UNIVERSITY OF VIRGINIA

PAVILION X

EXTERIOR RESTORATION PLAN

PAVILION X

UNIVERSITY OF VIRGINIA

PAVILION X

UNIVERSITY OF VIRGINIA

EXTERIOR RESTORATION PLAN

MESICK COHEN WILSON BAKER
ARCHITECTS

2007

PREPARED FOR

UNIVERSITY OF VIRGINIA

CHARLOTTESVILLE, VIRGINIA

PREPARED BY

MESICK COHEN WILSON BAKER ARCHITECTS

388 BROADWAY
ALBANY, NEW YORK 12207

3302 CRAGGY OAK COURT
WILLIAMSBURG, VIRGINIA 23188

PARTNER-IN CHARGE

M. JEFFREY BAKER

ARCHITECTURAL STAFF

JOHN D. ALVAREZ
THOMAS BURGESS
GINA GUNDERSEN

ARCHITECTURAL HISTORIAN

ERIC GRADOIA

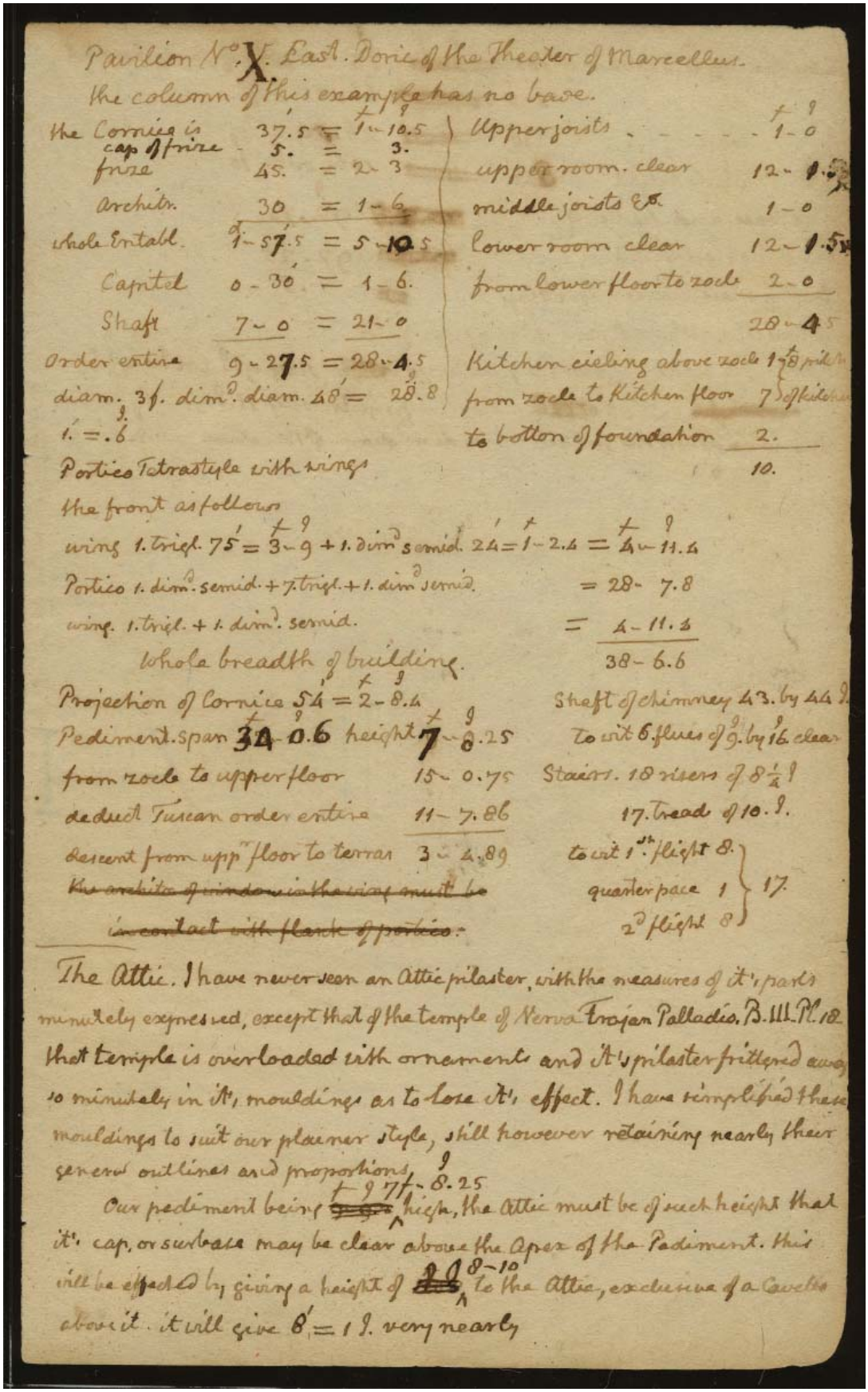
CONTENTS

INTRODUCTION

Over the past twenty years, six of Jefferson's pavilions along the lawn have been carefully recorded and studied for evidence relating to their earliest appearance during the first years of their existence. We have been fortunate to learn that, at least comparatively speaking, the pavilions themselves have survived remarkably well. Each has been adapted to accept a living pattern unplanned by Jefferson, but these adaptations have for the most part been made with a respect for the significance of Jefferson's original concept. No fires have destroyed any of the pavilions, which is remarkable considering the fact that the fireplaces within the buildings were used extensively and the fireplaces within the student rooms adjacent to the pavilions are still in use today. Conversely, water has been the root cause for much of the loss of Jefferson's original fabric throughout the lawn, and early efforts to thwart water infiltration has altered Jefferson's original concept more than any other intervention. Our appreciation of this fact was driven home during the preparation of the Chinese Rail investigation that commenced last year. It was most exciting to discover the original elevations and probable designs for the rails themselves, and these findings may someday greatly contribute to our appreciation of Jefferson's original scheme. The original rails were removed when the serrated roofs failed within a relatively short period of time, and the expedient gabled slate roofs constructed over the serrated roofs probably worked very well but destroyed important features of Jefferson's design. As research revealed, the portico decks along the front of each pavilion were carefully designed to be at the same level as the decks over the serrated roofs of the adjoining student rooms. This was discovered after carefully surveying the decks and their relationships to the surviving serrated roofs (and their deck ghosts) encapsulated beneath the gabled roof coverings.

