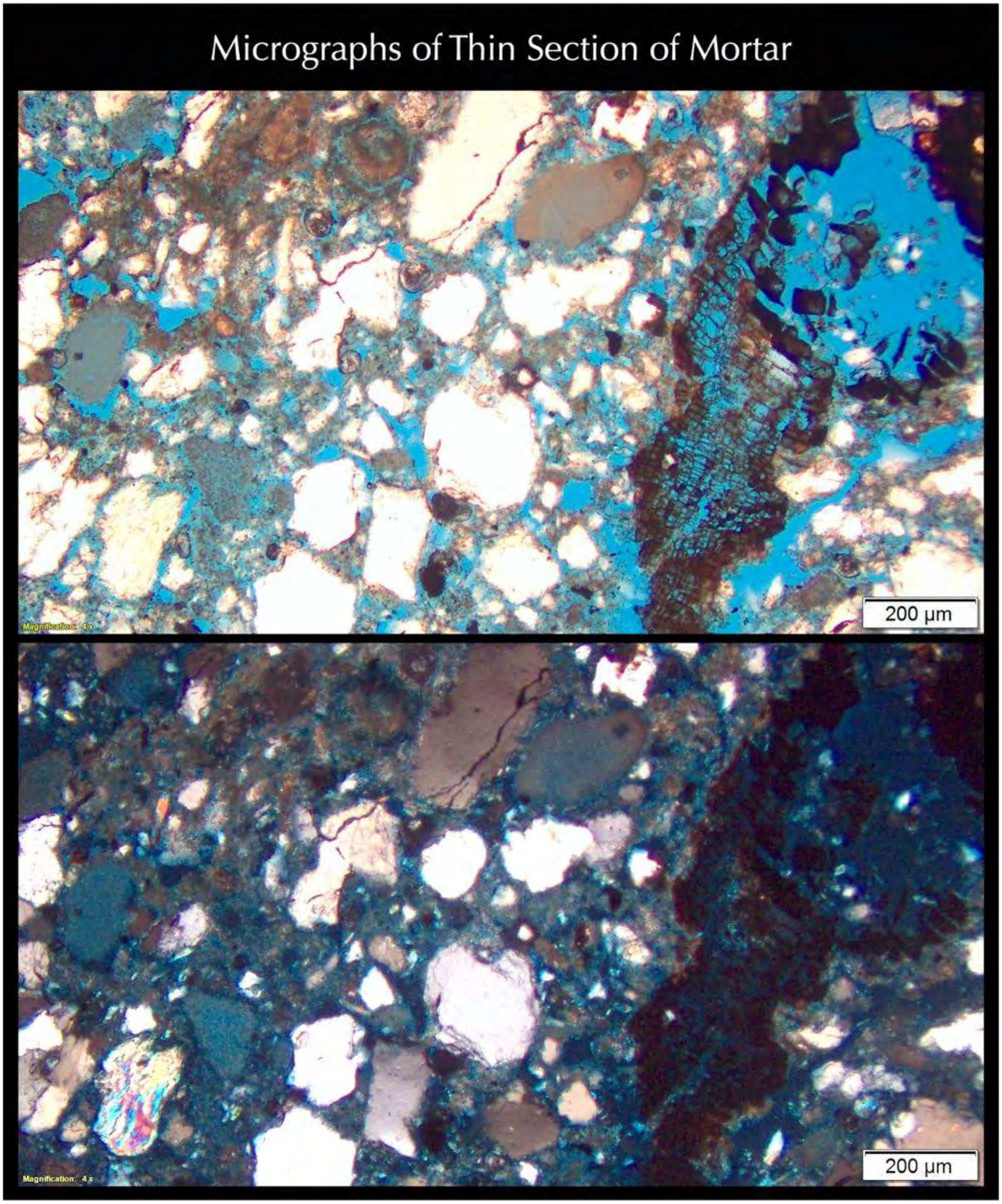


Figure 19: Micrographs of thin section of mortar showing: (a) very fine-grained, porous, carbonated to near-isotropic appearance of interstitial paste fraction; (b) subangular to subrounded, mostly equidimensional siliceous sand particles that are <1 mm in size, (c) some sheet-like flakes of mica and potential clay minerals, (d) a few lumps of unmixed lime, which also shows a near-isotropic nature in XPL photo (bottom) as opposed to severely carbonated nature commonly found in lime lumps in many historic mortars, and (e) the non-air-entrained nature of mortar. A reddish brown ferruginous silicified wood contaminant is seen at right.

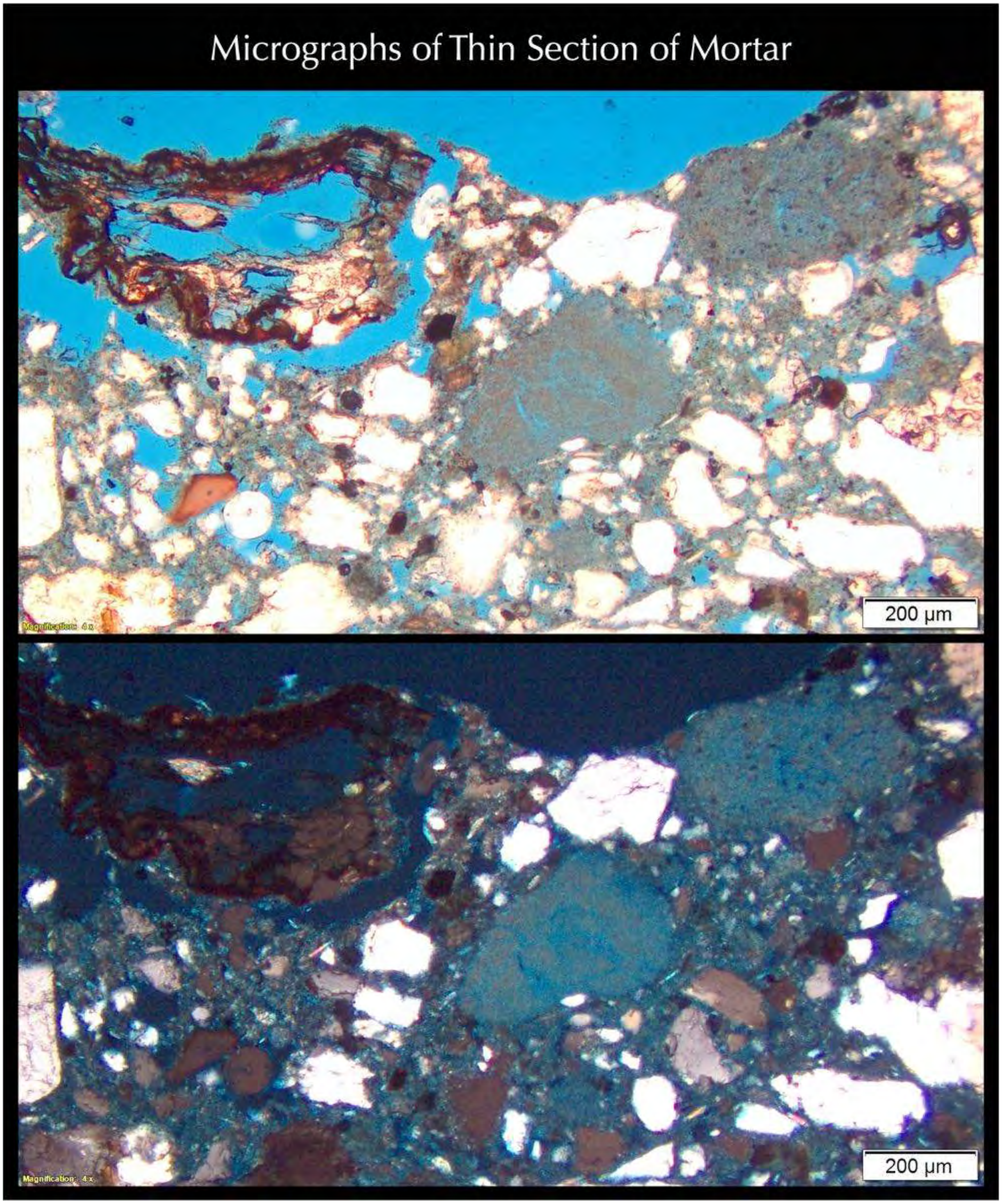


Figure 20: Micrographs of thin section of mortar showing: (a) very fine-grained, porous, carbonated to near-isotropic appearance of interstitial paste fraction; (b) subangular to subrounded, mostly equidimensional siliceous sand particles that are <1 mm in size, (c) some sheet-like flakes of mica and potential clay minerals, (d) a few lumps of unmixed lime, which also shows a near-isotropic nature in XPL photo (bottom) as opposed to severely carbonated nature commonly found in lime lumps in many historic mortars, and (e) the non-air-entrained nature of mortar. A reddish brown ferruginous silicified wood contaminant is seen at top.

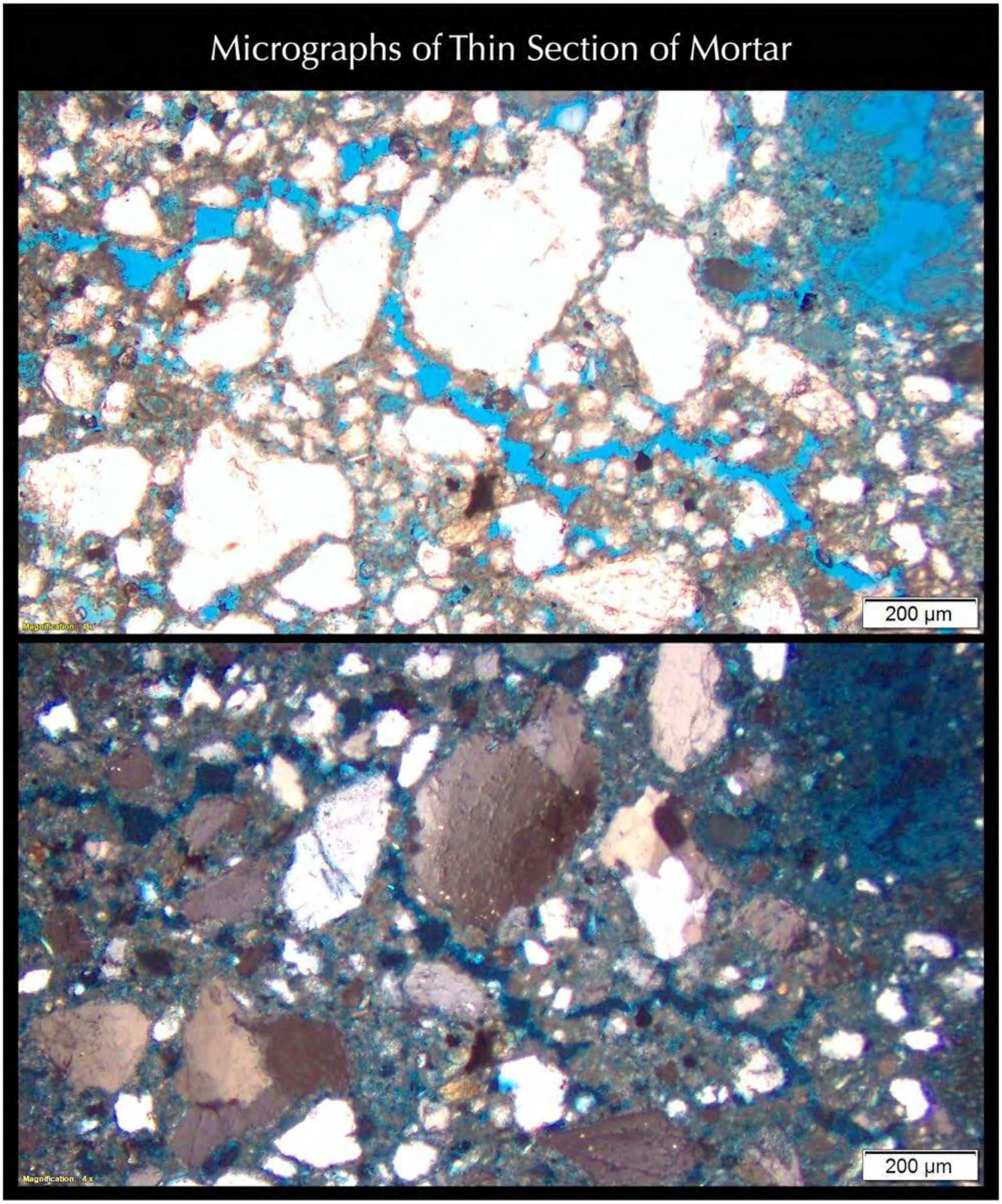


Figure 21: Micrographs of thin section of mortar showing: (a) very fine-grained, porous, carbonated to near-isotropic appearance of interstitial paste fraction; (b) subangular to subrounded, mostly equidimensional siliceous sand particles that are <1 mm in size, (c) some sheet-like flakes of mica and potential clay minerals, (d) a few lumps of unmixed lime, which also shows a near-isotropic nature in XPL photo (bottom) as opposed to severely carbonated nature commonly found in lime lumps in many historic mortars, and (e) the non-air-entrained nature of mortar. A few microcracks are highlighted by blue epoxy in the top PPL photo.

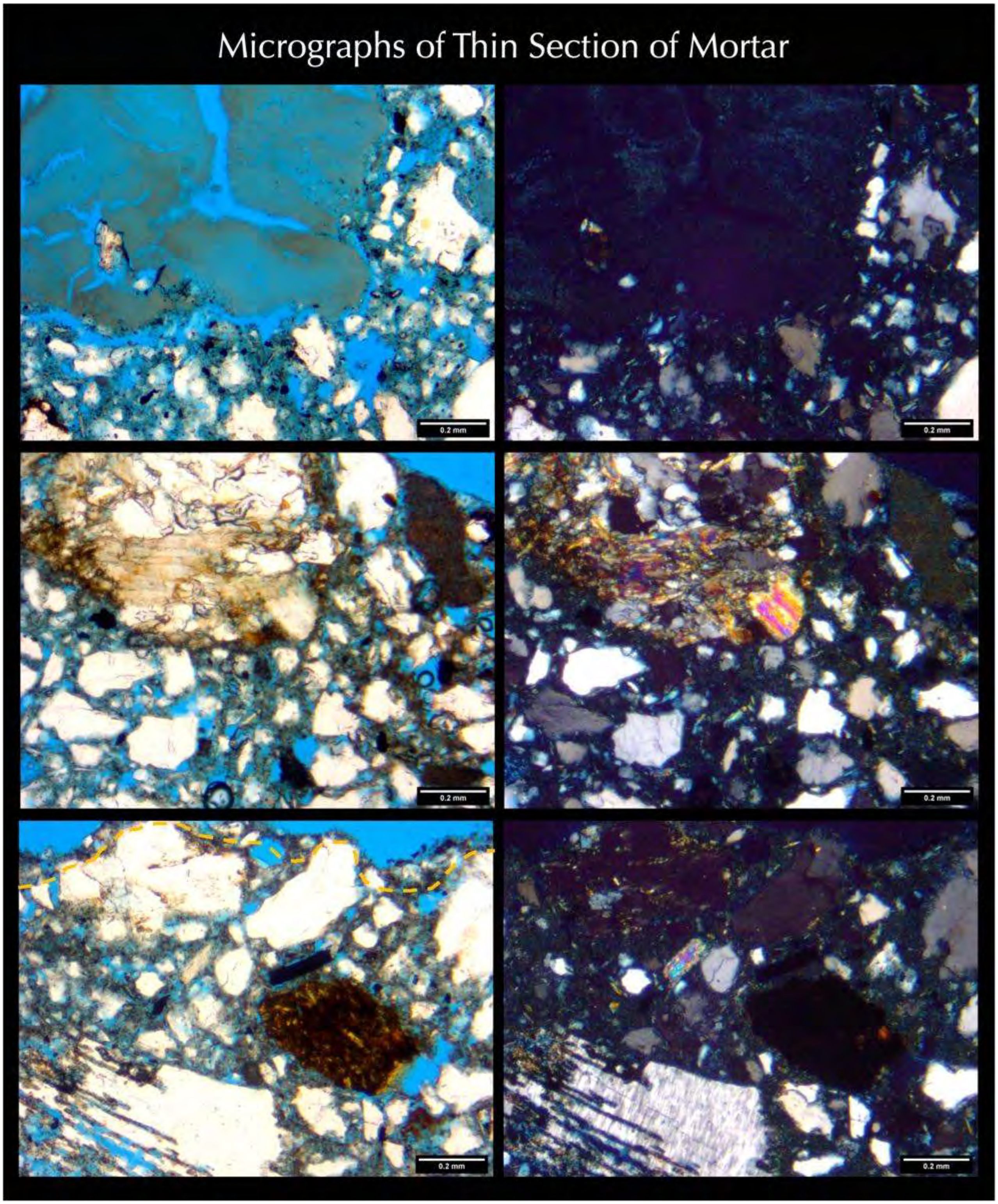


Figure 22: Micrographs of thin section of mortar showing: (a) very fine-grained, porous, carbonated to near-isotropic appearance of interstitial paste fraction; (b) subangular to subrounded, mostly equidimensional siliceous sand particles that are <1 mm in size, (c) some sheet-like flakes of mica and potential clay minerals, (d) a few lumps of unmixed lime, which also shows a near-isotropic nature in XPL photo (bottom) as opposed to severely carbonated nature commonly found in lime lumps in many historic mortars, and (e) the non-air-entrained nature of mortar.

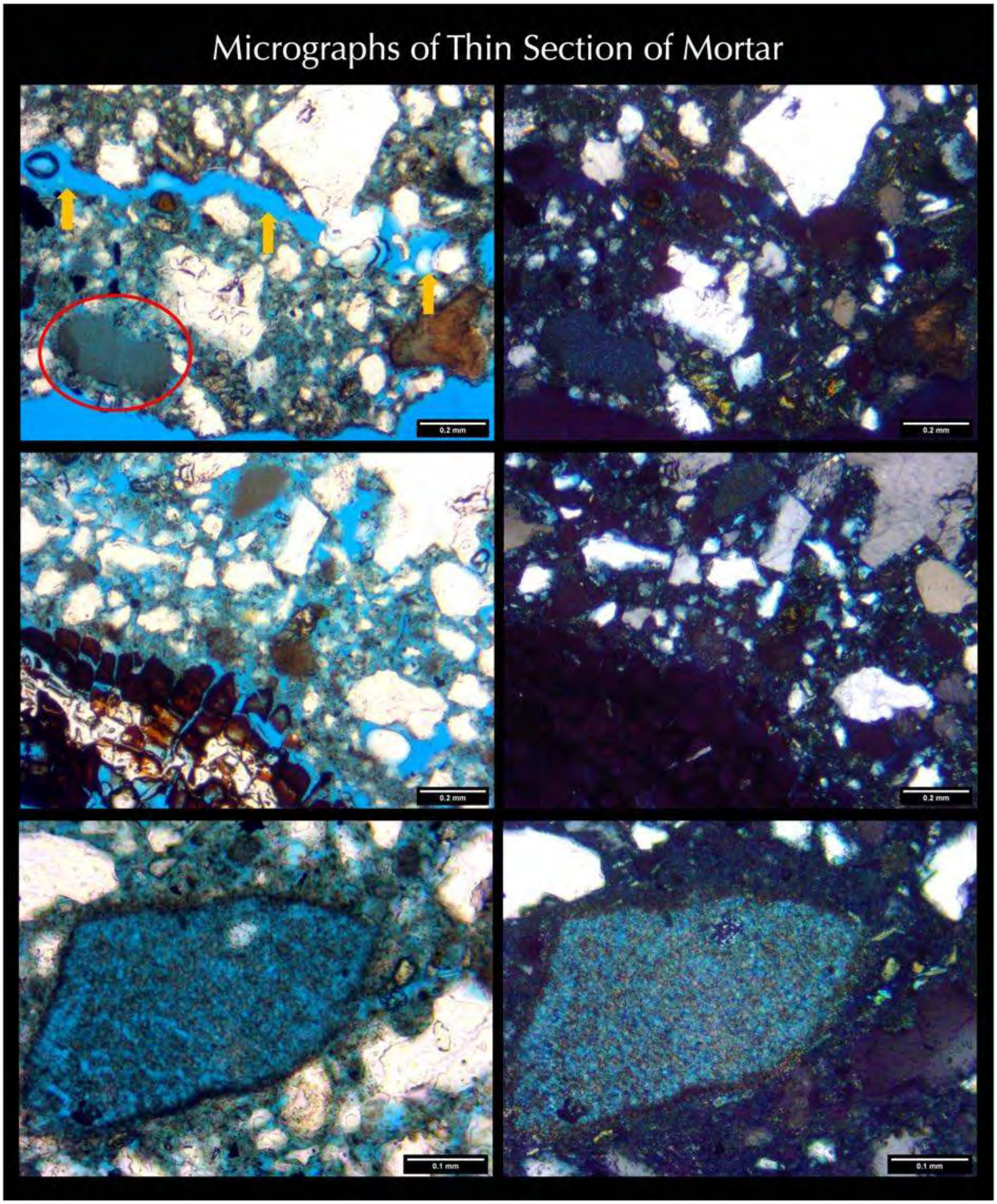


Figure 23: Micrographs of thin section of mortar showing: (a) very fine-grained, porous, mildly carbonated to near-isotropic appearance of interstitial paste fraction; (b) subangular to subrounded, mostly equidimensional siliceous sand particles that are <1 mm in size, (c) some sheet-like flakes of mica and potential clay minerals, (d) a few lumps of unmixed lime, which also shows a near-isotropic nature in XPL photo (bottom) as opposed to severely carbonated nature commonly found in lime lumps in many historic mortars, and (e) the non-air-entrained nature of mortar. A few microcracks are highlighted by blue epoxy in the top left PPL photo. A ferruginous reddish brown contaminant is seen in the middle row photos.

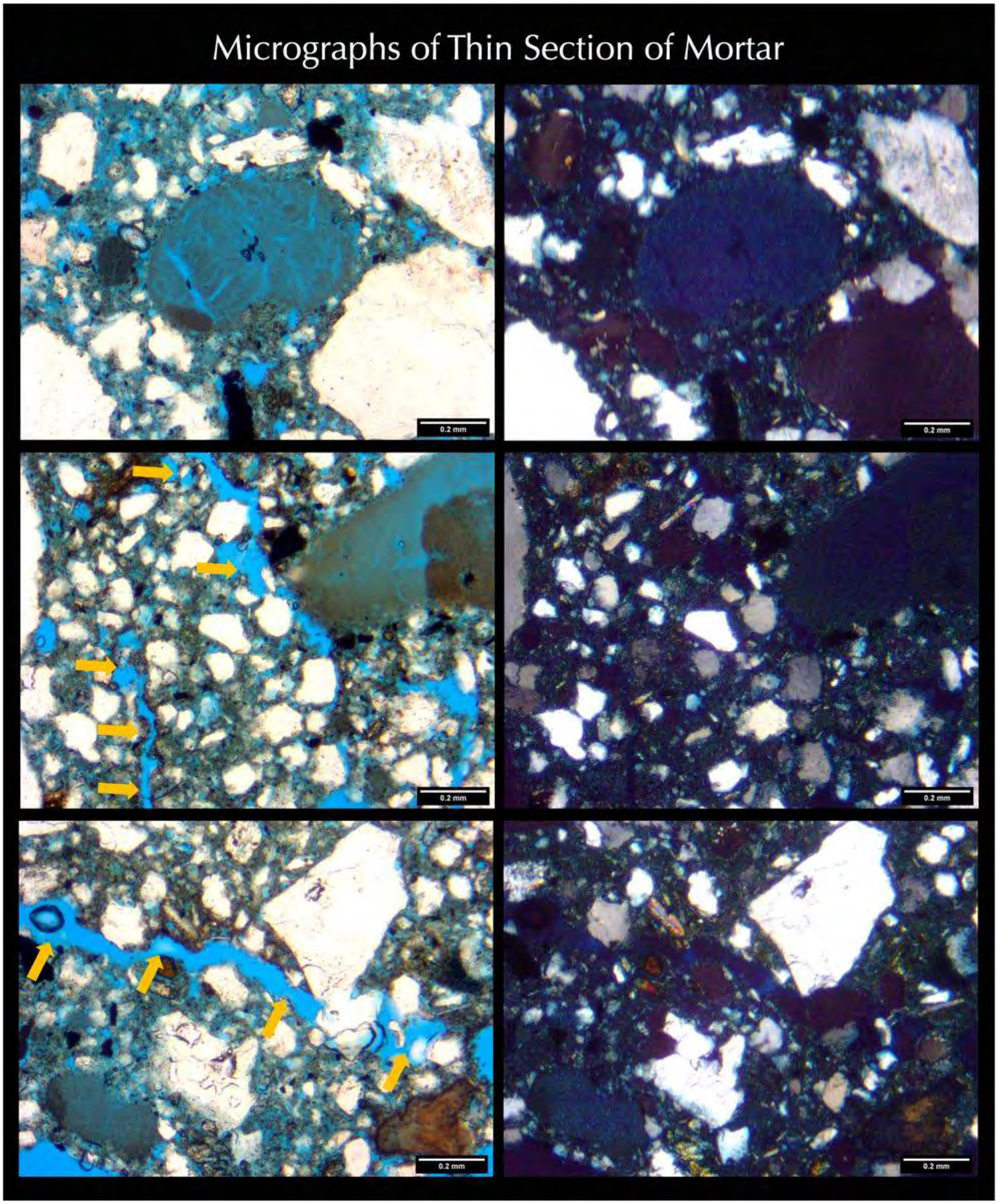


Figure 24: Micrographs of thin section of mortar showing: (a) very fine-grained, porous, mildly carbonated to near-isotropic appearance of interstitial paste fraction; (b) subangular to subrounded, mostly equidimensional siliceous sand particles that are <1 mm in size, (c) some sheet-like flakes of mica and potential clay minerals, (d) a few lumps of unmixed lime, which also shows a near-isotropic nature in XPL photo (bottom) as opposed to severely carbonated nature commonly found in lime lumps in many historic mortars, and (e) the non-air-entrained nature of mortar. A few microcracks are highlighted by arrows and blue epoxy in the middle and bottom left PPL photo.

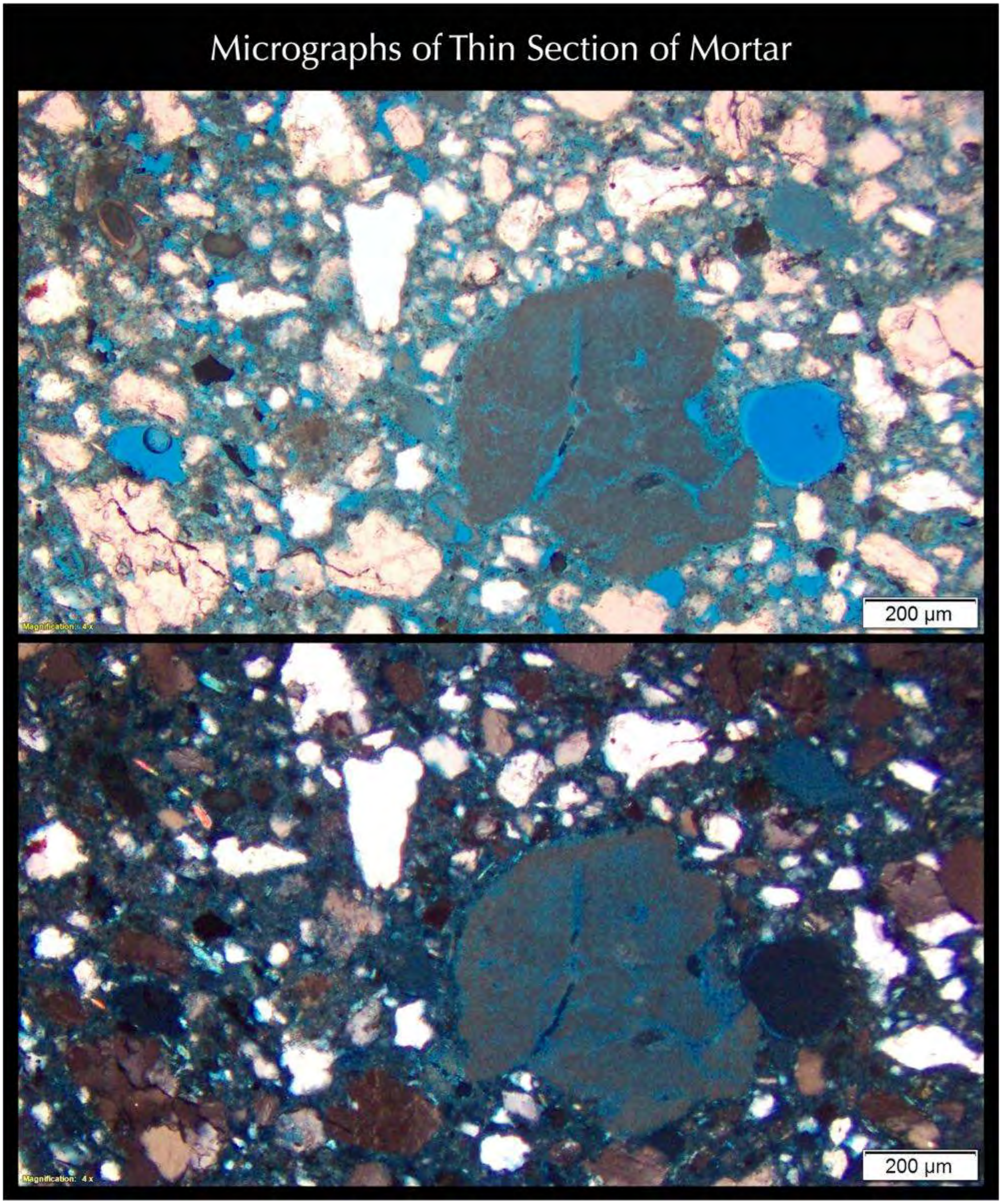


Figure 25: Micrographs of thin section of mortar showing: (a) very fine-grained, porous, mildly carbonated to near-isotropic appearance of interstitial paste fraction; (b) subangular to subrounded, mostly equidimensional siliceous sand particles that are <1 mm in size, (c) some sheet-like flakes of mica and potential clay minerals, (d) a few lumps of unmixed lime, which also shows a near-isotropic nature in XPL photo (bottom) as opposed to severely carbonated nature commonly found in lime lumps in many historic mortars, and (e) the non-air-entrained nature of mortar.

Optical Microscopy

Sand

Mortar contains ***siliceous natural sand*** consisting of major amount of siliceous component of variably strained quartz, and subordinate amounts of quartzite, feldspar, and other siliceous and minor ferruginous components, and a trace amount of flaky mica and clay minerals. A trace amount of reddish brown siliceous and ferruginous grains depicting microstructures of silicified plate tissue fragments are found. Particles are clear, light gray to off white to light brown, translucent, subangular to subrounded, mostly equidimensional, dense, hard, well-graded, well-distributed, nominal 1-mm in size, and present in sound conditions without any evidence of potentially deleterious reactions (e.g., alkali-aggregate reactions).

Grain-size distribution of sand extracted from the mortar after hydrochloric acid digestion showed very fine size fractions of sand (Figure 3) which are noticeably finer than the size distribution of modern masonry sand. Fineness modulus of sand determined to be only 0.62 with most of the size fractions concentrated in the less than 0.3 mm size. Figure 4 shows color, size, shape, angularity, and gradation of sand particles extracted from the mortar after acid digestion.

Figures 5 to 7 show distribution of sand particles in the lapped cross section and micrographs of lapped cross section, respectively, scanned on a flatbed scanner in Figures 5 and 6, and taken with a stereomicroscope in Figure 7. Figures 8 and 9 show distribution of sand particles in the thin section of mortar scanned with a film scanner. Figure 10 shows distribution of sand particles in thin section scanned with a film scanner where overall mineralogies and rock types are seen. Figures 11 through 24 show sand particles as seen in the thin sections with a petrographic microscope, which show quartz-based composition of sand.

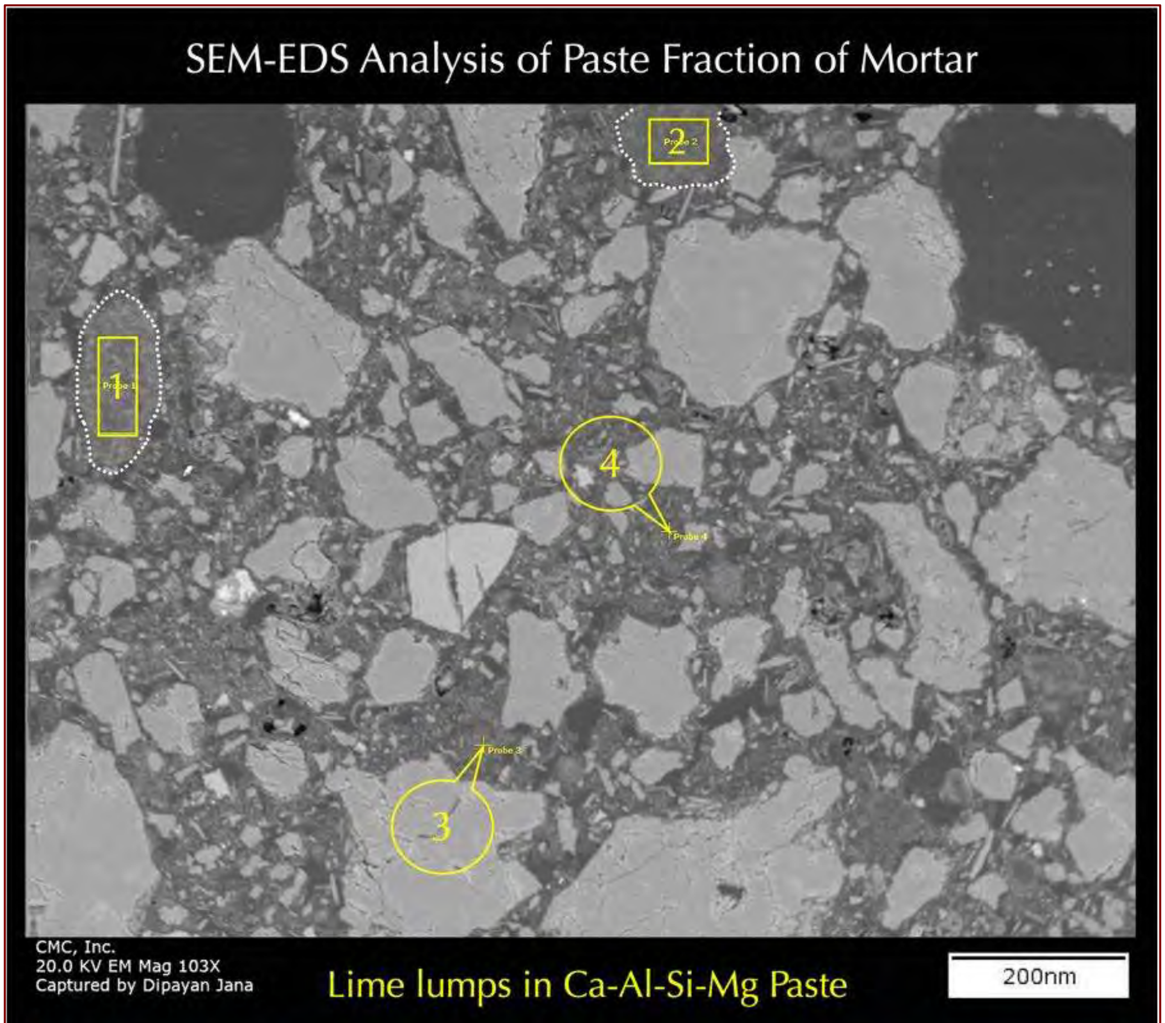
Binder

Optical microscopical examinations of the interstitial paste fraction shows many characteristic features of a historic lime mortar, e.g., numerous lumps of unmixed lime often showing internal shrinkage microcracks in coarser size lime lumps but the overall appearance shows a near-isotropic dark color in cross polarized light mode in a petrographic microscope, which is contrary to the high birefringence of a carbonated lime paste. Such near-isotropic nature of paste indicated the presence of another binder component along with lime, which has changed the overall optical properties of lime paste. The most common component, which does produce such near-isotropic appearance in optical properties is a calcined clay binder which participates in pozzolanic reaction with lime to produce calcium-magnesium-aluminum-silicate hydrate paste, which is optically more isotropic than a pure carbonated lime paste.

