

An Investigation of the Masonry of the Hayes House Kitchen Wing and Porch Piers



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INTRODUCTION

The Hayes House, located in Edenton, North Carolina, is possibly one of the best historic houses within the state. Owned by the same family for generations they focused on maintaining the property and grounds as stewards. The Hayes House or Hayes Plantation (Hayes) is located over a small creek to the southeast of downtown Edenton. Edenton itself is located along the north shore of the Albemarle Sound where the mouth of the Chowan River opens. Hayes was placed on the National Register of Historic Places and designated a National Historic Landmark in 1973. It was also documented by the Historic American Building Survey (HABS) in 1940 with the survey No. NC 3.

Over the course of the spring semester, archival research, laser scanning and measured drawings, a conditions assessment, and laboratory testing of mortar samples were conducted. This work was completed as an independent study project as an elective class within the Historic Preservation Master's Program from Clemson University. The goal of the project was to provide an overview of the masonry chimney within the kitchen wing and south porch piers, as well as assessing the brownstone stairs on both the north and south porches.

The first site visit occurred from February 14-18 and laser scanning, the conditions assessment, and collecting measurements was conducted. The second visit occurred April 3-6 and tasks included collecting measurements, taking mortar samples as well as some research in the Edenton Shepard-Pruden Memorial Library. Specifically, to look at their copy of John G. Zehmer Jr.'s *Hayes: The Plantation, Its People, and Their Papers*, which is out of print. Within the following report are sections on the history, construction, methodology, drawings, and findings from the conditions assessment and the mortar analysis at the Hayes House kitchen wing.

HISTORY

The history of Hayes begins with Samuel Johnston, a revolutionary war leader and North Carolina political figure, who deeded the land of Hayes to his son, James Cathcart Johnston, on November 9, 1814.¹ Though Samuel did not live at Hayes, he wished James to build a house for himself and his three sisters.² While there was already an existing dwelling and outbuildings on the land at Hayes, the house was considered dilapidated and in disrepair.³ James had to be aware of his fathers wishes, as James C. Johnston started planning a new dwelling on the property by 1812.

Classically educated, James built his reputation as “an intelligent and cultured, if eccentric, gentleman who had improved upon his inheritance to become one of North Carolina’s wealthiest men.”⁴ While James spent time and money to build and furnish Hayes, he did not spend much time here, instead choosing to travel to various springs and spas, managing his plantations, properties, and other business dealings through correspondences with various people, including enslaved workers on his plantation sites.⁵

After construction finished in 1817, James and his three sisters, Penelope Swann, Frances, and Helen all lived at Hayes until their respective deaths with James outliving his sisters. James, Frances, and Helen all remained unmarried, while Penelope was widowed. Though James was a bachelor, he had various relationships with women including a rejected marriage proposal, and four daughters with one of his enslaved women, Edith Wood.⁶ While these daughters were technically his closest family, they were not recognized, though James did help them leave the south and gain their freedom in Pennsylvania.⁷

¹ Folder 222: October-December 1814: Scan 3, in the Hayes Collection #324, Southern Historical Collection, The Wilson Library, University of North Carolina at Chapel Hill.

² Catherine W Bishir, “Severe Servitude to House Building: The Construction of Hayes Plantation House, 1814-1817,” within *Southern Built: American Architecture, Regional Practice*, (University of Virginia Press : United States), 2006, 127.

³ John G. Zehmer Jr., *Hayes: The Plantation, Its People, and Their Papers*, (Chapel Hill, Raleigh, NC: Office of Archives and History, NC Dept. of Cultural Resources : in association with the North Caroliniana Society), 2007, 10.

⁴ Bishir, “Severe Servitude to House Building,” 128.

⁵ Zemer Jr., *Hayes: The Plantation, Its People, and Their Papers*, 9.

⁶ Zemer Jr., *Hayes: The Plantation, Its People, and Their Papers*, 9.

⁷ Deloris Williams, “Hayes Plantation, Chowan County,” NCGenWeb Project, Plantations of North Carolina, January 26, 2024.

Throughout Johnston's life, he frequently gave money to his extended family "to cover debts, sudden needs, education of children, and travel."⁸ Aside from giving away money, James would frequently have his extended family stay with him at Hayes including his first cousin once removed, James C. Johnston Jr.. He addressed letters to his 'Uncle' and signed 'his affectionate nephew'.⁹ While only a few member of the Johnston family would reside at Hayes, as a southern plantation there were also enslaved people living and working on the property. A report for the 1860 census listed 94 enslaved individuals of various ages including three deaths on the 1374 acres of land with a value of \$112,000, the equivalent of \$3,977,321.63 in 2024.¹⁰ These numbers are just for Hayes, Johnston owned other plantation sites, indicating that there were many other enslaved people working for him.

While James C. Johnston owned many slaves, he was of the mind that they should be free, even if he never could free his own.¹¹ Even without freeing them, enslaved individuals at Hayes were treated well, with various records showing clothing and other necessities provided by Johnston as well as brandy during Christmas. Whether morally right or wrong, James C. Johnston believed an enslaved individual on one of his properties was better off than a worker in a northern factory.¹² His correspondence with various northerners and the American Colonization Society revealed that he had seriously thought about freeing his slaves and even possibly leaving the country if it could prove a profitable endeavor. Johnston wrote in 1833, "I think the time will soon arrive when slave property will be of little or no value."¹³

The years prior to Johnston's death saw his fluctuating health and business concerns which were only exacerbated by the Civil War breaking out. A little over a week after the attack at Fort Sumter, Johnston received word from both New York and Norfolk that all business was suspended, and it was unsafe to send merchant ships as the cities were blockaded.¹⁴ Hayes passed through the Civil War relatively unscathed, though other of Johnston's properties were raided by troops, and the enslaved people conscripted.¹⁵ In 1863, Johnston wrote of the third

⁸ Zemer Jr., *Hayes: The Plantation, Its People, and Their Papers*, 59.

⁹ Zemer Jr., *Hayes: The Plantation, Its People, and Their Papers*, 62.

¹⁰ Zemer Jr., *Hayes: The Plantation, Its People, and Their Papers*, 85.

¹¹ Zemer Jr., *Hayes: The Plantation, Its People, and Their Papers*, 76.

¹² Zemer Jr., *Hayes: The Plantation, Its People, and Their Papers*, 76-77.

¹³ Zemer Jr., *Hayes: The Plantation, Its People, and Their Papers*, 77.

¹⁴ Zemer Jr., *Hayes: The Plantation, Its People, and Their Papers*, 95-96.

¹⁵ Zemer Jr., *Hayes: The Plantation, Its People, and Their Papers*, 99-102.

departure of James C. Johnston Jr. and family to Lynchburg, Virginia during the war. This departure deeply offended James as he “hoped they never returned” and even forbade James Jr’s return to Hayes.¹⁶ James Jr. ignored his pseudo-father’s request and ended up being paid \$10,000, likely so he could not claim any more from his elder cousin.¹⁷

Johnston, so aggrieved by his family’s departure, even changed his will a few months after this so that no one in his immediate family would inherit any of his properties. Instead, he left his properties to various business partners or close friends. Hayes, he left to Edward Wood, a close friend, “to keep my property from being scattered and divided and dilapidated.”¹⁸ Slightly under two years before his death, Johnston wrote to Wood, “I do not wish any of my relatives to have anything to do with my affairs or be suffered to interfere in any way whatever.”¹⁹ Edward Wood initially refused to accept but was won over eventually. Johnston and Wood remained in contact throughout the last two years of his life, including detailing his funeral arrangements on April 9, 1865, a month before his death.²⁰

After Johnston’s death, Wood moved to Hayes immediately and had his will read after the funeral, a year later when they presented the will to the Chowan County Court, Johnston’s family members contested it in court.²¹ Upon losing the case, they appealed to the Chowan County Superior Court with witness testimony claiming Johnston was insane and Wood was only trying to make money. When they lost the appeal, the case then went before the North Carolina Supreme Court who still upheld the will.²²

Edward Wood and his descendants chose to live at Hayes, along with some of the newly freed enslaved individuals. They agreed to work the land in exchange for housing, food, firewood, a garden, and the tools and equipment needed.²³ Though Johnston had bequeathed Hayes to Edward Wood, Wood and his descendants felt that their family were stewards of the property and should continue to maintain it with great care and sensitivity.²⁴ Even going as far as not being interred in the cemetery at Hayes, but maintaining it as the Johnston Family

¹⁶ Zemer Jr., *Hayes: The Plantation, Its People, and Their Papers*, 102-103.