The exercise of carefully surveying the serrated roofs and their relationship to the adjacent pavilions was accompanied by a close study of Jefferson's notes related to the construction of the student rooms and the pavilions themselves. As the earlier study revealed, Jefferson conceived of the pavilions, the portico decks and the student rooms together so that they would form a harmonious complex inextricably linked throughout the composition. This understanding has lead to the realization that it is perhaps imprudent to study an individual pavilion without studying its relationship to the whole composition. This is particularly important at Pavilions IX and X, where the pavilions and their flanking student rooms form single buildings. Virtually all of Jefferson's design notes and dimensions relate each pavilion to the Tuscan order of the student rooms, and this fact was illustrated using diagrams with Jefferson's dimensions clearly marked.

Although Jefferson's notes and calculations are almost incomprehensible to the average reader, they become readily understood in diagrammatic form. Most importantly, the act of stepping into Jefferson's shoes and re-calculating each proportion and each dimension brings forth a unique understanding of Jefferson's design process, complete with his errors, omissions and liberties with the classical orders. Learning from this exercise, this approach was taken during the present study.



Pavilion N°. X. East. Doric of the Theater of Marcellus.

the columns of this example has no base.

the Cornice is	37.5	= 1-10.5	
cap of frize	5.	= 3.	
frize	45.	= 2-3	
Architr.	30	= 1-6	
whole Entabl.	1-57.5	= 5-10.5	
Capital	0-30	= 1-6.	
Shaft	7-0	= 21-0	
Order entire	9-27.5	= 28-4.5	

diam. 3f. dim^{n}. diam. 48' = 28.8

1'. = .6

Upper joists	1-0
upper room. clear	12-1.5
middle joists &c.	1-0
lower room clear	12-1.5
from lower floor to zocle	2-0
	28-4.5
Kitchen cieling above zocle	1-8 pitch
from zocle to Kitchen floor	7 of kitchen
to bottom of foundation	2.
	10.

Portico Tetrastyle with wings

the front as follows

wing 1. trigl. 75' = 3-9 + 1. dim^{n} semid. 24' = 1-2.4 = 4-11.4

Portico 1. dim^{n}. semid. + 7. trigl. + 1. dim^{n} semid. = 28-7.8

wing. 1. trigl. + 1. dim^{n}. semid. = 4-11.4

whole breadth of building. 38-6.6

Projection of Cornice	54'	= 2-8.4	
Pediment. span	34-0.6	height	7-8.25
from zocle to upper floor		15-0.75	
deduct Tuscan order entire		11-7.86	
descent from upp^{r} floor to terras		3-4.89	

~~the architr. of window in the wing must be in contact with flank of portico.~~

Shaft of chimney 4 3. by 4 4 I.

To suit 6 flues of 9. by 16. clear

Stairs. 18 risers of 8 1/2 I.

17. tread of 10. I.

to suit 1st. flight	8.	17.
quarter pace	1	
2d flight	8	

The Attic. I have never seen an Attic pilaster, with the measures of it's parts minutely expressed, except that of the temple of Nerva Trojan Palladio. B. III. Pl. 18. that temple is overloaded with ornament and it's pilaster frittered away so minutely in it's mouldings as to lose it's effect. I have simplified these mouldings to suit our plainer style, still however retaining nearly their general outlines and proportions.

Our pediment being 7f.-8.25 high, the Attic must be of such height that it's cap, or surbase may be clear above the Apex of the Pediment. this will be effected by giving a height of 8-10 to the Attic, exclusive of a Cavetto above it. it will give 8' = 1 I. very nearly

Figure 1. Jefferson's building notebook for the University of Virginia. Dated June 18th, 1819. Specification for Pavilion X. Albert and Shirley Small Special Collections Library, University of Virginia.