Air

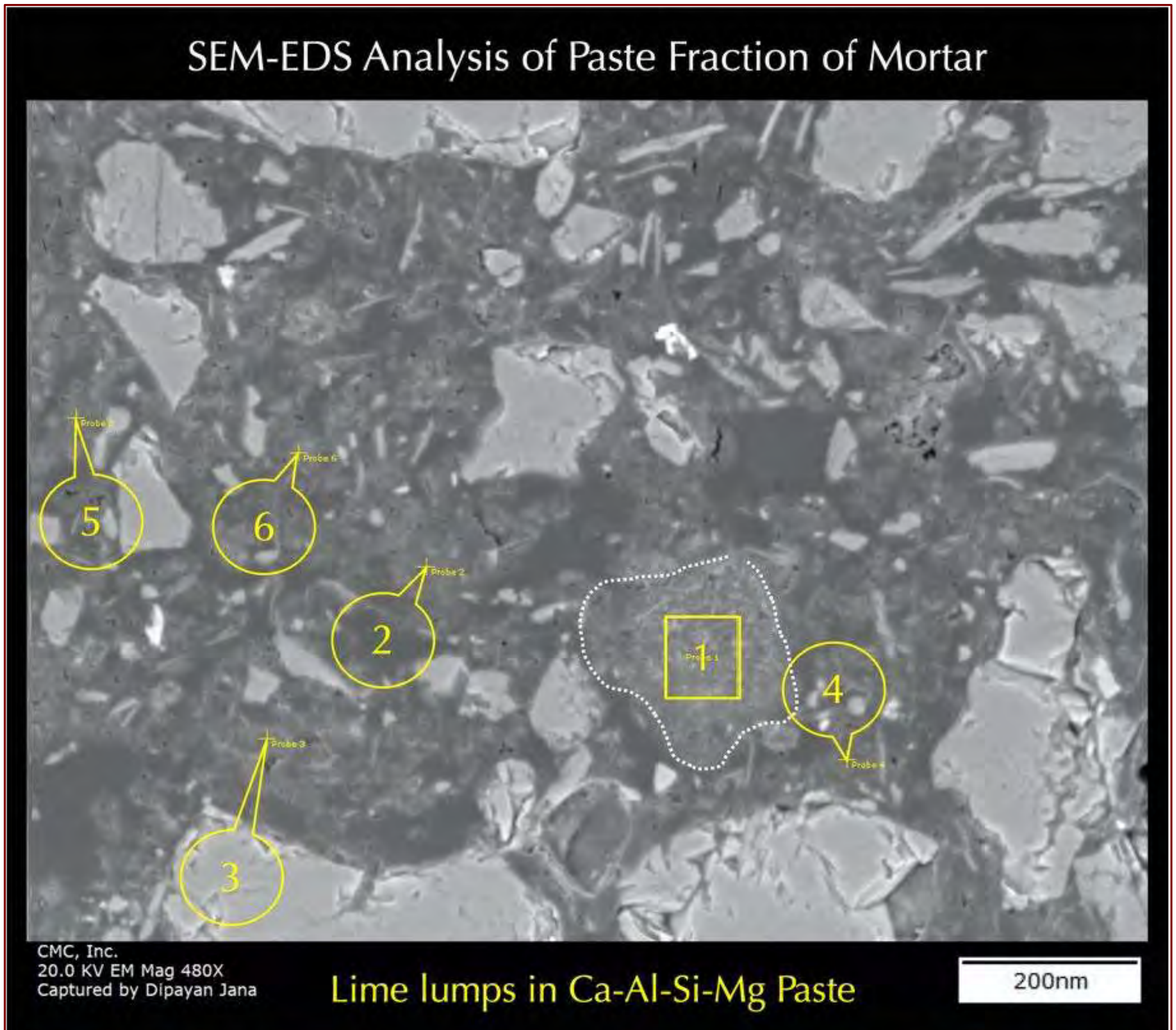
Mortar is ***non-air-entrained***, which is depicted in micrographs of lapped section in Figure 7 as well as in thin section in Figure 10, which is not unusual for its reported early 19th century derivation.

Scanning Electron Microscopy and X-ray Microanalyses of Mortar



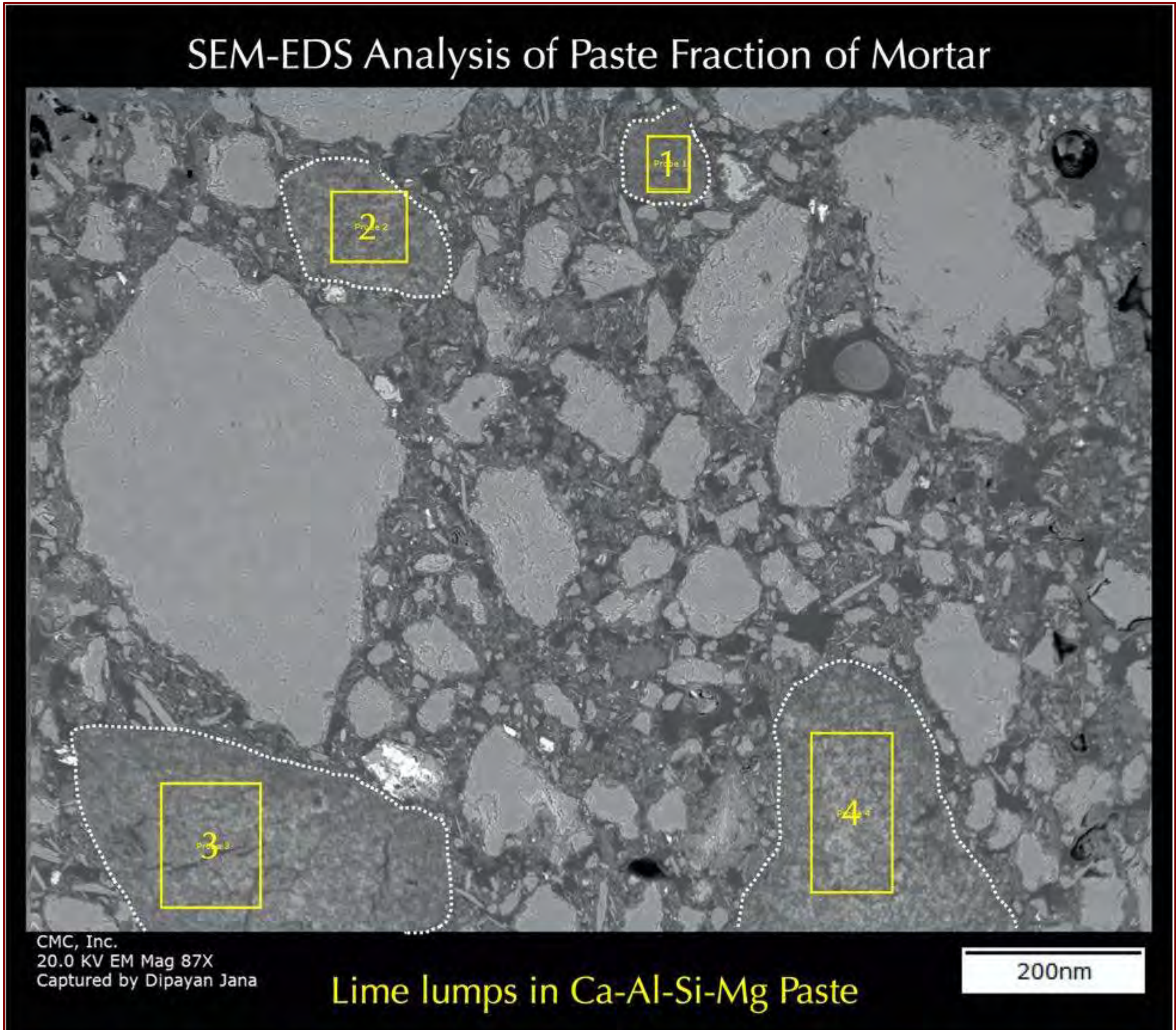
Probe	CaO	SiO2	Al2O3	K2O	MgO	FeO	Na2O	TiO2	SO2	Total	Paste-CI	Phase
1	45.51	1.70	2.52	1.69	49.44	0.46	0.00	0.23	0.00	100.00	0.07	Dolomitic Lime
2	92.77	2.40	0.88	0.95	3.68	0.27	0.00	0.00	0.00	100.00	0.08	Lime
3	86.23	1.96	1.38	0.70	8.90	0.56	0.50	0.00	0.00	100.00	0.07	Lime
4	22.23	42.06	24.54	0.72	7.51	2.81	0.13	0.72	0.00	100.01	4.48	Paste

Figure 26: Backscatter electron image (top), and X-ray microanalyses at the tips of callouts and in boxed areas in Probes 1 through 4 detecting compositional variations of lime lumps and paste in the mortar. Paste and lime lump compositions are presented (bottom) as oxide variations of all detected EDS peaks normalized to 100% except carbon (from epoxy) and gold (from coating). Paste cementation indices, CI (after Eckel 1922) measure relative hydraulicity of paste e.g., non-hydraulic lime pastes have very low CI (< 0.50) compared to Portland cement pastes (CI is >1). Paste shows CI > 1 as opposed to typical <1 value for carbonated lime pastes in many historic mortars indicating the presence of silica and alumina from addition of calcined clay component as a second binder after lime. Lime lump composition shows addition of a dolomitic lime binder. The cementation indices (CI) of paste are calculated after Eckel (1922) as CI = $[(2.8*SiO_2)+(1.1*Al_2O_3)+(0.7* Fe_2O_3)]/[(CaO)+(1.4*MgO)]$. Lime lumps are marked by white dotted lines.



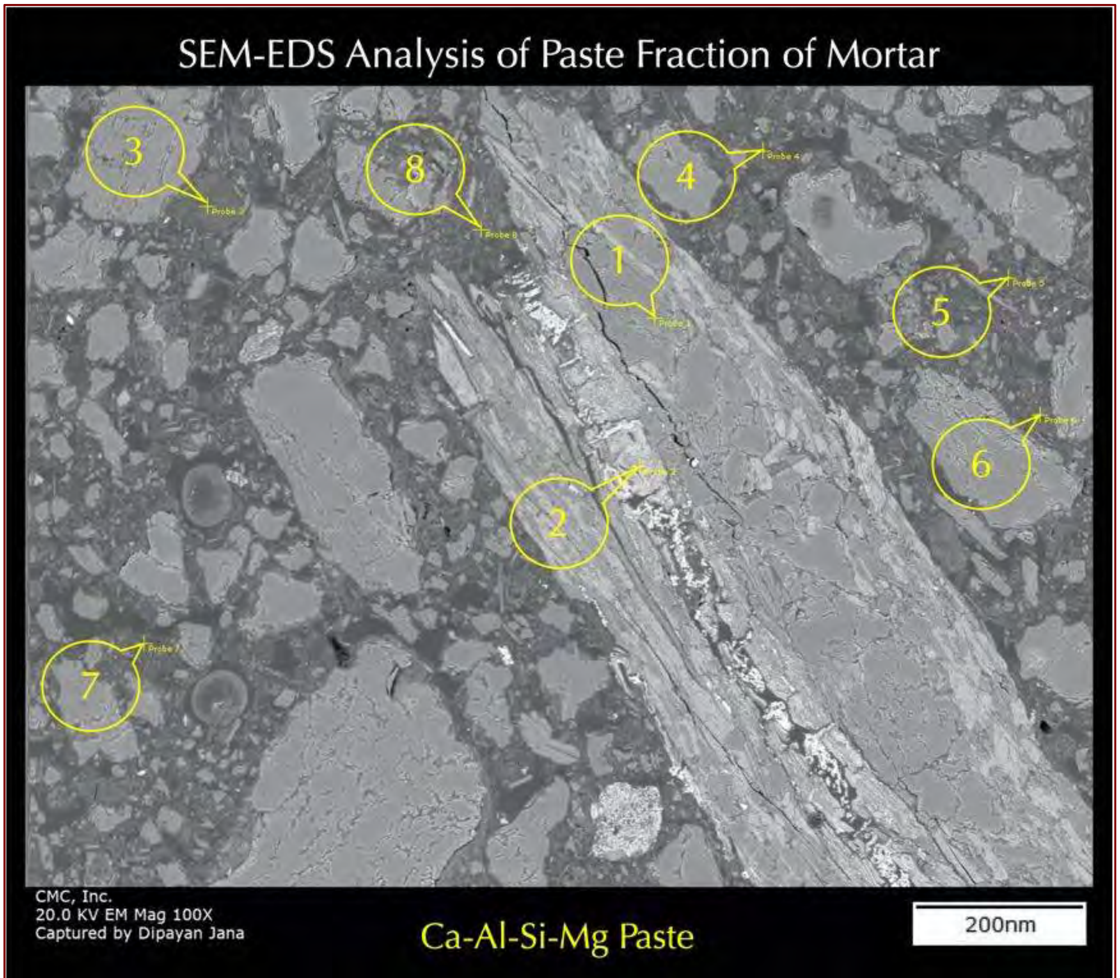
Probe	CaO	SiO2	Al2O3	K2O	MgO	FeO	Na2O	TiO2	SO2	Total	Paste-CI	Phase
1	**14.69**	3.11	15.85	0.24	**64.81**	1.28	0.00	0.02	0.00	100.0	0.26	Dolomitic Lime
2	**20.37**	**44.21**	**10.36**	0.31	**23.42**	0.95	0.23	0.15	0.00	100.0	2.56	Paste
3	**18.06**	**65.67**	**7.67**	0.03	**7.62**	0.86	0.00	0.11	0.00	100.0	6.72	Paste
4	**40.08**	**25.37**	**14.20**	0.99	**16.32**	2.63	0.20	0.21	0.00	100.0	1.41	Paste
5	1.70	96.20	0.73	0.00	1.22	0.00	0.07	0.08	0.00	100.0	-	Quartz
6	**34.27**	**15.46**	**10.96**	0.01	**38.27**	1.02	0.00	0.00	0.00	100.0	0.64	Dolomitic Lime

Figure 27: Backscatter electron image (top), and X-ray microanalyses at the tips of callouts and in boxed area in Probes 1 through 6 detecting compositional variations of lime lumps and paste in the mortar. Paste and lime lump compositions are presented (bottom) as oxide variations of all detected EDS peaks normalized to 100% except carbon (from epoxy) and gold (from coating). Paste cementation indices, CI (after Eckel 1922) measure relative hydraulicity of paste e.g., non-hydraulic lime pastes have very low CI (< 0.50) compared to Portland cement pastes (CI is >1). Paste shows CI > 1 as opposed to typical <1 value for carbonated lime pastes in many historic mortars indicating the presence of silica and alumina from addition of calcined clay component as a second binder after lime. Lime lump composition shows addition of a dolomitic lime binder. The cementation indices (CI) of paste are calculated after Eckel (1922) as CI = $[(2.8*SiO_2)+(1.1*Al_2O_3)+(0.7*Fe_2O_3)]/[(CaO)+(1.4*MgO)]$. Lime lumps are marked by white dotted lines.



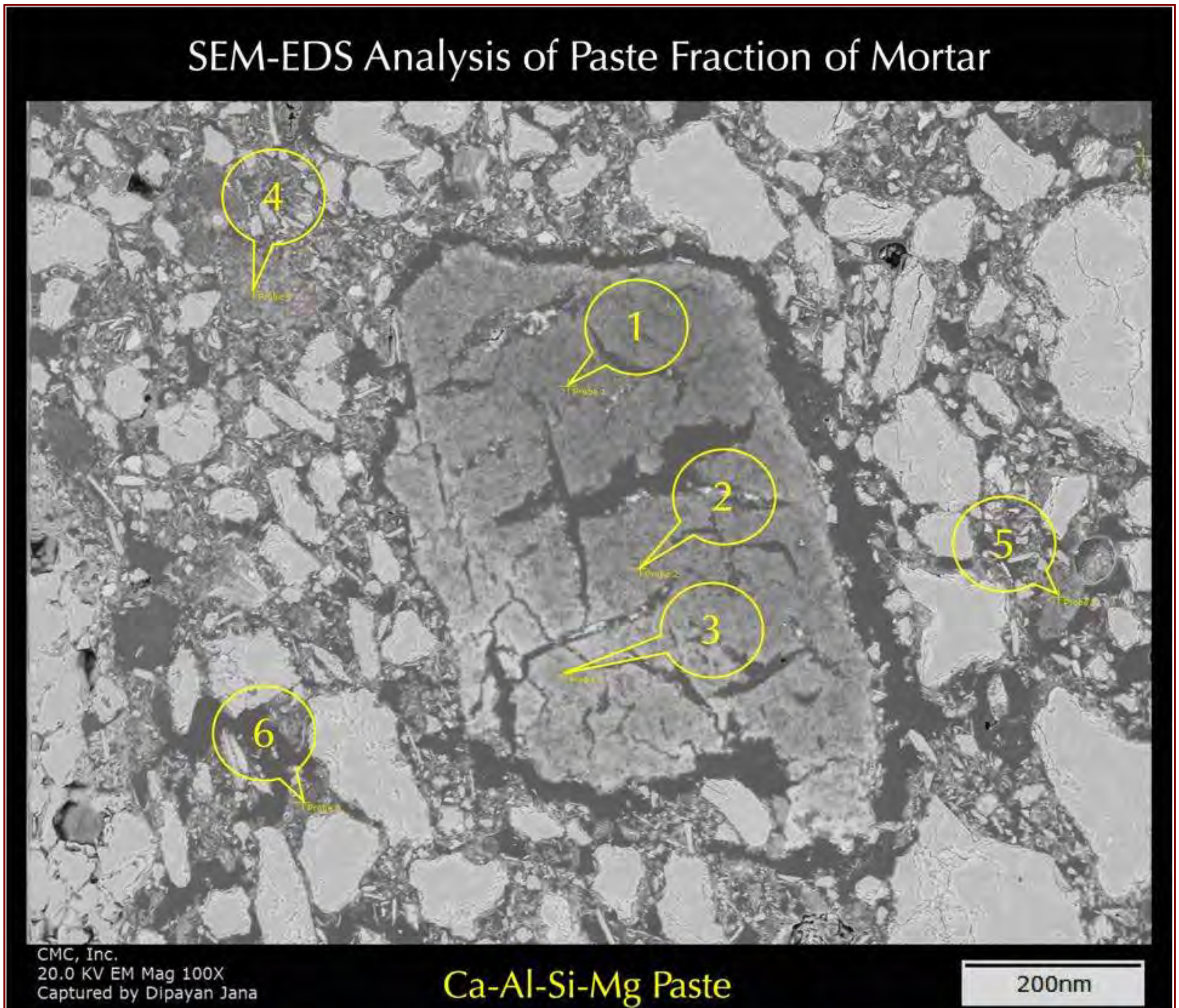
Probe	Ca	Si	Al	K	Mg	Fe	Na	Ti	S	O	Total	Phase
1	30.82	1.69	5.23	0.08	25.17	0.82	0.00	0.24	0.00	35.94	100.0	Dolomitic Lime
2	61.39	1.42	2.70	0.01	3.29	0.20	0.16	0.00	0.00	30.82	100.0	Lime
3	64.24	0.96	0.56	0.19	3.07	0.31	0.68	0.12	0.00	29.86	100.0	Lime
4	65.53	0.64	1.06	0.12	2.41	0.30	0.22	0.00	0.00	29.71	100.0	Lime

Figure 28: Backscatter electron image (top), and X-ray microanalyses at the tips of callouts and in boxed areas in Probes 1 through 4 detecting compositional variations of lime lumps in the mortar. Lime lump compositions are presented (bottom) as oxide variations of all detected EDS peaks normalized to 100% except carbon (from epoxy) and gold (from coating). Paste cementation indices, CI (after Eckel 1922) measure relative hydraulicity of paste e.g., non-hydraulic lime pastes have very low CI (< 0.50) compared to Portland cement pastes (CI is >1). Lime shows CI < 1 which are consistent with carbonated lime pastes in many historic mortars. Lime lump compositions show addition of a dolomitic lime binder from where leaching of magnesia component has occurred during service to cause between-lump variations in Ca/Mg ratios. Lime lumps are marked by white dotted lines.



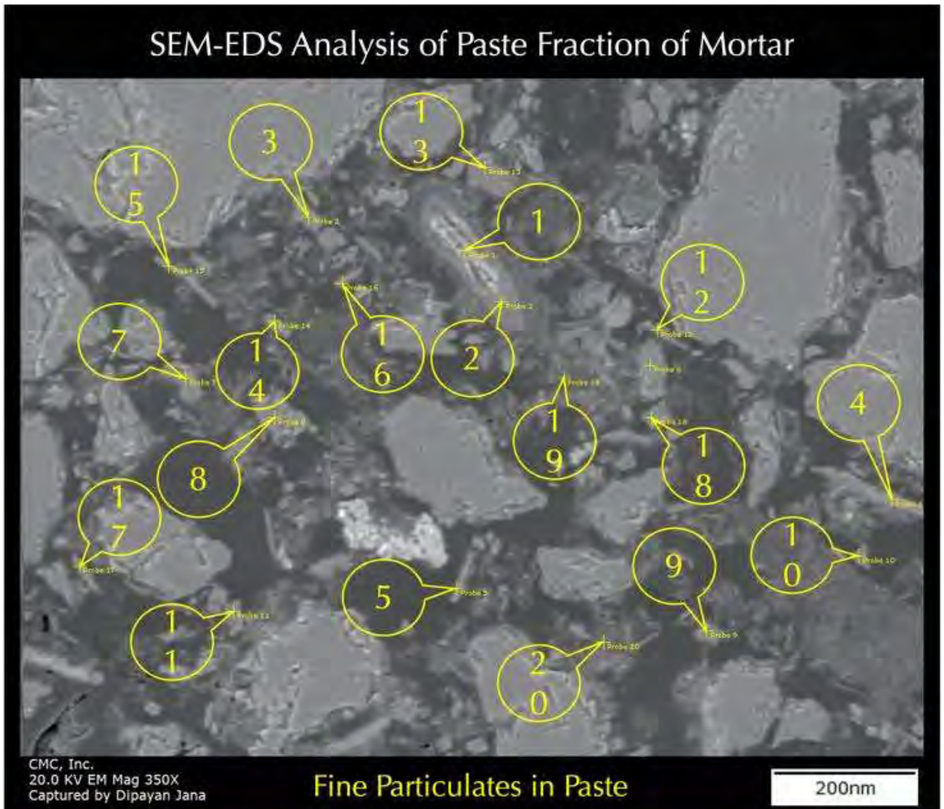
Probe	Ca	Si	Al	K	Mg	Fe	Na	Ti	S	O	Total	Paste-CI	Phase
1	0.00	46.60	0.00	0.00	0.03	0.09	0.04	0.05	0.00	53.19	100.0	0.17	Silica
2	1.97	14.45	7.72	0.01	0.96	38.39	0.08	0.37	0.00	36.04	100.0	0.11	Iron
3	**21.24**	**1.97**	**17.60**	0.06	**19.46**	0.23	0.00	0.08	0.00	39.37	100.0	0.52	Paste
4	**27.73**	**13.47**	**3.91**	0.43	**13.23**	1.22	0.14	0.28	0.00	39.61	100.0	0.93	Paste
5	**22.41**	**10.12**	**14.70**	0.01	**9.58**	1.69	0.00	0.68	0.00	40.81	100.0	1.28	Paste
6	**11.93**	**22.39**	**13.40**	0.04	**3.91**	2.22	0.03	0.38	0.00	45.70	100.0	4.54	Paste
7	**7.56**	**31.88**	**5.75**	0.00	**4.69**	1.61	0.10	0.22	0.00	48.19	100.0	6.85	Paste
8	**56.56**	**2.58**	**1.40**	0.06	**6.41**	1.07	0.42	0.00	0.00	31.50	100.0	0.15	Paste

Figure 29: Backscatter electron image (top), and X-ray microanalyses at the tips of callouts in Probes 1 through 8 detecting compositional variations of paste and a contaminant in the mortar. Paste and contaminant compositions are presented (bottom) as oxide variations of all detected EDS peaks normalized to 100% except carbon (from epoxy) and gold (from coating). Paste cementation indices, CI (after Eckel 1922) measure relative hydraulicity of paste e.g., non-hydraulic lime pastes have very low CI (< 0.50) compared to Portland cement pastes (CI is >1). Paste shows mostly CI > 1 as opposed to typical <1 value for carbonated lime pastes in many historic mortars indicating the presence of silica and alumina from addition of calcined clay component as a second binder after lime. The cementation indices (CI) of paste are calculated after Eckel (1922) as CI = $[(2.8*SiO_2)+(1.1*Al_2O_3)+(0.7*Fe_2O_3)]/[(CaO)+(1.4*MgO)]$. The contaminant at the center shows silica and iron from ferruginous silicified composition as seen in optical micrographs.



Probe	Ca	Si	Al	K	Mg	Fe	Na	Ti	S	O	Total	Paste-CI	Phase
1	62.21	1.13	0.00	0.37	5.36	0.44	0.15	0.08	0.00	30.26	100.0	0.05	Lime
2	63.90	0.94	0.00	0.31	4.42	0.25	0.22	0.00	0.00	29.96	100.0	0.04	Lime
3	64.22	0.93	0.40	0.06	4.14	0.29	0.00	0.03	0.00	29.94	100.0	0.05	Lime
4	57.25	1.03	0.32	0.25	9.51	0.33	0.18	0.09	0.00	31.04	100.0	0.05	Paste
5	23.64	2.30	20.65	0.14	13.36	0.40	0.02	0.00	0.00	39.49	100.0	0.70	Paste
6	0.00	46.44	0.13	0.06	0.02	0.09	0.08	0.01	0.00	53.16	100.0	-	Quartz

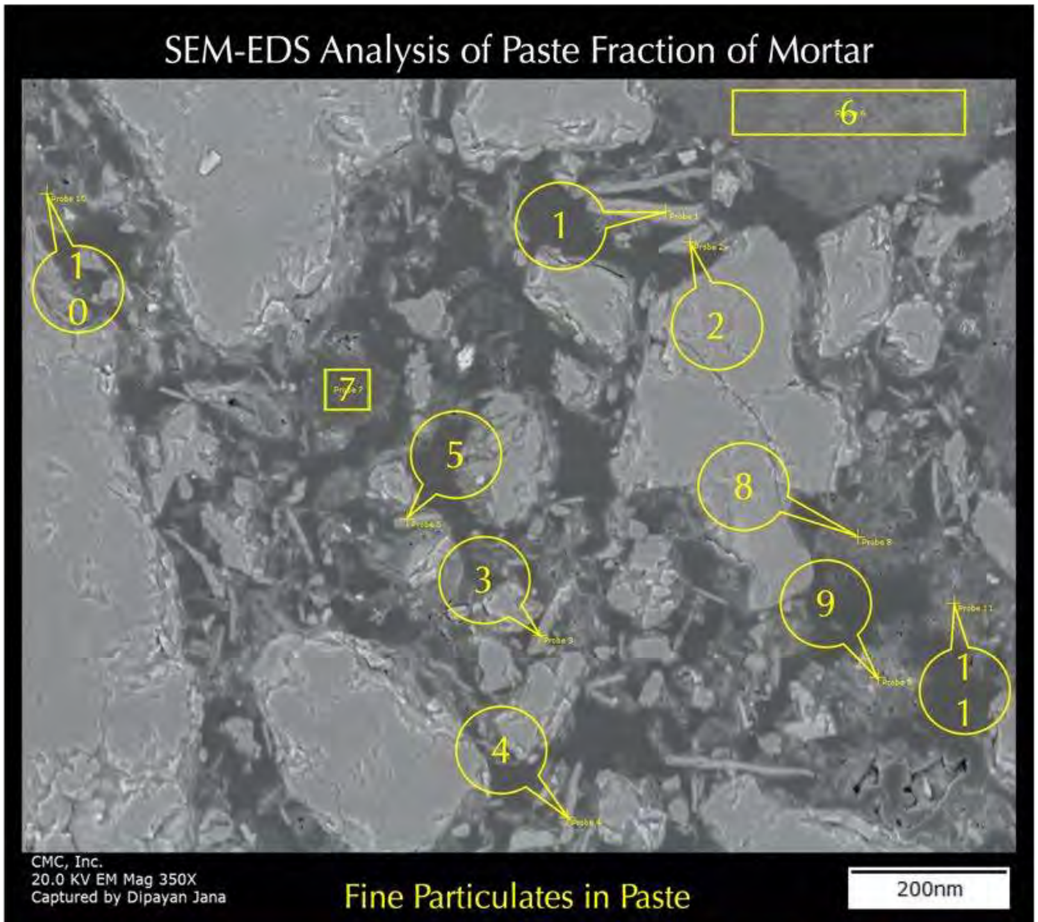
Figure 30: Backscatter electron image (top), and X-ray microanalyses at the tips of callouts in Probes 1 through 6 detecting compositional variations of a central incompletely burnt dolomitic lime and neighboring paste in the mortar. Compositions are presented (bottom) as oxide variations of all detected EDS peaks normalized to 100% except carbon (from epoxy) and gold (from coating). Paste cementation indices, CI (after Eckel 1922) measure relative hydraulicity of paste e.g., non-hydraulic lime pastes have very low CI (< 0.50) compared to Portland cement pastes (CI is >1). Both the central lime and neighboring paste show CI < 1. The cementation indices (CI) of paste are calculated after Eckel (1922) as CI = [($2.8*SiO_2$)+($1.1*Al_2O_3$)+($0.7*Fe_2O_3$)]/[(CaO)+($1.4*MgO$)]. Probe #6 is from a fine quartz sand particle.



Probe	Ca	Si	Al	K	Mg	Fe	Na	Ti	S	O	Total	Paste-Cl	Phase
1	5.43	19.83	9.66	8.97	12.05	0.14	0.03	0.34	0.00	43.48	100.0	-	Particle
2	19.18	14.95	12.44	0.13	10.19	0.17	0.00	0.17	0.00	42.71	100.0	-	Particle
3	0.01	46.68	0.02	0.00	0.00	0.05	0.02	0.00	0.00	53.23	100.0	-	Particle
4	0.12	27.53	14.29	6.70	1.02	2.02	0.26	0.33	0.00	47.39	100.0	-	Particle
5	3.36	41.97	0.02	0.40	1.36	0.83	0.00	0.31	0.00	51.18	100.0	-	Particle
6	0.00	46.63	0.00	0.00	0.00	0.08	0.03	0.01	0.00	53.21	100.0	-	Particle
7	0.00	46.53	0.05	0.00	0.01	0.00	0.08	0.08	0.00	53.20	100.0	-	Particle
8	0.00	46.48	0.20	0.00	0.02	0.01	0.08	0.01	0.00	53.19	100.0	-	Particle
9	0.00	46.66	0.00	0.00	0.02	0.05	0.06	0.00	0.00	53.21	100.0	-	Particle
10	1.45	43.49	1.75	0.00	0.68	0.13	0.07	0.10	0.00	52.30	100.0	-	Particle
11	0.25	34.35	9.47	0.00	0.00	0.01	6.08	0.01	0.00	49.81	100.0	-	Particle
12	1.68	25.71	15.44	6.15	1.94	1.77	0.16	0.17	0.00	46.95	100.0	-	Particle
13	0.25	34.65	9.27	0.03	0.02	0.07	5.78	0.01	0.00	49.90	100.0	-	Particle
14	0.51	43.83	2.34	0.25	0.21	0.17	0.05	0.09	0.00	52.54	100.0	-	Particle
15	1.46	24.52	16.84	6.72	1.64	1.33	0.53	0.27	0.00	46.70	100.0	-	Particle
16	1.91	28.73	11.80	4.59	2.70	1.86	0.29	0.47	0.00	47.66	100.0	-	Particle
17	0.68	26.56	16.55	7.00	0.47	0.40	0.47	0.28	0.00	47.53	100.0	-	Particle
18	0.09	45.90	0.75	0.00	0.10	0.00	0.07	0.00	0.00	53.09	100.0	-	Particle
19	3.05	16.51	26.65	0.60	3.35	2.18	0.40	0.08	0.00	47.03	100.0	-	Particle
20	21.19	15.85	9.05	1.01	9.19	1.76	0.04	0.25	0.00	41.58	100.0	-	Particle

Figure 31: Backscatter electron image (top), and X-ray microanalyses at the tips of callouts and in boxed areas in Probes 1 through 20 detecting compositional variations of various fine particulates scattered throughout the interstitial fractions between siliceous sand.

Compositional variations show the presence of mica and clay particles along with major amount of siliceous sand.



Probe	Ca	Si	Al	K	Mg	Fe	Na	Ti	S	O	Total	Paste-Cl	Phase
1	5.43	19.83	9.66	8.97	12.05	0.14	0.03	0.34	0.00	43.48	100.0	-	Particle
2	19.18	14.95	12.44	0.13	10.19	0.17	0.00	0.17	0.00	42.71	100.0	-	Particle
3	0.01	46.68	0.02	0.00	0.00	0.05	0.02	0.00	0.00	53.23	100.0	-	Particle
4	0.12	27.53	14.29	6.70	1.02	2.02	0.26	0.33	0.00	47.39	100.0	-	Particle
5	3.36	41.97	0.02	0.40	1.36	0.83	0.00	0.31	0.00	51.18	100.0	-	Particle
6	0.00	46.63	0.00	0.00	0.00	0.08	0.03	0.01	0.00	53.21	100.0	-	Particle
7	0.00	46.53	0.05	0.00	0.01	0.00	0.08	0.08	0.00	53.20	100.0	-	Particle
8	0.00	46.48	0.20	0.00	0.02	0.01	0.08	0.01	0.00	53.19	100.0	-	Particle
9	0.00	46.66	0.00	0.00	0.02	0.05	0.06	0.00	0.00	53.21	100.0	-	Particle
10	1.45	43.49	1.75	0.00	0.68	0.13	0.07	0.10	0.00	52.30	100.0	-	Particle
11	0.25	34.35	9.47	0.00	0.00	0.01	6.08	0.01	0.00	49.81	100.0	-	Particle

Figure 32: Backscatter electron image (top), and X-ray microanalyses at the tips of callouts and in boxed areas in Probes 1 through 20 detecting compositional variations of various fine particulates scattered throughout the interstitial fractions between siliceous sand.

Compositional variations show the presence of mica and clay particles along with major amount of siliceous sand.

Probe #6 is from a lime lump which shows calcitic lime composition.

Mortar Mineralogy from XRD

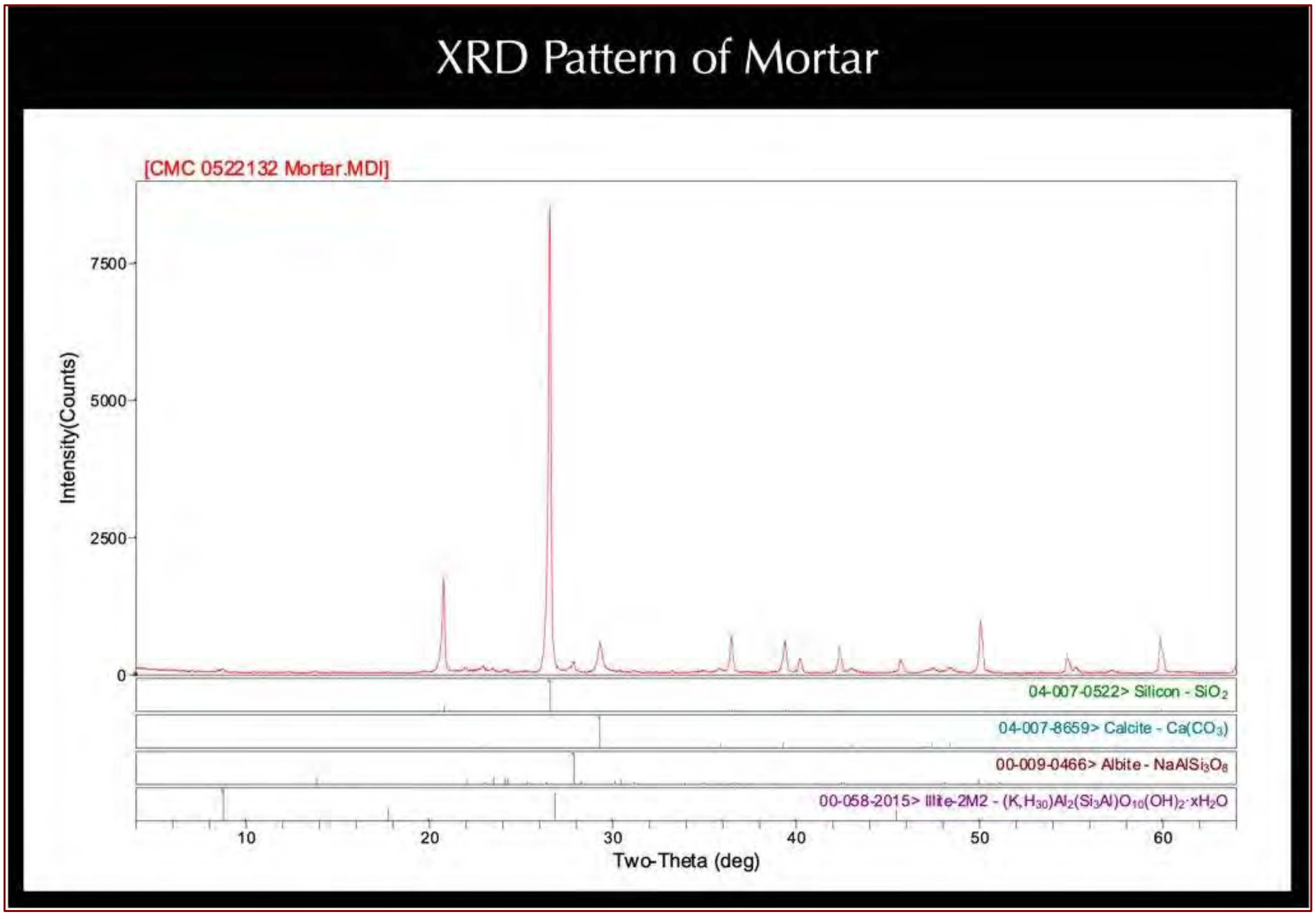


Figure 33: X-ray diffraction pattern of bulk mortar sample showing the dominance of quartz from silica sand, subordinate calcite from the lime binder and trace albite and illitic clay from the sand particles.