¹⁷ Zemer Jr., *Hayes: The Plantation, Its People, and Their Papers*, 103.

¹⁸ Bishir. “Severe Servitude to House Building,” 150.

¹⁹ Zemer Jr., *Hayes: The Plantation, Its People, and Their Papers*, 105.

²⁰ Zemer Jr., *Hayes: The Plantation, Its People, and Their Papers*, 108.

²¹ Zemer Jr., *Hayes: The Plantation, Its People, and Their Papers*, 110.

²² Zemer Jr., *Hayes: The Plantation, Its People, and Their Papers*, 110-113.

²³ Zemer Jr., *Hayes: The Plantation, Its People, and Their Papers*, 136.

²⁴ Zemer Jr., *Hayes: The Plantation, Its People, and Their Papers*, 162.

Cemetery.²⁵ The Woods held onto Hayes until 2022 when the State of North Carolina bought the property for \$4,329,500 to create a historic site, leased to the Elizabeth Van Moore Foundation for 50 years and helped by the Edenton Historical Commission.²⁶ The plans for Hayes are ongoing with a goal of some kind of park on the property for the town.

²⁵ Zemer Jr., *Hayes: The Plantation, Its People, and Their Papers*, 162.

²⁶ Tyler Newman, "State Finalizes Purchase of Hayes Farm in Edenton," *Chowan Herald*, January 18, 2023.

CONSTRUCTION

For the actual construction of Hayes, James Cathcart Johnston hired William Nichols, an upcoming architect from Bath, England, to design and manage the project. Nichols, influenced by classical architecture books, designed a five-part Palladian villa home. The central mass of the house has two curved hyphens leading to symmetrical wings on the south side of the house. These wings hold the library to the west, and the kitchen house to the east. Nichols stayed in North Carolina from 1800-1827 working as an architect, carpenter, engineer, and superintendent. He was the first resident architect for the state of North Carolina, since John Hawks, also an English native. Hawks was known for his Palladian architecture and design of Tryon Palace in New Bern 40 years earlier.²⁷

William Nichols worked in Edenton for a portion of his time in the state and is credited with the restoration of St. Paul's Church. He spent the three years working on Hayes before moving south to Raleigh to work on the Governor's Mansion and other buildings before travelling further south. He designed a lot of his buildings in the Greek Revival and Gothic Revival styles with large porticos with full height columns and decorative features. He favored stylish and sophisticated architecture and his buildings across the south tend to favor each other.

Compared to other grand homes in North Carolina, Hayes has a frame structure instead of masonry. Using wood to frame the house would have saved Johnston money, as the nearby forests provided wood quicker and cheaper than brickmaking. Johnston sourced timber from William Dartlet of nearby Windsor in the spring of 1814. To mill all of this, he decided to use teams of enslaved pit sawyers.²⁸ At this time, enslaved craftsmen on plantation sites could gain passes to travel to a site to work for either their own wage or the plantation owner. Johnston hired enslaved workers from not only his friends in Edenton, but also from further away including at least four men from Zachariah Howell in Norfolk, Virginia.²⁹ David Clark, his friend in Edenton sent men named Wilson and Anthony, while Zachariah sent Moses, Stepney, Gilbert,

²⁷ Catherine W. Bishir and Peter B. Sandbeck, "Hawks, John (ca. 1731-1790)," North Carolina Architects & Builders: A Biographical Dictionary, 2009.

²⁸ Bishir, "Severe Servitude to House Building," 134-35.

²⁹ Bishir, "Severe Servitude to House Building," 134-35 and "Johnston Family Papers, 1811-1865." In the Hayes Collection 1694-1928, Southern Historical Collection. The Wilson Library : University of North Carolina, Chapel Hill.

and Randall.³⁰ These teams of pit sawyers averaged around 200 feet of lumber a day. Losing only a few days to bad weather, sickness, and the occasional visit home. Johnston paid Moses, Stepney, Gilbert, and Randall around \$5 dollars a day for their work and \$20 to Zachariah for the use of their labor.³¹

For the bricks that Johnston did need to build the foundation, chimneys, and porch piers, he ordered 100,000 bricks from a local Edenton brickmaker named James Cunningham. According to a letter sent to Johnston by one of his enslaved named Sam, July 8, 1813, Sam had reached out to a bricklayer for the number of bricks and barrels of lime it would take to build the foundation and chimneys.³² That letter and the transcription are shown below.

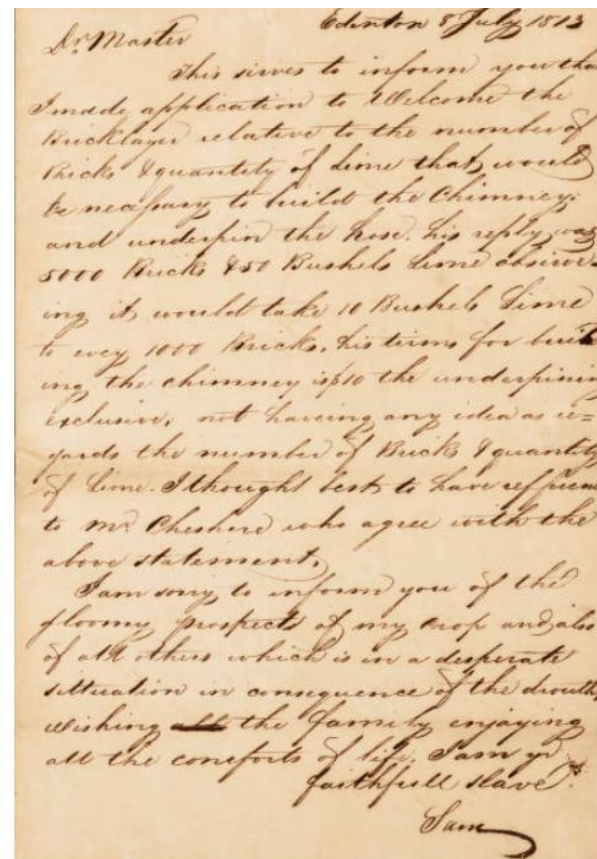
Dr Master Edenton 8 July 1813

 This serves to inform you that

I made application to welcome the Bricklayer relative to the number of Bricks & quantity of lime that would Be necefary(?) to build the chimney; And underpin the hose. His reply was 5000 bricks 50 bushels lime observe(?)ing it would take 10 bushels lime to every 1000 bricks, his reply for building the chimney is \$10 the underpinning Exclusive, not haveing any idea as regards the number of brick I quantity Of lime. I thought best to have reference to mr. Cheshire(?) who agree with the Above statement.

I am sorry to inform you of the Gloomy prospects of my crop and also Of all others which is in a desperate Sittuation in consequence of the drouth. Wishing the family enjayeing All the coneforts of life, I am yr

Faithfull slave
Sam



Dr. Master Edenton 8 July 1813

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Faithfull slave
Sam

Figure 1 Letter from Sam July 8, 1813

³⁰ "Johnston Family Papers, 1811-1865." In the Hayes Collection 1694-1928, Southern Historical Collection.

³¹ Bishir, "Black Builders in Antebellum North Carolina," Within Southern Built: American Architecture, Regional Practice, University of Virginia Press : United States, 2006, 75.

³² Bricklayer quote_00324_0217_0001. "Johnston Family Papers, 1811-1865." In the Hayes Collection 1694-1928, Southern Historical Collection.

This letter dated 1813 shows that Johnston was planning out his house even before his father left him the property in the will. Most likely due to the length of time needed to build a house at this time. Sourcing the building materials alone could take upwards of a year to gather without including any of the other items needed like glass for windows, hardware such as hinges, doorknobs, or nails, or finishes like paint or plaster. Most of these items would have to be sourced from other states that were manufacturing items.

When it was time to lay the bricks, Johnston sent word to the Parkers, the team of masons he had originally asked to lay his house, but they replied that they would not be able to come due to a backlog created by illness. Instead Johnston hired a well-known slave artisan in Edenton by the name of Joe Welcome.³³ Joe Welcome, who worked with Nichols previously on the St. Paul's Church was owned by a friend of Johnston's, Josiah Collins, Jr., a merchant planter in Edenton.³⁴ Joe Welcome focused his craft mainly on masonry, which allowed him to increase his skill which in turn allowed him to earn a higher wage from his work. Even as an enslaved man, Joe Welcome led construction crews at Hayes and other locations, being paid 12 shillings 6 pence instead of the typical 6-10 shillings.³⁵

Along with Joe Welcome, Josiah sent Jim Millen to also work on Hayes. While there would have likely been an entire team of both enslaved and freemen working on the construction, only the names of those who Johnston was paying really show up in the collection of Hayes Papers. Another letter sent December 3, 1815 records paying two men, Harry and Dick, the amount of \$63 for work on the house in November and December.³⁶ Though this document, shown below, does not specify the status of these two men, \$63 dollars for two men with no last names listed could mean that these were additional slave craftsman hired out to work on Hayes.