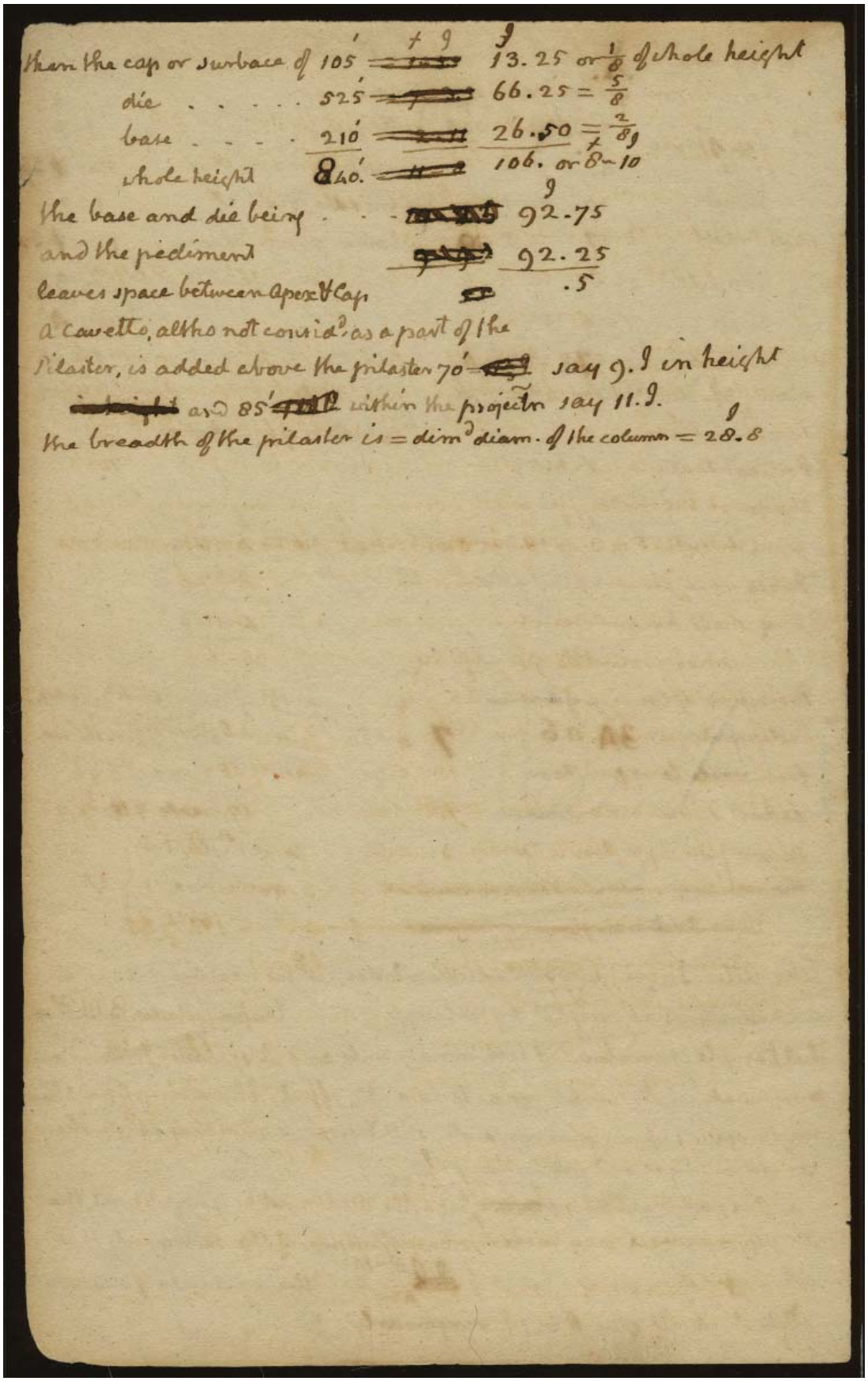
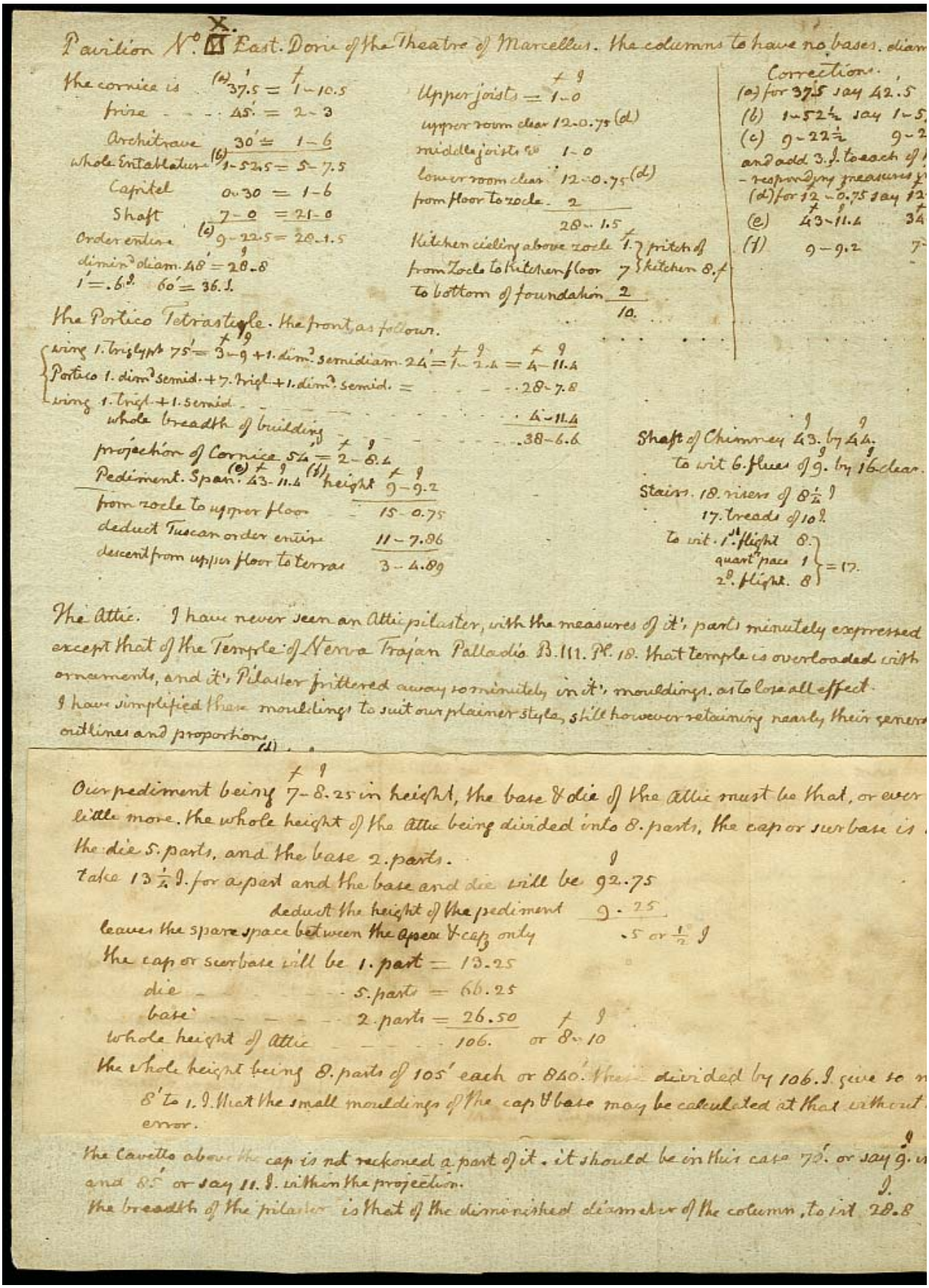


Figure 1a. Jefferson's building notebook for the University of Virginia. Dated June 18th, 1819. Specification for Pavilion X continued. Albert and Shirley Small Special Collections Library, University of Virginia.


Pavilion N.° X. East. Dorie of the Theatre of Marcellus. the columns to have no bases. diam

the cornice is (a) 37.5 = 1-10.5
frize 45. = 2-3
Architrave 30' = 1-6
whole Entablature (b) 1-52.5 = 5-7.5
Capitel 0.30 = 1-6
Shaft 7-0 = 21-0
Order entire (c) 9-22.5 = 28-1.5
diminᵈ diam. 48' = 28-8
1' = .6 I. 60' = 36. I.

Upper joists = 1-0
upper room clear 12-0.75 (d)
middle joists = 1-0
lower room clear 12-0.75 (d)
from floor to rocle 2
28-1.5
Kitchen cieling above rocle 1.7 pitch of
from rocle to kitchen floor 7 kitchen 8.f
to bottom of foundation 2
10.