Compositions of Mortar from XRF (Major Element Oxides), Acid & Alkali Digestion (Soluble Silica), Loss on Ignition (Free Water, Combined Water, Carbonation), and Acid-Insoluble Residue Content (Siliceous Sand Content)

Table 1 shows oxide compositions of mortar determined from pressed pellet of pulverized (< 45-micron size) bulk mortar in XRF. A silica content of 62.4 percent reflects contribution from siliceous component of sand, and some from the binder, as also seen in optical microscopy and XRD analysis of the mortar.

Lime content (9.8%) is consistent with addition of a lime binder and a second aluminosilicate binder where the latter is judged to be from addition of a calcined clay binder stabilized with lime.

Alumina, iron, and alkalis are contributed from both sand and calcined clay binder fraction in paste. Sulfate is from cement paste. Balance includes volatiles (combined H_2O, CO_2) not measured in XRF.

Acid-insoluble residue content of 73.5% is determined after digesting pulverized (<0.3 mm size) fragment of mortar in hydrochloric acid. The result indicates contribution from the siliceous sand and perhaps a subordinate part from the calcined clay binder residues in the paste.

Chemical Analyses (XRF & Gravimetric) of Mortar

Mortar Compositions	Mortar	Methods
Silica - SiO_2	62.390	ED-XRF
Alumina - Al_2O_3	5.057	ED-XRF
Iron - Fe_2O_3	1.508	ED-XRF
Lime - CaO	9.841	ED-XRF
Magnesia - MgO	2.402	ED-XRF
Sodium - Na_2O	0.437	ED-XRF
Potassium - K_2O	0.614	ED-XRF
Titanium - TiO_2	0.739	ED-XRF
Phosphorus - P_2O_5	0.206	ED-XRF
Sulfate - SO_3	0.0005	ED-XRF
Total	83.290	ED-XRF
Acid-Insoluble Residue	73.5	Gravimetry
Loss on Ignition @ 110°C	1.00	Gravimetry
Loss on Ignition @ 550°C	2.00	Gravimetry
Loss on Ignition @ 950°C	7.00	Gravimetry

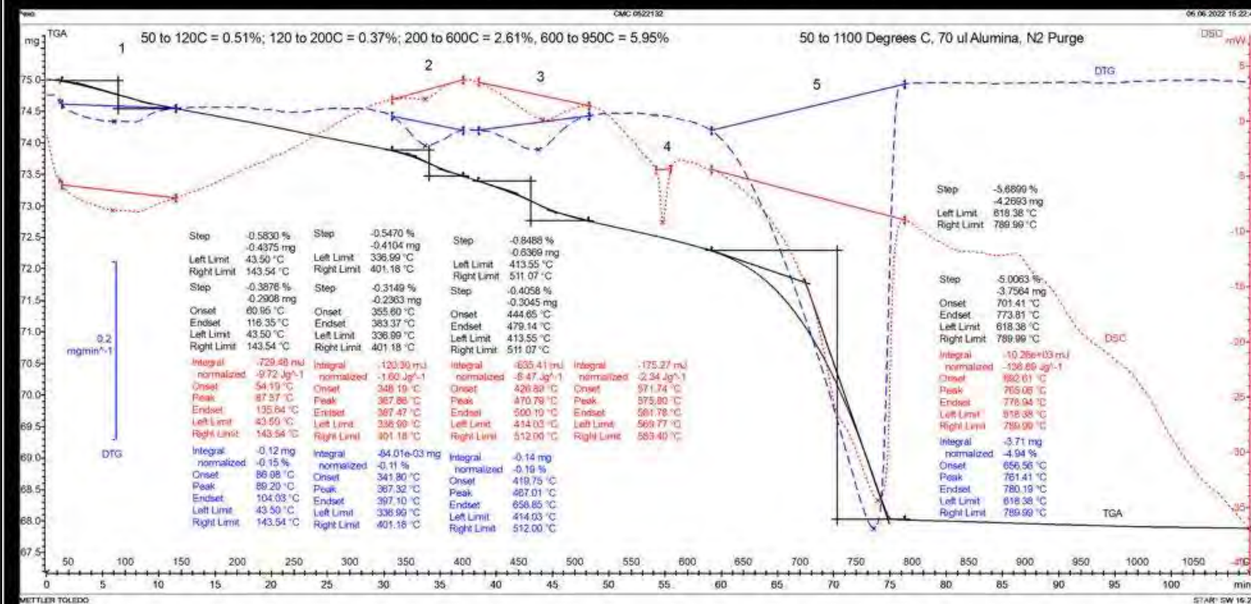
Table 1: Bulk oxide compositions of mortar from XRF, and acid-insoluble residue contents and losses on ignition from gravimetry.

Due to the presence of siliceous components in sand, the determined acid-insoluble residue content is considered representative of the sand content in the mortar.

Loss on ignition of a separate aliquot of pulverized mortar to 110°C, 550°C, and 950°C correspond to free water, combined (hydrate) water, and degree of carbonation, respectively. The loss on ignition at 550°C corresponds to the water contents from dehydration of Portland cement paste. The loss on ignition at 950°C corresponds to degree of carbonation of carbonated lime paste.

Thermal Analysis of Mortar

Thermal Analyses of Mortar



T(°C)	Up to 120°C	120°C to 200°C	200°C to 600°C	> 600°C
Phases	Hygroscopic Water	Water from Hydrated Salts	Structural Water From Hydraulic Components	CO_2 from decomposition of carbonates
Mass Loss From TGA	0.51	0.37	2.61	5.95
Mass Loss (%) From Gravimetry	1.00	-	2.00	7.00

Peaks#	Peak Position (°C)	Phase
1 (DTG)	89.20	Water
2 (DTG)	367.32	Brucite
3 (DTG)	467.01	Ca-Al-Si-Mg-hydrate
4 (DSC)	575.80	Quartz, 54.4%
5 (DTG)	761.41	Calcite, 10.35%

Figure 34: TGA (in bold black), DSC (in dotted red), and DTG (in dashed blue) curves of mortar showing losses in weights due to decompositions (loss of water and carbon dioxide) of various phases during controlled heating in a Mettler-Toledo's simultaneous TGA/DSC 1 unit from 30ºC to 1100ºC in a ceramic crucible (alumina 70µl, no lid) at a heating rate of 10ºC/min in a nitrogen purge at a rate of 75 mL/min. Dehydration and decarbonation reactions are marked as endothermic peaks in the DTG curve, whereas alpha to beta-form polymorphic transition of quartz is marked at the characteristic temperature of 575ºC in the DSC curve. Similar results are obtained from thermal analyses and gravimetry for mass losses from loss of free water (up to 120ºC), structural water (200 to 600ºC), and carbonation (600 to 950 ºC), respectively. Endothermic peaks have confirmed the presence of dolomitic lime putty and a calcined clay binder. DSC curve has provided a quartz content of 54.4 percent (excluding the albite component of sand or calcined clay fraction as found in gravimetry and XRD results).

Water-Soluble Chloride Ion in Mortar

Water-Soluble (ASTM C 1218), or, Acid-Soluble (ASTM C 1152) Chloride Analysis 2022-05-12

Determination

Method . . . . DET U Chloride Auto 751

Sample data

ID1 . . . . CMC 0522132

ID2 . . . . Mortar

ID3 . . . .

Sample size 1.002g

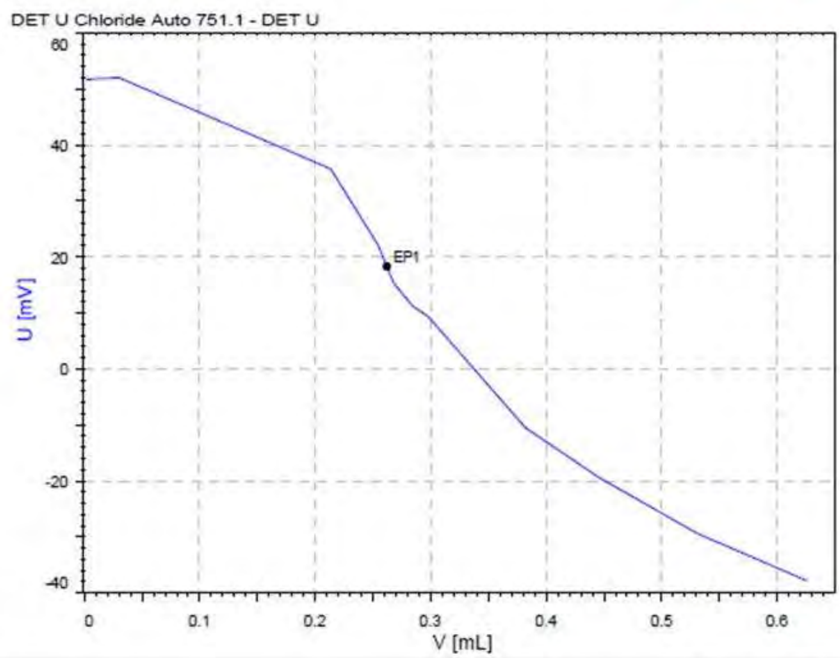
End points

DET U **DET U Chloride Auto 751.1**

EP1 . . . . 18.3 mV . . . . 0.2620 mL

Results

% Chloride . . . . $\boxed{\textbf{0.0463 \%}}$



Metrohm

Figure 35: Water-soluble chloride in the mortar after digesting about a gram of pulverized mortar in deionized water for 30 minutes at a temperature below boiling, followed by continued digestion in water at the ambient laboratory condition for 24 hours. The filtrate was analyzed by potentiometric titration with a silver nitrate titrant. Filtrate shows the presence of negligible but detectable chloride.

DISCUSSION

MORTAR TYPE, INGREDIENTS, AND CONDITION

The type of the mortar received is determined to be a high-lime dolomitic lime-Portland cement-sand mortar, which is equivalent to a modern ASTM C 270 Type O cement-lime mortar.

Mortar	Main Mortar	Other Contaminants	Comments
Bedding mortar from attic	Dolomitic lime and calcined clay binders and siliceous sand	A few reddish brown silicified ferruginous plate fragments are found as accidental contaminants	Tan, moderately dense and soft, individual fragments are intact, a few loose dusts were present with the fragments when received; a few fragments show white lumps of unmixed lime

Table 2: Mortar composition determined from optical microscopy and other tests.

MIX CALCULATIONS OF MORTAR

Since the mortar composition and components found are not typical of lime-only or cement-lime binders mix proportions of mortar are obtained from chemical analysis (gravimetry), and optical and scanning electron microscopy.

a. A lime content of 11.8 percent is determined from the CO_2 content of mortar from loss on ignition at 950°C (i.e., 7%) divided by 0.594 (molecular weight of CO_2 i.e., 44 divided by molecular weight of lime, $Ca(OH)_2$ i.e., 74). Considering lime to be a dolomitic lime, containing 41% CaO and 29% MgO, dolomitic lime content of mortar can be determined from bulk MgO content of mortar from XRF, which is 2.4 percent. A dolomitic lime content of 8.3% is obtained considering the MgO content in mortar and a dolomitic lime. Taking an average of these two calculated lime contents will provide a lime content of 10 percent.

b. Since the sand is determined to be a siliceous type, sand content is determined from acid-insoluble residue content, which is 73.5 percent;

c. Volumetric proportions of lime, and sand are calculated from corresponding dry densities of 40, and 80 lbs./ft^3, respectively. Volumetric proportions of lime-to-sand are thus calculated to be, 0.250-to-0.918.

d. Therefore, the volumetric proportions of dolomitic lime, and sand are calculated to be about 1-part lime to 3½-part sand, which is not similar to any modern-day ASTM C 270 mortar but is very typical of many historic lime mortars.

e. However, since the mortar is also determined to contain an aluminosilicate binder component as seen from near-isotropic nature of the paste in optical microscopy and aluminosilicate composition of binder along with Ca and Mg components in the paste from SEM-EDS studies, the estimated lime content is judged lower than calculated amount due to the presence of a second aluminosilicate binder, which is best judged to have been added as a calcined clay binder. Calcined clay is a common binder component found in many historic mortars which participates in a pozzolanic reaction with the lime binder and improves the overall strength and durability of mortars. Many Roman mortars incorporated such an aluminosilicate component added as volcanic ash with the main calcitic lime binder produced from calcination of marl.

CONDITION

The examined historic mortar from early 19th century (circa 1828) is consistent with many historic lime mortars in having a dolomitic lime binder, which however also incorporated an aluminosilicate component with the addition of a second calcined clay component to provide an added strength and durability of mortar through pozzolanic reactions between calcined clay and dolomitic lime.

REPOINTING MORTAR

Based on: (i) the determined binder composition of mortar from optical microscopy; (ii) sand composition from optical microscopy; (iii) XRF and gravimetric analysis of loss on ignition, and soluble silica contents; and (iv) XRD studies of mineralogical compositions, etc., the volumetric proportions of replacement mortar suitable for the mortar examined are provided in the following Table.

Main Mortar	Mortar Type	Estimated Proportions of Main Mortar	Potential Recommendations For Repointing Mortar
Bedding mortar from attic	Dolomitic lime and calcined clay binders and siliceous sand	Maximum 1-part dolomitic lime to 3½-part sand but a calcined clay component was also added with lime to improve the overall strength of mortar from lime-calcined clay pozzolanic reactions	NHL 3.5 or NHL 5 binder and silica sand at 1-part binder to 2 to maximum 3-part sand by volume

Table 3: Mix proportion of mortar examined, and recommended repointing mortar to check the best suitable mortar from mock-up batches tried over a small test area for match in terms of appearance and properties to the existing stone masonry and original jointing mortar.

Overall appearance of the final mortar would depend on a match on sand, which constitutes the dominant proportion of the mortar. Sand to be used should be (a) siliceous, (b) match in color to the color of sand in the examined mortar, (c) preferably be from similar sources, (d) be free of any debris, unsound, clay particles, or any potentially deleterious constituents such as mica flakes as found in the present mortar, (e) conform to the size requirements of ASTM C 144 for masonry sand as opposed to very find sand found in the examined mortar, (f) not exceed maximum 3 times the sum of separate volumes of binder components, and (g) be durable.

No pigment should be added to the pointing mortar. Use of Portland cement binder should be avoided.

Initial rate of absorption (suction), and compressive strength of host masonry units are also important to determine the suitable mortar type, e.g., water retention properties (controlled by lime content) of mortar should be matched with the suction properties of masonry units.

Due to atmospheric weathering and alterations, an exact match in color to the existing mortars may not be possible, which, even if possible, could alter in future due to continued atmospheric weathering in the presence of oxygen, moisture, salt solutions, and other elements.

Appendix 2 provides various suggestions and guidelines for repointing mortar selections.

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APPENDIX 1 –

LABORATORY TESTING OF MASONRY MORTARS

METHODOLOGIES[1]

Until 1970-1980, characterization of masonry mortars was mostly based on traditional wet chemical analysis (Jedrzejewska, 1960, Stewart and Moore, 1981), where interpretation of results were often difficult if not impossible without a good knowledge of the nature of different ingredients. The majority of later characterization proposed optical microscopy (Erlin and Hime 1987, Middendorf et al. 2000, Elsen 2006) as the first step in identification of different components of mortar based on which other analytical techniques including wet chemistry are performed. Many advanced instrumental analyses e.g., scanning electron microscopy and X-ray microanalysis, X-ray diffraction, X-ray fluorescence spectroscopy, atomic absorption, thermal analysis, infrared spectroscopy, etc. play significant roles in examinations of masonry mortars (Bartos et al. 2000, Elsen 2006, Callebaut et al. 2000, Erlin and Hime 1987, Goins 2001, 2004, Groot et al. 2004, Doebley and Spitzer 1996, Chiari et al. 1996, Middendorf et al. 2000, 2004, 2005, Leslie and Hughes 2001, Martinet and Quenee 2000, Valek et al., 2012, and Jana 2005, 2006). The choice of appropriate analytical technique depends mainly on the questions that have to be addressed, and, on the amount of material available.

Purposes of laboratory testing of mortar are: (a) to document a historic or modern masonry mortar by examining its sand and binder components, proportions of various ingredients, and their effects on properties and performance of the mortar, (b) evidence of any chemical or physical deterioration of mortar from unsoundness of its ingredients to effects of potentially deleterious agents from the environment (e.g., salts), (c) records of later repointing events and their beneficial or detrimental effects on the performance of the original mortar and masonry units, and finally, (d) an assessment of an appropriate restoration mortar to ensure compatibility with the existing mortar.

Currently there are two standardized procedures available that describe various laboratory techniques for analyses of masonry mortars with special emphases on historic mortars. One is ASTM C 1324 "Standard Test Method for Examination and Analysis of Hardened Masonry Mortar," which includes detailed petrographic examinations, followed by chemical analyses, along with various other analytical methods to test masonry mortars as described in various literatures, e.g., XRD, thermal analysis, and infrared spectroscopy. The second one is the RILEM method described in a series of publications from Middendorf et al. (2004, 2005).

The present mortar was tested by following these established methods of ASTM C 1324, and RILEM, which include detailed petrographic examinations, i.e., optical and scanning electron microscopy and X-ray microanalyses (SEM-EDS), followed by chemical analyses (gravimetry, acid digestion), X-ray fluorescence (XRF), X-ray diffraction (XRD), and thermal analyses (TGA, DTG, and DSC). Mortar sample was first photographed with a digital camera, scanned on a flatbed scanner, and examined in a low-power stereomicroscope for the preliminary examinations, e.g., to screen any unusual pieces having different appearances, e.g., representing contaminants from prior pointing episodes or remains of host masonry units.

Representative subset pieces of interest are then selected for: (a) optical microscopy and (b) scanning electron microscopy and X-ray microanalysis for chemical and mineralogical compositions, and microstructures of sand, paste, and overall mortar, (c) acid digestion, preferably from un-pulverized or lightly pulverized sample for extraction of siliceous sand by acid digestion for grain size distribution, (d) loss on ignition from ambient to 950°C temperatures for free and hydrate water, and carbonate contents, (e) acid digestion for determination of insoluble residue content, (f) cold acid and hot alkali digestions for determination of soluble silica content from hydraulic binder if any, after pulverizing a subset to finer than 0.3 mm size, and, (g) ultra-fine pulverization (<44-micron) of a subset for XRD, XRF, and thermal analysis. Any additional analyses, if needed, e.g., water digestion of mortar for determination of water-soluble salts by ion chromatography, or, Fourier-transform infrared spectroscopy of mortar for determining any coatings or organics added, etc. are done on the as-needed basis from the remaining set.

Information obtained from petrographic examinations is crucial to devise appropriate guidelines for subsequent chemical and other analytical methods, and, to properly interpret the results of chemical analyses. For example, detection of siliceous versus calcareous versus argillaceous components of aggregates in sample, or, the presence

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[1] For details on laboratory facilities for testing of masonry mortar, visit www.cmc-concrete.com

of any pozzolan in the binder (slag, fly ash, ceramic dusts, etc.) from petrography restricts which chemical method to follow, and how to interpret the results of such analyses, e.g., acid-insoluble residue contents.

Therefore, a direct chemical analysis e.g., acid digestion of a mortar without doing a prior petrographic examination to determine the types of aggregates and binder used could lead to highly erroneous results and interpretation. Armed with petrographic and chemical data and based on assumed compositions and bulk densities of the sand and the binder(s) similar to the ones detected from petrographic examinations, volumetric proportions of sand and various binders present in the examined sample can be calculated. The estimated mix proportions from such calculations can provide only a rough guideline to use as a starting mix for mock-up mixes during formulation of a pointing mortar to match with the existing mortar.

Extraction of Siliceous Sand by Acid Digestion and Sieve Analysis

For mortars containing siliceous sand (e.g., containing quartz, quartzite, granite, sandstone, siltstone, feldspar, etc.), sand can be extracted by digesting a few representative as-received mortar fragments in (1+3) dilute hydrochloric acid to dissolve away all binder fractions and extract, wash, and dry the acid-insoluble component of mortar, which is mostly the siliceous component of sand. The mortar fragments are first gently broken down into small pieces in a porcelain mortar and pestle making sure not to reduce inherent grain-size of sand during this size-reduction process of bulk mortar. Subsequent smaller pieces are then placed in a 250-ml glass beaker completely immersed in dilute hydrochloric acid and stirred with a magnetic stirring rod over a stirrer for a period of at least 24 hours to several days depending on the binder type for complete digestion of binder fractions and settlement of siliceous sand at the bottom of beaker to be filtered out for sieve analysis.

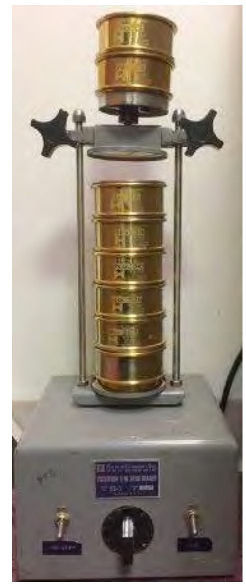


Fig. A1: Gilson mini sieve shaker used for sieve analysis of sand extract from mortar after acid digestion.

Sand particles thus extracted are washed, oven-dried, and sieved in an automatic mini sieve shaker through various U.S. Sieves from No. 4 (4.75 mm) through 8 (2.36 mm), 16 (1.18 mm), 30 (0.6 mm), 50 (0.3 mm), 100 (0.15 mm), and 200 (0.075 mm) for determination of the size, shape, angularity, and color of sands retained on various sieves. Grain-size distribution of sand is then compared with ASTM C 144 specifications for masonry sand. Photomicrographs of sand retained on each sieve are then taken with a stereomicroscope to record the sand size, shape, and color variations. For low amount of sample, or, for sample having calcareous sand, image analysis (e.g., Image J) on stitched photomicrographs of thin sections taken from multiple areas can be done to determine the sand-size distribution (Elsen et al. 2011).

Optical Microscopy

The main purposes of optical microscopy of masonry mortar are characterization of:

a. Aggregates, e.g., type(s), chemical and mineralogical compositions, nominal maximum size, shape, angularity, grain-size distribution, soundness, alkali-aggregate reactivity, etc.;
b. Paste, e.g., compositions and microstructures to diagnose various type(s) of binder(s) used;
c. Air, e.g., presence or absence of air entrainment, air content, etc.;
d. Alterations, e.g., lime leaching, carbonation, staining, etc. due to interactions with the environmental agents during service, and effects of such alterations on properties and performance of mortar; and
e. Deteriorations, e.g., chemical and/or physical deteriorations during service, cracking from various mechanisms, salt attacks, possible reasons for the lack of bond if reported from the masonry unit, etc.

Fragments selected from preliminary examinations for microscopy are sectioned, polished, and thin-sectioned (down to 25-30 micron thickness) preferably after encapsulating and impregnating with a dyed-epoxy to improve the overall integrity of the sample during precision sectioning and grinding, and to highlight porous areas, voids, and cracks. Prepared sections are then examined in a high-power stereo-zoom microscope up to 100X magnifications having reflected and transmitted-light, and plane and crossed polarized-light facilities, and eventually in a high-power petrographic microscope (up to 600X magnifications) equipped with transmitted, reflected, polarized, and fluorescent-light facilities. Capturing high-resolution micrographs from these microscopes via high-resolution high frame rate digital microscope cameras with appropriate image analyses software are an integral part of documentations during petrographic examinations.

Therefore, the essential steps followed during optical microscopy are:

a. Visual examination of as-received, fresh fractured, and sectioned surfaces of mortar on a flatbed scanner and in a stereo-microscope;
b. Preparation of clear epoxy-encapsulated block of mortar for subsequent sectioning and lapping for examinations of sand and binder in a stereo-microscope;
c. Preparation of a blue or fluorescent dye-mixed epoxy-impregnated large-area (50 × 75 mm) thin section of mortar of uniform thickness of 25-30 micron across the section;
d. Observation of thin section in a transmitted-light stereo-zoom microscope from 5X to 100X preferably with polarized-light facilities to observe large-scale distribution of sand and mortar microstructure in plane polarized light and sand type and carbonation of paste in crossed polarized light; and finally
e. Observation of thin section in a polarized-light (petrographic) microscope from 40X to 600X equipped with transmitted and reflected, polarized and fluorescent-light facilities for examinations of sand and binder compositions and microstructures.

For thin section preparation, representative fragments are oven-dried at 40 to 60°C to a constant mass and placed in a flexible (e.g., molded silicone) sample holder, then encapsulated with a colored dye-mixed (e.g., blue dye commonly used in sedimentary petrography, or, fluorescent dye, Elsen 2006) low-viscosity epoxy resin under vacuum to impregnate the capillary pore spaces of mortar, improve the overall integrity of sample during sectioning by the cured epoxy, highlight porous areas of mortar, alterations, cracks, voids, reaction products, etc. The epoxy-encapsulated cured solid block of sample is then de-molded, sectioned if needed, and processed through a series of coarse to fine grinding on metal and resin-bonded diamond grinding discs with water or a lubricant, eventually a perfectly flat clean ground surface is glued to a frosted large-area (50 × 75 mm) glass slide. Careful precision sectioning and precision grinding of the sample is then done in a thin-sectioning machine till the thickness is down to 50 to 60 micron. Final thinning down to 25 to 30 micron thickness is done on a glass plate with fine (5-15 micron) alumina abrasive. Thin section is eventually polished with various fine (1 micron to 0.25 micron size) diamond abrasives on polishing wheels suitable for

Fig. A2: CMC's optical microscopy laboratory that houses various stereomicroscopes and polarizing microscopes used for this study.

examinations in a petrographic microscope, and eventually in SEM-EDS. Sample preparation steps are described in detail in Jana (2006).

More elaborate steps followed during optical microscopy include:

a. Visual examinations of sample as-received to select fragments for detailed optical microscopy; initial digital and flatbed scanner photography of sample as-received;
b. Low-power stereo-microscopic examinations of saw-cut and freshly fractured sections of sample for evaluation of variations in color, grain-size and appearances of sand, and the nature of the paste;
c. Examinations of oil immersion mounts for special features and materials in a petrographic microscope;
d. Examinations of colored (blue or fluorescent) dye-mixed epoxy-impregnated polished thin sections in a transmitted-light stereo-zoom microscope for determination of size, shape, angularity, and distribution of sand, as well as abundance and distribution of void and pore spaces that are highlighted by the colored dye-mixed epoxy;
e. Image analyses of micrographs of thin sections for estimations of pores, voids, intergranular open spaces, and shrinkage microcracks by using Image J or other image analysis software, where multiple micrographs are collected in plane polarized light mode by using a high-resolution stereo-zoom microscope equipped with transmitted and polarizing light facilities and stitched to get an adequate representative coverage;
f. Examinations of colored (blue or fluorescent) dye-mixed epoxy-impregnated polished thin sections in a petrographic microscope for detailed compositional, mineralogical, textural, and microstructural analyses of aggregates and binders, along with diagnoses of evidence of any deleterious processes and alterations (e.g., lime leaching, precipitation of secondary deposits and alteration products, salts);
g. Examinations of polished thin or solid section in reflected-light (epi-illumination) mode of petrographic microscope after etching the surface with acids to identify various non-hydrated hydraulic phases (e.g., C_2S, C_3S, C_3A, etc., Middendorf et al., 2005);
h. Examinations of any physical or chemical deterioration or signs of improper construction practices from microstructural evidences;
i. Stereo-microscopical examinations of size, shape, and color variations of sand extracted after hydrochloric acid digestion; and finally,
j. Selection of areas of interest to be examined by scanning electron microscopy.

Scanning Electron Microscopy & Microanalysis by Energy-Dispersive X-ray Spectroscopy (SEM-EDS)

Methods followed during SEM-EDS studies include: (a) secondary electron imaging (SEI) to determine the microstructure and morphology of the examined surface of sample, (b) backscatter electron (BSE) imaging to determine compositions of various phases from various shades of darkness/grayness/brightness from average atomic numbers of phases from the darkest pore spaces to brightest iron minerals (e.g., thaumasite, periclase, ettringite, quartz, dolomite, monosulfate, gypsum, calcite, C-S-H, aluminate, calcium hydroxide, belite, alite, free lime, and ferrite having progressively increasing average atomic numbers and brightness in BSE image), (c) X-ray elemental mapping (dot mapping) of an area of interest to differentiate various phases, (d) point-mode or area (raster)-mode analysis of specific area/phase of interest on a polished thin or solid section, and (e) average compositional analysis of a specific phase or an area on a polished thin or solid section or small subset of a sample.

The main purposes of SEM-EDS examinations of masonry mortars are to:

a. Observe the morphologies and microstructures of various phases of sand and binder,
b. Characterize the typical fine-grained microstructure of hydrated, carbonated, and hydraulic components of binder that are too fine to be examined by optical microscopy and are not well crystallized to be detected by XRD;
c. Determine major element oxide compositions, and compositional variations of paste, and from that determine the type of binder(s) used, especially to differentiate non-hydraulic calcitic and dolomitic lime mortars from hydraulic lime varieties (e.g., from silica contents of paste), natural cements (e.g., from silica and magnesia contents), pozzolans, slag cements, Portland cements, etc. all from their characteristic differences in compositions and hydraulicities (e.g., cementation index of Eckel 1922);

d. Determine composition of residual hydraulic phases to assess the raw feed and calcination processes used in manufacturing of binder;
e. Assess hydration, carbonation, and alteration products of binders,
f. Investigate effects of various alterations of paste during service and its role on properties and performance of mortar,
g. Detect salts and other potentially deleterious constituents,
h. Detect pigments and fillers,
i. Examine compositional variations across multiple mortars installed, etc.; and eventually
j. Complement and confirm the results of optical microscopy.

Due to characteristic difference in compositions of pastes made using various binders, e.g., non-hydraulic lime (CaO dominates over all other oxides), variably hydraulic lime (CaO with variable SiO_2 contents depending on degree of hydraulicity), dolomitic lime (high CaO and MgO), natural cement (CaO, SiO_2, Al_2O_3, and MgO contents are high, high MgO and FeO contents are characteristic), and Portland cement (CaO and SiO_2 contents are higher than all other oxides), SEM-EDS analysis of paste is a powerful method for detection of the original binder components in the sample. Effects of chemical alterations and various chemical deteriorations of a mortar (e.g., lime leaching, secondary calcite precipitates, gypsum deposits, etc.) can also be detected by SEM-EDS.

SEM-EDS analysis is done in a CamScan Series 2 scanning electron microscope equipped with a high-resolution column 40Å tungsten, 40 kV electron optics zoom condenser 75° focusing lens operating at 20 kV, equipped with a variable geometry secondary electron detector, backscatter electron detector, EDS detector for observations of microstructures at high-resolution, compositional analysis, and quantitative determinations of major element oxides from various areas of interest, respectively. Revolution 4Pi software was used for digital storage of secondary electron and backscatter electron images, elemental mapping, and compositional analysis along a line, or on a point or an area of interest. Portion(s) of interest on the polished 50 mm × 75 mm size thin section used for optical microscopy were subsequently coated with carbon or gold-palladium film and placed on a custom-made aluminum sample holder to fit inside the large multiported chamber of CamScan SEM equipped with the eucentric 50 × 100 mm motorized stage. Usually, features of interest from optical microscopy are marked on the thin section with a fine-tipped conductive marker pen for further observations in SEM. Alternately, solid polished section or grain mount from phases or areas of interest can also be examined. Procedures for SEM examinations are described in ASTM C 1723 and Sarkar, Amin, and Jana (2000).

Fig. A3: Camscan SEM equipped with Ametek EDAX silicon drift detector for elemental analyses, secondary electron detector for morphological analyses and high-resolution YAG backscatter electron detector for microstructural analyses, and 4Pi revolution module for data collection and analyses.

Chemical Analysis (Gravimetry and Instrumental Analysis)

Following petrographic examinations, chemical analyses of the mortar are done to determine the:

a. Hydrochloric acid-insoluble residue content to determine the siliceous sand content;
b. Losses on ignition due to release of free water, hydrate water, and CO_2;
c. Soluble silica contents contributed from hydraulic binders; and,
d. Bulk oxide contents, e.g., lime, silica, alumina, magnesia, alkalis, and others.

Chemical analyses are done by using various methods outlined in ASTM C 1324 and Middendorf et al. 2005a, e.g., by wet chemistry (gravimetry) and various instrumental techniques, e.g., atomic absorption spectroscopy (AAS), inductively coupled plasma atomic emission spectroscopy (ICP-AES), and X-ray fluorescence spectroscopy (XRF). Steps followed during chemical analyses of mortars are summarized in Fig. A4.

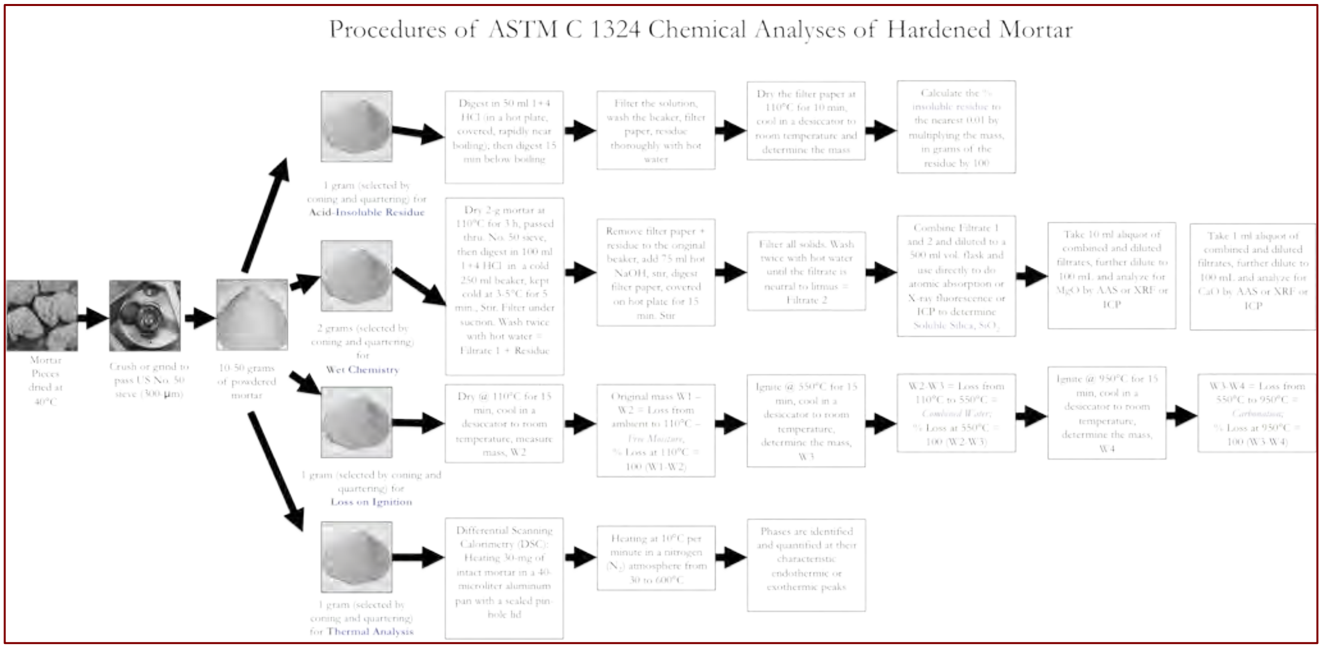


Fig. A4: Steps followed during various chemical analyses of mortars according to ASTM C 1324.