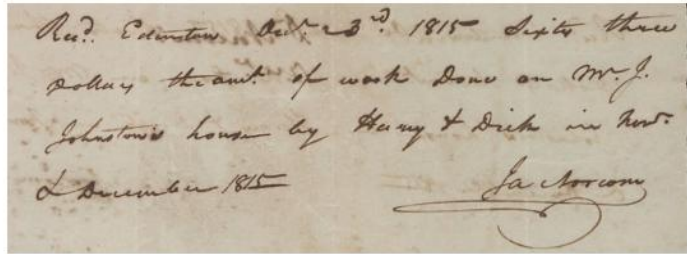
³³ Bishir, "Severe Servitude to House Building," 139.

³⁴ Bishir, "Severe Servitude to House Building," 139.

³⁵ Bishir, "Black Builders in Antebellum North Carolina," 75.

³⁶ Folder 226: October-December 1815: Scan 42, "Johnston Family Papers, 1811-1865." In the Hayes Collection 1694-1928, Southern Historical Collection.

Ru.d Edenton Dec. 3rd 1815 sixty three
Dollars the amt. Of work done on Mr. J
Johnstons house by Harry & Dick in Nov.
& December 1815. Ja Norcom(?)



Recd. Edenton Dec 3rd 1815 sixty three
dollars the amt. of work done on Mr. J.
Johnstons house by Harry & Dick in Nov.
& December 1815
Ja Norcom

Figure 2 Payment for Harry and Dick

Hayes, while being a grand mansion in North Carolina, was far less expensive than other grand homes. James, on his father's advice, instructed his friend in New York to pick out only the plainest and neatest kinds of furniture that would fit into rural North Carolina. Items that fit into the North Carolina plantation lifestyle instead of a lavish city home.³⁷ This focus on less decorative and stylish furnishings also would keep the cost of the project down. That is not to say that Johnston was hard on money, he made enough money from his various plantations and business dealings that towards the end of his death he was considered one of the wealthiest people in North Carolina.³⁸ But even with Johnston's wealth, he could not have built Hayes alone, and both the enslaved and freedmen working to construct this house deserve the recognition of their work.

Though this history is more of an overview, it provided a starting point for my investigation into the construction of Hayes and the people who would have built, lived, and worked here. This allowed my study to focus on the specific time frame of construction, and family names to research more for potential workers, both freed and enslaved. Knowing that the materials, specifically wood and bricks, were sourced locally allowed for less specific study on the location they were obtained from and instead the who and how of constructing the kitchen wing. My following mortar analysis should therefore show similar results to other buildings constructed from this same period using locally sourced bricks and masons.

³⁷ Bishir, "Severe Servitude to House Building," 129.

³⁸ Bishir, "Severe Servitude to House Building," 129.

METHODOLOGY

This section describes the methodology for this independent study starting with research of Edenton, North Carolina and the Hayes property. In particular, the two separate site visits, and the mortar analysis of samples at the CDC.C. Historic Preservation Laboratory in Charleston, South Carolina. While there is no formal research question associated with this work, it was understood that this study would study anything possibly related to the construction of the chimney, composition of mortar, or use of the rooms within the kitchen wing.



Figure 3 South Room Facing Chimney Block

The tools and equipment used while in Edenton included drafting equipment such as graph paper, pencils, an architectural scale and straightedge. Measurement tools included a 25-foot metal tape measure, a Bosch laser tape measure, and a Protimeter® Mini BLD2000 moisture meter. A personal Samsung cell phone was used to take photos, and a flashlight was used in the loft for visibility. These photos were taken on the default setting and optimized by the phone for photo settings. The Laser Scanner used was a Leica model BLK360 and utilized an iPad Pro for

controls. The only Personal Protective Equipment used were work gloves when investigating during the first site visit and safety glasses and gloves when collecting the mortar samples during the second.



*Figure 4 Tools Used.
Showing the Laser Scanner, Laser Tape, and Moisture Meter*

This project began with research into Edenton and Hayes, moving into a search of archival materials of the Hayes Collection. This was limited to online records as the physical copies are stored at the University of North Carolina Chapel Hill Louis Round Wilson Library Southern Historical Collection. General research into masonry and assessing the conditions of features was conducted through conversations with a professional mason working with a restoration company within Charleston, South Carolina in preparation of the first site visit.

The first site visit occurred over the span of four days from February 14 through 18. The first day spent in Edenton was an introduction to Edenton with Robert Leath, Andrew Owenby, and Wade Rogers. During the time spent on site at Hayes, one day was spent laser scanning the kitchen wing, both exterior and interior, using a Leica Laser scanner and Cyclone FIELD 360 software on the iPad Pro. To enhance this work, measurements were taken by hand to cover the overall distances and smaller details the scan might miss. The second day was spent documenting

the conditions of the masonry chimney block within the center of the kitchen wing. This also included one final scan with the laser scanner to form a point of attachment between the first floor and the loft, which was not accurately aligning from the previous day scanning.



Figure 5 South Porch of Hayes

The third day lasted only half a day, and was comprised of an assessment of the masonry piers of the south porch and the brownstone steps on both the north and south porches. Moisture contents were checked in various areas and were inflated due to rain the night before. This site visit ended with a final walkthrough with Robert, Andrew, and Wade to discuss what had been done so far, the next steps, and the goals of the project. One of these next steps was removing the infill from the north room's fire box which had been closed up sometime before the boiler system was placed in the north room. This would be completed before the second site visit occurred.

Between the two site visits, cabinets and walls were removed as well from the north room which revealed a doorway between the previously internally separate rooms. Due to this, the laser scan data from the first visit does not include this and so the sides of the chimney were limited by what was visible. Conditions were noted on areas outside the wall and cabinets within the south room and the wall and counterspace in the north room. All of the data collected during this site visit was taken back to Charleston for post processing.

Back in Charleston, the laser scanner data was post processed into a point cloud file that could be imported into AutoCAD. As the software is proprietary and utilizes a license key, the necessary laptop was borrowed from the Director of the Historic Preservation department. Once

the post processing was completed the point cloud was imported into an AutoCAD file and the floorplan, north elevation of the chimney, and south elevation of the chimney were traced out using various section views of the point cloud. This allowed for accurate drawings of the building without having to hand measure every value. The measurements taken by hand of details were added to these drawings after most of the larger details were completed. These drawings are contained within the Measured Drawing section of this report.

Between the first and second site visits research into the Hayes Collection continued along with the AutoCAD work. Communication with Robert and Andrew about the removal of the north room fire box infill occurred when that work was undertaken including photos, direct video of the removal, and social media posts about the work.

The second site visit occurred over three days from April 3 through 6. This site visit happened concurrently with the Conservation Lab class visit to Edenton comprising the first-year students within the program. While their trip was structured with house tours, walking tours, and other events, some time was spent with them for specific events. Though this limited the amount of time spent at Hayes, one day was dedicated to examining the removed infill from the north



Figure 6 Sample HP-01 Location.

fire box and measuring it and the newly uncovered doorway within the wall between the two rooms. Some time was spent talking to the class about this project on their tour of Hayes that day.

That afternoon included collecting two mortar samples to take back to Charleston for analysis. One sample was collected from underneath the south porch on the back side of the arch near the stairs. This was near a potential area of repointing and included some of the parging on the intrados of the arch. It was given the designation of HP-01 for Hayes Porch. The other location was the interior of the uncovered north room chimney about five feet off the ground where the mortar was already loose and failing. It



Figure 7 Sample HC-01 Location



Figure 8 Sample HC-01 During Acid Digestion

was designated HC-01 for Hayes Chimney. These two sample locations were documented and the samples carefully collected with a hammer and chisel before being placed into a labelled bag.