Correction.
(a) for 37.5 say 42.5
(b) 1-52½ say 1-5
(c) 9-22½ 9-2
and add 3.I. to each of
- respondy measures
(d) for 12-0.75 say 12
(e) 43-11.4 34
(f) 9-9.2 7-

The Portico Tetrastyle. the front as follows.

wing 1. triglyph 7.5' = 3-9 + 1. diᵐ semidiam. 24' = 1-2.4 = 4-11.4
Portico 1. diᵐ semid. + 7. trigl + 1. diᵐ semid. = 28-7.8
wing 1. trigl + 1. semid. 4-11.4
whole breadth of building 38-6.6

projection of Cornice 5.4 = 2-8.4
Pediment. Span (e) 43-11.4 height (f) 9-9.2
from rocle to upper floor 15-0.75
deduct Tuscan order entire 11-7.86
descent from upper floor to terras 3-4.89

Shaft of Chimney 43. by 44.
to wit 6. flues of 9. by 16 clear.
Stairs. 18. risers of 8½ I
17. treads of 10 I
to wit. 1ˢᵗ flight 8.
quartᵉ pace 1
2ᵈ. flight. 8
= 17.

The Attic. I have never seen an Attic pilaster, with the measures of it's parts minutely expressed except that of the Temple of Nerva Trajan Palladio B. III. Pl. 18. that temple is overloaded with ornaments, and it's Pilaster frittered away so minutely in it's mouldings, as to lose all effect. I have simplified these mouldings to suit our plainer style, still however retaining nearly their general outlines and proportions.

Our pediment being 7-8.25 in height, the base & die of the attic must be that, or ever little more. the whole height of the attic being divided into 8. parts, the cap or surbase is the die 5. parts, and the base 2. parts.
Take 13¼ I. for a part and the base and die will be 92.75
deduct the height of the pediment 9.25
leaves the spare space between the apex & cap only .5 or ½ I
The cap or surbase will be 1. part = 13.25
die 5. parts = 66.25
base 2. parts = 26.50
whole height of Attic 106. or 8-10

The whole height being 8. parts of 105' each or 840. these divided by 106. I give so n 8' to 1. I. that the small mouldings of the cap & base may be calculated at that without error.

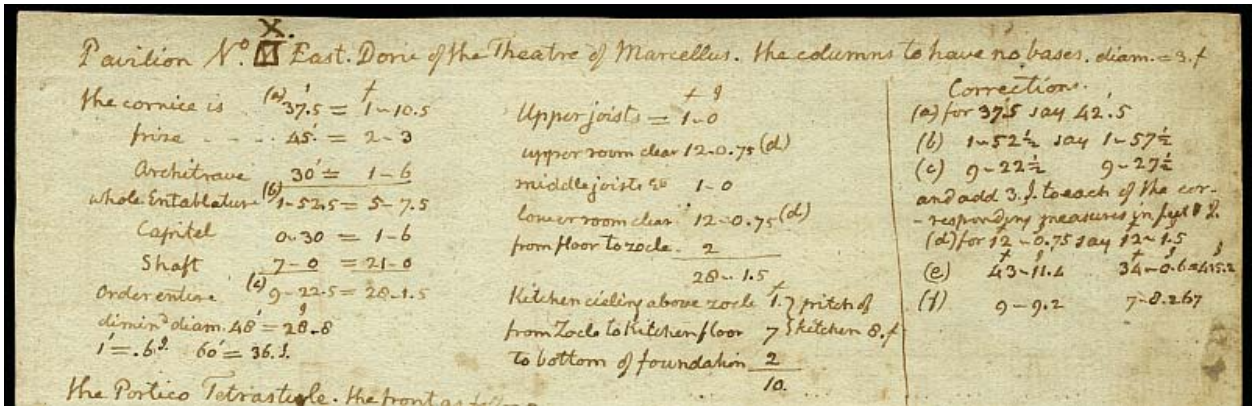
The Cavetto above the cap is not reckoned a part of it. it should be in this case 7.5' or say 9. I. and 8.5' or say 11. I. within the projection.
The breadth of the pilaster is that of the diminished diameter of the column, to wit 28.8

Figure 2. Specification for Pavilion X located on the reverse side of Jefferson's drawing for the pavilion. N326. Albert and Shirley Small Special Collections Library, University of Virginia.

While no discoveries were made that will significantly alter our view of Pavilion X, some points were found that will be of interest to any scholar interested in Jefferson's overall approach to the use of the classical orders, as well as the minutia of his design details.

SUMMARY OF ARCHITECTURAL EVIDENCE

There are two specifications in Jefferson's hand that are devoted to the design of Pavilion X. One of these may be found in his building notebook for the University of Virginia dated July 18th, 1819 (Figure 1+1a), and the other is a near duplicate that is a separate page (Figure 2). The separate page version appears to have an entire section devoted to the Attic parapet pasted on its page. Judging from the fact that this pasted section appears to cover over text beneath it, it appears that the parapet was designed with other dimensions and that the pasted over version corrects earlier calculations. This page also has a "Corrections" section in the upper right hand corner that modifies the dimensions of the original calculations to the left (Figure 3). The calculations on the left were modified because Jefferson evidently failed to include a dimension for a fillet beneath the cornice of the Doric order. It is impossible to tell from these corrections which document came first, since Jefferson also made corrections to the building notebook version of his specifications. However, instead of inserting additional dimensions in a margin, he simply wrote over or crossed out his earlier dimensions.


Pavilion N° X. East. Doric of the Theatre of Marcellus. the columns to have no bases. diam. = 3.f

The cornice is (a) 37.5 = 1-10.5
frize . . . 45. = 2-3
Architrave 30 = 1-6
Whole Entablature (b) 1-52.5 = 5-7.5
Capitel 0.30 = 1-6
Shaft 7-0 = 21-0
Order entire (c) 9-22.5 = 28-1.5
diminr diam. 48 = 28-8
1 = .6.2 60 = 36.1.

Upper joists = 1-0
upper room clear 12-0.75 (d)
middle joists &c 1-0
lower room clear 12-0.75 (d)
from floor to zocle 2
28-1.5
Kitchen ceiling above zocle 1.7 pitch of
from Zocle to Kitchen floor 7 Kitchen 8.f
to bottom of foundation 2
10.