Acid Digestion

Acid digestion is perhaps the most commonly used test of masonry mortar, which is done to: (a) extract sand from sample by dissolving out the binder fractions so that grain-size distribution of sand can be done by sieve analysis, and (b) assess insoluble sand content in the sample. Sand content after acid digestion is determined both from: (a) 1.00 gram of pulverized sample (finer than 0.3 mm size) digested in 50-ml dilute (1+3) HCl (heated rapidly but below boiling), and, (b) from digesting a representative bulk sample *per se* (for harder mortars or mortars perhaps with light pulverization) in multiple fresh batches of (1+3) HCl at ambient temperature. The former usually gives better result due to small amount, pulverization to easily remove the binder fraction for digestion, and use of rapidly heated acid, whereas latter method requires multiple episodes of digestion in fresh acid and is time-consuming. Acid digestion is also done as the first step to determine soluble silica content in a sample as described below, which is contributed from the hydraulic components in binder.

All these goals of acid digestion depend on the assumptions that: (i) sand is siliceous in composition and does not contain any acid-soluble constituents (e.g., carbonates), and, (ii) binder entirely dissolves in acid and does not contain any acid-insoluble constituents (gypsum, clay, etc.). Applicability of acid digestion to assess these tasks should therefore be first verified by optical microscopy to confirm the siliceous nature of sand without any appreciable acid-soluble constituents, and calcareous nature of binder, and none without any appreciable argillaceous (clay) constituents.

For grain-size distribution of sand (for sample found from optical microscopy to contain siliceous sand), a few representative fragments of (preferably not pulverized or lightly pulverized in a porcelain mortar and pestle for harder mortars to break down to smaller size fraction without crushing the sand to retain the original sand size) are selected for digestion in multiple fresh batches of (1+3) dilute hydrochloric acid to dissolve away all binder fractions and extract, wash, and oven-dry the acid-insoluble component of aggregate. Usually multiple episodes of acid digestion in fresh batches of acid and filtration of residues are needed to entirely remove the binder fractions without losing the finer fractions of sand.

Soluble Silica From Cold Acid & Hot Alkali Digestion

Digestion of a pulverized sample of mortar in a cold acid followed by further digestion of residue in a hot alkali hydroxide solution are done to determine the soluble silica content contributed from the hydraulic component of binder, where cold acid digestion usually dissolves most of the binder without affecting the sand, followed by hot alkali hydroxide digestion to dissolve remaining soluble silica from calcium silicate hydrate component of paste or in mortars containing hydraulic binders. The soluble silica content corresponds to the silica mostly contributed from the hydraulic binder components (and a minor amount from any soluble silica component in the aggregates).

For determination of soluble silica content (modified from ASTM C 1324), 5.00 grams of pulverized sample (finer than 0.3 mm size, without excessive fines) is first digested in 100-mL cold (at 3 to 5°C) HCl and filtered through two 2.5-micron filter papers (filtrate #1). The residue with filter papers is then digested again in hot (below boiling) 75-ml NaOH, and filtered through two 2.5-micron filter papers (filtrate# 2). The two filtrates from acid and alkali digestions are then combined, re-filtered twice with 2.5-micron and then through 0.45-micron filter paper to remove any suspended silica fines, brought to 250 ml volume with deionized water, and then used for soluble silica determination by an analytical method, such as atomic absorption spectroscopy (AAS), inductive coupled plasma optical emission spectroscopy (ICP-OES), or X-ray fluorescence spectroscopy (XRF). Multiple steps of filtrations from 2.5-micron to submicron filter papers are necessary to remove any suspended silica from sand that can skew the result. Instrument to be used for such determination must be calibrated with several silica standards in matrices similar to the one used in mortar analysis. An XRF unit calibrated with filtrates from acid-and-alkali-digested series of laboratory-prepared standards of Portland cement and silica sand mortars (moist cured at *w/c* of 0.50 for 30 days) having various proportions of Portland cements (SiO_2 contents of standards ranging from 1 to 10%) were used for determining SiO_2 Kα X-ray intensities from known stoichiometric silica (cement) contents of standards (using exact 5.00 grams as samples) prepared by the same procedure of cold HCl-digestion/filtration/hot NaOH-digestion/2nd filtration/combination of two filtrates/re-filtration steps as followed for mortars.

Hydraulic binder content is calculated as: [(soluble SiO_2, weight percent in sample as calculated) divided by assumed soluble SiO_2 content in binder] ×100, where assumed SiO_2 contents of binders varies with binder types, e.g., 21% in Portland cement, 20% in natural cement, 27% in slag cement, 7 to 10% in hydraulic lime, etc., or, more preferably, from the average paste-SiO_2 content determined from SEM-EDS.

Weight Losses on Ignition

Losses in weight of a mortar on stepwise heating from ambient to 110°C, 550°C, and 950°C temperatures liberate free water from capillary pore spaces by 110°C, combined water from dehydroxylation of various hydrous phases (calcium silicate hydrate, calcium hydroxide, etc.) by 550°C, and liberation of carbon dioxide from decomposition of carbonated paste and carbonate minerals by 950°C. Such losses in weight are measured by following the procedures of ASTM C 1324 by heating 1.00 gram of pulverized mortar (finer than 0.3 mm) in an alumina crucible in a muffle furnace in a controlled step-wise heating at a heating rate of 10ºC/min. Mortars having hydraulic binders and hydration products of such provide measurable combined water contents after calcination to 550°C, whereas those having high calcareous components (high-calcium lime mortar or mortar having calcareous sand) produce higher weight losses during ignition to 950°C. Usually, a good correlation is found between weight losses at 550°C from dehydration of combined water, and, soluble silica contents contributed from hydraulic binders amongst series of mortars containing variable amounts of hydraulic phases.

X-ray Diffraction (XRD)

X-ray diffraction is a powerful laboratory technique used during investigation of masonry mortars, for reasons, such as:

a. Determination of bulk mineralogical composition of mortar, including its aggregate and binder mineralogies; e.g., quartz in sand from major diffraction peaks at 26.65°, 20.85°, 50.14° 2θ, or calcite in sand or carbonated lime binder from major peaks at 29.41°, 39.40°, 43.15° 2θ, or Portlandite in binder from major peaks at 34.09°, 18.09°, 47.12° 2θ;
b. Individual mineralogy and alteration products of aggregate at various size fractions, and binder phases;
c. Detection of dolomitic lime binder from brucite in the mortar from major peaks at 38.02°, 18.59°, 50.86° 2θ;
d. Detection of lime (Portlandite), gypsum (11.59°, 20.72°, 29.11° 2θ), or cement binders;
e. Detection of any potentially deleterious constituents, e.g., deleterious salts, or efflorescence deposits;
f. Detection of a mineral oxide-based pigmenting component; and,
g. Detection of components, which are difficult to detect by microscopical methods.

X-ray diffraction can be done on: (i) pulverized (to finer than 45 micron size) portion of bulk sample, or (ii) on the sand extracted from mortar by acid digestion, if sand has complex mineralogy, or also (iii) on the binder-fraction by separating sand from the binder from a carefully ground sample (in a mortar and pestle) and passing the ground mass through US 200 sieve (75 micron) to collect the fraction rich in binder. XRD pattern of a sample containing silica sand typically shows quartz as the dominant phase that surpasses peaks for all other phases (e.g., calcite, dolomite, clay, secondary deposits); hence binder separation is sometimes useful to detect minor minerals of interest (e.g., salts or pigments). For mortars containing marine shell fragments as sand, aragonite appears with calcite as two calcium carbonate phases from the shell fragments and paste. For binder mineralogy, sample is first dried at 40°C to a constant mass, then carefully crushed without pulverizing the sand, and sieved through a 75-micron opening screen to retain sand-rich fraction on the sieve and obtain the finer binder-rich fraction for further pulverization down to finer than 45 micron. Salts and other soft components can be analyzed from binder fraction. Efflorescence salts on masonry walls are also analyzed routinely in XRD.

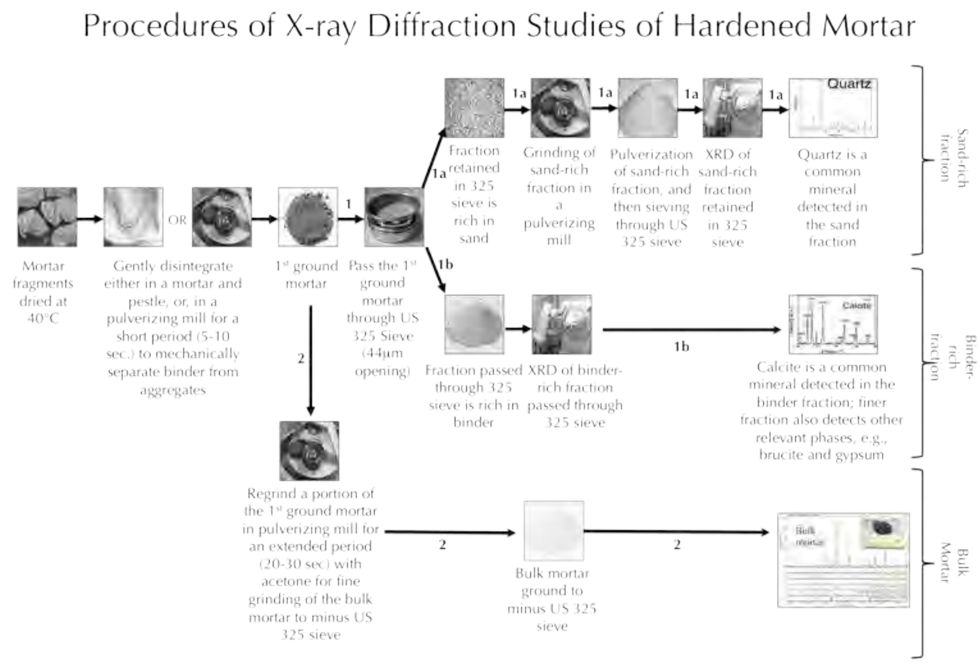


Fig. A5: Steps followed during XRD studies.

For sample preparation, a Rocklab (Sepor Mini-Thor Ring) pulverizer is used to grind sample down to finer than 100 microns. Usually, a few drops of anhydrous alcohol are added to reduce decomposition of hydrous phases from the heat generated from grinding. Approximately 10 grams of sample is ground first in the pulverizer, from which about 8.0 grams of sample is selected, mixed with an appropriate binder (e.g., three Herzog grinding aid pellets from Oxford Instruments having a total binder weight of 0.6 gram for 8 grams of sample for a fixed binder proportion of

7.5 percent); the mixture is then further ground in Rocklab pulverizer and in a McCrone micronizing mill with anhydrous alcohol down to finer than 44 micron size. Approximately 7.0 grams of binder-mixed pulverized sample thus prepared is weighed into an aluminum sample cup and inserted in a stainless-steel die press to prepare the sample pellet. A 25-ton Spex X-press is used to prepare 32 mm diameter pellet from the pulverized sample. The pressed pellet is then placed in a custom-made circular sample holder for XRD and excited with the copper radiation of 1.54 angstroms. Sample holders made with quartz or silicon are best for working with very small quantities of sample because these holders create no diffraction peaks between 2° and 90° 2θ (Middendorf et al. 2005).

XRD is carried out either: (a) in a Bruker D2 Phaser benchtop powder diffractometer equipped with a Lynxeye 1D detector, a θ-θ goniometer, a Cu X-ray tube (Cu k-alpha radiation of 1.54 angstroms), a primary slit of 1 mm, a receiving slit of 3 mm, a position sensitive 1D Lynxeye XE-T detector, generator settings used are 30 kV and 10mA (300 watt, scanned at 2θ from 8° to 64° with a step of 0.05° 2θ integrated at 0.05 sec. step^{-1} dwell time, or, (b) in a floor-standing Siemens D5000 Powder diffractometer (θ-2θ goniometer) employing a long line focus Cu X-ray tube, divergent and anti-scatter slits fixed at 1 mm, a receiving slit (0.6 mm), diffracted and incident beam Soller slits (0.04 rad), a curved graphite diffracted beam monochromator, and a sealed proportional counter. Siemens D5000 is equipped with (a) a horizontal stage (fixed), (b) an X-ray generator with CuKα, fine focus sealed tube source, (c) large diameter goniometer (600 mm), low divergence collimator, and Soller slits, (d) fixed detector slits 0.05, 0.2, 0.6, 1.0, 2.0, and 6.0, and (e) Scintillation detector. Generator settings used are 40 kV and 30 mA. Tests are usually run at 2θ from 4° to 64° with a step scan of 0.02° and a dwell time of one second. The resulting diffraction patterns are collected by DataScan 4 software of Materials Data, Inc. (MDI) for Siemens D5000 or Bruker Diffrac.Suite software for D2 Phaser, and analyzed by Jade software of MDI with ICDD PDF-4 database of diffraction data for the Siemens D5000 unit, or Bruker Diffrac.Eva software with COD (Crystallographic Open Database) for the D2 Phaser. Phase identification, and quantitative analyses were carried out with MDI's Search/Match with Easy Quant, or Bruker's Diffrac.Eva, and both with Rietveld modules, respectively. A third-party Match! software is also used for transferring raw data from both equipment and processing for phase identification and Rietveld analyses using search/match with the inherent COD database.

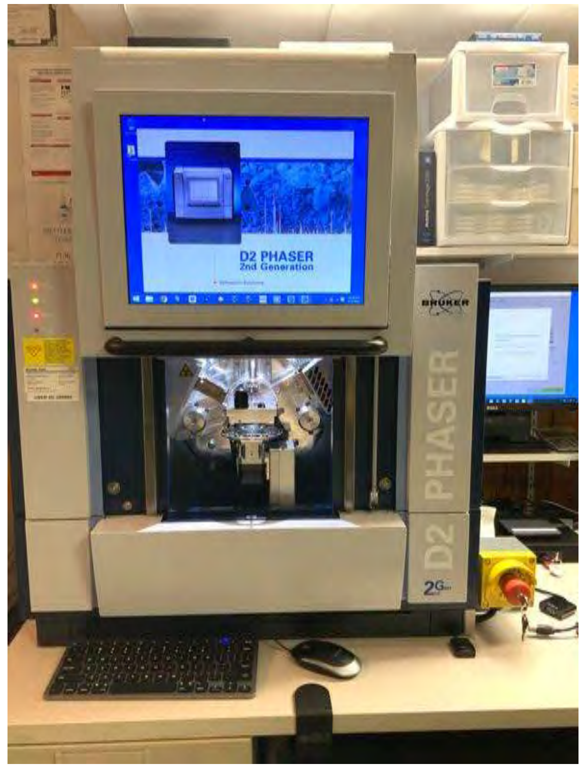


Fig. A6: Bruker D2 Phaser with automated six-sample stage.

Fig. A7: Siemens D5000 X-ray diffractometer and MDI Jade search/match software used for determination of mineralogical composition of mortar. Left to right: Rocklab pulverizer for initial grinding of sample with anhydrous alcohol; McCrone micronizing mill for final grinding; Spex 25-ton press for pellet preparation; Siemens D5000 X-ray diffractometer; and custom-made sample holder to place a 32-mm diameter pellet on sample stage.

X-ray Fluorescence (XRF)

X-ray fluorescence (XRF) is used for determining: (a) major element oxide composition of sample, and, (b) soluble silica content of filtrate after digestion of sample in cold-HCl and hot-NaOH. Major element oxide compositions provide clues about the siliceous sand content of mortar from silica content, type of binder used (e.g., a dolomitic lime or natural cement based binder gives a characteristically higher magnesia than a calcitic lime or Portland cement based binder), calculation of lime content in a cement-lime mortar from bulk CaO content from XRF, effect of alterations and deteriorations (e.g., salt ingress in a mortar from marine environment can be diagnosed from excessive sodium, sulfate, and chlorine, etc.), etc. A series of standards from Portland cements, lime, gypsum, to various rocks, and masonry cements of certified compositions (e.g., from USGS, GSA, NIST, CCRL, Brammer, or measured by ICP) are used to calibrate the instrument for various oxides, and empirical calculations are done from such calibrations to determine oxide compositions of mortars. For mortars with highly unusual compositions (e.g. severely salt-contaminated or a gypsum-based mortar) a standard-less FP calculation is done to determine the best possible composition.

Fig. A8: Rigaku NEX-CG in CMC, which can perform analyses of 9 pressed pellet or fused bead of sample. Samples are prepared either as pressed pellet (usually the one already prepared for XRD) or can also accommodate fused bead with proper calibration of standard beads

An energy-dispersive bench-top X-ray fluorescence unit from Rigaku Americas Corporation (NEX-CG) is used. Rigaku NEX-CG delivers rapid qualitative and quantitative determination of major and minor atomic elements in a wide variety of sample types with minimal standards. Unlike conventional EDXRF analyzers, the NEX-CG was engineered with a unique close-coupled Cartesian Geometry (CG) optical kernel that dramatically increases signal-to-noise. By using monochromatic secondary target excitation, instead of conventional direct excitation, sensitivity is further improved. The resulting dramatic reduction in background noise, and simultaneous increase in element peaks result in a spectrometer capable of routine trace element analysis even in difficult sample types. The instrument is calibrated by using various certified (CCRL, NIST, GSA, and Brammer) reference standards of cements and rocks. The same pressed pellet used for XRD for mineralogical compositions is used for XRF to determine the chemical composition.

Thermal Analyses (TGA, DTG, and DSC)

Thermal analyses encompasses: (1) thermogravimetric analysis (TGA), which measures the weight loss in a sample as it is heated, where weight loss can be related to specific physical decomposition of a phase of interest at a specific temperature that is characteristic of the phase from which both the phase composition and the abundance can be determined; (2) differential thermal analysis (DTA, or first derivative of TGA i.e. DTG) measuring temperature difference between the sample and an inert standard (Al_2O_3) both are heated at the same rate and time where endothermic peaks are recorded when the standard continues to increase in temperature during heating but the sample does not due to decompositions (e.g., dehydration of hydrous or decarbonation of carbonate phases); the endothermic or exothermic transitions are characteristic of particular phase, which can be identified and quantified using DTA (or DTG); and (3) differential scanning calorimetry (DSC), which follows the same basic principle as DTA, whereas temperature differences are measured in DTA, during heating using DSC energy is added to maintain the sample and the reference material (Al_2O_3) at the same temperature; this energy use is recorded and used as a measure of the calorific value of the thermal transitions that the sample experiences; this is useful for detection of quartz that undergoes polymorphic (α to β form) transitions and no weight loss.

Thermal analyses are done to determine the presence and quantitative amounts of: (a) hydrates (e.g., combined water liberated from paste dehydration during decomposition of calcium-silicate-hydrate component in paste at 180-190ºC); (b) sulfates (gypsum from decompositions at 125ºC, and 185-200ºC, ettringite at 120-130ºC, thaumasite at 150ºC); (c) brucite from its dehydroxylation at 300-400ºC to confirm the presence of dolomitic lime; (d) hydrate water from decomposition of Portlandite component of paste at 400-600ºC; (e) quartz from polymorphic transformation (α to β form) at 573ºC; (f) cryptocrystalline calcite in the carbonated lime matrix from decomposition at 620-690ºC, or magnesite at 450-520ºC, or (g) coarsely crystalline calcite e.g., in limestone by decomposition at 680-800ºC or (h) dolomite at 740-800ºC and 925ºC, and (i) phase transition of belite (C_2S) at 693ºC, etc. Phases are determined from their characteristic decomposition temperatures occurring mostly as endothermic peaks or polymorphic transition temperatures as for quartz.

Fig. A9: Mettler-Toledo simultaneous TGA/DSC1 unit in CMC that can accommodate 32 samples. The top left photo shows the TGA/DSC1 unit with sample robot for automation as well as the sample holder for pressing aluminum sample holders. Sample is pulverized in a ring pulverizer shown in the bottom left, then a small amount (usually 30-70 mg) is weighed in a precision balance (shown 2nd from left in bottom row) and taken in an alumina sample holder (without lid). For DSC measurements up to 600°C, sometimes sample is taken in an aluminum holder and pressed in sample press (3rd from left in bottom row) and pierced with a needle for release of volatiles from decomposition. A PolyScience chiller (rightmost one in the bottom row) is used to cool the furnace. An ultrapure nitrogen gas is purged through the system during analyses.

a. 120-150°C = Ettringite decomposition from cement paste (thaumasite at 150ºC) and water release (endotherm);

b. 120, 180-200°C = Gypsum decomposition and water release (endotherm);

c. 100-200ºC = Hydrate water from decomposition of calcium silicate hydrate (CSH);

d. 300-400°C = Brucite decomposition from dolomitic lime mortar (or from soluble magnesium salts in the paste from the use of natural cement) and water release (endotherm);

e. 400-600°C = Portlandite decomposition from Portland cement paste and water release (endotherm);

f. 500-680°C = Magnesite decomposition for dolomitic lime mortar (endotherm);

g. 573°C = Alpha-to-beta polymorphic transformation of quartz the main component of silica sand in mortar;

h. 620-690°C = Calcite decomposition for cryptocrystalline calcite formed during carbonation of lime in mortar;

i. 680-800°C= Calcite decomposition for coarsely crystalline calcite in limestone or marine shells (endotherm);

j. 740-800ºC = Dolomite decomposition (endotherm);

k. >950°C = Slight exotherm from initial surface reaction of lime and silica, followed by larger endotherm from melting.

Simultaneous TGA and DSC analyses are done in a Mettler Toledo TGA/DSC 1 unit on 30-70 mg of finely ground (<0.6 mm) sample in alumina crucible (70 µl, no lid) from 30°C to 1000°C at a heating rate of 10°C/min with high purity nitrogen as purge gas at a flow rate of 75.0 ml/min. TGA/DSC 1 simultaneously measures heat flow in addition to weight change. The instrument offers high resolution (ultra-microgram resolution over the whole measurement range), efficient automation (with a reliable sample robot for high sample throughput), wide measurement range (measure small and large sample masses and volumes) broad temperature scale (analyze samples from ambient to 1100°C), superior ultra-micro balance, simultaneous DSC heat flow measurement (for simultaneous detection of thermal events, e.g., polymorphic alpha-to-beta transition of quartz and quartz content), and a gastight cell (ensures a properly defined measurement environment).

Fourier Transform Infra-Red Spectroscopy (FT-IR)

Fourier-transform infrared spectroscopy (FT-IR) measures interaction between applied infrared radiation and the molecules in the compounds of interest (Middendorf et al. 2005). FT-IR is particularly useful for detection of admixture, additives, and polymer resins, mainly to identify various organic components (functional groups) in mortar (e.g., methyl CH_3, organic acids CO-OH, carbonates CO_3) from their characteristic spectral fingerprints in FT-IR spectrum. FT-IR can also be used for detection of main mineral phases in a hydraulic binder, CSH, carbonates, gypsum, and clays (Middendorf et al. 2005). Organic compounds such as synthetic (e.g., acrylics, polyesters) and natural resins, carbohydrates, colorants, oils and fats, proteins, waxes as well as inorganic compounds, e.g., corrosion products, minerals, pigments, paints, fillers, stone, glass, and ceramics can be detected by this technique.

Fig. A10: Perkin Elmer Spectrum 100 FT-IR unit with Universal ATR attachment for examinations of coatings on mortars.

FT-IR measurements are done in a Perkin Elmer Spectrum 100 FT-IR spectrophotometer running with Spectrum 10 software. Sample is measured using attenuated total reflection (ATR) on a single bounce diamond/ZnSe ATR crystal between a frequency range of 4000 to 650 cm^{-1}. Each run is collected at 4 cm^{-1} resolution with Strong Beer-Norton apodization. Data are collected with a temperature-stabilized deuterated triglycine sulfate (DTGS) detector by placing the sample in contact with the ATR crystal and by applying force from the pressure applicator supplied with the ATR accessory. The application of pressure enable the sample to be in intimate contact with the ATR crystal, ensuring achievement of a high-quality spectrum. Additionally, more conventional KBr pellet is also sometimes used for samples on as-needed basis.

Ion Chromatography

Salts can cause various deteriorations from: (a) mere aesthetic issues of surface efflorescence by precipitation from evaporation of leachates on the surfaces followed by atmospheric carbonation of the precipitates where salts deposit as individual crystals or as crust to (b) more serious internal distress in mortar from crystallization inside the pores (sub-fluorescence or crypto-fluorescence) from expansive forces associated with crystallization of salt from supersaturated solutions. Some common salts are calcium carbonates (e.g., calcite, vaterite), magnesium carbonate

(magnesite), sodium carbonate hydrate and bicarbonate (thermonatrite, trona, nahcolite), sulphates (gypsum, thenardite, epsomite, melanterite, mirabilite, glauberite, or ettringite and thaumasite from oxidation of sulfides or cement hydrates), and chlorides (halite, sylvite, calcium oxychloride from deicing salts, salt-bearing aggregates, ground water). X-ray diffraction and SEM-EDS can determine many of these salts as long as they are present in detectable amounts. Ion chromatography is an established technique used for analyses of various water-soluble anions and cations in salts (e.g., chloride, sulfate, and nitrate anions, and magnesium, calcium, alkali, ammonium cations) to assess magnitude of environmental impacts on masonry units and mortars, and subsequent effects of such salt ingress. Samples are pulverized, digested in deionized water to remove all water-soluble salts, then solid residues are filtered out and the water-digested filtrates are analyzed by an ion chromatograph.

Ion chromatography methods are described in ASTM D 4327 "Standard Test Method for Anions in Water by Chemically Suppressed Ion Chromatography." Briefly, an aliquot of 1 gram of pulverized sample (passing No. 50 sieve) is digested in 50 ml deionized water for 6 to 8 hours on a magnetic stirrer at a temperature below boiling point of water; then the digested sample is filtered through two 2.5-micron filter papers using vacuum, followed by a second filtration through micro-filter (0.45 micron) paper, then the filtrate is either used directly or diluted to 100 to 250 ml with deionized water depending on the concentration of anions, and used for analysis to get ppm-level fluoride, chloride, nitrite, bromide, nitrate, phosphate, and sulfate in the water-digested sample in Metrohm 861 Advanced Compact IC. The instrument is calibrated against ten different custom-made Metrohm anion standard solutions having all these anions from 10-ppm to 100-ppm levels. To check the accuracy of the instrument, a solution of know concentration is run first prior to the analyses of samples. Weight percent concentrations are obtained from (ppm-results times original filtrate volume times dilution factor) divided by sample weight.

Steps Followed During Laboratory Testing

Figure A12 shows the four main steps followed during laboratory investigation of masonry mortars, e.g.,

a. From preliminary visual examinations to petrographic examinations of mortars to determine the types of aggregates used and the binders present, based on which
b. Subsequent chemical analyses were done to determine the chemical compositions of binders and proportions of sand, water, and degree of carbonation. Information obtained from petrographic examinations is useful and form the very guidelines to devise the appropriate chemical methods to follow, and to properly interpret the results of chemical analyses.
c. For example, detection of siliceous versus calcareous versus argillaceous natures of aggregates in mortar, or the presence of any pozzolan in the binder (slag, fly ash, ceramic dusts, etc.) from petrography restricts which chemical method to follow, and how to interpret the results of such analyses, e.g., acid-insoluble residue contents.
d. Therefore, a direct chemical analysis e.g., acid digestion of a mortar without doing a prior petrographic examination to determine the types of aggregates and binder used could lead to highly erroneous results and interpretation.
e. Armed with petrographic and chemical data and based on assumed compositions and bulk densities of the sand and the binder(s) similar to the ones detected from petrographic examinations volumetric proportions of sand and various binders present in the examined mortar can be calculated.
f. The estimated mix proportions from such calculations can provide at least a rough guideline to use as a starting mix during formulation of mock-uprepointing mixes to match with the existing mortar.

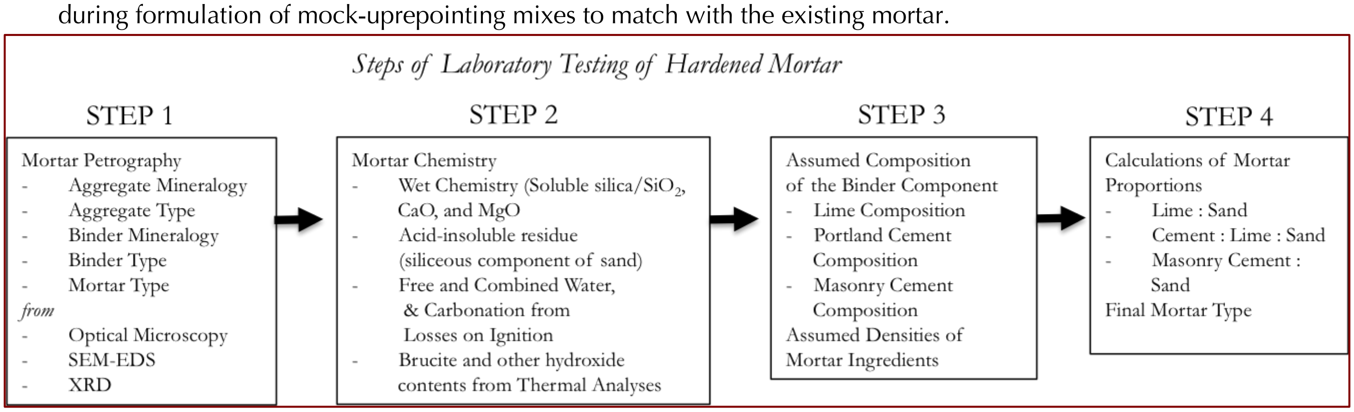


Fig. A12: Steps followed during laboratory investigation of mortar.

Laboratory Analyses of Masonry Mortars

Initial Mortar (50 to 100 grams) [Photographed with digital camera & flat-bed scanner, As-received condition, total weight, and dimensions of largest piece are documented]

Intact Pieces (20+ g)

1. Optical Microscopy

I. Perform visual examination of mortar as received, then saw-cut and fractured surfaces and with a low-power stereomicroscope,
II. Take digital and flat bed scanner photos of intact piece(s),
III. Encapsulate the piece for thin section microscopy in a flexible mold with a low-viscosity colored or fluorescent dye-mixed epoxy to highlight voids, pores, cracks, etc.,
IV. Prepare thin section (< 30 micron thickness) and polish the thin section for optical and SEM-EDS analyses,
V. Scan the thin section on a flat-bed scanner with the thin section residue,
VI. Take transmitted light high-power stereo-zoom photomicrographs of thin sections from different areas to be stitched to determine volumes and size distributions of pore spaces and sand grains by Image J,
VII. Take plane and crossed polarized-light photomicrographs of sand and binder fractions in thin section from a petrographic microscope and determine areas for further studies by SEM-EDS,
VIII. Do detailed petrographic examinations to determine the sand and binder compositions, sand mineralogy and texture, binder phases, residual binders, alterations, and products of any deleterious reactions, immersion mounts of specific areas of interest, etc.

2. SEM-EDS

I. Put conductive coating only on the portion of polished thin section intended for SEM-EDS studies from optical microscopy,
II. Take backscatter and/or secondary electron images, and if needed X-ray elemental maps,
III. Select multiple areas on paste to determine oxide compositions and Eckel's cementation indices,
IV. Tabulate the paste composition variations across the backscatter/secondary electron image.
V. Determine chemical compositions of resides left from the original components of the binders, as well as the hydration and carbonation and other alteration products

Lightly hand-ground in a Mortar & Pestle (30+ g)

3. Acid Digestion - Sand Color & Sand Size Distribution (10 g)

I. Take 10 g. of mortar lightly ground in mortar & pestle and digest in HCl (1+3) in a 250 ml beaker on a magnetic stirrer until all sand separates and settles at the bottom of beaker,
II. Filter all through two 2.5 micron filter paper, wash the beaker, filter paper, and all sand residue with dist. water,
III. Dry the residue at 110°C in an oven for 10 min., gently brush out from the filter paper and collect, then sieve the entire sand residue through No. 4 through 200 sieves in a mini sieve shaker (e.g., from Gilson),
IV. Determine the mass retained on each sieve, and on the pan (finer than No. 200 sieve),
V. Take photomicrographs of sand particles retained on each sieve for sand color variations in a stereomicroscope.

4. Acid & Alkali Digestion – Soluble Silica for Hydraulic Binder (5 g)

I. Grind 5-6 g of lightly ground fraction from mortar & pestle in a WC pulverizer for 30 sec.
II. Sieve thru. No. 50 sieve, collect the fraction passing the sieve,
III. Re-grind the residue retained on sieve for 15 sec. and mix thoroughly with the previous fraction;
IV. Use 5.000 g of thus prepared powder (passing No. 50 sieve) for digestion in 100 ml cold (3-5°C/38-41°F) HCl (1+4) in a 250 ml beaker for 15 min. on a magnetic stirrer,
V. Filter thru. two 2.5 micron filter paper and keep the filtrate# 1,
VI. Digest the residue with filter paper in 75 ml hot NaOH (below boiling) on hot plate for 15 min. on magnetic stirrer,
VII. Cool down to room temp. and filter thru. two 2.5 micron filter paper and collect filtrate# 2,
VIII. Combine these two filtrates, filter the combined filtrates thru. two 2.5 micron filter paper to remove any suspended silica (especially for sand-rich mortars, or if mortar is grounded too long); then dilute to 250 ml in a volumetric flask with dist. water, an aliquot (about 10 ml) is then used for XRF for soluble silica determination against the calibrations with standard PC mortars of known soluble silica contents prepared in the same way.

5. Acid Digestion – Acid-Insoluble Residue Content for Siliceous Sand Content (2 g)

I. Take 1-2 g of prepared mortar powder from Step 4 iii (passing No. 50 sieve) and digest in 50 ml HCl (1+3) in a 250 ml beaker (covered) on a hot pate rapidly near boiling, then 15 min. at a temp. below boiling, then cool down to room temperatures,
II. Filter thru. two pre-weighed 2.5 micron filter papers, washing the beaker, paper, and residue thoroughly with hot water,
III. Dry the filter paper at 110C for 10 min, cool in a desiccator to room temp. and measure the weight.
IV. Subtract from mass of dry filter paper to determine acid-insoluble residue content.

6. Chemical Analysis – Loss On Ignition for Free and Combined Water Content, and Carbonate plus Carbonation (2 g)

I. Take 1-2 g (W_1) of prepared mortar powder from Step 3 iii (passing No. 50 sieve) in a tarred porcelain crucible (keep a record of mass of the empty crucible),
II. Dry at 110°C for 15 min in a muffle furnace pre-set to 110°C, cool in a desiccator to room temp. and measure the mass (W_2) by subtracting the empty crucible mass from the total mass,
III. Ignite at 550°C for 15 min. in the muffle furnace pre-set to 550°C, cool in a desiccator to room temp. and measure the mass (W_3) by subtracting the empty crucible mass from the total mass,
IV. Ignite at 950°C for 15 min. in the muffle furnace pre-set to 950°C, cool in a desiccator to room temp. and measure the mass (W_4) by subtracting the empty crucible mass from the total mass,
V. Calculate the losses on ignition at 110°C, 550°C, and 950°C for free water, combined water, and carbonate plus degree of carbonation, respectively.

7. Mineralogy of Bulk Mortar, Extracted Sand, Extracted Binder, or Salt from XRD (at least 8 g)

I. Weigh 8.00 g of mortar (or extracted sand or binder as needed) lightly ground in a mortar & pestle, add three grinding/pelletizing aid tablets (e.g., from Oxford Instruments) and pulverize in a suitable mill to minimize contamination (e.g., Rocklab pulverizer with WC bowl or McCrone Micronizing Mill with agate) for 3 min. with anhydrous alcohol to get <45 micron size particles passing U.S. No. 325 sieve,
II. Take 6.8 to 7.0 g. of ground <45 micron prepared mass in an aluminum sample holder inside a stainless steel die to prepare a 32 mm pellet with 25 ton pressure for 1 min,
III. Use the prepared pellet for XRD and then use the same pellet for XRF.
IV. Do XRD on the binder-rich fraction, or salt either on a shallow-depth sample holder or preferably on a zero background quartz plate for small volume of sample.

8. Bulk Mortar's Composition from X-Ray Fluorescence (XRF) (same pellet used in XRD)

I. Use the same pellet prepared for XRD in the XRF, or, use a fused bead if sample volume is low to prepare a pellet. In either method, have calibrations of measured oxides with adequate standard.
II. XRF can also be used with proper calibrations for soluble silica determination on the filtrates after acid and alkali digestions, as described in Section 4.