Upon return to Charleston the samples were analyzed as whole pieces and fibers within the HP-01 sample removed for further analysis. The samples were then powdered before being placed into a beaker within the fume hood and slightly saturated with water before adding Muriatic Acid creating a chemical reaction. The particles lifted up the sides of the beaker were washed down with water and more acid and water added until the reaction was not so violent. A magnetic stirring rod was then placed carefully into the beaker and the beaker stirred on a Fisher Scientific Isotemp self-stirring machine within the fume hood for 24 hours. A watch glass was placed on the top of the beaker to prevent any type of contamination and to prevent splashes and fumes from rising from the acidic solution. After 24 hours passed, the beaker was removed from the self-stirring machine and tested with more muriatic acid for a reaction. Finding none, a piece of filter paper was weighed and placed into a funnel in an Erlenmeyer flask and the liquid carefully poured into the funnel to separate the fines from the aggregate. At this point the second mortar sample was started within the fume hood following the same process as the first. Over the next 24 hours, the filter paper was refilled with

liquid from the beaker until no more filtered out. The beaker was then placed within an incubator manufactured by Lab-Line Instruments, Inc. Model No. 120 to dry. Once the last filtration had completed, the filter paper was placed on a watch glass and set in the incubator for 24 hours as well. This process was completed on the second sample concurrently. Once the beakers and filter paper for each sample was dry, they were removed from the incubator and weighed. The now dry aggregate within the beaker had to be moved to a plastic weigh boat to not overload the scale. This aggregate was then placed into a U.S.A. Standard Test Sieve manufactured by Gilson Company, Inc. This sieve stack was manually shaken for 10 minutes to sort the particles by size. Weigh boats were also labelled for each section of the sieve stack and weighed before the aggregate was added. Once sorted in the sieve stack each numbered pan was carefully poured into the corresponding weigh boat and weighed to find the weight of the aggregate sample. Both mortar samples went through this process. After sorting the aggregates of each mortar sample, the now sorted aggregate was analyzed for size, shape, sphericity, and color to finish the mortar analysis. Those findings are within the Mortar Analysis section of this report.

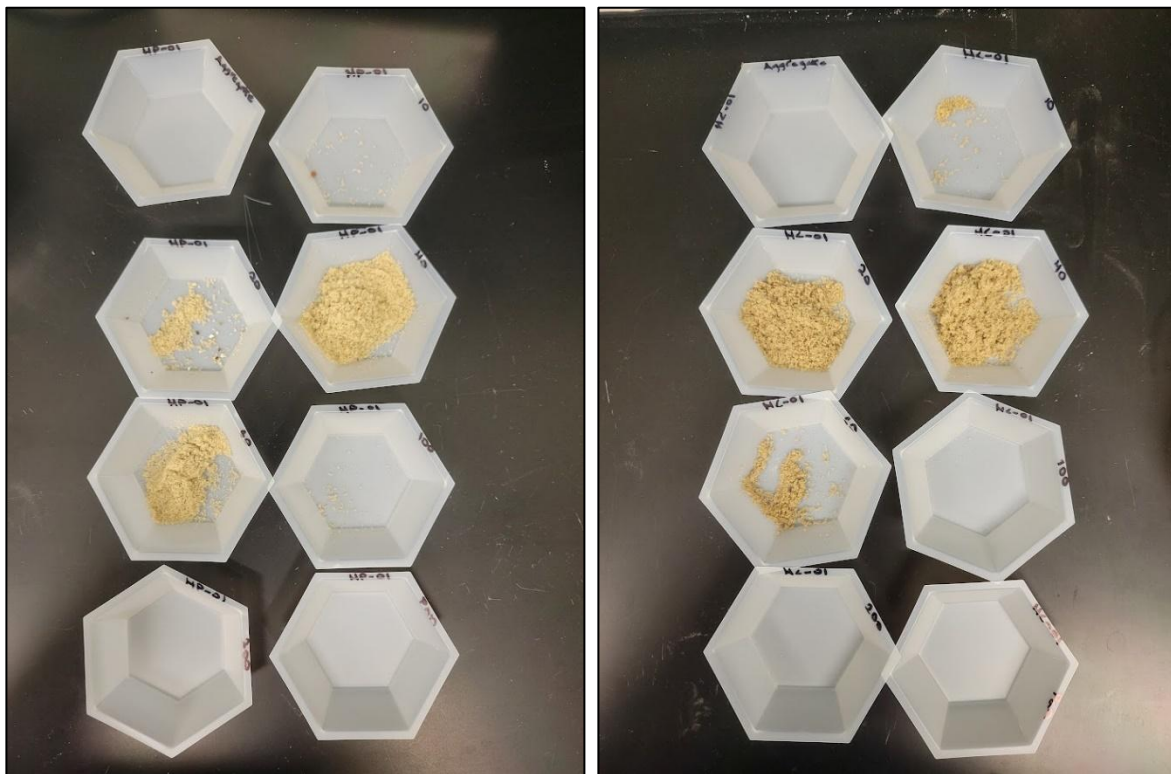
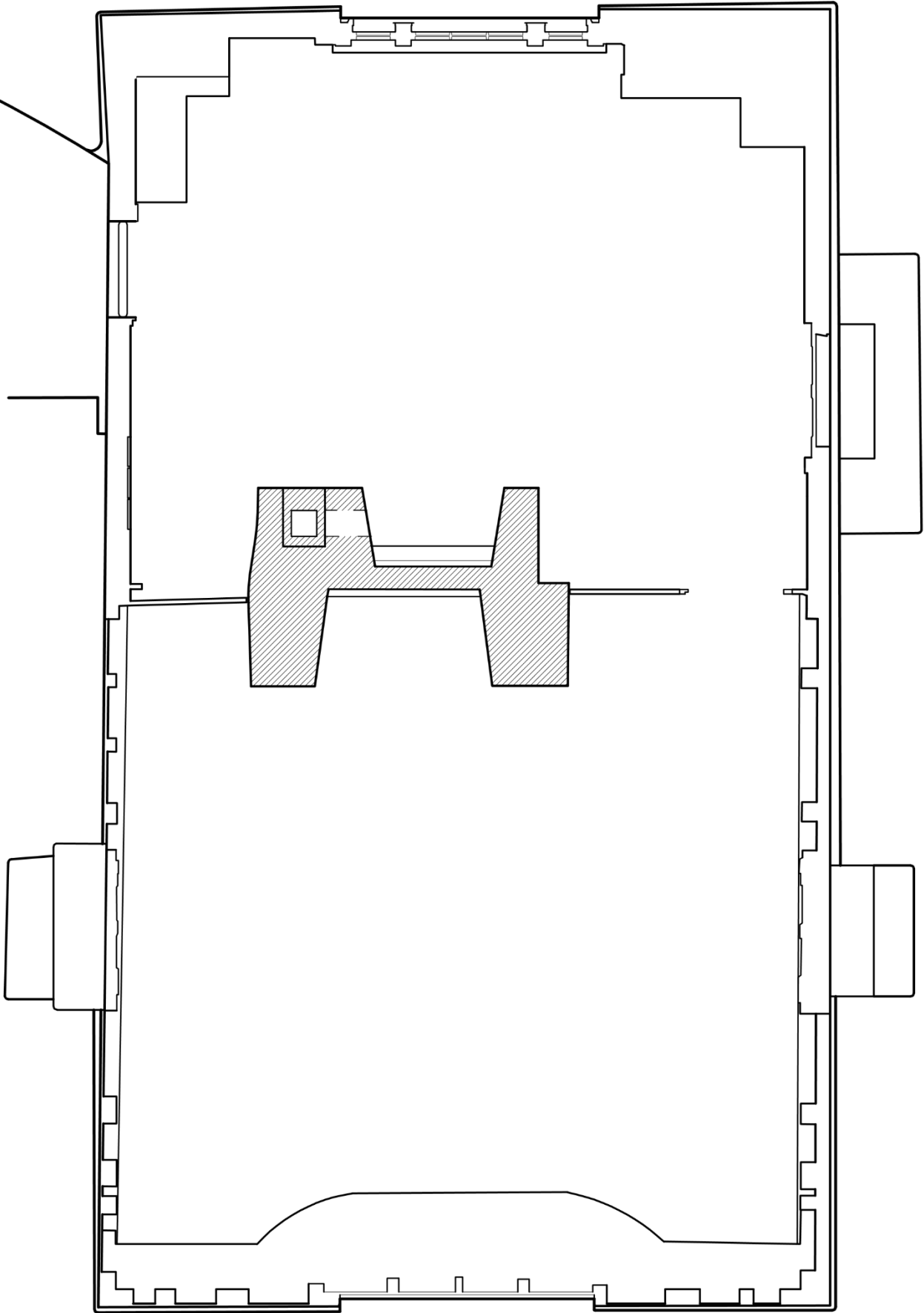


Figure 9 Aggregate After Sifting. Left: HP-01 Right: HC-01

MEASURED DRAWINGS

The following pages are the measured drawings created from the laser scanning and hand measurements. These drawings include the floor plan from around four feet off the ground and the elevations of the chimney block from both rooms. The elevations are named based on the room that the chimney block fireboxes are located. These drawings are to the Historic American Building Survey standards and use the template supplied by the Clemson University Master of Science in Historic Preservation program.