Corrections.
(a) for 37.5 say 42.5
(b) 1-52½ say 1-57½
(c) 9-22½ 9-27½
and add 3.f. to each of the cor-
-responding measures in feet & f.
(d) for 12-0.75 say 12-1.5
(e) 43-11.4 34-0.6=415.2
(f) 9-9.2 7-8.267

The Portico Tetrastyle. the front

Figure 3. Detail of specification for Pavilion X located on the reverse side of Jefferson's drawing for the pavilion. Note corrections at right of page. N326. Albert and Shirley Small Special Collections Library, University of Virginia.

Jefferson entitled each of these specifications "Pavilion X. East. Doric of the Theatre (or 'Theater' in the building notebook version) of Marcellus." It is interesting to note that the separate page specifications show that Jefferson crossed out the Roman numeral "V" and made it an "X". The building notebook version appears to show that Jefferson extended a "V" to make it an "X". This may be explained by Jefferson's renumbering of the pavilions during the design process. Jefferson's Giacomo Leoni version (or any version) of Palladio (1721) does not provide enough specific information regarding the dimensions and proportions of the Doric order of that structure to allow the reader to recreate it on paper. Therefore, Jefferson turned to plate 2 of *Roland Freart de*

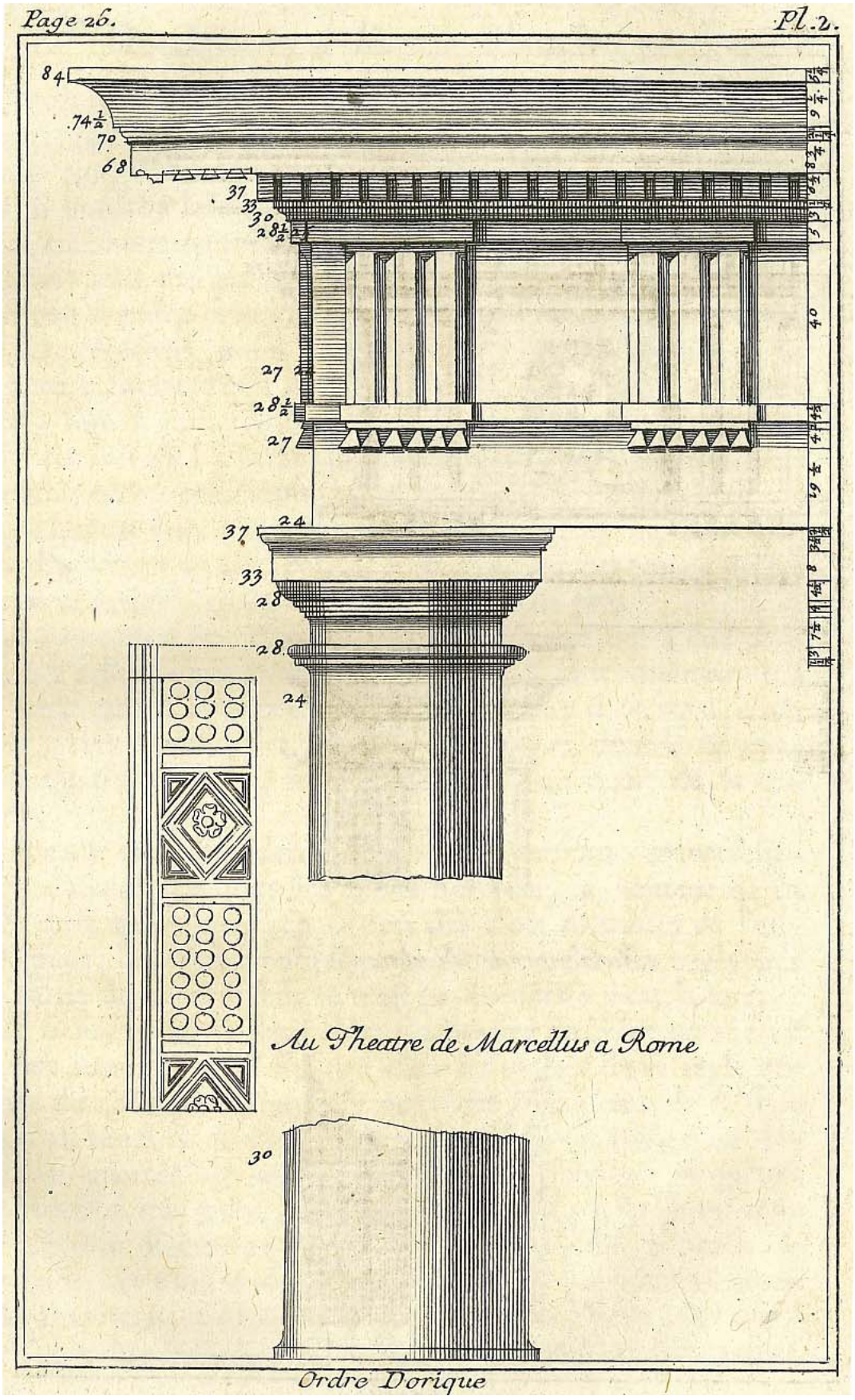


Figure 4. Doric order of the Theater of Marcellus, *Roland Freart de Chambray's Parallele de L'Architecture Antique Avec La Moderne* (1766).