9. Thermal Analyses (0.1 g), TGA, DTG, DSC, DTA, for quantitative analysis of various hydrous, sulfate, and carbonate phases in mortar, content of dolomitic lime added from the brucite content in mortar as determined from TGA or DSC, etc.

I. Simultaneous TGA and DSC analyses can be done on 30-70 mg of finely ground (<0.6 mm) mortar in alumina crucible (70 µl, no lid) from 30°C to 1000°C at a heating rate of 10°C/min with high purity nitrogen as purge gas at a flow rate of 75.0 ml/min .

10. Infrared Spectroscopy, for determination of various organic additives, paint, and clays in mortar

I. Take an aliquot of powder prepared for thermal analysis, or peel a paint and use that in Universal ATR of FTIR.
II. Alternately, digest a pulverized mortar in acetone to extract the organic additive and analyze the liquid in FTIR for characteristic functional groups.

11. Ion Chromatography of Water-Soluble Salts (1 g)

I. Take an aliquot of 1.00 gram powder prepared for chemical analysis (i.e. passing U.S. No. 50 sieve), digest in hot (below boiling) 50 ml distilled or deionized water for at least 6 hours in a beaker on a magnetic stirrer covered with watch glass, filter the solid residues out to collect the filtrate and analyze the final 100 ml of filtrate for soluble salts (chloride, sulfate, nitrate, nitrite, phosphate, etc.) by ion chromatography.

Fig. A13: Outlines of step-by-step procedures of various laboratory analytical methods for examination of a masonry mortar.

Which Technique(s) to Use?

The following Table summarizes various properties of mortars obtainable by different laboratory techniques, including relative merits of these techniques for specific information.

Information	Optical Microscopy	SEM-EDS	XRD	XRF	Chemical (Gravimetry)	Chemical (Titration & IC)	Sieve Analyses of Sand	Thermal	FTIR
Mortar Sand Type	X	X	X	X		X			
Sand Composition	X	X	X	X					
Sand Mineralogy	X	X	X						
Sand Soundness	X	X							
Sand Fineness	X						X		
Sand Grading & Color	X						X		
Mortar Binder Type(s)	X	X	X					X	
Binder Composition	X	X	X					X	
Binder Microstructure	X	X							
Portland Cement	X	X	X	X				X	
Hydrated Calcitic Lime	X	X						X	
Dolomitic Lime	X	X	X					X	
Hydraulic Lime	X	X							
Masonry Cement	X	X							
Natural Cement	X	X							
Carbonation	X	X	X					X	X
Carbonated Paste vs. Carbonate Sand	X							X	
Fillers	X	X						X	
Organic Components		X						X	X
Surface Treatments	X	X							X
Clay Contaminants	X		X					X	X
Mortar Type	X	X			X				
Masonry Discoloration	X	X	X	X				X	
Masonry Cracking	X	X	X						
Mortar Softening	X	X			X				
Mortar Crumbling	X	X	X		X				
Mortar Cracking	X	X	X	X			X	X	
Mortar Discoloration	X	X	X	X					
Mortar Shrinkage, Stiffening	X	X							
Bond to Masonry	X	X							
Masonry efflorescence	X	X	X	X					
Salt Attack	X	X	X			X		X	
Polymer								X	X
Mix Proportion	X	X	X	X	X				
Repointing Mortar Suggestions	X	X	X	X	X		X	X	X
Miscellaneous Failure Analysis	X	X	X	X	X			X	X

Techniques: Optical microscope = Low power stereomicroscope, petrographic microscope having reflected and transmitted-light facilities. SEM-EDS = Scanning electron microscopy and energy-dispersive X-ray microanalysis. XRD = X-ray diffraction. XRF = X-ray fluorescence. Gravimetry = Loss on ignition, acid-insoluble residue, and soluble silica. Titration = Potentiometric titration for chloride. IC = Ion chromatography for chloride, sulfate, and nitrate anions. Sieve Analysis = Grain size distribution of sand extracted from mortar. Thermal = Thermogravimetric analysis (TGA) i.e. weight loss under controlled heating, and differential scanning calorimetry (DSC) i.e. measurement of differential heat flow during heating. FTIR = Fourier Transform Infrared Spectroscopy.

APPENDIX 2 –
SUGGESTIONS FOR REPOINTING MORTAR

SUGGESTIONS ON FORMULATION OF REPOINTING MORTARS

The following two Tables provide various repointing mortar formulations, many of which are commonly suggested for historic as well as modern masonry renovation projects, where the choice depends on: (a) the type of the masonry units present, (b) the exposure condition during service, and (c) the type of the original mortar present. The following suggestions from various references are for general guideline purposes only and provide no guarantee to the overall match in appearance and properties to the existing mortars, which must be determined by trial and error by the project architect/engineer.

Masonry Units	Mortar Type		
	Sheltered	Moderate	Severe
Very hard and durable (e.g., granite, hard-cored brick, etc.)	Type O (1-2-9), or, 1-part NHL 3.5 to 2-part sand	Type N (1-1-6), or, 1-part NHL 3.5 to 5 to 2-part sand	Type S (1-0.5-4.5) or, 1-part NHL 3.5 to 5 to 2-part sand
Moderately hard and durable (e.g., limestone, durable stone, molded brick)	Type K (1-3-11), or, 1-part NHL 2 to 3.5 to 2-part sand	Type O (1-2-9), or, 1-part NHL 3.5 to 2-part sand	Type N (1-1-6), or, 1-part NHL 3.5 to 5 to 2-part sand
Minimally durable, soft (soft hand-made brick)	Type L (0-1-3), or, 1-part NHL 2 to 2-part sand	Type K (1-3-11), or, 1-part NHL 2 to 3.5 to 2-part sand	Type O (1-2-9), or, 1-part NHL 3.5 to 2-part sand

Table A2-1: Various possibilities of repointing mortars made using cement, lime, and sand for various masonry units and exposure conditions (Mack and Speweik, 1998), where the mix proportions by volume within parentheses indicate cement-to-lime-to-sand proportions for various formulations. Type 'L' is a straight lime mortar containing no cement. For restoration of historic structures containing lime mortars, natural hydraulic lime (NHL) mortars, or, natural cement – lime mortars are more preferable than modern ASTM C 270 Portland cement-based mortars.

Location	Mortar Type	
	Recommended	Alternative
Interior	Type O, or, 1-part NHL 3.5 to 2-part sand	Type K or Type N
Exterior - Above Grade, Exposed on one side, unlikely to be frozen when saturated, not subject to high wind or other significant lateral load	Type O, or 1-part NHL 3.5 to 2-part sand	Type N or Type K
Exterior – Other than above	Type N, or 1-part NHL 3.5 to 5 to 2-part sand	Type O

Table A2-2: ASTM C 270 Guide for selection of repointing mortar. Mix formulations for different suggestions are as follows: Type K: 1-part Portland cement and $2^1/_2$ to 4 parts hydrated lime; Type O: 1-part Portland cement and $2^1/_2$ parts hydrated lime or lime putty; Type N: 1-part Portland cement to over $1^1/_4$ to $2^1/_2$ parts hydrated lime or lime putty. Aggregate ratio of $2^1/_4$ to 3 times sum of volume of cement and lime for all formulations.

Finally, the following section provides some additional information to consider during selection of an appropriate repointing mortar for a renovation project:

a) It is more important for a repointing mortar to be as close in physical, chemical, and mechanical properties to the existing mortar as possible than to conform to the ASTM C 270 specification for cement-lime or masonry/mortar cement mortars for unit masonry, which are for modern mortars to use for modern structural applications, and not necessarily applicable to renovation of historic lime mortars. As a general rule, repointing mortar should be of same strength or softer than the original mortar.

b) Aggregate to use in the repointing mortar should be similar in color, gradation, appearance, mineralogy, and composition to the sand used in the existing mortar as long as sand to be used does not contain any potentially unsound constituents if detected in the original sand. Sand should be clean, free of any debris, unsound, or clay particles. Masonry sands should conform to the grading requirements of ASTM C 144. Avoid using sand that contains appreciable amounts of potentially alkali-silica reactive particles (e.g., strained quartz, quartzite, chert). Many historic mortars contain fine sand having fineness modulus noticeably lower than modern ASTM C 144 sand, use of excessive fines in sand would increase the water requirement of mortar mix and hence should be substituted with masonry sand in conformance to the grading requirements of ASTM C 144. Carbonate sands, if detected from petrographic examinations (crushed marble, seashell, etc.) should be substituted with similar sands. Clay fractions and micaceous minerals should be avoided since those constituents can absorb moisture and bring undesirable expansions. Brick chips in sand, if detected, are known to develop good mechanical bond to paste and hence should be used from similar sources.

c) Binder for repointing mortar should be as close to the binder of the existing mortar in composition and properties as possible. For historic lime mortars, possible choices of binders are many:

(i) Non-hydraulic high-calcium lime, or magnesian lime, or dolomitic lime (ASTM C 51) either in dry hydrate (hydrated lime) form, or in slurry or putty form;

(ii) Hydraulic lime of various types produced from calcination of impure limestone or dolomite; e.g.,

(iii) Natural hydraulic lime (i.e., NHL 2, NHL 3.5, and NHL 5 with increasing strengths, e.g., for respective applications on stuccos, or brick/stone masonry units, or load-bearing applications; feebly, moderately, and eminently hydraulic natural hydraulic limes with increasing hydraulicity and 28-day compressive strengths from >2 to <7 MPa, to >3.5 to <10 MPa, to >5 to <15 MPa, respectively, produced from calcination of impure limestones having up to 10% clay, 11-20% clay, and 21-30% clay, respectively);

(iv) Natural cements conforming to specifications of ASTM C 10;

(v) A combination of above-mentioned binders, e.g., natural cement and lime binders

(vi) With or without a pozzolan (e.g., fly ash, slag, etc. with lime if added strength and durability are needed);

(vii) Portland or masonry cement, if used must be added at appropriate proportions to lime depending on the applications, having cement-lime proportions tested to find the best match in properties to the existing mortar.

(viii) For breathability of the masonry wall, least stress to the exiting mortar, accommodation of building movements, and good bond to masonry units, the binder of choice should be durable and similar in properties and performance to the existing binder having a good service record.

d) During applications of modern masonry mortars: (i) a job-mixed cement-lime mortar is commonly preferred by the architects than a masonry cement mortar, due to the better quality control of the former mortar; (ii) a masonry cement mortar is characteristically air-entrained, which may interfere with the bond to the adjacent masonry units, whereas, a non-air-entrained cement-lime mortar provides a better bond to the adjacent masonry units than an air-entrained masonry cement mortar, (iii) air entrainment usually provides better workability and freeze-thaw durability to a mortar, however, as mentioned, it reduces the bond to the adjacent masonry units (depending on air content); (iv) for Portland cement-lime mortars, a Type M or S mortar (i.e. having a higher cement content than lime and hence a higher strength) is preferred for load-bearing applications than a Type N mortar (having a higher lime content than cement, hence provides better workability and water retention than a Type S or M mortar); (v) Portland cement to use in a mortar should conform to the specification of ASTM C 150; hydrated lime should conform to ASTM C 207; masonry/mortar cement, if used, should conform to ASTM C 91/C 1329; blended hydraulic cement, if used, should conform to ASTM C 595; (vi) relative proportions of Portland cement and lime will control the overall strength, workability, and bond properties of the repointing mortar.

e) Mineral oxides or carbon-based pigments, if used and positively detected in an examined mortar, should be carefully replicated in the repointing process to reproduce the color, texture, and appearance similar to the existing mortar (including the effects of atmospheric weathering on pigments). Dosage of pigment in the repointing mortars should be estimated from trial mixes of various dosages.

f) If the original mortar contains a polymer component as suspected from microscopy, characterization of polymer should be done by FTIR-spectroscopy.

g) A mortar strong in compressive strength might be desirable for a hard stone (such as granite), whereas a softer, more permeable lime mortar would be preferable for a historic wall of soft brick. Masonry deterioration caused by salt deposition results when the mortar is less permeable than the masonry unit. A strong mortar is still more permeable than hard, dense stone. However, in a wall constructed of soft bricks where the masonry unit itself has a relatively high permeability or vapor transmission rate, a soft, high lime mortar is necessary to retain sufficient permeability; using a strong mortar with a soft brick will result in spalling of bricks.

h) To have an optimum bond of a mortar to the adjacent masonry unit, relative proportions of cementitious materials and lime contents in the mortar should be carefully controlled. Lime provides the necessary workability and water retention, which are important in a mortar when used with a masonry unit of high suction). Therefore, the initial rate of absorption (or suction property) of the adjacent masonry units should also be carefully determined to match with the appropriate lime content in the mortar.

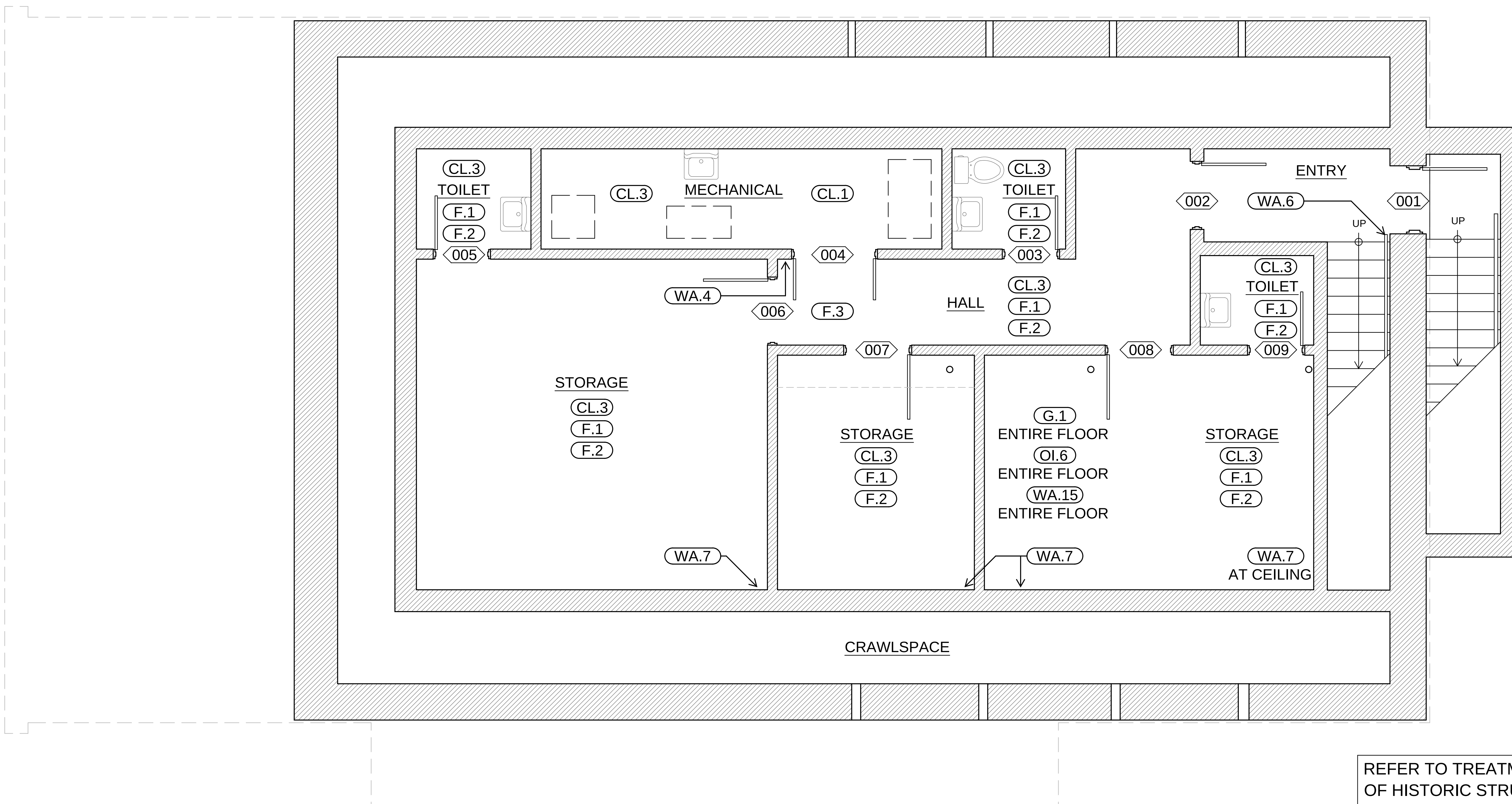
i) The final repointing mortar should match in color and appearance to the existing mortars; the closest match should be determined by trial and error on small test areas of the masonry wall to be tuck-pointed with mock-up mixes.

END OF REPORT[2]

[2] The CMC logo is made using a lapped polished section of a 1930's concrete from an underground tunnel in the U.S. Capitol.

APPENDIX C

ARCHITECTURAL CONDITION ASSESSMENT DRAWINGS



REFER TO TREATMENT CHAPTER OF HISTORIC STRUCTURE REPORT FOR INFORMATION & QUANTITIES FOR TREATMENT CODES

Basement Floor Plan
Scale: $\frac{3}{16}$" = 1'-0"

Fluvanna County Historic Courthouse

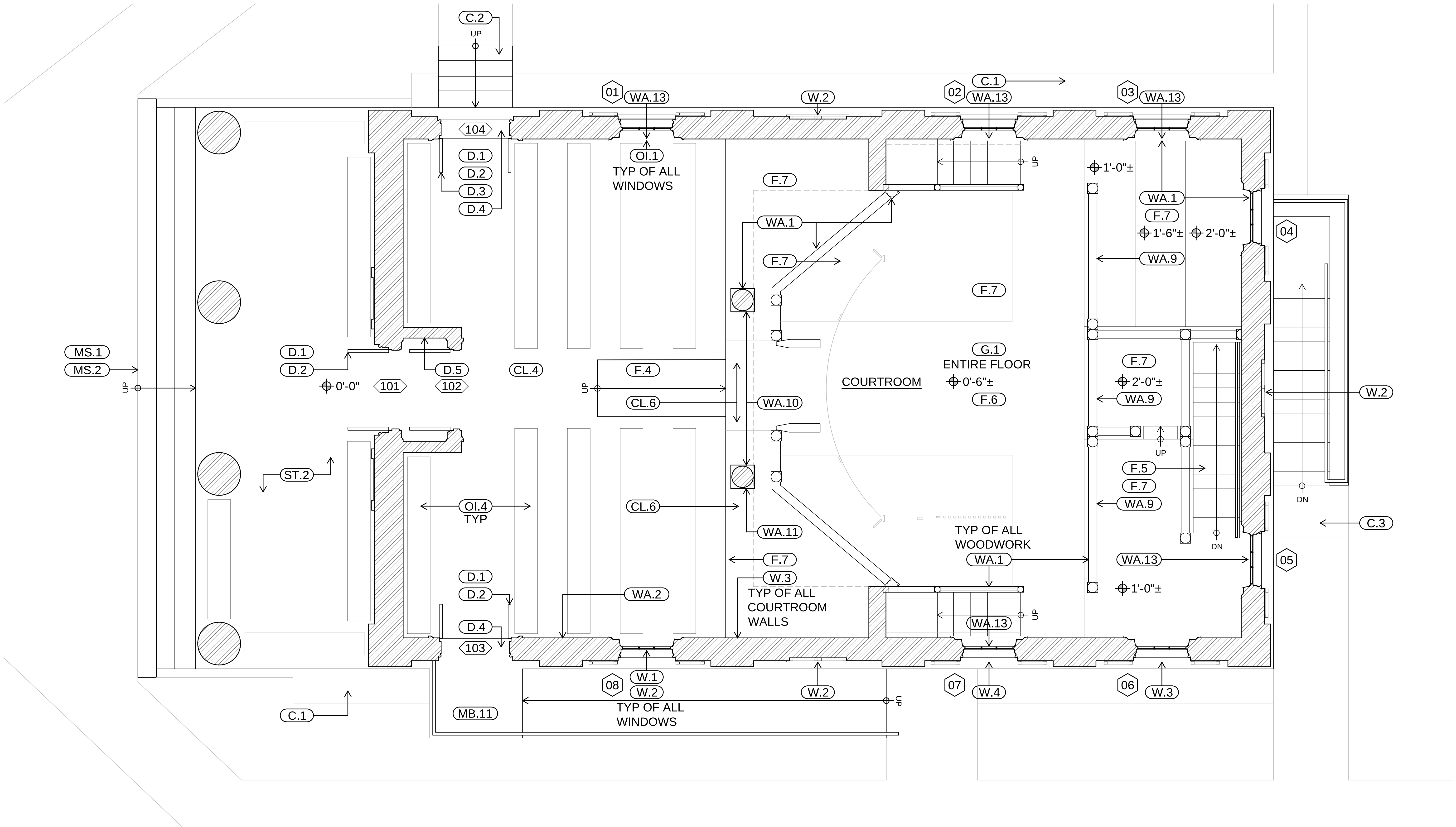
0 2'8" 5'4" 10'8" 21'4" 42'8" 85'4"

21 June 2022

Palmyra, Virginia

John Milner Associates
Preservation • a division of MTFA

Train Architects



Ground Floor Plan

Scale: $\frac{3}{16}$" = 1'-0"

Fluvanna County Historic Courthouse

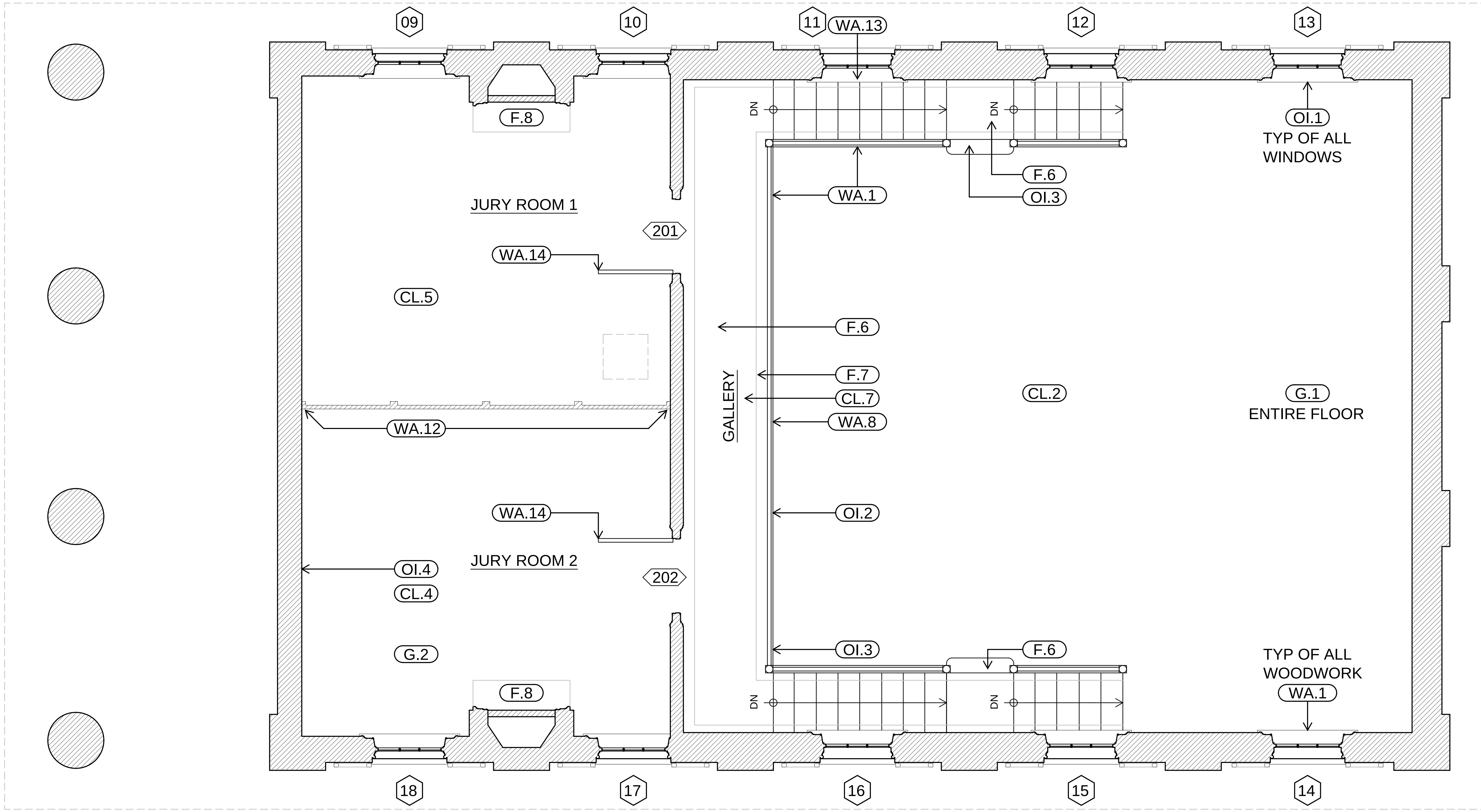
0 2'8" 5'4" 10'8" 21'4" 42'8" 85'4"

21 June 2022

Palmyra, Virginia

John Milner Associates
Preservation • a division of MTFA

Train Architects



Mezzanine Floor Plan
Scale: $\frac{3}{16}$" = 1'-0"

Fluvanna County Historic Courthouse

0 2'8" 5'4" 10'8" 21'4" 42'8" 85'4"

21 June 2022

Palmyra, Virginia

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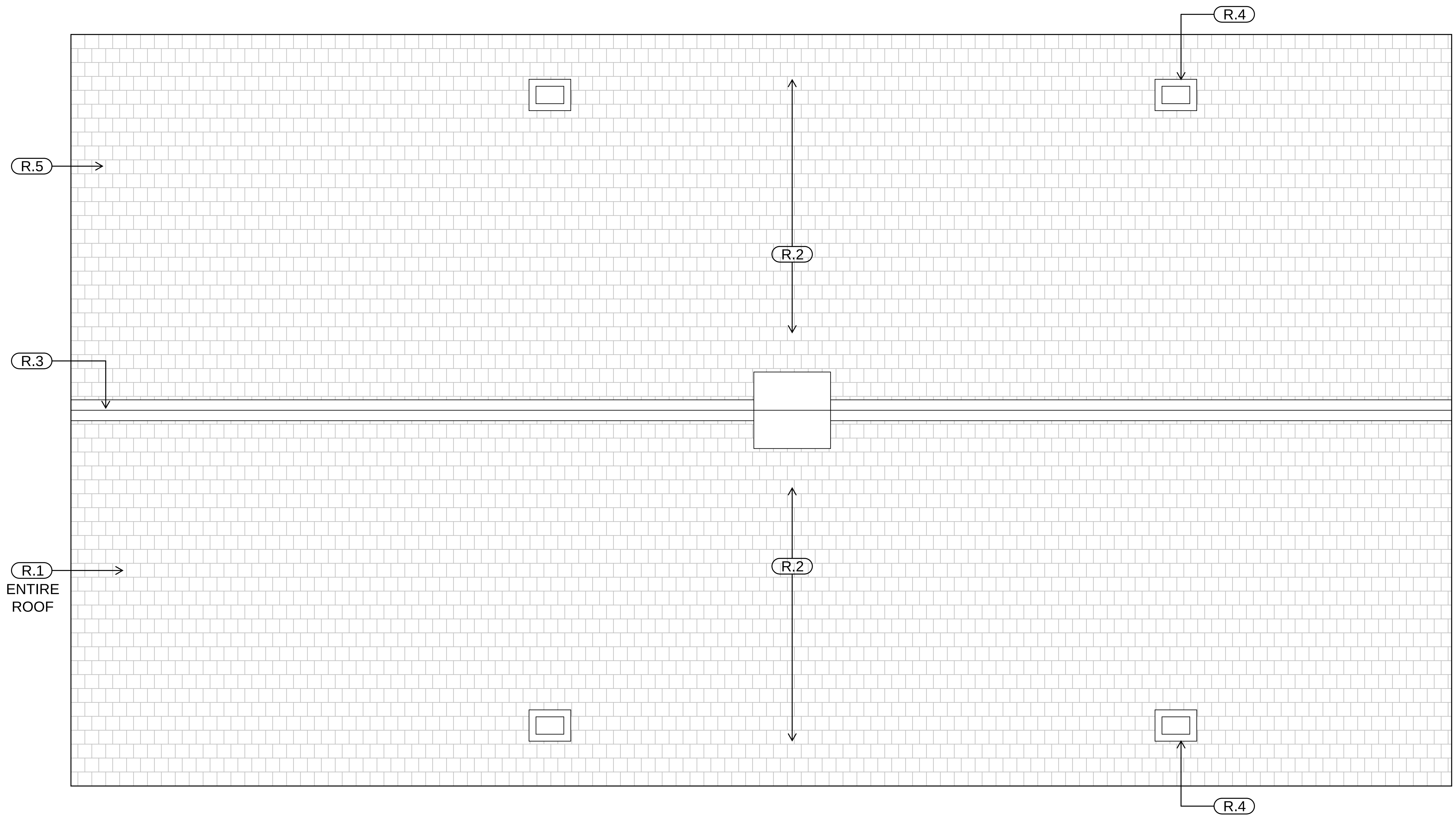
Preservation • a division of MTFA

Train Architects



Roof Plan

Scale: $\frac{3}{16}$" = 1'-0"

Fluvanna County Historic Courthouse

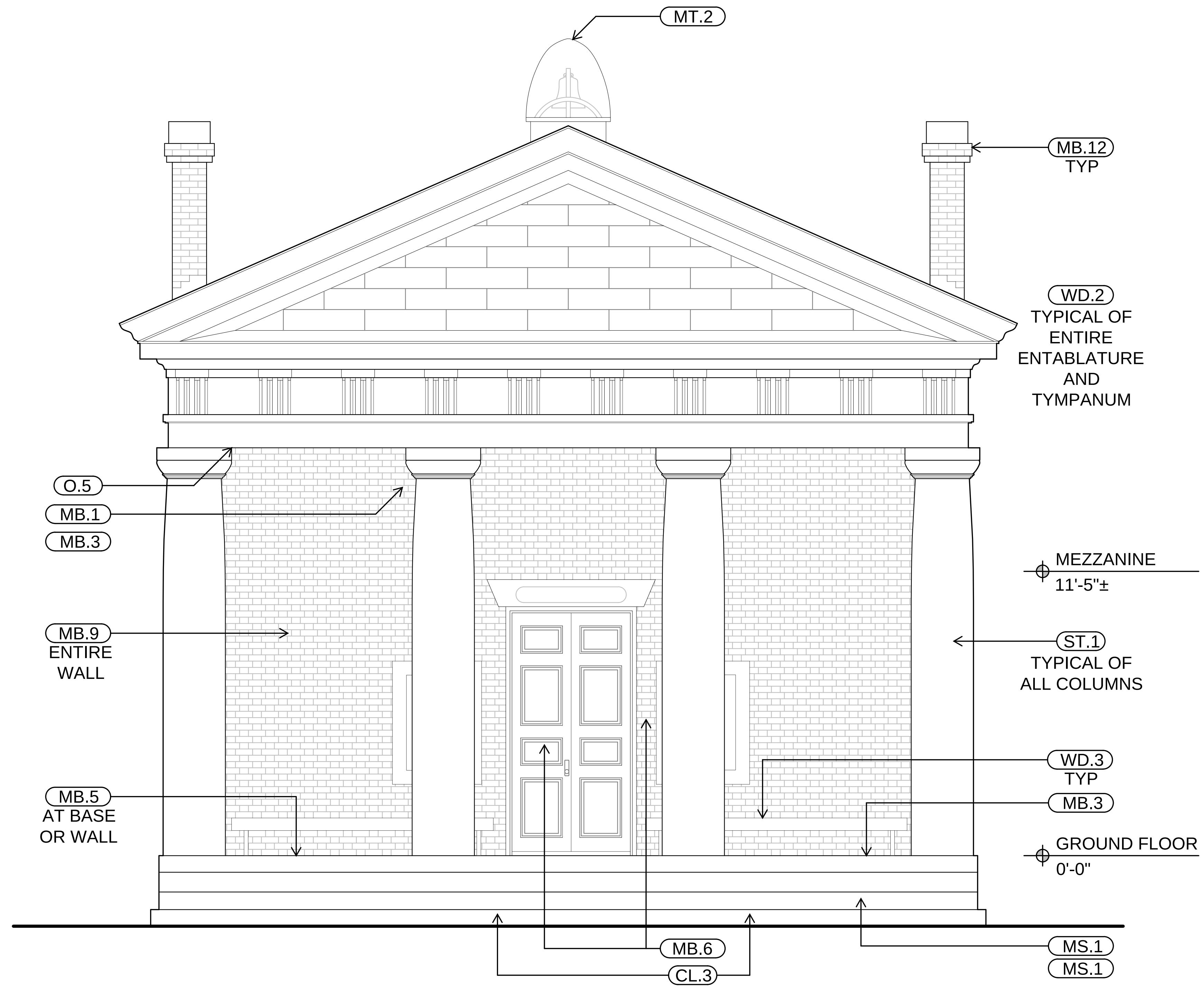
0 2'8" 5'4" 10'8" 21'4" 42'8" 85'4"

21 June 2022

Palmyra, Virginia

John Milner Associates
Preservation • a division of MTFA

Train Architects



Exterior Elevation - South
Scale: $\frac{3}{16}$" = 1'-0"

Fluvanna County Historic Courthouse

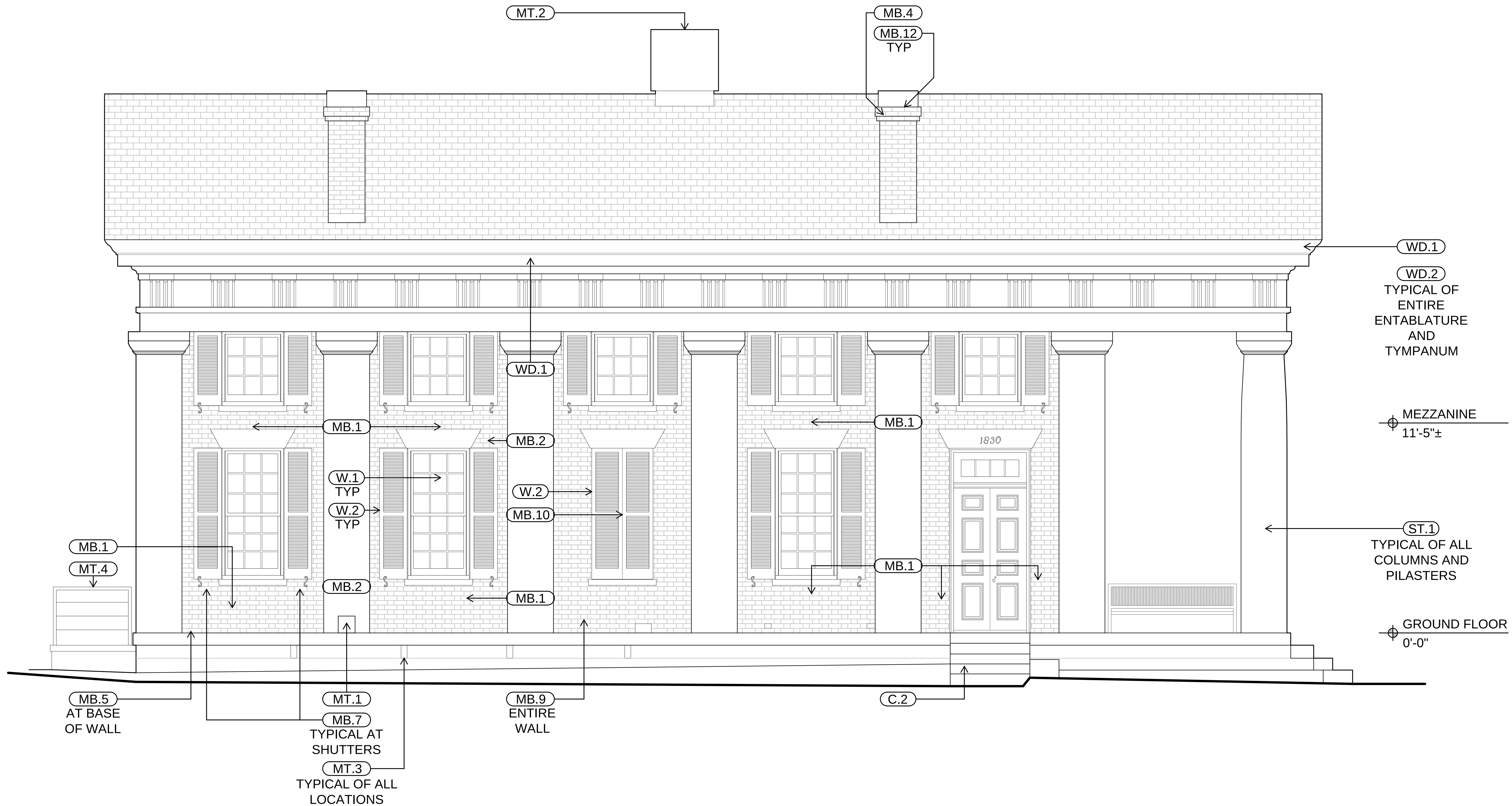
0 2'8" 5'4" 10'8" 21'4" 42'8" 85'4"