While the arches on either side of the fireboxes in both rooms are cut off, research into finding similar cases did not reveal any results. These arches remain a mystery as to their original purpose and what era of the house they may be associated.



FLOOR PLAN

1/4"=1'-0" 1:48



DRAWN BY: JESSICA RIDDER

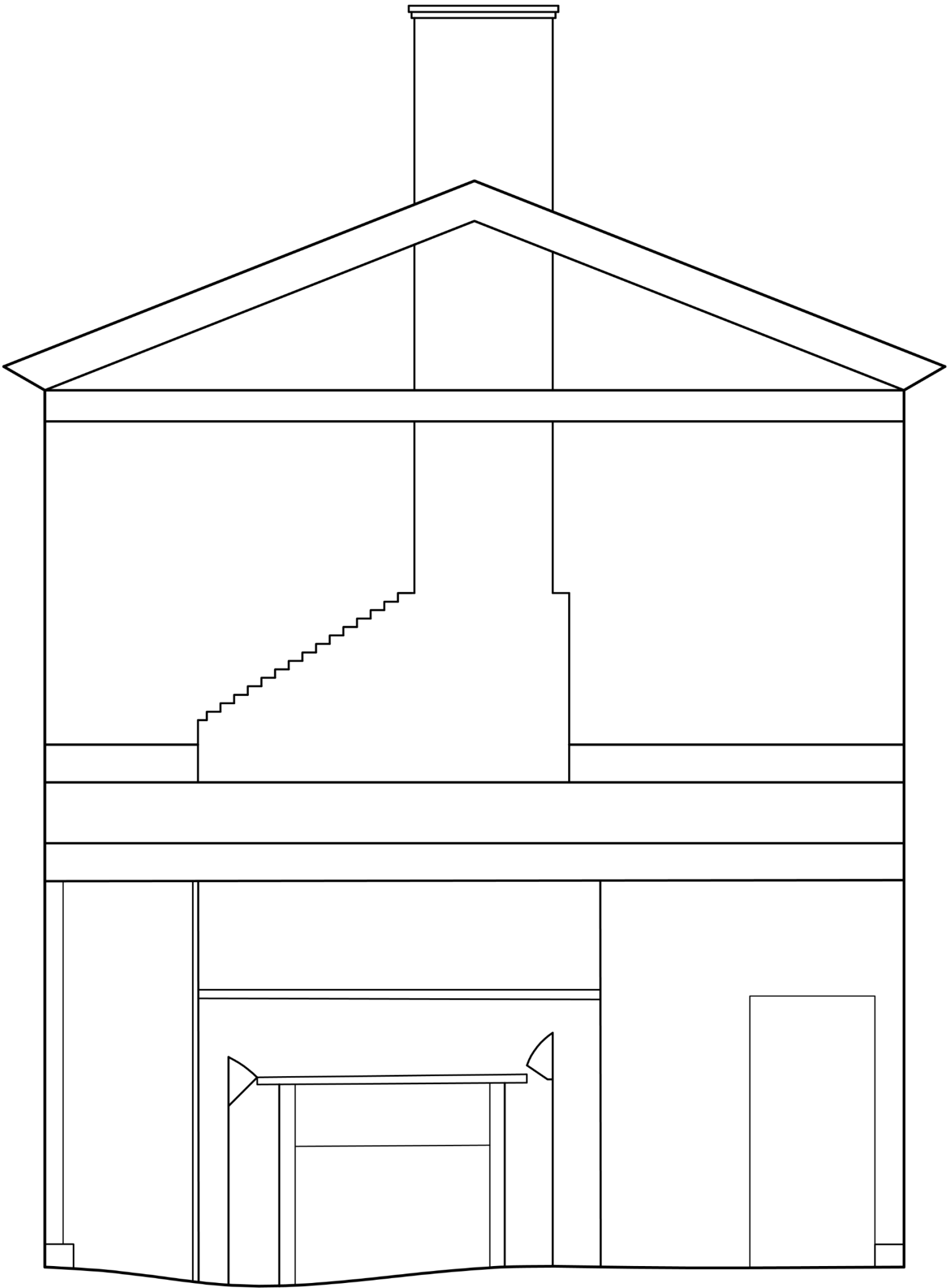
NATIONAL PARK SERVICE
U.S. DEPARTMENT OF THE INTERIOR

HAYES HOUSE - EDENTON, NC
CLEMSON DESIGN CENTER, CHARLESTON, SC

SURVEY NO.

HISTORIC AMERICAN
BUILDINGS SURVEY
SHEET 1 OF 1

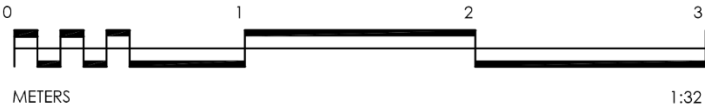
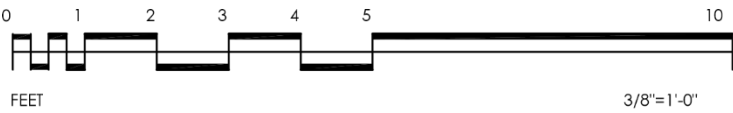
LIBRARY OF CONGRESS
INDEX NUMBER



SOUTH ROOM ELEVATION

3/8"=1'-0"

1:32



DRAWN BY: JESSICA RIDDER

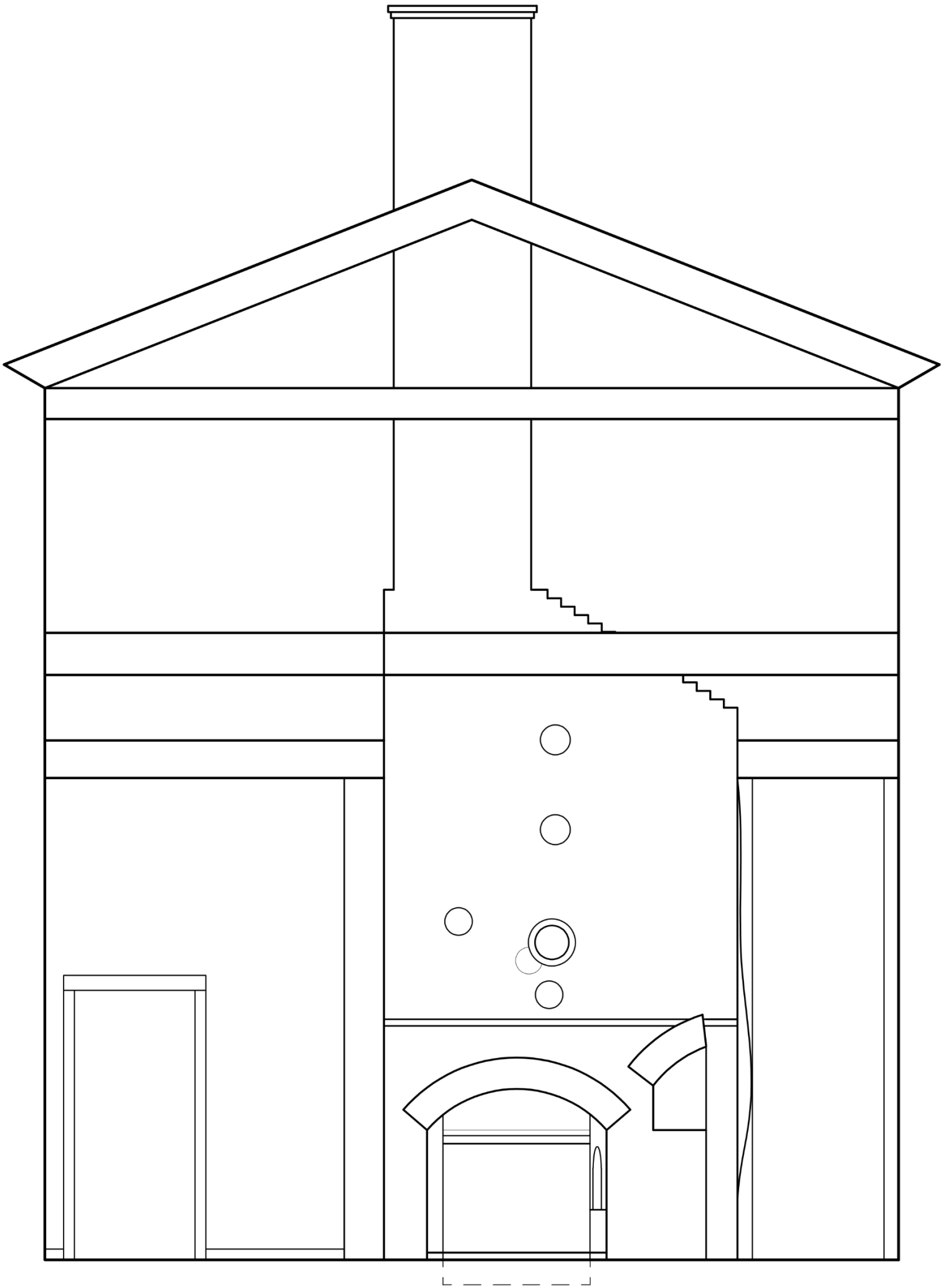
NATIONAL PARK SERVICE
U.S. DEPARTMENT OF THE INTERIOR

HAYES HOUSE - EDENTON, NC
CLEMSON DESIGN CENTER, CHARLESTON, SC

SURVEY NO.