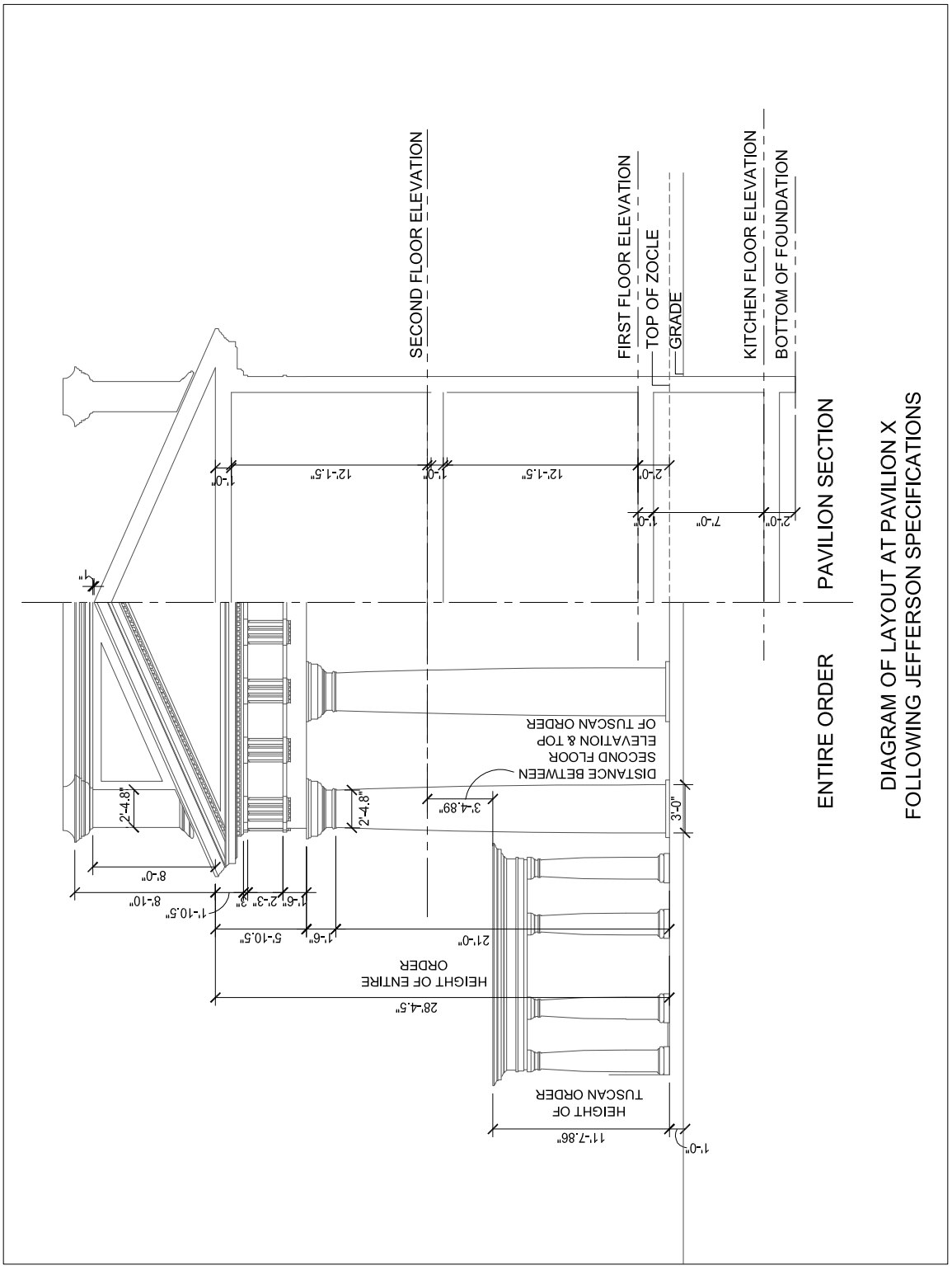


Figure 5. Diagram of layout at Pavilion X following Jefferson's specifications.

Chambray's Parallele de L'Architecture Antique Avec La Moderne (1766), where the Doric order of the Theater of Marcellus is described in enough detail to accurately draw it to any proportion desired (Figure 4). Jefferson followed this plate with reasonable accuracy and only changed the upper cymatium from a cavetto to a cyma reversa. He followed Palladio's instruction by leaving the base off as it was at the Theater of Marcellus.

The enclosed diagram summarizing Jefferson's notes and dimensions reveals that the pavilion was conceived using the same method as that used on his other pavilions (Figure 5). More precisely, his vertical dimensions for the pavilion are considered in elevation and section simultaneously by using two columns. The column on the left side of the page is a summary of his calculations for the exterior Doric order, while the column on the right side of the page is a summary of his vertical dimensions through the pavilion, including the room heights at each floor level, the floor thicknesses, etc. Jefferson ensured that both of these columns added up to the same vertical dimension (in this case 28'-4.5"), and used the zocle as a datum that linked the interior and exterior together. As the previous Chinese rail report illustrated, the vertical dimensions were also reconciled to the vertical dimension of the Tuscan order at the student rooms (11'-7.86") so that he could calculate the "descent from the uppr floor to [the] terras", which he figured to be 3'- 4.89" (Figure 6). This once again demonstrates that Jefferson intended to keep the portico deck at the same elevation as the decks above the student rooms, which was also the same as the elevation of the top of the Tuscan order of those rooms. Our field investigations again substantiated that the actual deck elevation was somewhat higher, leaving space for a plinth board to fill in the gap from the top of the Tuscan entablature to the actual deck elevation. Actual measurements taken of the pavilion over the past several months have revealed that the vertical dimensions correspond within an inch of the dimensions described in Jefferson's notes.

Once the overall vertical dimensions were resolved, Jefferson's calculations demonstrate that he defined the width of the building using the module dimensions of the triglyphs and metopes of the Doric entablature. The width of the portico entablature itself was calculated to be "1. dim.d semid. + 7. trigl. + 1 dim.d semid. = 28f-7.8I". This running dimension takes a bit of interpretation.

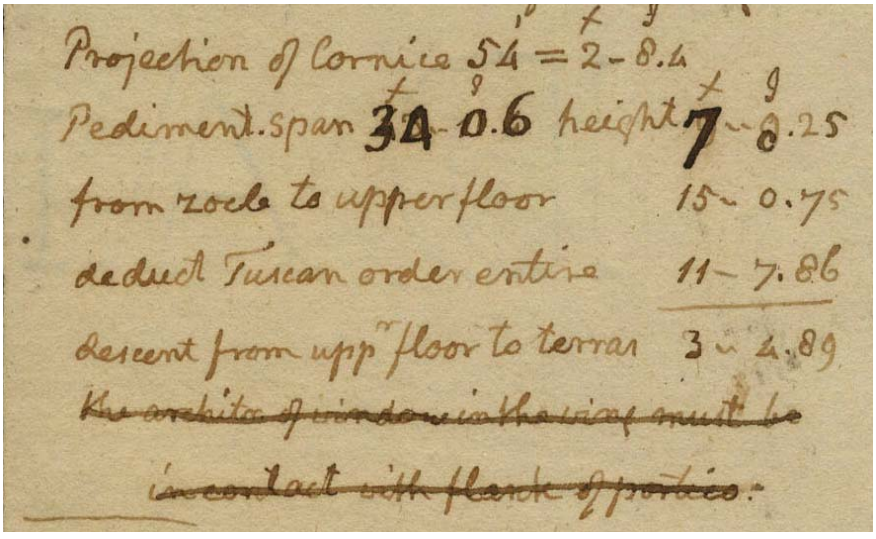


Figure 6. Calculations for the "descent from the uppr floor to [the] terras"