21 June 2022

Palmyra, Virginia

John Milner Associates
Preservation • a division of MTFA

Train Architects



Exterior Elevation - West

Scale: $\frac{3}{16}$" = 1'-0"

Fluvanna County Historic Courthouse

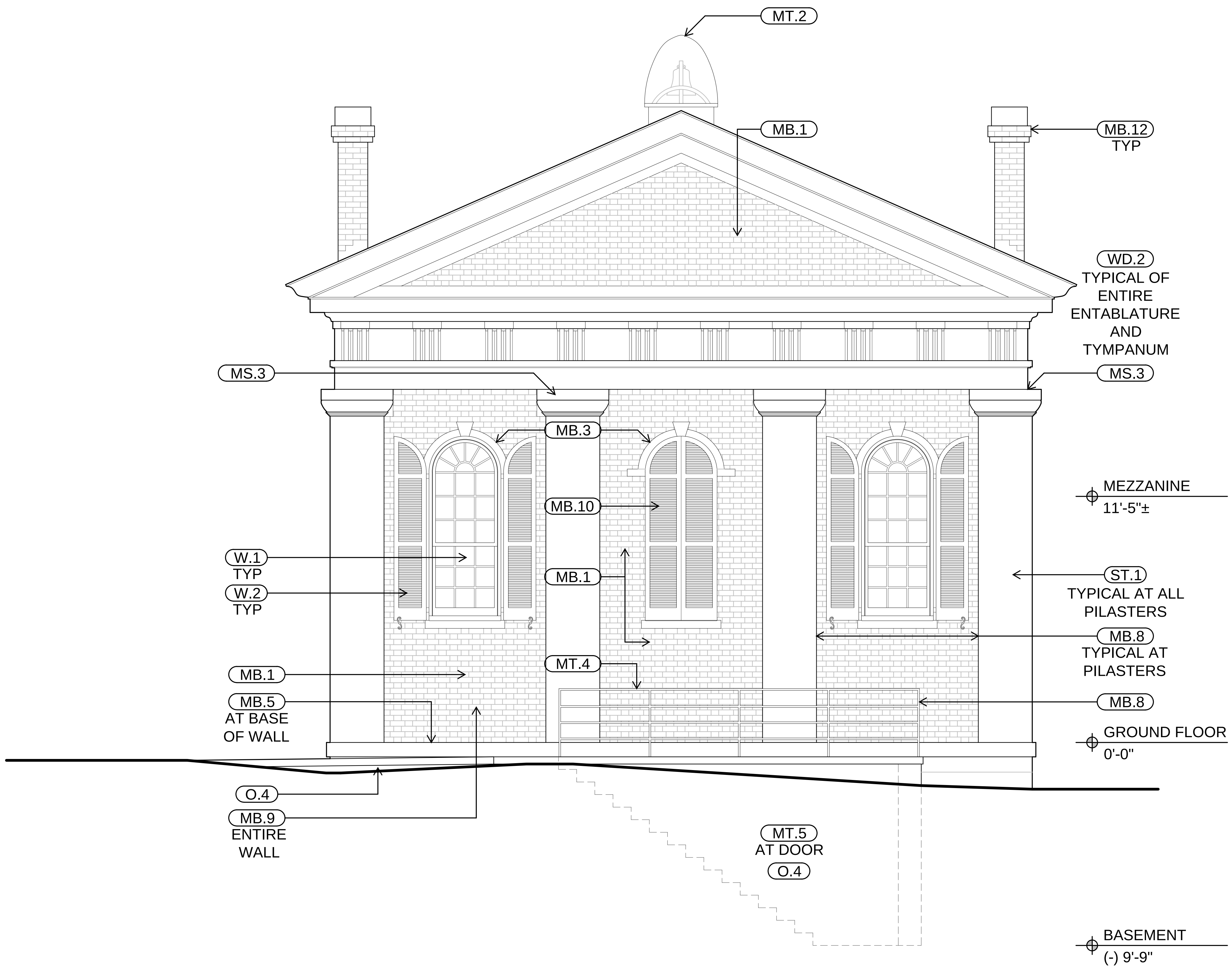
0 2'8" 5'4" 10'8" 21'4" 42'8" 85'4"

21 June 2022

Palmyra, Virginia

John Milner Associates
Preservation • a division of MTFA

Train Architects



Exterior Elevation - North

Scale: $\frac{3}{16}$" = 1'-0"

Fluvanna County Historic Courthouse

0 2'8" 5'4" 10'8" 21'4" 42'8" 85'4"

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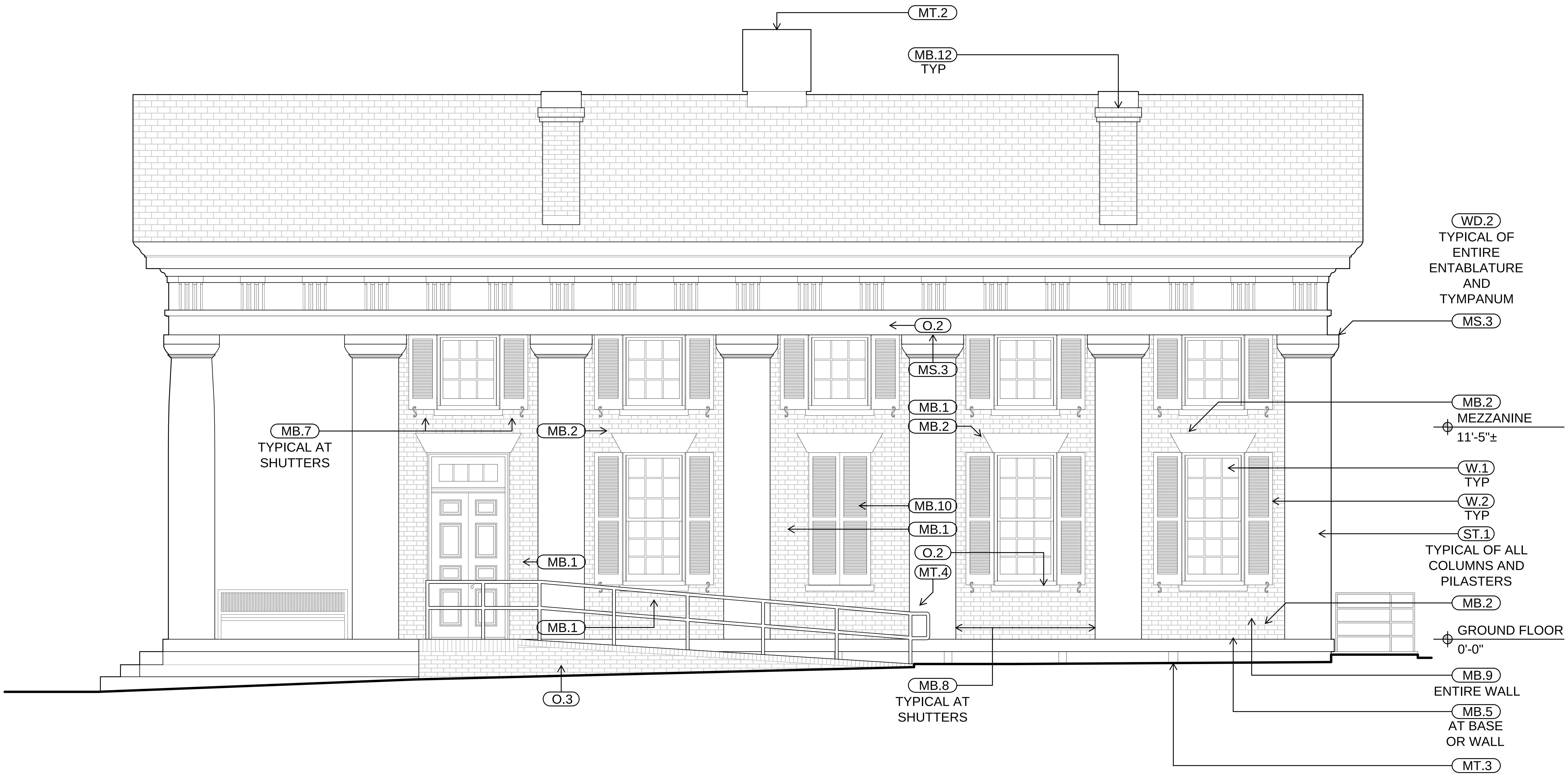

Exterior Elevation - East
Scale: $\frac{3}{16}$" = 1'-0"

Fluvanna County Historic Courthouse

0 2'8" 5'4" 10'8" 21'4" 42'8" 85'4"

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Longitudinal Section - Thru Entry
Scale: 3/16" = 1'-0"

Fluvanna County Historic Courthouse

0 2'8" 5'4" 10'8" 21'4" 42'8" 85'4"

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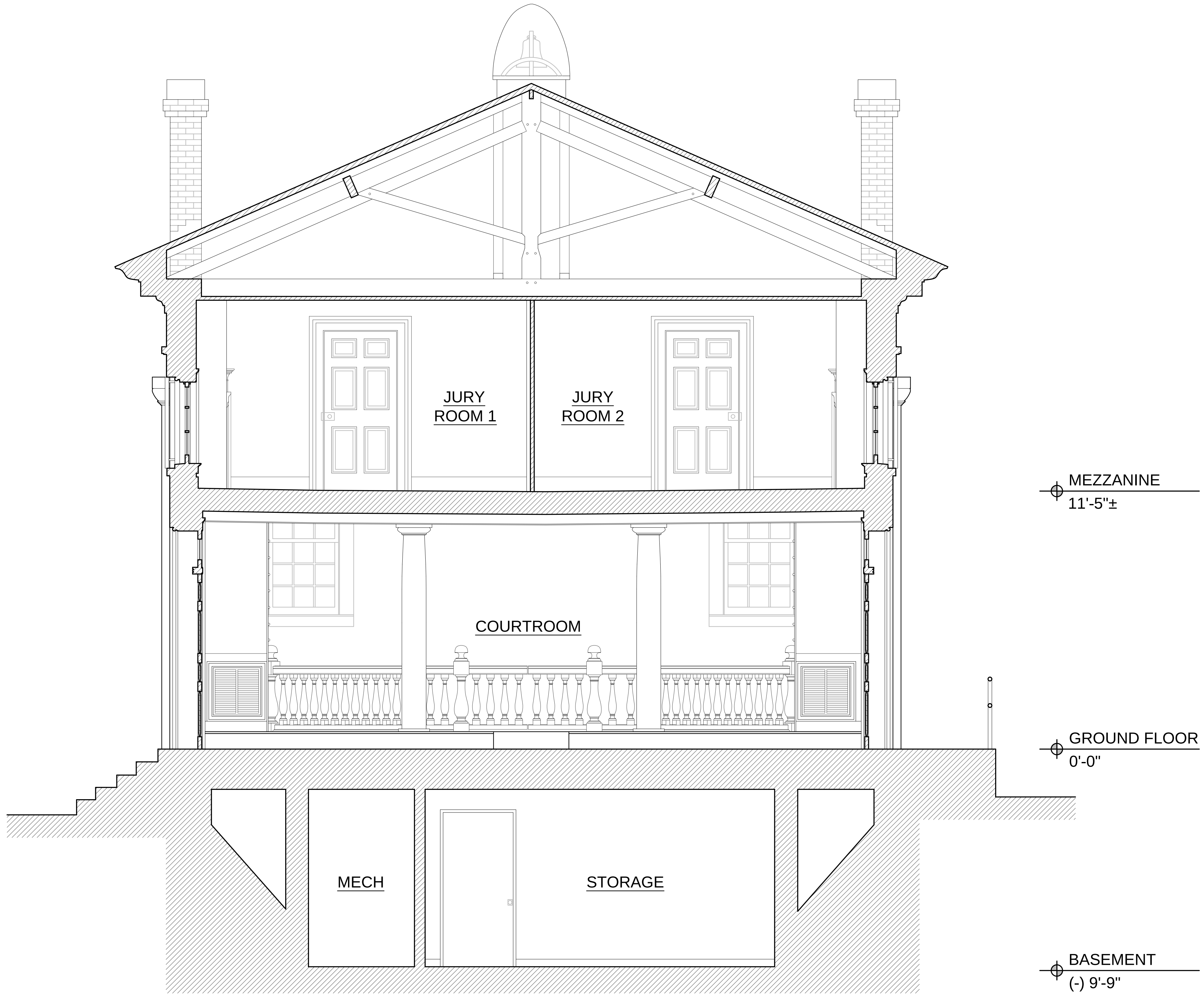

Cross Section - Thru Side Doors
Scale: $\frac{3}{16}$" = 1'-0"

Fluvanna County Historic Courthouse

0 2'8" 5'4" 10'8" 21'4" 42'8" 85'4"

21 June 2022

Palmyra, Virginia

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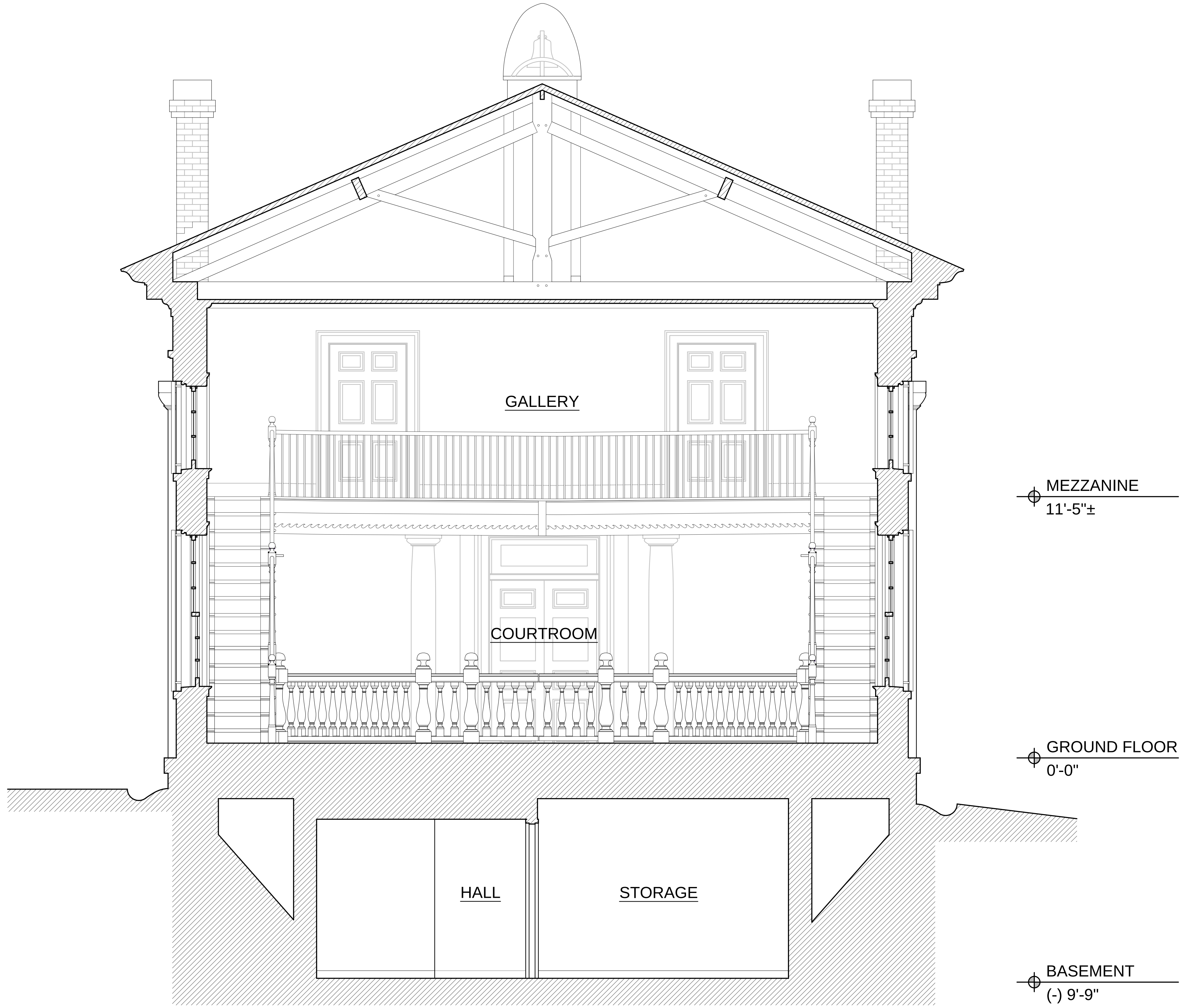
Train Architects



Cross Section - Thru Basement Stair
Scale: $\frac{3}{16}$" = 1'-0"

Fluvanna County Historic Courthouse

0 2'8" 5'4" 10'8" 21'4" 42'8" 85'4"

21 June 2022

Palmyra, Virginia

John Milner Associates
Preservation • a division of MTFA

Train Architects

APPENDIX D

JOHN HARTWELL COCKE'S ORIGINAL SPECIFICATIONS FOR COURTHOUSE

ORIGINAL CONSTRUCTION SPECIFICATIONS

The following is the transcript of the original manuscript of agreement prepared by General Cocke for the Palmyra Courthouse Construction, circa 1830 as included in the 1973 Feasibility Study by Grigg, Wood, Browne & Williams.

Foundations

The foundations to the level of the brick floor in the portico room in rear of the Bar to be of best rubble masonry laid in strong cement and from the ground upwards, to be grouted: to be finished with a stringing course of cut or hammer dressed stone, or cut of stone to be not less than four inches thick, and if of hammer dressed stone not less than six inches thick with square joints showing all around the building a projection of one and a half inch beyond the faces of the pilasters and foundation walls. These walls to be at least 27 inches thick and to be sunk not less than eighteen inches below the surface of the adjacent ground unless a solid rock foundation shall be found nearer to the surface. The site of the building shall be reduced as nearly to a dead level as may be deemed necessary by the Commissioners and the lowest level of the first floor shall not be less than two feet above the level of the site.

Walls

The walls above the stringing course to be of hard brick throughout and of a uniform color where they show on the outside. From the entablature upwards, brick of rather inferior quality may be used to the top of the framing which must be beam-filled – the whole to be laid in best cement composed of clean sand and Thomas-Town lime in such proportions as may be approved by the Commissioner and must be made up a sufficient length of time before it is used, to ensure the perfect slaking of the lime – to be grouted wherever required by the Commissioners but especially through the walls opposite the pilasters: the walls between the pilasters to show good common stock brick with a nest joint laid in Flemish bond – the pilasters may be composed of brick of inferior appearance though as they are to be covered with the most approved weather proof cement, imitative of free stone.

Roof

The framing of the joists and roof to be of the most substantial kind with full square edge timbers of such dimensions and put together in such a manner as the Commissioner shall approve and deem sufficient to support the heavy covering designed to be used to be close sheeted with the best bastard pine plank not less than one inch thick and covered with slate: the ridge pole to be covered with sheet lead.

Entablature

The entablature to be executed in strict conformity to the order as laid down in the plan for which the Commissioners will furnish, if necessary, the full size (SHEET 2). Drafts or patterns to be composed entirely of the best heart pine free of knots. The raking cornice of the same, the portico pediment between the raking and level cornice to be finished in rustic work of the best heart pine and this together with the whole entablature including the raking cornice, to be painted and sanded to give it the appearance of free stone.

Openings

The door and window sills to be of cut stone not less than four inches thick. The door sills to be as wide as the full thickness of the walls in which they are placed. The window sills to project one and a half inch behind the face of the wall and extend into it six inches behind the face of the jamb and at least two inches under the subsill of the open window and the same within the wall of the recess of the sham windows. The door frames to be of the best pine. The window frames, including the subsills which must be at least three inches thick, to be of the same – the window bisection sash to be filled with the best Boston glass to be secured, both when up and down by steel spring fastenings. Cut stone lintels on the doors and first range of windows. Venetian shutters to be fixed in all the sham and hung in all the open windows with proper inside and outside fastenings for all those that open and shut. The Venetians to be painted green.

Columns and Pilasters

The columns and pilasters to be surmounted with cut stone capitals and their shafts to be covered with the best weather-proof plastering.

Inside Finishing

The first floor in rear of the bar to be of brick and on a level with the portico floor which shall also be of brick. From the Bar to the Justice's bench of heart pine plank raised one step. The different ranges of the Bar and Jury benches to be raised one full step from front to rear one above the other. The railing in front of the Justice's Bench, around the Clerk's table and in front of the Bar to be supported by turned balusters. The hand rails of the stair cases to the Jury Rooms and in front of the Gallery to be supported with square balusters. The doors to be paneled with inside fastenings to two of the outside doors and black lock to the third and to the two doors of the Jury Rooms. The doors and windows to be finished inside with plain jamb linings and single architraves with seats in the windows and all the floors to be finished to a plain __________ base or wash board with plain mantles over the fire places in the Jury Rooms and a tin plate stove with the necessary piping communicating with the flues on each side of the building as designated in the plan in the Court Room.

The whole interior of the walls and ceilings to be finished with the best plain plastering and white wash – and the wooden work except the floor to be painted a stone color – the whole to be done in a workman like style and finished by *[text ends unfinished]*

APPENDIX E

ADDITIONAL HISTORIC IMAGES

ADDITIONAL HISTORIC IMAGES

Figure E1. Exterior color photograph of the courthouse (1/6), May 1996, Box 36.1, Folder 6, Fluvanna Historical Society (FHS) collections.

Figure E2. Color photograph of the courthouse interior (3/6), May 1996, Box 36.1, Folder 6, FHS.

Figure E3. Black and white photo of the courthouse exterior, unattributed, Box 36.1, Folder 6, FHS.

Figure E4. Color photograph of the courthouse in snow, undated, Box 36.1, Folder 6, FHS.

Figure E5. Color photograph of the courthouse interior, May 1996, Box 36.1, Folder 6, FHS.

Figure E6. Color photograph of the courthouse, May 1996, Box 36.1, Folder 6, FHS.

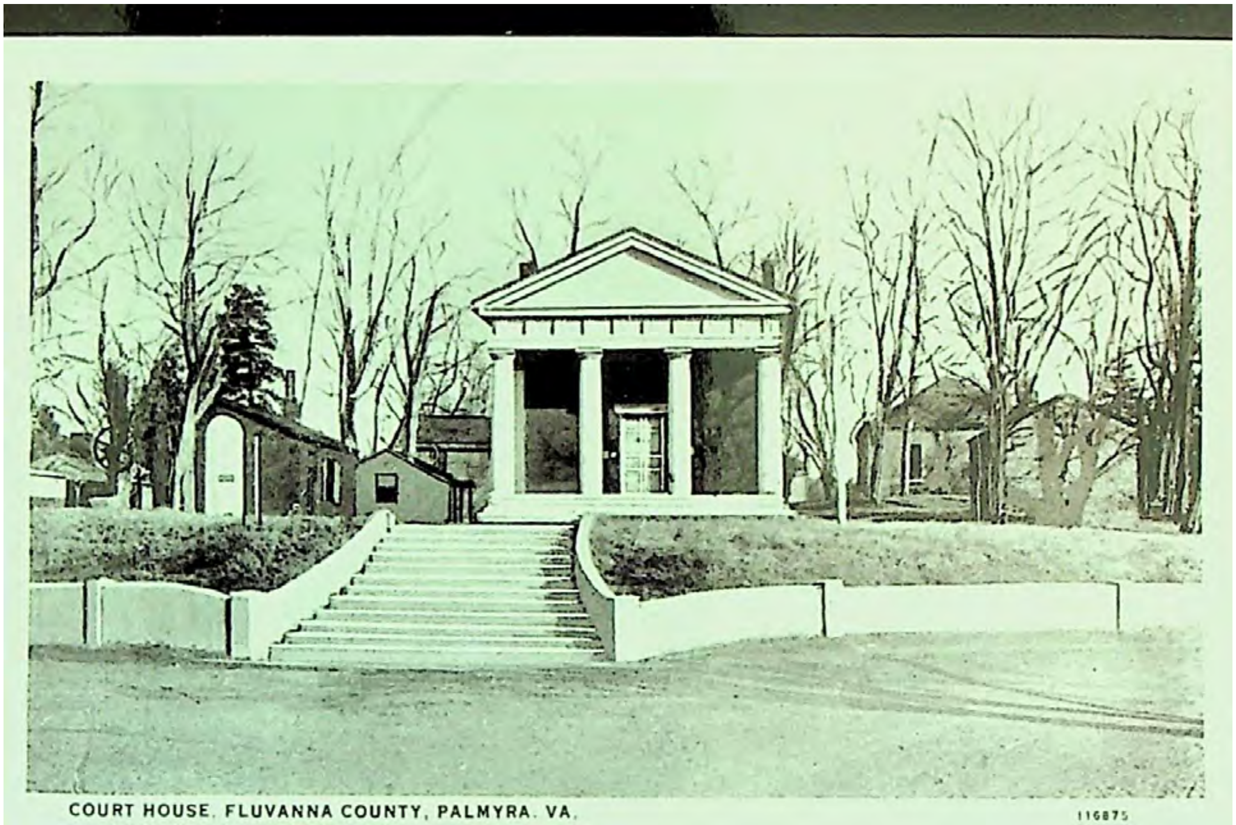


Figure E7. Early black and white print of the courthouse and outbuildings, undated, Box 36.1, Folder 6, FHS.

Figure E8. Color photo of the courthouse (photo 3), undated, Box 36.1, Folder 6, FHS.

Figure E9. Color photograph of a meeting outside the courthouse (photo 4), July 1963, Box 36.1, Folder 6, FHS.

Figure E10. Color photograph of a man seated inside the courthouse (photo 5), February 1964, Box 36.1, Folder 6, FHS.

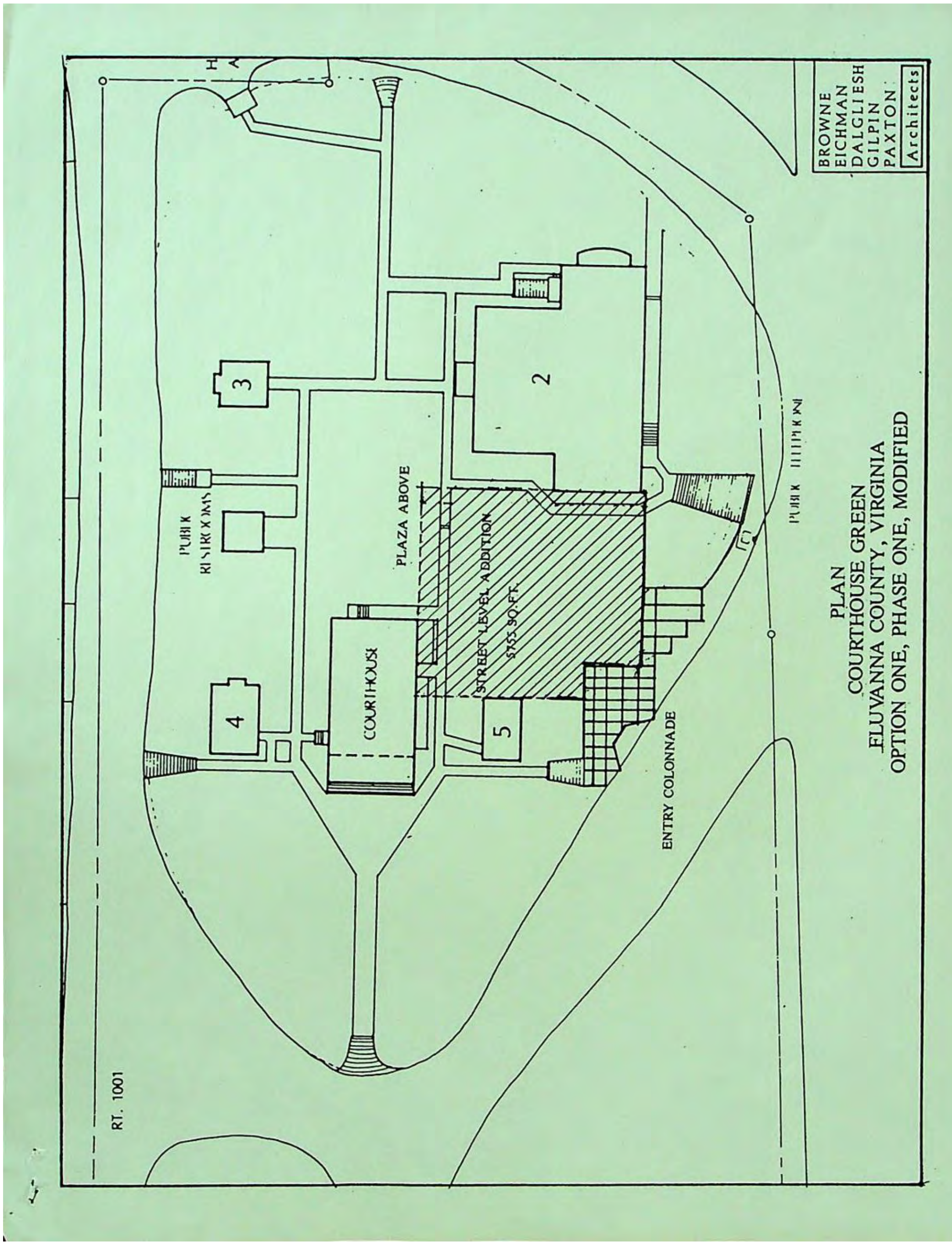


Figure E11. Plan Courthouse Green Fluvanna County Option One Phase One Browne etc., 1992 Courthouse Renovations, Box 36.1 Folder 13.

APPENDIX F

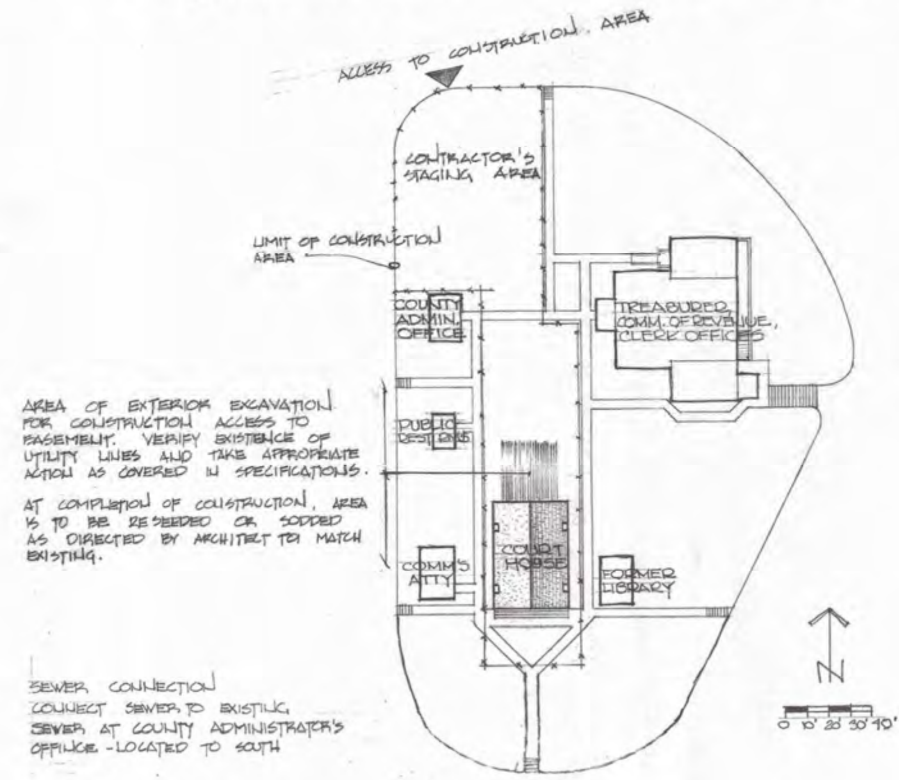
1977 GRIGG, WOOD & BROWNE RESTORATION BID DRAWINGS

THE RESTORATION OF THE FLUVANNA COUNTY COURTHOUSE

PALMYRA, VIRGINIA

UNITED STATES DEPARTMENT OF THE INTERIOR · NATIONAL PARKS SERVICE

PROJECT #51-74-00080



PHASE 1: EXTERIOR

COMPLETED 1 JANUARY 1976

PHASE 2: INTERIOR

15 JANUARY 1977

BASEMENT ADDITION FUNDED BY REVENUE SHARING GRANT

REVISED 2 MAY 1977

GRIGG, WOOD & BROWNE

ARCHITECTS AND CONSERVATORS

15 JAN 1977

COMMONWEALTH OF VIRGINIA
MILTON L. GRIGG
CERTIFICATE No. 278
CERTIFIED ARCHITECT

DIVISION 4: MASONRY
Section 4A: Masonry Restoration

1. RELATED DOCUMENTS:

a. The general provisions of the Contract, including General and Special Conditions, apply to the work specified in this section.

b. The Masonry Contractor shall familiarize himself with all other drawings and specifications to ascertain how they affect his work. He shall fully cooperate with all other sub-contractors and trades.

c: See Section 7A; MASONRY SEALANTS for related work.

d. See Section 9B; STUCCO FINISH OF COLUMNS & PILASTERS for related work.

2. DESCRIPTION OF WORK:

a. The extent of work covered this contract is shown on this drawing.

b. This work shall include, but not be limited to:

(1) Corrective tuckpointing of all masonry joints - face brick, stone work.
(2) Repair and/or replace all damaged units
(3) Masonry cleaning
(4) Reconstruction of chimneys
(5) Waterproofing of all exterior masonry surfaces
(6) Patching of all stucco work

3. MASONRY MATERIALS:

a. Exterior face brick shall match original exterior face brick to meet the approval of the Architect. The dimensions of the brick units shall approximate 7-3/4" - 8-1/4" x 2-3/4" x 4" as required with 5 courses=16".

b. Exterior face birck mortar for repointing and patching shall be "Flamingo" natural masonry mortar as manufactured by the Riverton Lime & Stone Company or approved equal. Color shall be as selected by the contractor to match existing mortar color to be approved by architect.

c. Hydrated lime shall conform to ASTM Specification C-207. Quicklime shall conform to ASTM Specification C-5.

d. Sand shall match existing in color, size and gradation.

e. Masonry surface cleaning material shall be "Sure-Klean" as manufactured by Process Solvent Co., Inc., Kansas City, Kansas.

4. PROCEDURE:

a. Sandblasting of any kind will not be permitted.

b. All masonry joints repointed in portland cement as indicated on the plan will be cleaned and repointed to a depth of 3/4".

c. Existing old masonry mortar joints will be correctively tuck-pointed as required.

d. All stone mortar joints will be cleaned and repointed.

e. Areas in stucco surfaces where spalding or cracking has occurred to be cleaned and patched with appropriate material to match existing texture as approved by architect.

f. All masonry and stucco surfaces will be cleaned with "Sure-Clean" following repointing. Application shall follow manufacturers recommendations. All dirt, grime and old paint shall be removed.

~~g. All masonry surfaces to be sealed following cleaning. (refer to section 7A).~~

5. CHIMNEYS:

a. All chimneys to be rebuilt retaining the old bricks where possible.

b. Chimneys indicated in drawings "to be sealed" to receive heavy lead coated copper cap installed to insure a weather tight seal.

6. DELIVERY AND STORAGE OF MATERIALS:

a. All materials shall be stored under cover and in a dry place in a manner which will prevent damage or intrusion of foreign matter.

b. Store cement, lime and air setting mortars in watertight, elevated containers.

7. LAYING CONDITIONS:

a. No masonry shall be laid when conditions are such that there is danger of freezing before the mortar is set.

b. Do not lay masonry in freezing weather unless suitable means are provided to heat materials, protect work from cold and frost and insure that mortar will harden without freezing. No anti-freeze ingredients shall be used.

8. INSPECTIONS:

A small area of restored masonry shall be completed and inspected by the Architect and the remaining masonry work is to be completed only after the Architect's approval of the sample panel.