HISTORIC AMERICAN
BUILDINGS SURVEY
SHEET 1 OF 1

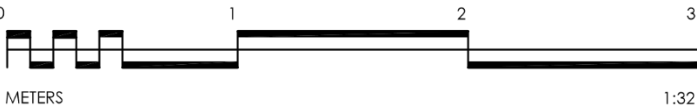
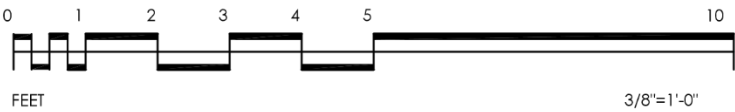
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NORTH ROOM ELEVATION

3/8"=1'-0"

1:32



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CONDITIONS ASSESSMENT

The following conditions assessment is based on notes taken during the first site visit. The conditions are shown for the masonry chimney block, south porch piers, and the brownstone steps to both porches.

Masonry Chimney Block

The chimney block within the kitchen wing has similar conditions on both sides with the most pressing being the loss of mortar throughout. While the mortar appears in good condition from a distance, close examination reveals that the mortar joints have turned to powder and are just laying on the tops of bricks in built up piles. These piles of aggregate, which appear to be sand, do not provide the connection between bricks that should be present. Instead, this mortar powder could allow bricks to move out of place or come loose entirely. This is most likely caused by moisture present either from rising damp or rain coming down the unprotected chimney.



Figure 10 Nails within the bricks

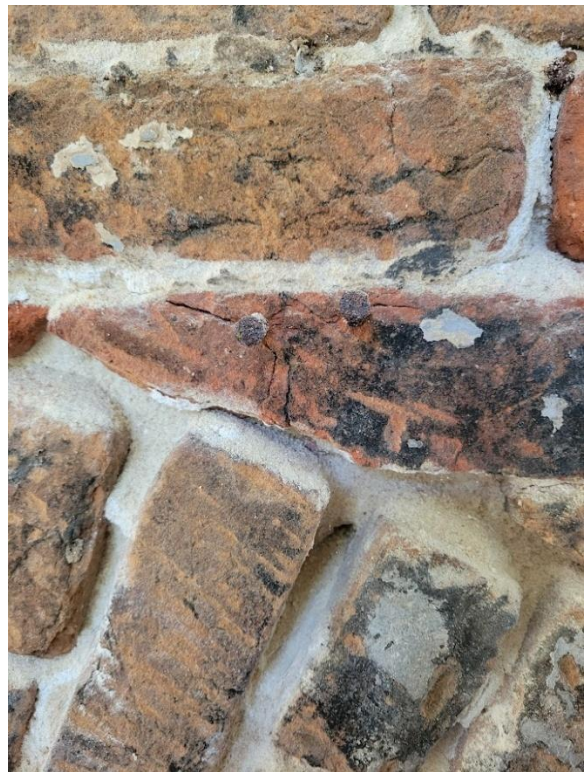


Figure 11 Conditions showing loose and powder mortar

Another finding within the masonry are multiple nails stuck into either bricks or the mortar joints that are now corroding. This is causing the bricks to crack as the corrosion expands the iron. As with the mortar joints, if left long enough, this could cause bricks to start spalling, which is the name for the face of the brick falling away leaving the interior of the brick exposed. This is bad for multiple reasons as the hardened outer surface of the brick that is glazed during the firing process provides some protection to the brick from physical damage as well as moisture problems that could erode the interior of the brick. Another sign that moisture is present is the salt efflorescence on the surface of some bricks towards the floor of the south room. This is just salt that has been absorbed into the brick along with water and as the water evaporates from the porous brick, it leaves behind the salt which can build up deposits as seen in Figure 12.



Figure 12 Salt efflorescence on the brick in the south room firebox

Some of the bricks have patches of plaster from previous parging on the surface. The patches are caused either by the plaster not bonding well with the entire surface of the brick and falling down, or something happening to weaken the bond to the brick and leading to the collapse. This on its own does not create a major problem and instead can be seen as a minor aesthetic change.

Porch Piers



Figure 13 Mortar loss and bio-growth (left), Water pipe under arch (right)

The porch piers under the south porch are in good condition with only some areas of mortar loss mainly towards the top where the porch sits against the brick. This is causing the mortar loss between the bricks and leading to the bio-growth within these joints. The presence of the water pipe underneath one of the arches is of note due to the chance of leaking or spraying water in close proximity to the masonry that could lead to deterioration.

Stone Steps

The stone steps on the north and south porches are made of the same brownstone, most likely acquired from New England as it is local to that region. These brownstone steps are hewn out of larger pieces of rock and show the ghost marks of tools used to split them and shape the sides. As a sedimentary stone, brownstone is formed in layers of deposited silt, sand, and mud that can be cleaved along those layer lines. This can be a problem for brownstone if it gets damaged exposing multiple layers that water or material wear could exacerbate. These steps show some signs of this cleaving on the edges of the stone shown below in Figure 14. The steps

on the north side also show signs of metal deterioration on the balusters with one even completely missing and laying on the ground next to the stairs. There are others that have shims stuck down beside them in the setting



Figure 14 Bottom step cleaving on north stair and baluster missing with broken sets in stone

The south porch stairs are also showing signs of settling and moving away from the porch. Figure 15 shows the gap between the pier and the stair support. This could be caused by the different weight between the piers and the stair supports which appear to just sit on the surface instead of having any other sort of foundation. The lack of foundation has slowly allowed the dirt to settle and the stairs to pull slightly away from the porch.



Figure 15 South Stairs Stone Step and Header

Summary of Conclusions

The conclusions drawn from the conditions assessment completed on the masonry block, porch piers, and brownstone steps indicate that presence of moisture is causing mortar loss, iron corrosion, salt efflorescence, and bio-growth. These conditions are present on both the masonry chimney block and the porch piers, with the majority being within the firebox of the south room. This is due to the uncapped chimney that allows an open path for moisture.

The stone steps show signs of cleaving along the sedimentary layers and settlement away from the South Porch. The railings on the north stairs are also showing signs of failing with shimmed or missing balusters, signs of corrosion, and loose settings.

Recommendations

After reviewing the conditions assessment results, my recommendations are to repoint the areas of mortar loss that could cause bricks to fall and potentially cause a total collapse if enough of them are displaced. Repointing would also take care of the bio-growth issue on the porch piers within the failing mortar. Another recommendation is to shore up the south porch stairs that are

pulling away from the porch which could lead to a large gap between the stairs and the porch causing a safety hazard.

Another higher priority recommendation is to install some kind of moisture barrier between the foundation of the kitchen wing and the masonry chimney block to prevent rising damp from leaving more salt deposits on the bricks. Along with this, putting a cap on the chimney will prevent rain from entering the interior, decrease the mortar loss, and moisture issues. This will also help with some of the brick spalling that is occurring within the firebox of the south room.

A moderate recommendation is to remove the metal nails from within the bricks. While they have already cracked some bricks, removing them regardless of corrosion status will still leave the holes in the bricks. Removing them will just prevent further cracking which could start breaking the bricks out of the masonry completely.

The low priority maintenance recommendations include monitoring the water pipe underneath the south porch for signs of leaking which could compromise the masonry arch surrounding it. This level of recommendation also includes either removing the patches of parging from the brick surface that have created staining, leaving them alone to show the progression of finishes on the masonry surface, or replastering the masonry surface to return to the parged look. This should be based on the preservation treatment that Hayes receives and what the period of significance is chosen.