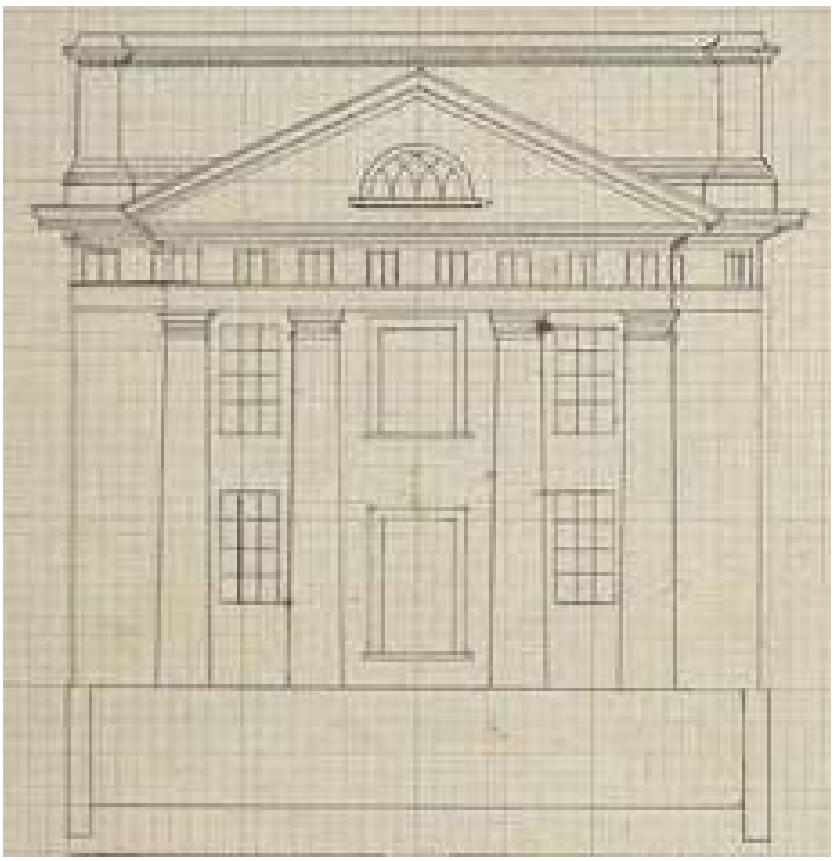


Figure 8. Jefferson's drawing for Pavilion X. Albert and Shirley Small Special Collections Library, University of Virginia.

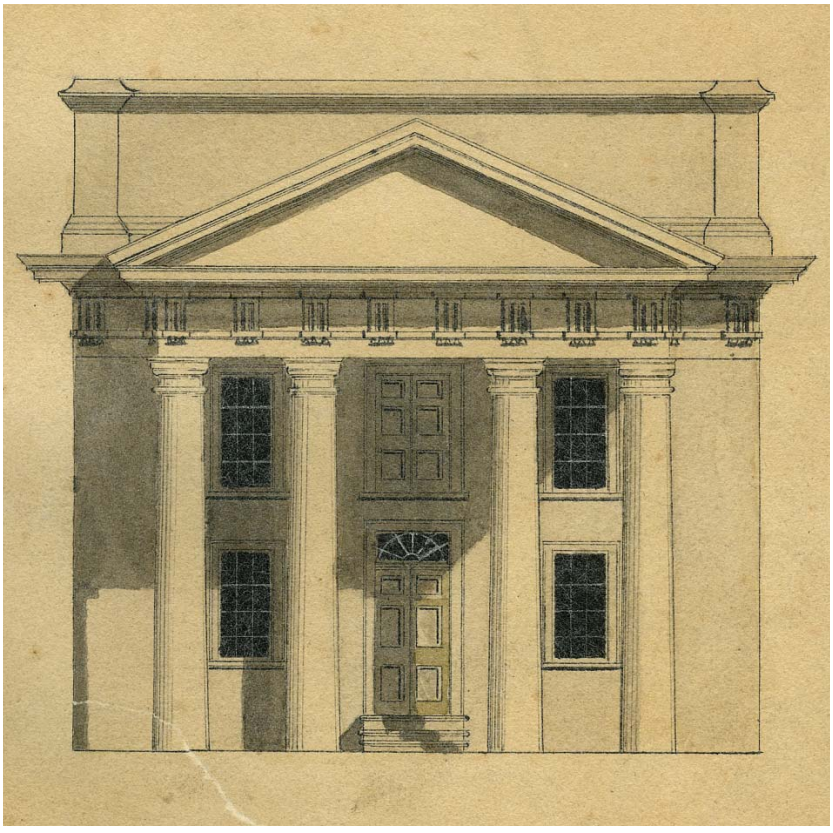


Figure 8a. Neilson's rendering of Pavilion X. Note missing fanlight. Albert and Shirley Small Special Collections Library, University of Virginia.

Jefferson was fully aware that Palladio stipulated that one metope is supposed to be the same width as its height. Adding the width of one triglyph to the width of one metope gave a dimension of 3'-9", which was then multiplied by seven since he figured that seven trigliphs and metopes would be necessary to span across the front of the portico. The full dimension of the portico frieze was obtained by figuring the partial metope width at the extreme ends of the frieze, which was calculated to be ½ of the diminished diameter of the column. In this case, the diminished diameter of the column was 28.8", giving a semi-diameter of 14.4". This was multiplied by two (for each end of the frieze), and added to the seven triglyph and metope units to give an overall width of 28'-7.8". Upon actual measurement, the width of the frieze is a remarkably close 28'-8.25" (Figure 7).