9. PROTECTION:

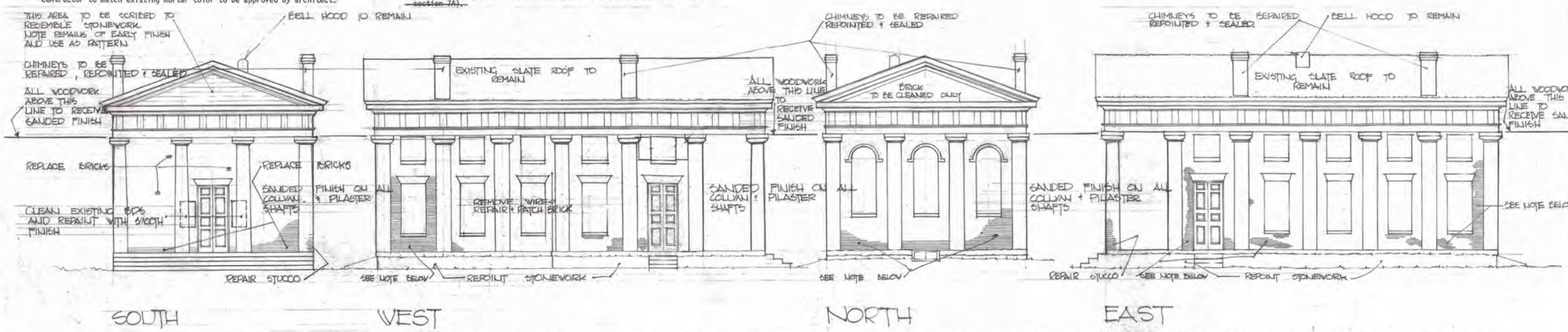
a. The surrounding surfaces, floor slabs, walls, partitions and door window frames, etc. shall be protected at all times during masonry work operations from stains, mortar and damage. If stained or damaged, they shall be cleaned and repaired at the same time the masonry work is cleaned and pointed.

10. CLEAN-UP:

a. At the completion of work, point up all exposed masonry filling up all holes and joints. Clean down brickwork both exterior and interior, using the solution which is specified and stiff fiber brushes, leaving masonry clean, free from mortar on face and in good condition, with tight mortar joints throughout.

11. GUARANTEE:

a. This Contractor shall guarantee all work performed and installed under this Section of these Specifications against defects in material and workmanship for a period of one (1) year beginning with the date of final acceptance of the work.



ELEVATIONS

SCALE 1/8" = 1'-0"

NOTES ▭ INDICATES AREAS PREVIOUSLY REPOINTED WITH CEMENT AND IN NEED OF AT LEAST 50% REPLACEMENT OF BRICK.

GENERAL PAINTING NOTES - WINDOWS
ALL WINDOW FRAMING, CASINGS AND SILLS TO BE SANDED FINISHED.
ALL WINDOW SASH TO RECEIVE SMOOTH FINISH.
SHUTTERS TO BE PAINTED WITH SEMIGLOSS ENAMEL
ALL COLUMNS AND PILASTERS TO BE SANDED FINISHED.
ALL DOORS TO RECIEVE SMOOTH FINISH.

DIVISION 7: MOISTURE CONTROL
Section 7A: Masonry Sealants

1. RELATED DOCUMENTS:

a. The General Provisions of the Contract, including General and Special Conditions, apply to the work specified in this section.

b. The contractor shall familiarize himself with all other drawings and specifications to ascertain how they affect his work. He shall fully cooperate with all other sub-contractors and trades.

c. See Section 4A; Unit Masonry Work

2. MATERIALS:

A clear, chlorinated rubber waterproofing compound for brick, stucco and stone surfaces, that is a single component material that shall not discolor porous masonry surfaces. The compound when completely cured, shall be unaffected by ultra violet radiation when properly applied. It shall be unaffected by salt content in the air or by sulphur or any form of exhaust fumes or spilled fuels. It shall also have the property to penetrate and harden deteriorating mortar and brick.

Products offered by manufacturers complying with the requirements include the following:

Primoid Standard Clear, Richmond Primoid
"Lambert's Exposite Clear Sealer #9-L-3", Pratt & Lambert

3. APPLICATION:

Apply by low pressure spray. Allow a minimum of 10 hours drying time and repeat process, being sure that material does not build up on the surface and run. Temperature for working shall be above 55°F. Material shall not be applied to surfaces showing dampness at a plaster setting (10%) on a Delmhorst moisture meter. Appropriate precautions for prevention of fire and inhalation shall be taken during application.

4. GUARANTEE:

The contractor shall guarantee all work performed and installed under this Specification against defects in materials and workmanship for a period of one (1) year beginning with the date of final acceptance of the work.

5. GENERAL:

All other Provisions related to and stated in Section 4A regarding storage, inspection, protection and clean-up shall apply to this section also.

DIVISION 9: FINISHES
Section 9A: Exterior Finishes

1. RELATED DOCUMENTS:

a. The general provisions of the Contract, including General and Special Conditions, apply to the work specified in this section.

b. The Painting Contractor shall familiarize himself with all other drawings and specifications to ascertain how they affect his work. He shall fully cooperate with all other contractors and trades.

c. Section 4A: Masonry Restoration

2. DESCRIPTION OF WORK:

a. The extent of work covered under this contract is shown on the drawings.

b. The work shall include but not be limited to:
(1) Painting of all exterior woodwork
(2) Painting of all exterior stucco work on columns and pilasters

3. PAINTING MATERIAL:

a. Paint to be high quality, flat exterior acrylic latex emulsion to comply with FS TT-P-19.

b. "Sanded Finish" aggregate to be "Pearl Tex" paint additive.

c. Surface conditioner to be #17-15 as manufactured by Pittsburgh Paint.

d. Alkyd Enamel (semi-gloss) to comply with FS TT-E-529, class A.

e. Use brushes as best suited for job.

4. PROCEDURE:

a. Surface Preparation - all cases.

(1) All surfaces to be scraped to remove loose paint
(2) Surfaces to be cleaned and prepared by application of specified surface conditioner following manufacturer's instructions explicitly.

b. Sanded Finishes - see plans.

(1) Pearl Tex to be mixed with flat latex at 1 pound to the gallon.
(2) Paint to be continually agitated during application.

c. Smooth Finish - see plan.

(1) Flat latex applied following manufacturers instructions explicitly.

d. Shutter Finish - to be applied to shutters.

(1) Scrape shutters to remove flaked or peeling paint.
(2) Clean surface as per manufacturers instructions
(3) Apply semi-gloss enamel to follow manufacturer's instructions explicitly.

5. DELIVERY & STORAGE OF MATERIALS:

a. All materials shall be stored under cover and in a dry place in a manner which will prevent damage or intrusion of foreign matter. Manufacturers labels are to be affixed thereon.

b. Store all paint in watertight and airtight containers elevated above ground.

6. SAMPLES & INSPECTIONS:

Submit samples for Architect's review of color and texture only. Compliance with all other requirements is the exclusive responsibility of the Contractor. Provide a listing of the material and application for each coat of each finish sample.

On 12" x 12" hardboard, provide 2 samples of each color and material, with texture to simulate actual conditions. Resubmit each sample as requested until required sheen, color and texture is achieved.

7. COLORS AND FINISHES:

Prior to initiating work, Contractor shall be supplied by Architect with color chips showing color and texture to be matched. These chips are to be matched and submitted for approval by the Architect before proceeding with the work.

8. PROTECTION:

Protect work of other trades, whether to be painted or not, against damage by the painting and finishing work. Leave all such work undamaged, with any damage corrected by cleaning, replacing and repainting, as directed by the Architect.

Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operation.

9. CLEAN-UP:

During the progress of work, remove from project all discarded paint materials, rubbish, cans and rags.

REVISIONS:

FLUVANNA COUNTY COURTHOUSE
PALMYRA, VIRGINIA

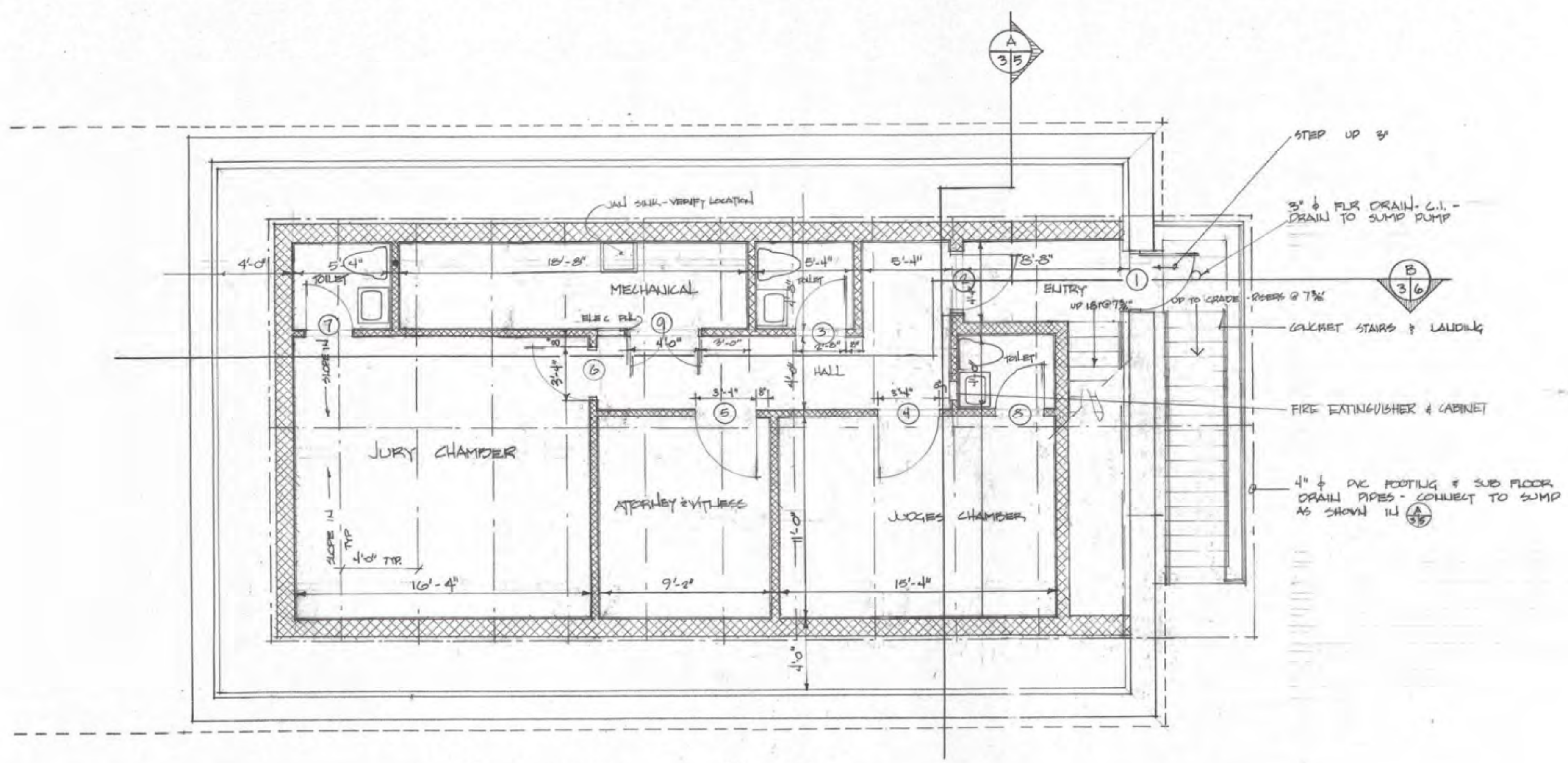
GRIGG, WOOD + BROWNE
ARCHITECTURAL CONSERVATORS
CHARLOTTESVILLE VIRGINIA

PHASE I
EXTERIOR RESTORATION

Job No	Date	Scale	Drn By
2185-73	30 Jan 74	1/8" = 1'-0"	Dan

2

Note: Pages have been scaled from 24x36" to 11x17", drawings are not to scale.



BASEMENT PLAN
SCALE 1/4" = 1'-0"

REVISIONS 2 MAY 1977

FLUVANNA COUNTY COURTHOUSE
PALMYRA, VIRGINIA

GRIGG, WOOD & BROWNE
ARCHITECTS · AIA
CHARLOTTESVILLE VIRGINIA

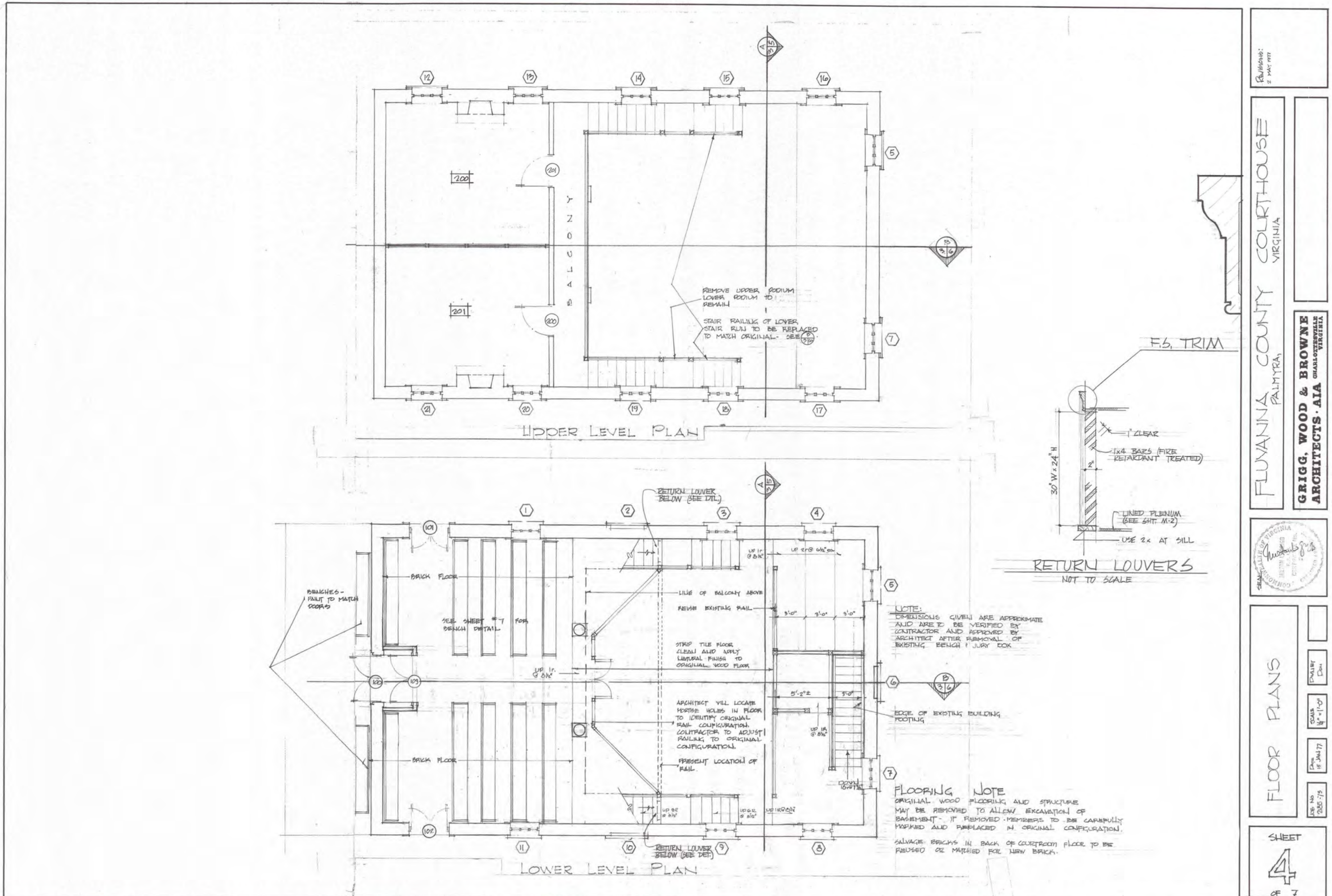
SEAL

BASEMENT PLAN

JOB NO 2185-73
DATE 15 JAN 77
SCALE 1/4" = 1'-0"
DRAWN
CHECKED

SHEET 3 OF 7

Note: Pages have been scaled from 24x36" to 11x17", drawings are not to scale.



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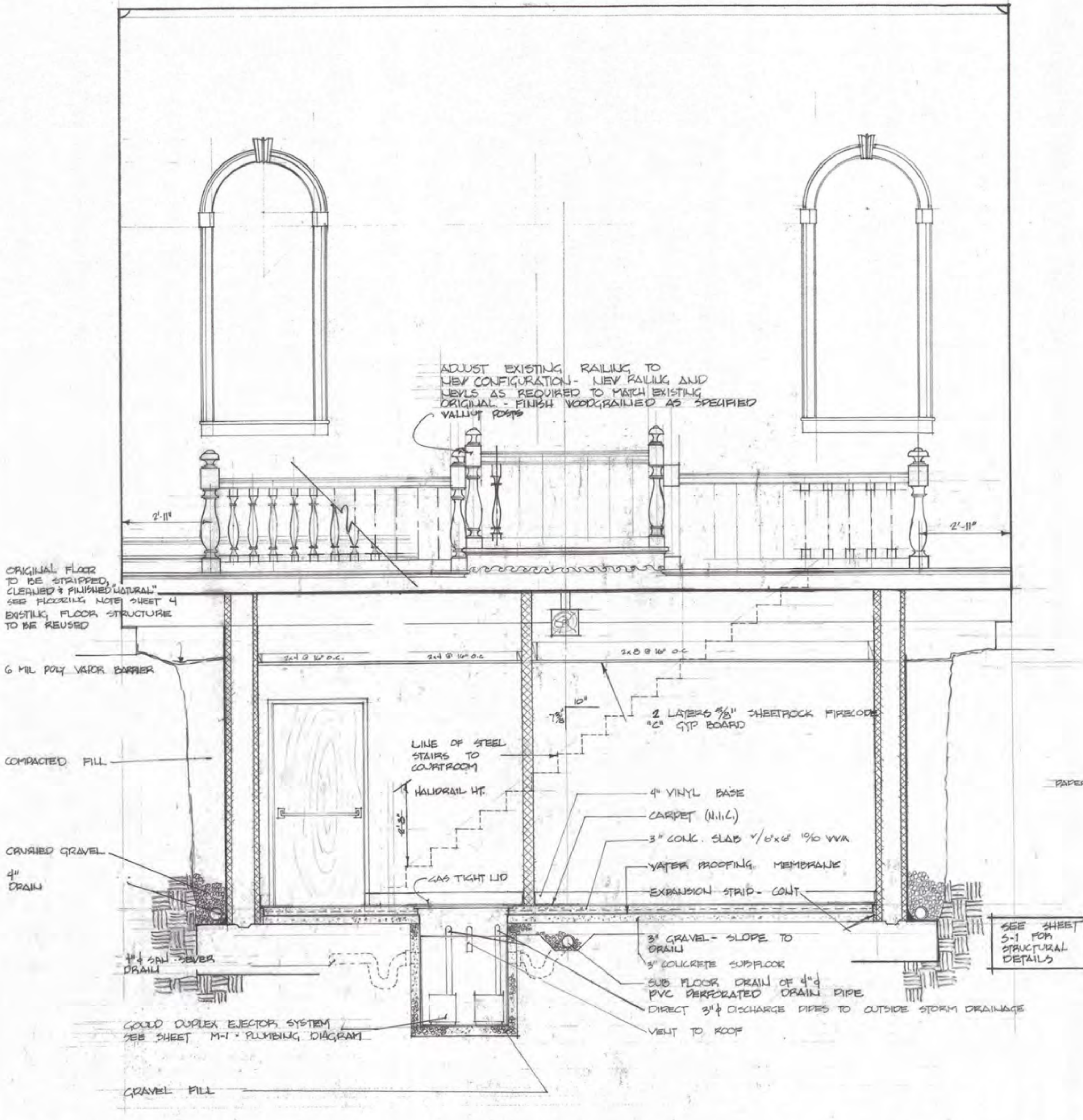
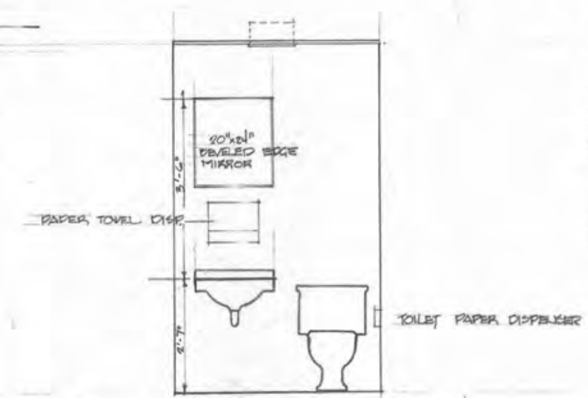


SEE SHEET S-1 FOR STRUCTURAL DETAILS

SECTION A 3/5
SCALE 1/2"=1'-0"



TYPICAL TOILET ELEVATION
SCALE 1/2"=1'-0"

PLUMBING FIXTURES

LAVATORIES	AMERICAN STANDARD "LUCERNE", 20"x18" WALL HUNG, #0351.023 W/ 2103.448 "HERITAGE" CENTER SET LAVATORY FAUCETT
TOILETS	AMERICAN STANDARD "ELONGATED CADET" #2109.254 W/ 5334.065 OPEN FRONT SEAT.

REVISIONS
2 MAY 1977

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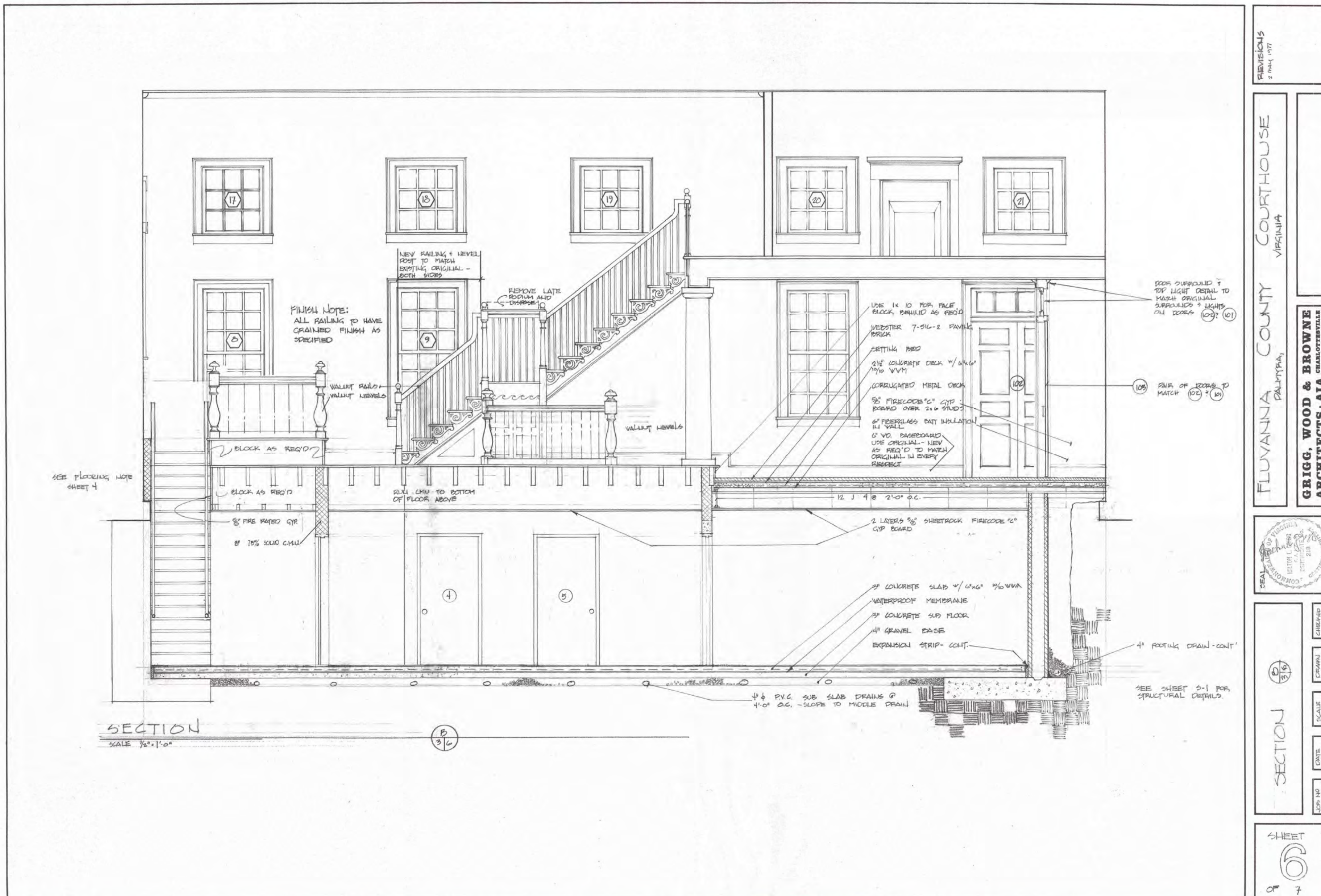
SEAL

SECTION A 3/5

CHECKED
DRAWN
SCALE 1/2"=1'-0"
DATE 18 JAN 77
JOB NO 2150-75

SHEET 5 OF 7

Note: Pages have been scaled from 24x36" to 11x17", drawings are not to scale.



Note: Pages have been scaled from 24x36" to 11x17", drawings are not to scale.

FINISH - SCHEDULE

BASEMENT

TOILETS AND JANITOR CLOSET

- WALLS - PAINT W/ LATEX ENAMEL
- CEILINGS - PAINT W/ LATEX ENAMEL
- FLOOR - VINYL CORLON SHEET FLOORING "COROUELLE"
- BASE - 4" VINYL BASE

ALL ROOMS AND HALLWAYS

- WALLS - PAINT W/ LATEX
- CEILINGS - PAINT W/ LATEX
- FLOOR - CARPET (BY OWNER)
- BASE - 4" VINYL BASE

ENTRY AND STAIRS

- WALLS - PAINT W/ LATEX ENAMEL
- FLOOR - GAUGED SLATE FLOOR TILE FOR THINSET APPLICATION - BY BUCKINGHAM SLATE - NO JOINTS
- STAIR TREADS - BUCKINGHAM SLATE
- BASE - BEADED WOOD AS IN COURTROOM

COURTROOM

- WALLS - PAINT W/ LATEX
- CEILINGS - PAINT W/ LATEX
- FLOOR - NATURAL FINISH
- TRIM & STAIRS - WOODGRAINED AS SPECIFIED
- TREADS & WALNUT NEWELS - NATURAL FINISH
- FURNISHINGS - NATURAL FINISH

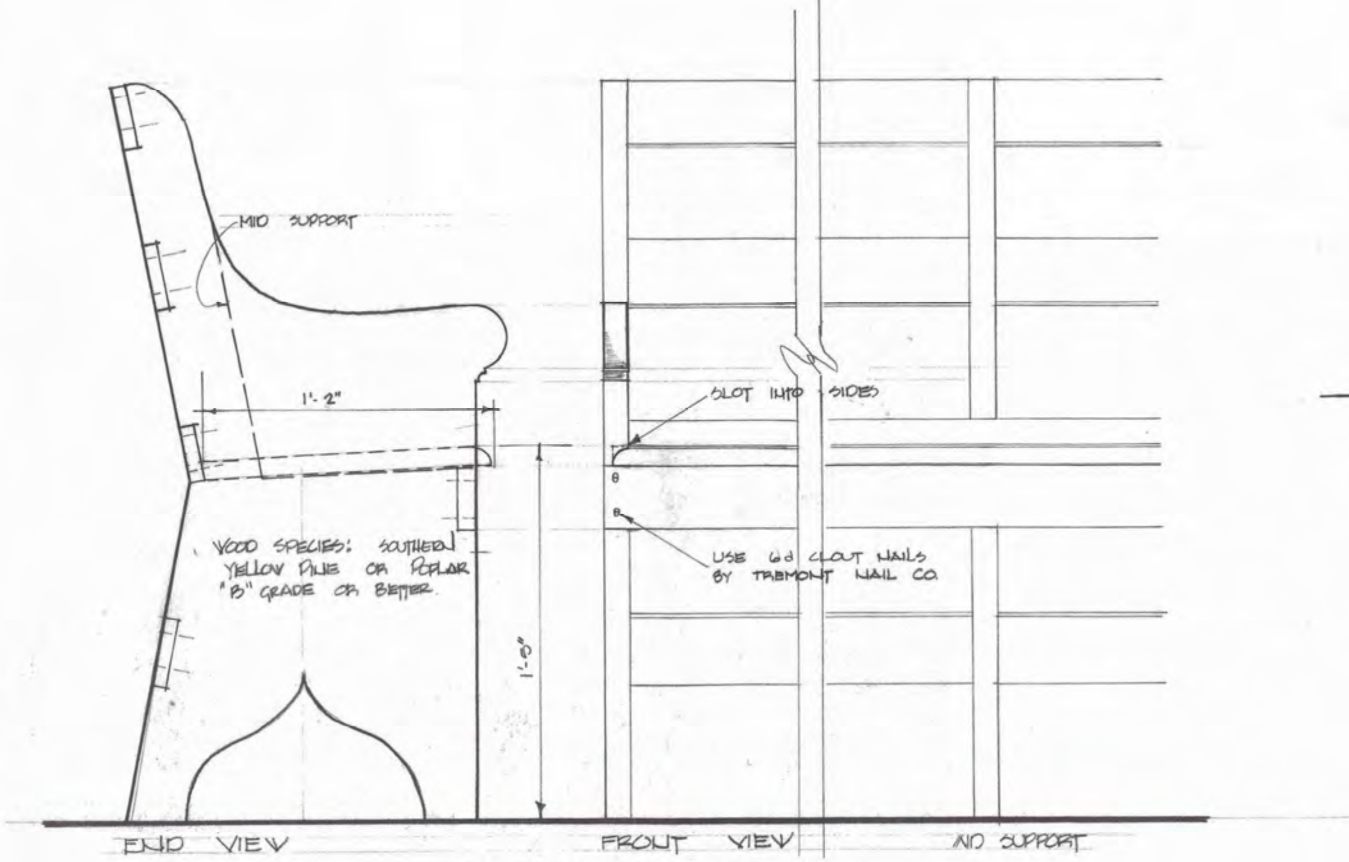
NOTE: COLOR SCHEDULE BY ARCHITECT

DOOR SCHEDULE

NO	LOCATION	SIZE	STYLE	DOOR MAT	DOOR FIN.	FRAME MAT	FRAME FIN	FRAME DET	HDWR	REMARKS
1	BASEMENT - REAR ENTRY	3°x6⁸	A	1¾" STL	PAINT	STL	PAINT	STD	1	W/ DOOR CLOSER
2	BASEMENT - HALL	3°x6⁸	A	1¾" STL	PAINT	STL	PAINT	STD	1	U.L. "C" LABEL DOOR W/ DOOR CLOSER
3	TOILET - HALL	2⁴x6⁸	A	1¾" WD	STAIN	STL	PAINT	STD	2	
4	ATTORNEY WITNESS - HALL	3°x6⁸	A	1¾" WD	STAIN	STL	PAINT	STD	2	
5	JUDGES CHAMBER - HALL	3°x6⁸	A	1¾" WD	STAIN	STL	PAINT	STD	2	
6	JURY CHAMBER - HALL	3°x6⁸	A	1¾" WD	STAIN	STL	PAINT	STD	2	SOUND-LINE
7	TOILET - JURY CHAMBER	2⁴x6⁸	A	1¾" WD	STAIN	STL	PAINT	STD	2	
8	TOILET - JUDGES CHAMBERS	2⁴x6⁸	A	1¾" WD	STAIN	STL	PAINT	STD	2	
9	MECH ROOM	2 - 1¹⁰x6⁸	A	1¾" WD	STAIN	STL	PAINT	STD	3	
100	ENTRY - EXISTING ORIGINAL								5	
101	SIDE ENTRY - EXISTING ORIGINAL								4	REPAIR OR REPLACE ORIGINAL DEAD BOLT AS DIRECTED BY ARCHITECT
102	SIDE ENTRY EXISTING ORIGINAL								4	" " "
103	ENTRY VESTIBULE	1 *	B	1¾" WD	PAINT	WD	PAINT	①	4	MOLDING PROFILE OF TRANSOM TO MATCH EXISTING ORIGINAL * BUILD FROM SITE DIMENSIONS
										PROVIDE NEW DEAD BOLTS TO MATCH ORIGINAL
200	EXISTING ORIGINAL								4	
201	EXISTING ORIGINAL								4	

HARDWARE SETS

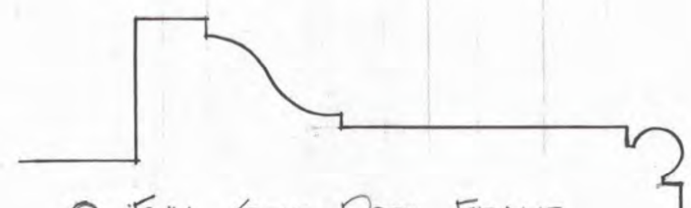
1. CORBIN NO. 26 NT PANIC BAR W/ DULL BRONZE LACQUER FINISH - PROVIDE NO. 38 GF45 STRIKE
2. CORBIN SERIES 300 NO 320 PRIVACY LOCK.
3. CORBIN SERIES 300 NO 355 KEYED OUTSIDE
4. BALL & BALL X-100 5" x 4" "CARPENTER" STYLE LOCK OR ANTIQUE ORIGINAL W/ 'AS-FORGED' OILED FINISH
5. BALL & BALL X-100 6" x 4" "CARPENTER" STYLE LOCK OR ANTIQUE ORIGINAL W/ 'AS-FORGED' OILED FINISH



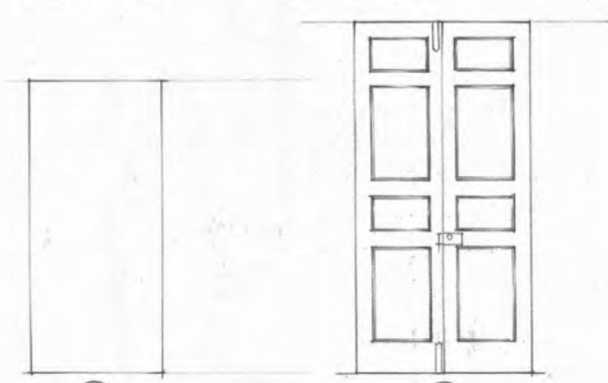
SEE SEATING LAYOUT - SHEET 4

SEATING DETAIL

SCALE 3" = 1'-0"



① FULL SIZE DOOR FRAME



Ⓐ 1¾" SOLID CORE STL. OR FLUSH WOOD DOOR HARDWOOD FACES U.L. "C" LABEL WHERE REQUIRED

Ⓑ 1¾" 6-PANELS BEADED FLUSH BOTH SIDES - DIMENSIONS TO MATCH EXISTING ORIGINAL (101) & (102)

REVISIONS 2 MAY 1977

FLUVANNA COUNTY COURTHOUSE
PALMYRA, VIRGINIA

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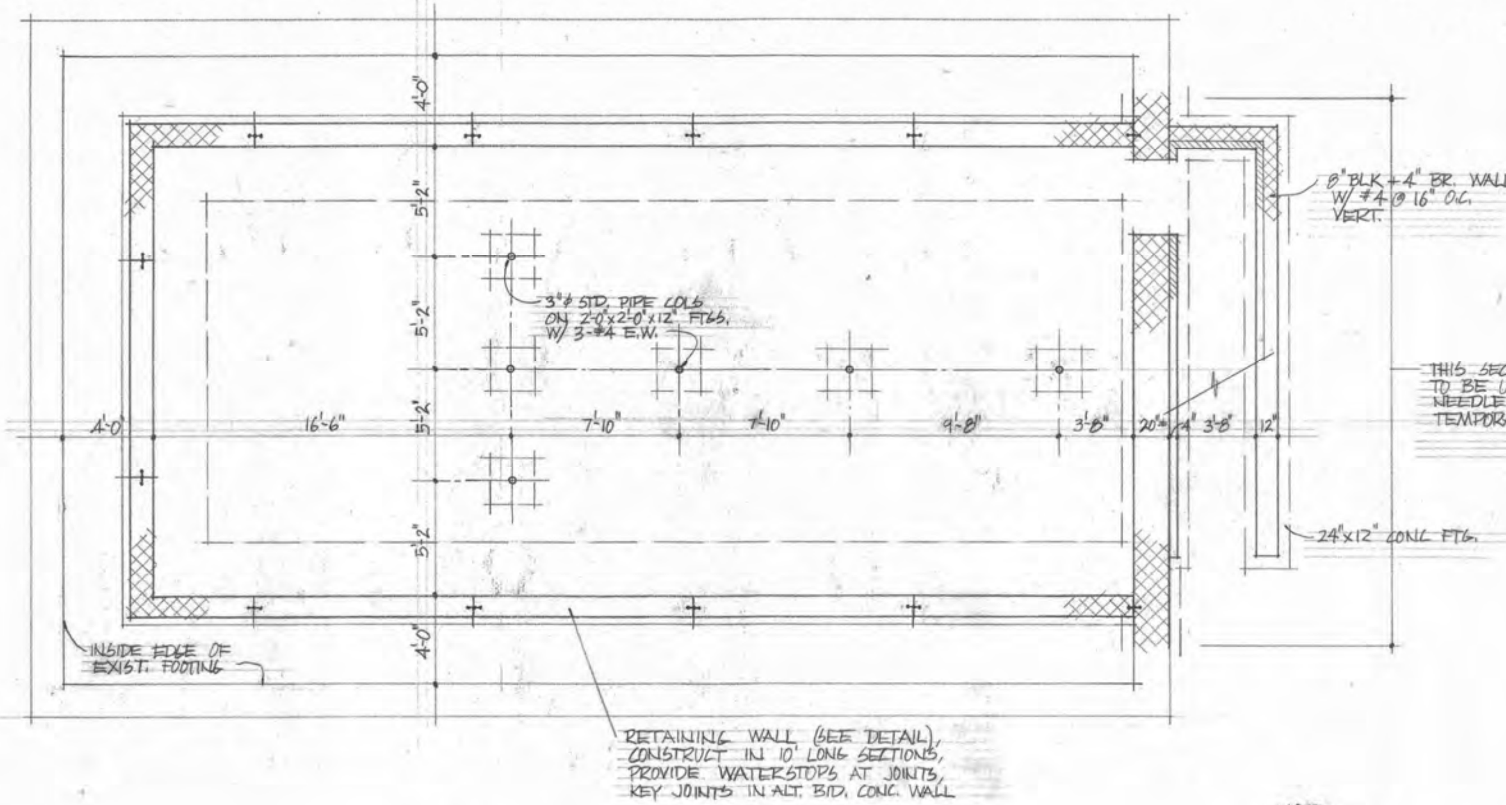
SEAL — COMMONWEALTH OF VIRGINIA · MILTON L. GRIGG · CERTIFIED ARCHITECT

FINISH & DOOR SCHEDULES

JOB NO	DATE	SCALE	DRAWN	CHECKED
2185-73	15 JAN 77	AS SHOWN	Gr.	