MORTAR ANALYSIS

While the lab testing process of this mortar analysis was described within the methodology, a visual pre-analysis was conducted on the mortar samples. During this pre-analysis, sample HP-01 revealed an interesting discovery. The sample taken from under the south porch had some kind of fiber embedded within the mortar. These fibers were extracted and examined under the microscope to try to determine what they were. After comparing the fiber to other images of different fibers, I was able to rule out any type of hair as these fibers did not have the growth plate pattern that hair does. To double check this, a sample of the fiber was compared to a strand of my hair under 20x magnification using transmitted light. The comparison showed that the fiber was different than hair and I moved onto comparing it to plant fibers. My first thought was that they were cotton fibers as they shared the same semi-circular shape of other examples, but after consulting another source written by Martha Goodman, I believe that the fibers are actually flax. The fibers could have been intentionally added to the mortar as an extra binder for the parging or accidentally added to the mortar when mixing. The fibers are shown below. The fibers have a curious spiral to them which appeared to be natural and not caused by their presence in the mortar. This spiral pattern is shown in Figure 16 with the red line indicating the edge of the fiber twisting from the bottom to the top of the strand as it moves from left to right. This sample, HP-01 was the only one to have these fibers present.

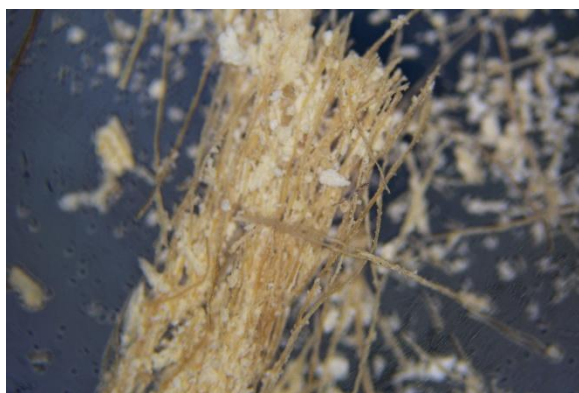


Figure 17 Fiber sample under 4x transmitted light



Figure 16 Single fiber strand under 20x transmitted light

**CLEMSON UNIVERSITY/ COLLEGE OF CHARLESTON
GRADUATE PROGRAM IN HISTORIC PRESERVATION**

Mortar Analysis	
Sample number: HP-01	
Project/Site: Hayes House	
Location: 1038 Hayes Farm Rd. Edenton, NC	Date sampled: 4/5/2025
Analysis performed by: Jessica Ridder	Date analyzed: 4/11/2025
Description of Sample	
Type/Location: Mortar and possible parging on back and intrados of arch under south porch. To the right of the stairs on the left pier about 2 feet off the ground	
Surface appearance: Granular, some larger aggregates, some brick dust and painted surfaces on larger pieces. Loose powder in the bottom of sample bag.	
Cross section: Same appearance as surface. Some areas of white, possible lime deposits	
Snap Strength: Easily broken with little force	
Color: 5Y 8/1 in Munsell Soil Color book	Texture: Unified Soil Classification System (USCS) sand medium 2 - 0.425 mm, sub rounded 0.5/0.9
Hardness: Softer than a penny, 1-2 on Mohs scale	Gross weight: 212.9992g Sample weight: 35.4352g
Filter paper weight: 1.7844g	Weight of the filter paper with the dry fines: 4.4182g

Gross sample photo before powdering:



Photomicrograph or sample location photo:



Components: after acid digestion

Fines:	Color: 10YR 8.5/1		%Weight: 7.43%	Weight: 2.6338g	
	Organic Matter: Some type of plant fiber, possibly flax or cotton				
	Composition: Silt <1/16mm				
Acid soluble fraction: (the digested binder)	%Weight: 44.6%		Weight: 15.8030g		
	Description of reaction: Very reactive, almost overflowed beaker. Many bubbles formed, some small particulates showed signs of bubbling on surface and breakdown. Slight color change				
	Filtrate color: 5Y 8/6				
	Composition: Lime				
Aggregate characterization:	Color: 2.5Y 8/2		%Weight: 47.97%	Weight: 16.9984g	
	Mineralogy: Small brick pieces and possible large sand grains				
	Grain shape: In chart below				
Sieve #	Particle Size	Sphericity	Shape	Sorting	Color
10	Very coarse sand	0.3/0.7	Angular	Coarse-poor	2.5 Y 8/2
20	Coarse sand	0.5/0.9	Sub-angular	Coarse-poor	2.5 Y 8/2
40	Medium sand	0.7/0.9	Sub-rounded	medium-poor	2.5 Y 8/2
60	Fine sand	0.7/0.9	Round	Fine-well	2.5 Y 8/2
100	Fine sand	0.7/0.9	Round	Fine-well	2.5 Y 8/2
200	Very fine sand	0.7/0.9	Round	Fine-well	2.5 Y 8/2

Pan	N/A	N/A	N/A	N/A	N/A
Fines	Very fine silt	0.9/09	Round	Fine-well	10 YR 8.5/1

Assessment

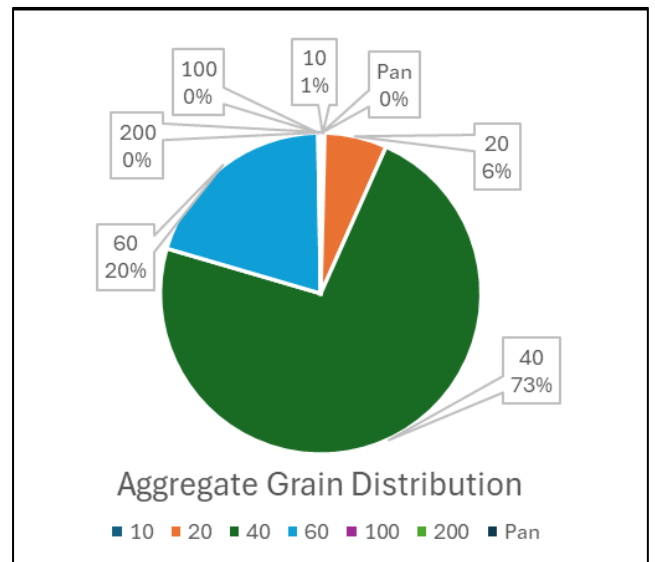
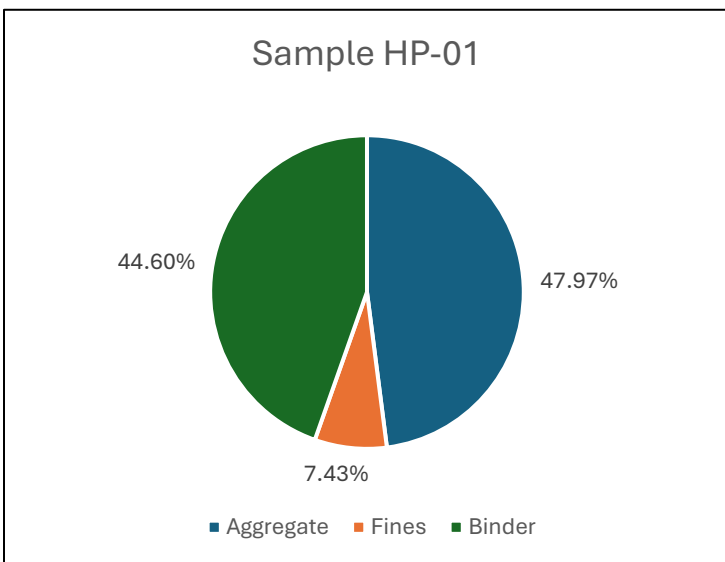
Mortar Type: Possibly Type O Mortar. Lime rich, pointing mortar for non-load bearing situations.