SHEET 7 OF 7

Note: Pages have been scaled from 24x36" to 11x17", drawings are not to scale.



FOUNDATION PLAN

SCALE 1/4" = 1'-0"

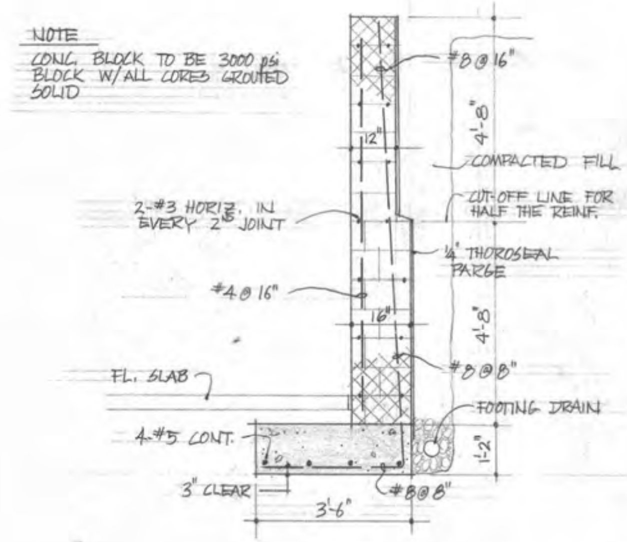
NOTE

EXCAVATE BASEMENT TO WITHIN 8 FEET OF INSIDE EDGE OF EXIST. FOOTING. EXCAVATE FOR RETAINING WALL IN SECTIONS 10 FEET LONG. CONSTRUCT EACH SECTION AS QUICKLY AS POSSIBLE AFTER FINAL EXCAVATION. NON-ADJACENT SECTIONS MAY BE EXCAVATED SIMULTANEOUSLY. KEEP EXCAVATION DRY AT ALL TIMES.

SEE FLOORING NOTE SHT 4

NOTE

CONC. BLOCK TO BE 3000 psi BLOCK W/ ALL CORES GROUTED SOLID

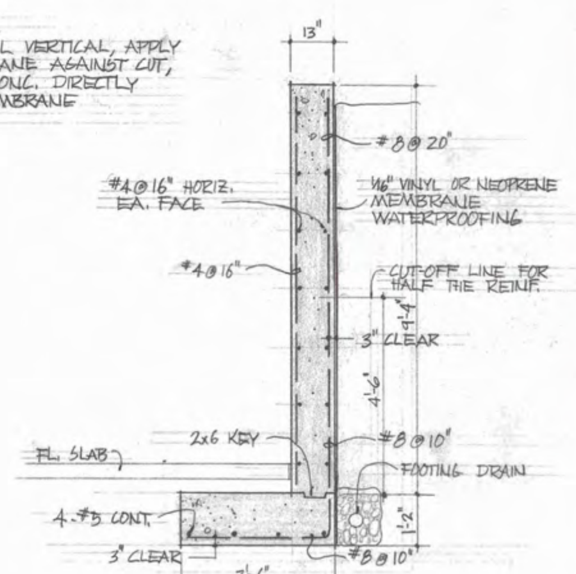


BASE BID RETAINING WALL

SCALE 1/2" = 1'-0"

NOTE

CUT SOIL VERTICAL, APPLY MEMBRANE AGAINST CUT, POUR CONC. DIRECTLY TO MEMBRANE



ALT. BID RETAINING WALL

SCALE 1/2" = 1'-0"

REVISIONS

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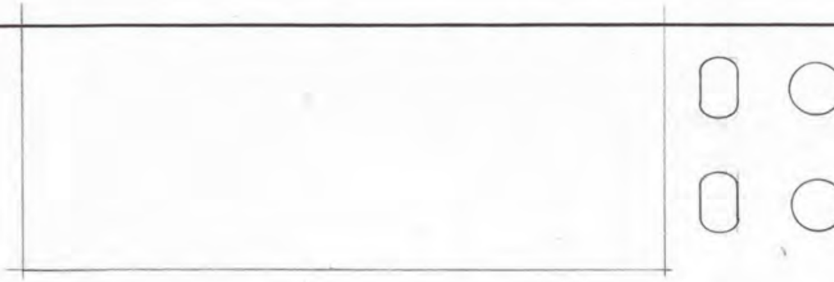
FOUNDATION DETAILS

JOB NO	2185-73
DATE	15 JAN 77
SCALE	AS SHOWN
DRAWN	PAS
CHECKED	

SHEET S-1 OF 1

Note: Pages have been scaled from 24x36" to 11x17", drawings are not to scale.



LOCATE CONDENSERS & HEAT PUMPS BEHIND COMMONWEALTH ATTORNEY'S OFFICE AS DIRECTED BY ARCHITECT. PROVIDE 4" HIGH CONC. PADS

MECHANICAL EQUIPMENT LIST

FURNACES 1 & 2 - CARRIER 58 HV 106 OIL-FIRED UPFLOW FURNACE, 85 MBH BONNET CAPACITY, 1500 cfm, CARRIER 28 AR 042 COOLING COIL, CARRIER 49 BB 001 HUMIDIFIER.

CONDENSING UNITS 1 & 2 - CARRIER 38 EF 045, 42 MBH (A.R.I. STD. 210 TOTAL COOLING CAPACITY), 240 V/1ϕ.

FAN-COIL 1 - CARRIER 40 AQ 030, 9 KW 2-STAGE SUPPLEMENTARY ELECTRIC HEAT, 900 cfm, 240 V/1ϕ.

HEAT PUMP 1 - CARRIER 38 CQ 027, 26.5 MBH COOLING, 29 MBH HIGH-TEMP. HEATING, 15 MBH LOW-TEMP. HEATING (A.R.I. STD. 240 RATINGS), 240 V/1ϕ.

FAN-COIL 2 - CARRIER 40 AQ 024, 7.5 KW 2-STAGE SUPPLEMENTARY ELECTRIC HEAT, 700 cfm, 240 V/1ϕ.

HEAT PUMP 2 - CARRIER 38 CQ 020, 19 MBH COOLING, 21 MBH HIGH-TEMP. HEATING, 10 MBH LOW-TEMP. HEATING (A.R.I. STD 240 RATINGS), 240 V/1ϕ.

FILTERS - RESEARCH PRODUCTS 'SPACE-GARD' HIGH-EFFICIENCY AIR CLEANER.

CONTROLS - HONEYWELL OR EQUAL, TAMPERPROOF DAY T'STAT - HEAT & COOL, MANUAL CHANGEOVER, CONTINUOUS FAN OPERATION, NIGHT T'STAT - HEAT ONLY (SET 55°), TIME CLOCK - 7 DAY W/ AUX. SPRING POWER. PROVIDE MANUAL BYPASS SWITCH.

DUCTWORK - SHEET METAL OF THICKNESS REQ'D BY CODE, SOUND-LINE W/ ½" LINACOUSTIC (EXCEPT FOR RUNOUTS TO BASEBOARD DIFFUSER), INSULATE W/ 1" FOIL-FACED FIBERGLASS. PROVIDE FLEXIBLE CONNECTIONS AT AIR HANDLER, TURNING VANES AT SQUARE ELBOWS, VOLUME CONTROLS AT BRANCH TAKEOFFS.

GRILLES, REGISTERS, & DIFFUSERS - KRUEGER OR APPROVED EQUAL, WHITE ENAMEL FINISH.

PLUMBING FIXTURES

WC - AM. STD. 'ELONGATED WATER-SAVER CADET' W/ #5320.114 SEAT

LAV - AM. STD. 'LUCERNE' 20"x18" W/ 2103.406 FITTINGS

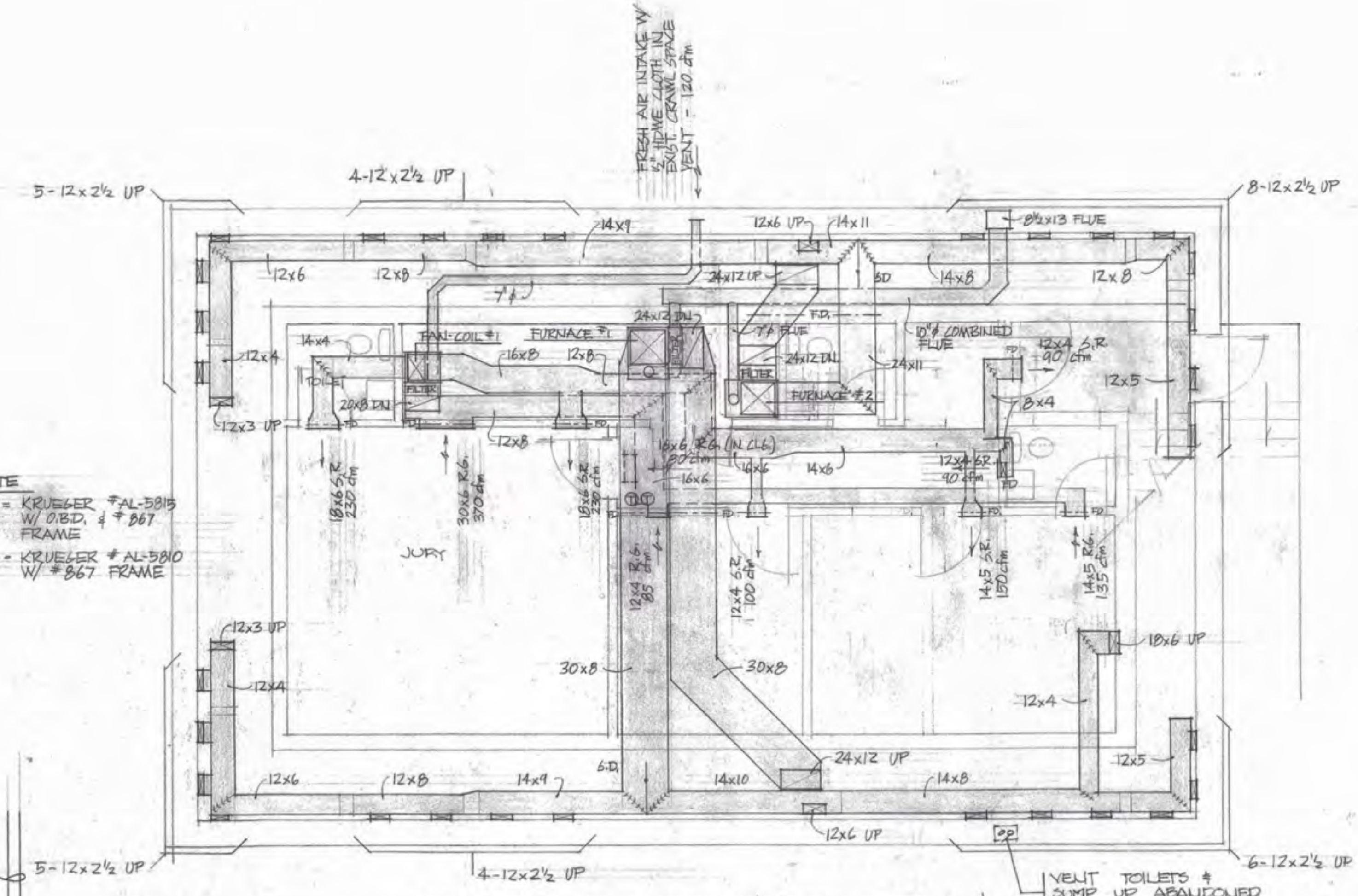
SS - AM. STD. 'LAKEWELL' W/ TRAP STANDARD & #8340.242 FITTINGS

DF - 'OASIS' MODEL 7P

NOTE

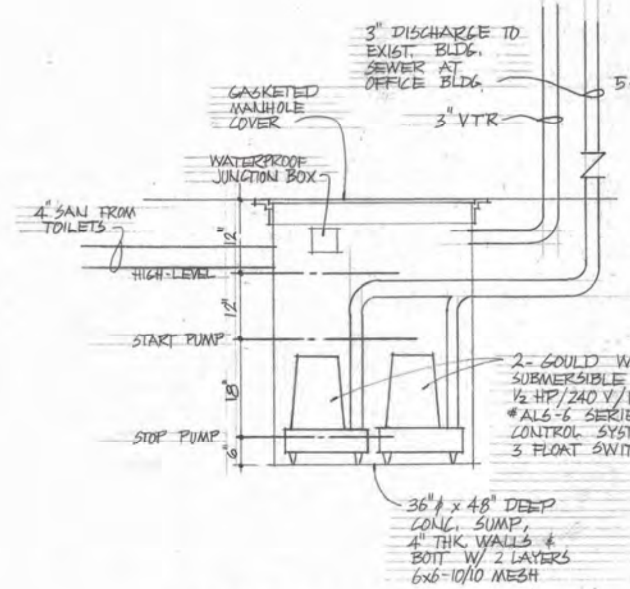
S.R. = KRUEGER #AL-3815 W/ O.B.D. & #867 FRAME

R.G. = KRUEGER #AL-3810 W/ #867 FRAME



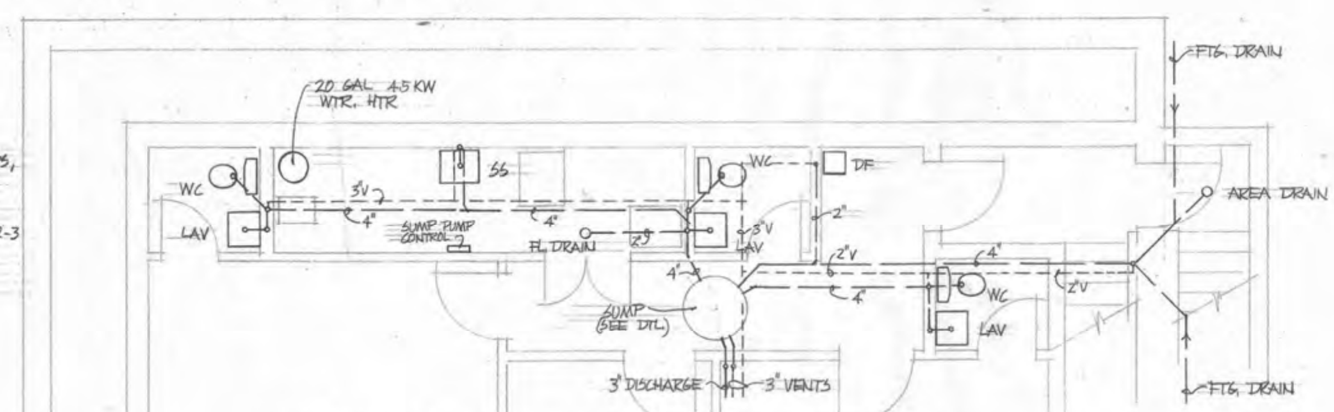
BASEMENT MECHANICAL PLAN

SCALE ¼"=1'-0"



SUMP PUMP DETAIL

SCALE ¾"=1'-0"



BASEMENT PLUMBING PLAN

SCALE ¼"=1'-0"

REVISIONS 5/3/77

FLUVANNA COUNTY COURTHOUSE

PALMYRA, VIRGINIA

GRIGG, WOOD & BROWNE ARCHITECTS · AIA CHARLOTTESVILLE VIRGINIA

SEAL

BASEMENT MECHANICAL PLAN

CHECKED

DRAWN P.S.

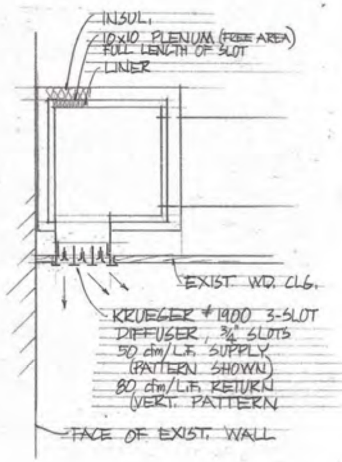
SCALE ¼"=1'-0"

DATE 18 JAN 77

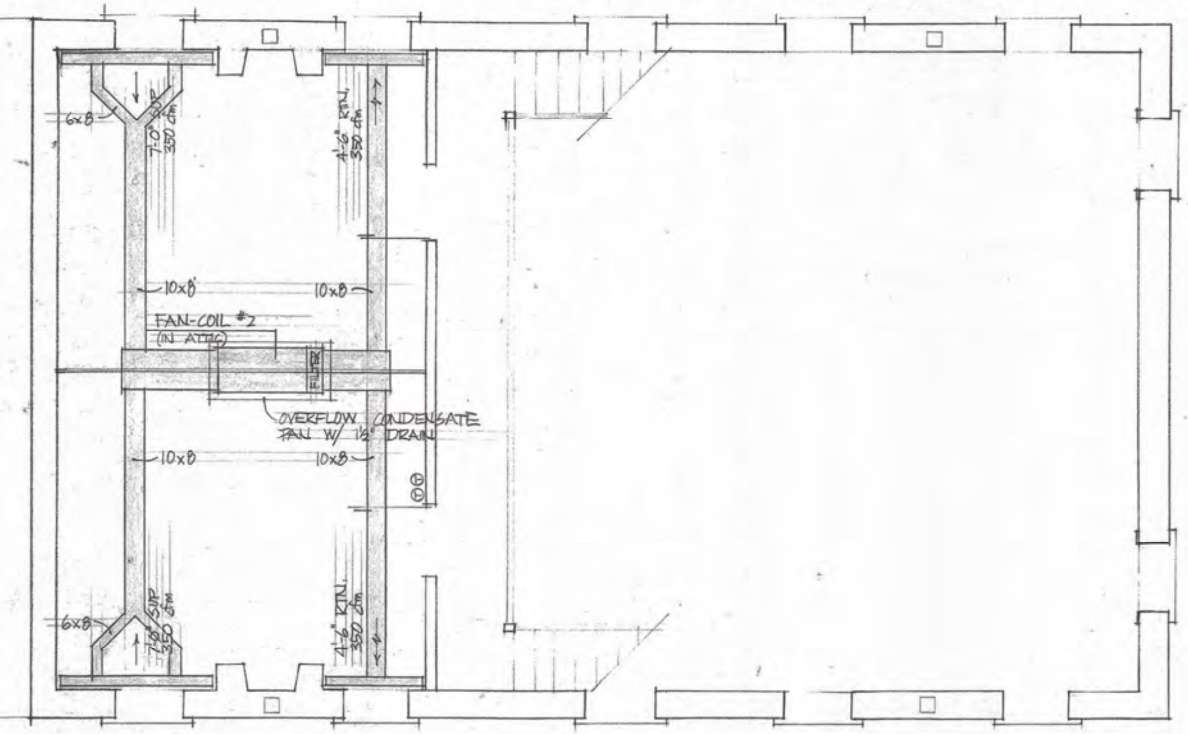
JOB NO 2138-73

SHEET M-1 OF 2

Note: Pages have been scaled from 24x36" to 11x17", drawings are not to scale.

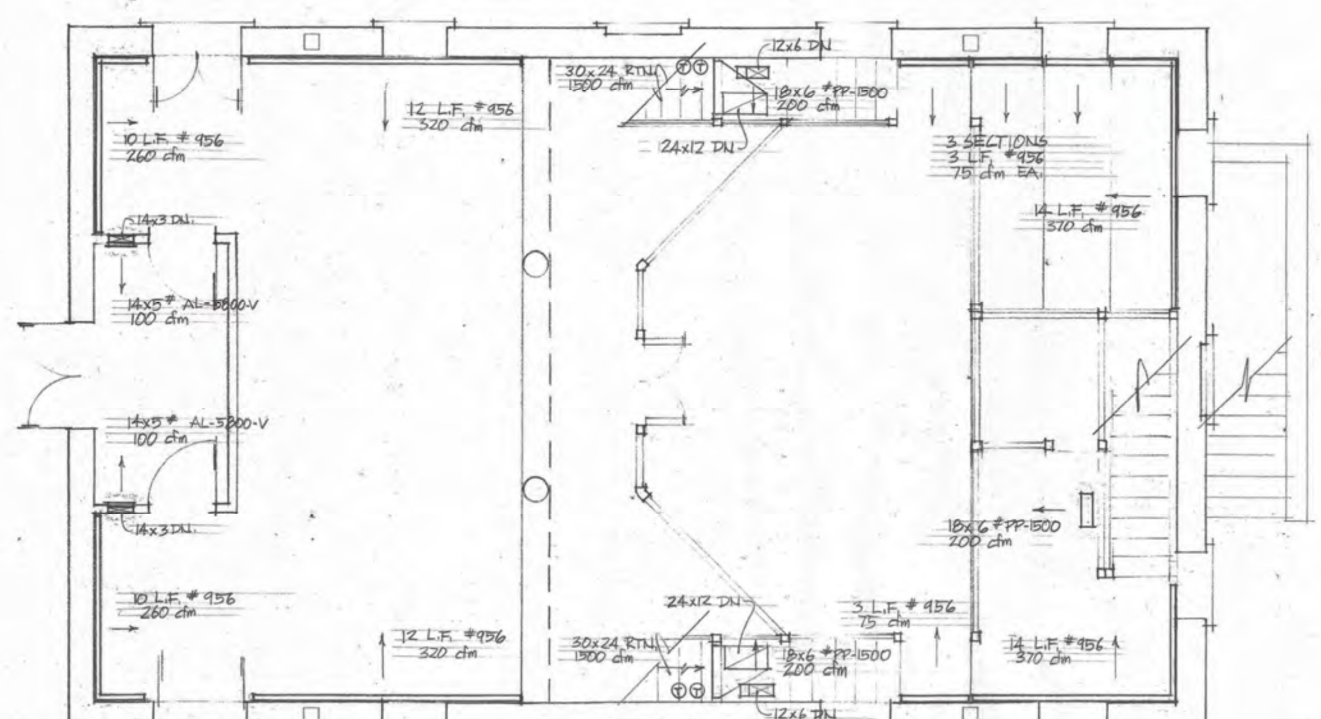


SECOND FLOOR DIFFUSERS
SCALE 1 1/2"=1'-0"

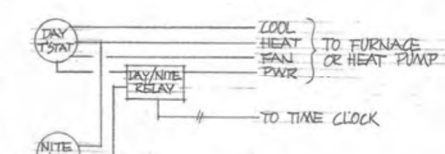


SECOND FLOOR MECHANICAL PLAN
SCALE 1/4"=1'-0"

NOTE: ALL GRILL & REGISTER DESIGNATION NO. ARE BY KRUEGER DIV. UNLESS OTHERWISE NOTED.



FIRST FLOOR MECHANICAL PLAN
SCALE 1/4"=1'-0"



CONTROL SCHEMATIC
NOT TO SCALE
(TYPICAL FOR EACH ZONE)

REVISIONS

FLUVANNA COUNTY COURTHOUSE
PALMYRA VIRGINIA

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SEAL

FIRST & SECOND FLOOR MECHANICAL PLAN

JOB NO. 2136-75
DATE 18 JAN 77
SCALE 1/4"=1'-0"
DRAWN
CHECKED

SHEET M-2 OF 2

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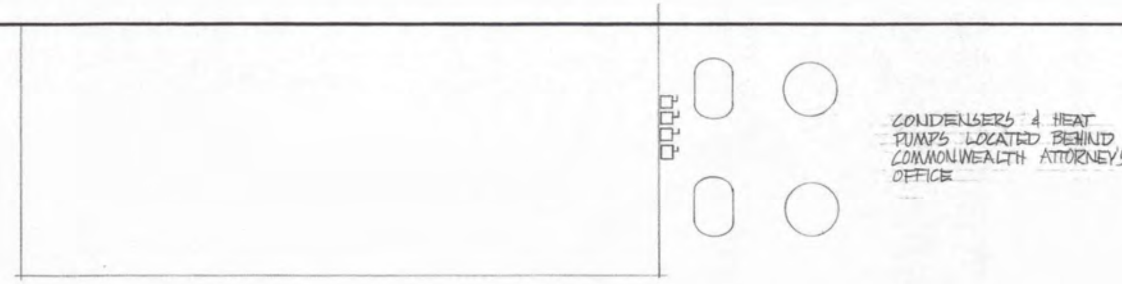
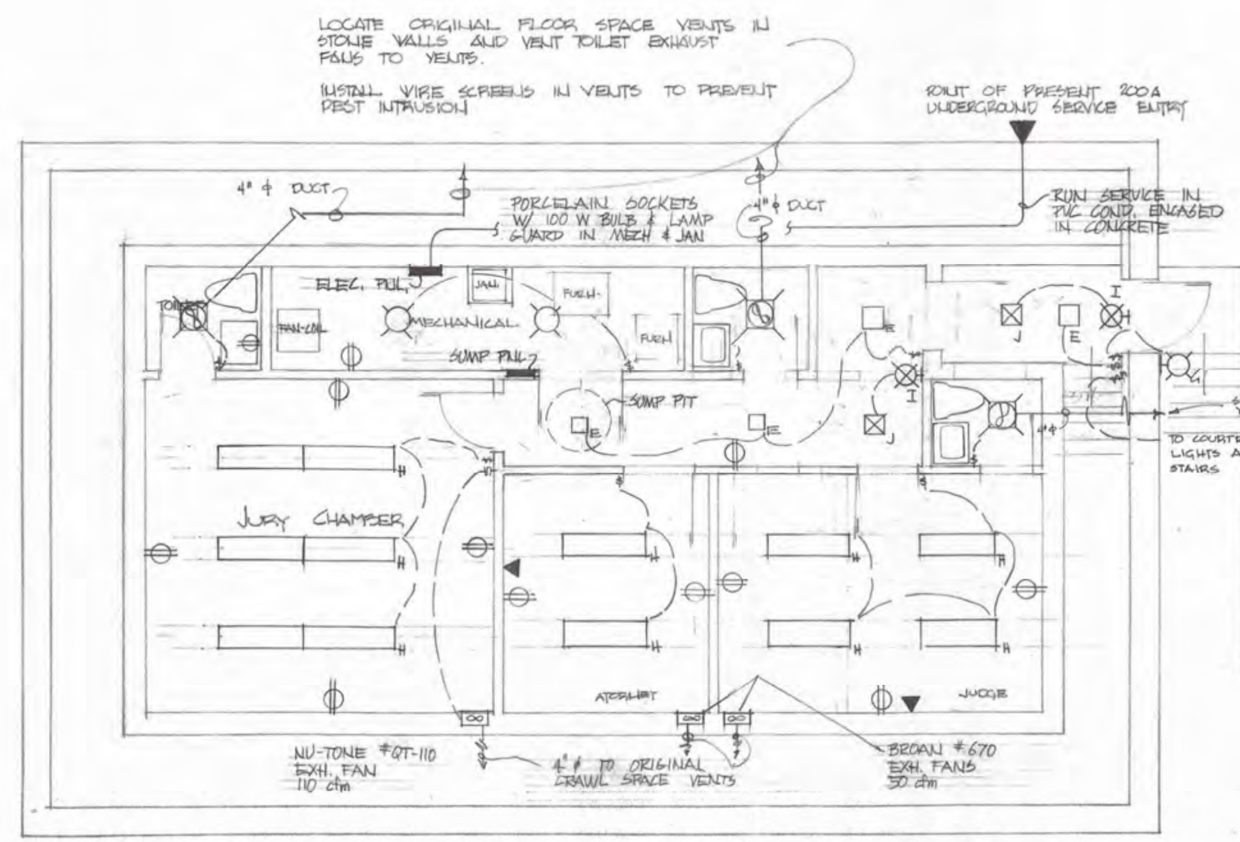




BASEMENT ELECTRICAL PLAN

LIGHT FIXTURE SCHEDULE

- A — LIGHTOLIER #16305 "SKYLIGHT W/2 40V. R.S. COOL WHITE TUBES EACH FIXTURE 12" × 48"
- B — LIGHTOLIER #7055 W/ SPECULAR CLEAR ALZACK W/ 1 300W PS-25 BULB.
- C — LIGHTOLIER #7055 W/ SPECULAR CLEAR ALZACK W/ 1 200W. A-23 BULB U.L. RATED DAMP LOCATION BELOW PORTICO.
- D — LIGHTOLIER #7054 W/ SPECULAR CLEAR ALZACK W/ 1 100W. A-19 BULB
- E — LIGHTOLIER #6800, 8¼" SQ × 4½" H – W/ 2 60W BULBS EACH
- DUPLEX RECEPTACLE OUTLETS
- SINGLE RECEPTACLE OUTLET MOUNTED IN FLOOR
- M — OUTLETS FOR CLERKS RECORDING AND SOUND AMPLIFICATION SYSTEM TO BE PROVIDED BY OWNER PROVIDE ¾ϕ PLASTIC CONDUIT UNDERFLOOR AND INSTALL OWNERS MICROPHONE WIRES IN CONDUIT.
- M — SAME AS ABOVE – FLOOR MOUNTED
- F — LIGHTOLIER "OPALEX" #6770 -8¼"ϕ × 4⅞" W/100W A-19 BULB
- NUTONE 8672 CEILING FAN & LIGHT W/ 1-60 W BULB
- G — LIGHTOLIER "OPALEX" #6780 10"ϕ × 5" W/ 100W A-19 BULB WALL MOUNTED -U.L. LISTED FOR WET LOCATION
- H — LIGHTOLIER #13150 SURF.-MTD. FLUORESCENT FIXT 12" × 48", WHITE ACRYLIC DIFFUSER, 2-40W R.S. COOL WHITE TUBES
- I — EXIT LIGHT – CHLORIDE SXX-S-1-R
- J — EMERGENCY LIGHT – CHLORIDE SPU-30M-S-R

PROVIDE NEW 200A, 120/240 V, 1ϕ/3W ELEC. PANEL W/ MAIN BREAKER, 42 POLES

ALL WIRING TO BE ACCORDING TO NATIONAL ELECTRIC CODE - 1975 EDITION

REMOVE ALL EXISTING FIXTURES AND SWITCHES – PATCH HOLES. – ABANDON EXISTING WIRING.

GENERAL CONTRACTOR TO CAREFULLY CUT OPENINGS FOR NEW LIGHT FIXTURES AND PATCH HOLES AFTER INSTALLATION OF FIXTURES.

VEPCO WILL PROVIDE NEW SERVICE TO FORMER LIBRARY BLDG.

REVISIONS
8 MAY 1977
27 MAY 1977
FAG

FLUVANNA COUNTY COURTHOUSE
PALMYRA, VIRGINIA

GRIGG, WOOD & BROWNE
ARCHITECTS · AIA
CHARLOTTESVILLE VIRGINIA

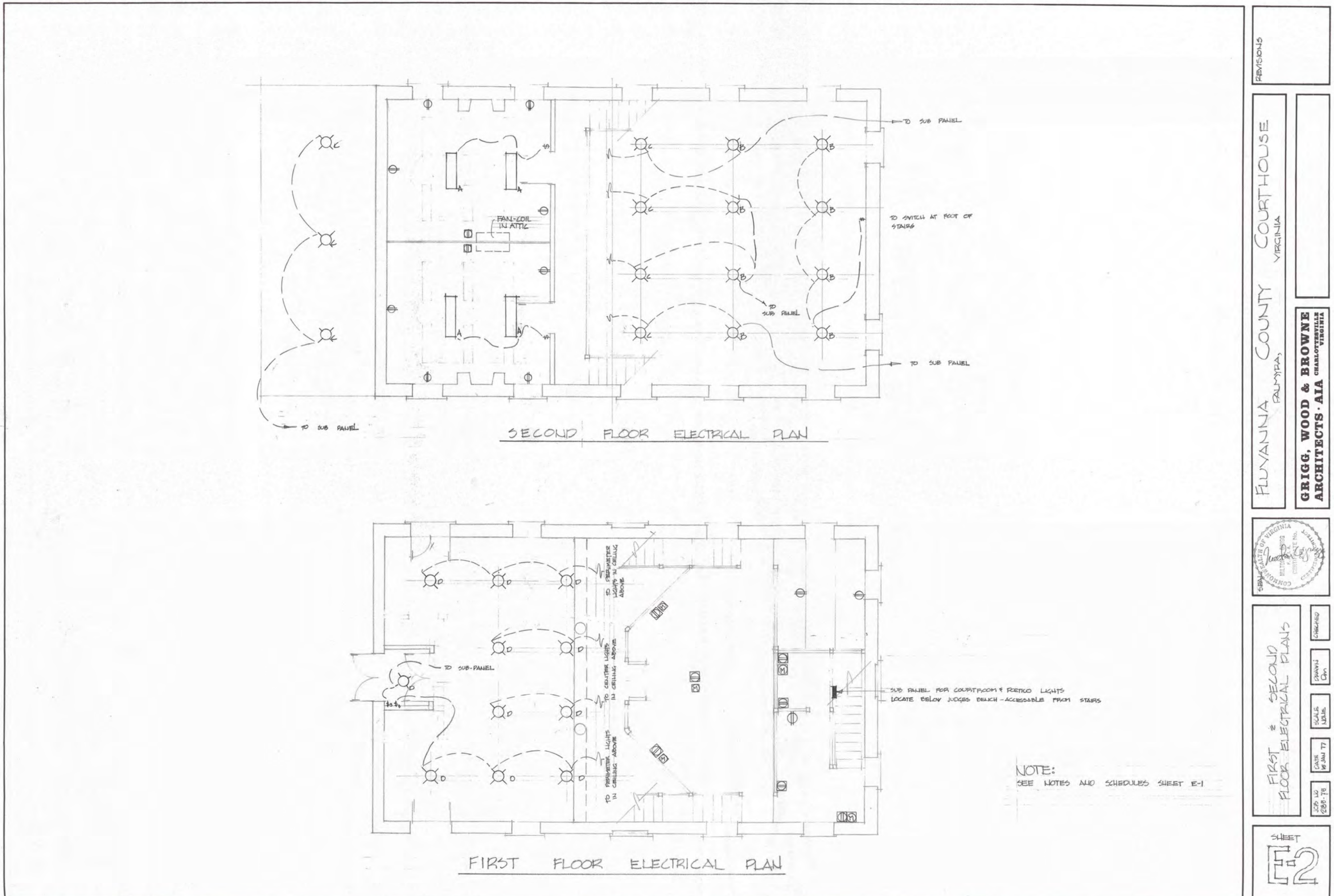
SEAL

BASEMENT ELECTRICAL PLAN

JOB NO	DATE	SCALE	DRAWN	CHECKED
2185-73	15 JAN 77	NONE		

SHEET E-1 OF 2

Note: Pages have been scaled from 24x36" to 11x17", drawings are not to scale.



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