Fines: 1

Acid Soluble: 6

Aggregate: 6

Sieve #	Mass of Container (g)	Mass of Sample and Container (g)	Mass Retained (g)	% Mass Retained
10	1.9126	1.9811	0.0685	0.1933
20	1.9334	2.9998	1.0664	3.0094
40	1.9238	14.3063	12.3825	34.9441
60	2.0787	5.5149	3.4362	9.6971
100	2.0448	2.0866	0.0418	0.1180
200	2.0564	2.0594	0.003	0.0085
Pan	2.0038	2.0038	0	0.0000



**CLEMSON UNIVERSITY/ COLLEGE OF CHARLESTON
GRADUATE PROGRAM IN HISTORIC PRESERVATION**

Mortar Analysis	
Sample number: HC- 01	
Project/Site: Hayes House	
Location: 1038 Hayes Farm Rd. Edenton, NC	Date sampled: 4/5/2025
Analysis performed by: Jessica Ridder	Date analyzed: 4/11/2025
Description of Sample	
Type/Location: Smaller kitchen room, inside chimney on right side. At level with the smoke shelf	
Surface appearance: Granular, some larger aggregates, some soot residues present across the surfaces. Loose powder in the bottom of sample bag.	
Cross section: Same appearance as surface. Some areas of white, possible lime deposits	
Snap Strength: Easily broken with little force	
Color: 10 YR 7/4 in Munsell Soil Color book	Texture: Unified Soil Classification System (USCS) sand medium 2 - 0.425 mm, sub rounded 0.5/0.9
Hardness: Softer than a penny, 1-2 on Mohs scale	Gross weight:
	302.2294g
	Sample weight
	32.6130g
Filter paper weight:	Weight of the filter paper with the dry fines:
1.8078g	3.4302g

Gross sample photo before powdering:



Photomicrograph or sample location photo:

**Components: after acid digestion**

Fines:	Color: 10YR 7/2		%Weight: 4.97%	Weight: 1.6224g	
	Organic Matter: None found				
	Composition: Silt <1/16mm				
Acid soluble fraction: (the digested binder)	%Weight: 35.21%		Weight: 11.4831g		
	Description of reaction: Very reactive, almost overflowed beaker. Many bubbles formed, some small particulates showed signs of bubbling on surface and breakdown. Slight color change				
	Filtrate color: 7.5YR 6/8				
	Composition: Lime				
Aggregate characterization:	Color: 10YR 7/4		%Weight: 59.82%	Weight: 19.5075	
	Mineralogy: Small brick pieces and possible large sand grains				
	Grain shape: In chart below				
Sieve #	Particle Size	Sphericity	Shape	Sorting	Color
10	Medium sand	0.5/0.9	Sub-rounded	Coarse-poor	10YR 7/4
20	Medium sand	0.7/0.9	Sub-rounded	Medium-well	10YR 7/4
40	Medium sand	0.9/0.9	Rounded	Fine-poor	10YR 7/4
60	Fine sand	0.9/0.9	Rounded	Fine-poor	10YR 7/4
100	Fine sand	0.9/0.9	Rounded	Fine-well	10YR 7/4
200	N/A	N/A	N/A	N/A	N/A

Pan	N/A	N/A	N/A	N/A	N/A
Fines	Very fine silt	0.9/0.9	rounded	Fine-well	10YR 7/2

Assessment

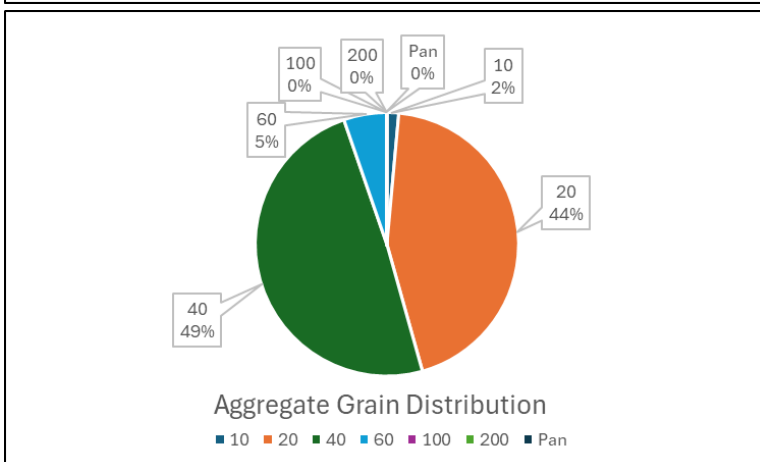
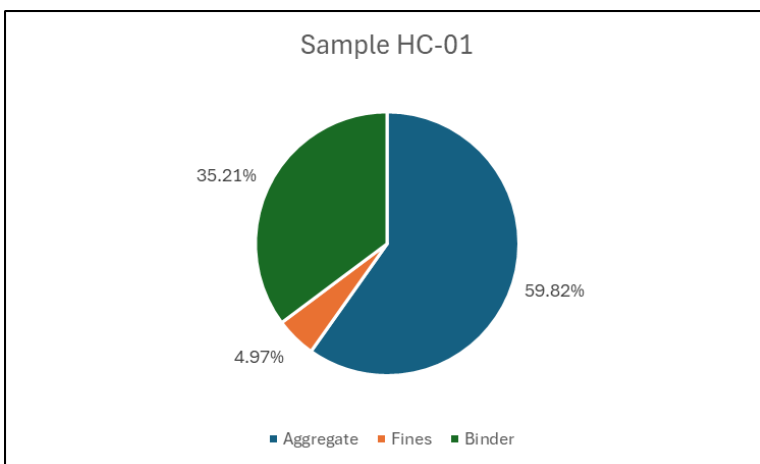
Mortar Type: Possibly Type K mortar. While the ratio does not exactly match the 1:3:10, this is the closest to the assessed ratio below.

Fines: 1

Acid Soluble: 7

Aggregate: 12

Sieve #	Mass of Container (g)	Mass of Sample and Container (g)	Mass Retained (g)	% Mass Retained
10	2.0044	2.2869	0.2825	0.8662
20	2.0226	10.6453	8.6227	26.4395
40	2.1193	11.6878	9.5685	29.3395
60	1.8945	2.925	1.0305	3.1598
100	1.8975	1.8997	0.0022	0.0067
200	1.8651	1.8661	0.0010	0.0031
Pan	2.0335	2.0336	0.0001	0.0003



Based on this mortar analysis, neither sample of mortar produced an exact match to a known mortar ratio. Sample HP-01 was a close match to Type O mortar with a ratio of 1:6:6 versus Type O at 1:2:9. This reflects only a third of the aggregate switched to increase a third of the binder. This lime rich mortar would also explain the white deposits found within the mortar during the pre-analysis. As this type of mortar has a compressive strength of 350psi it is considered non-loadbearing. This means that for any repointing that includes the bedding mortar a stronger type of mortar should be used to prevent failure. However, the mortar used should be weaker than the surrounding bricks to prevent damage to the brick faces.

The Chimney sample HC-01 produced a ratio of 1:7:12, a closer match to Type K mortar at 1:3:10. While providing the closest match, Type K mortar is used for historic preservation situations as it is porous and is considered non-loadbearing. Considering this mortar sample was removed from the interior of the chimney where temperature and moisture fluctuations are likely, it does not make sense for it to be this type. One explanation for this is that the mortar is likely old and compressive strengths may not have been as understood or regulated as today. Usually for chimneys, Type M mortar is chosen as it has a high compressive strength. With historic bricks however, this can cause damage as the old bricks are more porous and will move and crumble before the mortar.

When selecting a mortar to repoint these areas, I recommend using the Type O for the porch piers when only a shallow joint needs repointed. If a deeper joint is found, use a higher compressive strength mortar that will support the bricks without causing damage. The Chimney may be able to have Type K mortar used on it if the joints are shallow and the rest of the bricks are supported by a stronger mortar type. Otherwise, a higher compressive strength mortar should be used here as well.

To determine if a mortar type will damage the bricks, a brick from these areas could be tested for its compressive strength and a mortar selected based on that. Based on the compressive strength of a brick, it could determine that a mortar higher than the brick should be used. This could be due to needing a loadbearing mortar which could damage the bricks, but be necessary to support the masonry. In this case, the mortar should be based on the life safety risk of a masonry failure.

CONCLUSIONS

In conclusion, this study examined the Hayes Collection stored at the University of North Carolina, Chapel Hill, laser scanned and created measured drawings of the kitchen wing, assessed the conditions of the masonry in the kitchen, porch piers, and steps, and analyzed the mortar from two locations. The results from this independent study should provide future researchers a basis on studying the Hayes house masonry elements in Edenton, North Carolina in regards to the architecture of the kitchen wing. Further research could expand out to the rest of the main house and either document any changes from the original HABS survey or focus on the foundation underneath the main house. Someone could also expand this conditions assessment to including the entire house for a complete picture into the condition of the house, especially after being in private hands for so long. Further research could try to determine what the arches were used for on either side of the firebox and when they could have been installed or removed to only leave the remaining segments that are present today. Another avenue of research could include attempting to find the specific locations of materials such as the wood from Windsor or clay or aggregate used to make the bricks.

Hayes is a beautiful site and has a lot to offer both the town of Edenton and any researchers that may want to use the site to study, research, or test different preservation and conservation issues. Hayes is a great addition to not only the building stock of North Carolina but also the south as a wider region providing insight into the life of a rural town surrounded by plantations instead of an urban city.

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