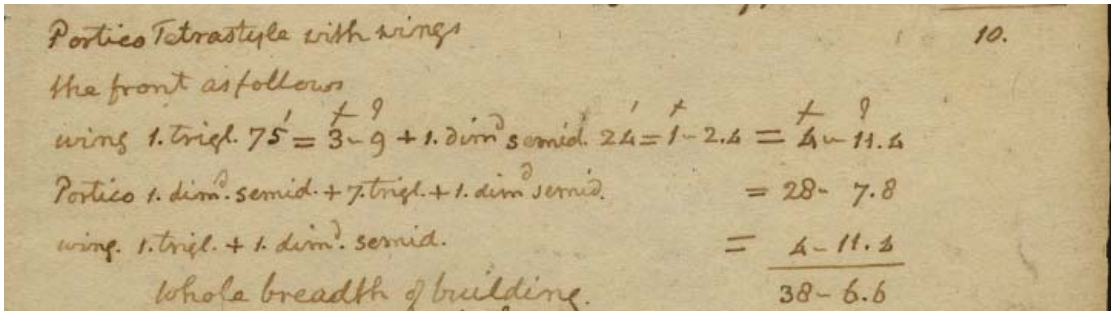


Figure 7. Calculations for the "Whole breadth of building"

Figure 9. The Theatre of Marcellus.

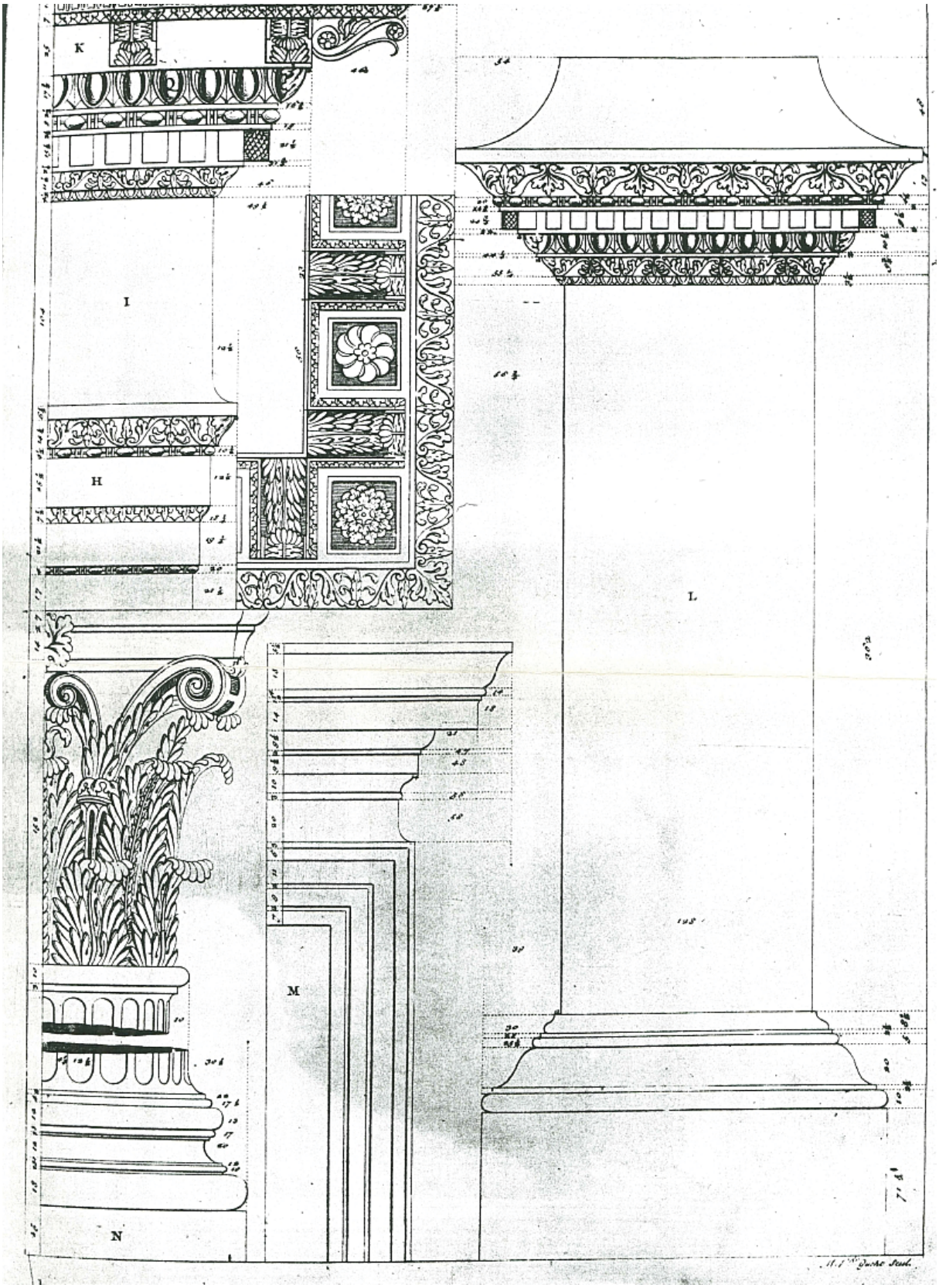


Figure 10. Temple of Nerva Trajan from *Quattro Libri dell'Architettura by Andrea Palladio.* Leoni edition, 1721, Book IV, Plate VIII. Albert and Shirley Small Special Collections Library, University of Virginia.

After arriving at the dimension of the portico entablature, Jefferson calculated the width of the entire pavilion by adding "1. trig. + 1. dimd. Semid." to each end of his portico frieze. This means that he expected to have one triglyph/metope unit and one half of a diminished metope unit along the face of the pavilion walls between the juncture of the portico and the extreme north and south ends of the building. Renderings by both Jefferson and Neilson all show that these calculations were superseded when another ½ triglyph was added in the inside corners of the frieze in an apparent effort to make the entire composition work (Figures 8 and 8a). At some point during the design or construction process, both of these solutions were again superseded when a full second triglyph was added along with another nearly full metope. This resulted in a pavilion that is 43'-8.75" wide instead of the 38'-6.6" originally calculated by Jefferson in his notes.

The dimension of the width of the portico frieze was necessary to obtain the height of the pediment. This was determined by adding the width of the cornice projection at each end to the width of the frieze (which was calculated to be 34'-0.6" and in actuality is 34'-9.25") and multiplying that span by 2/9. Jefferson appeared to have always followed the Palladian pediment formula where the height was stipulated to be 2/9 the width of the span. His calculated pediment height was 7'-8.25", and although the overall length of the main cornice is nine inches longer than Jefferson specified, the actual height of the pediment is only ¼" higher or 7'-8.5".

The height of the pediment was particularly critical to Jefferson's design since this pavilion was to be capped with a very large "Attic" parapet on its roof. Although the Theater of Marcellus did not have an Attic story, Jefferson must have been attracted to the concept of such a feature

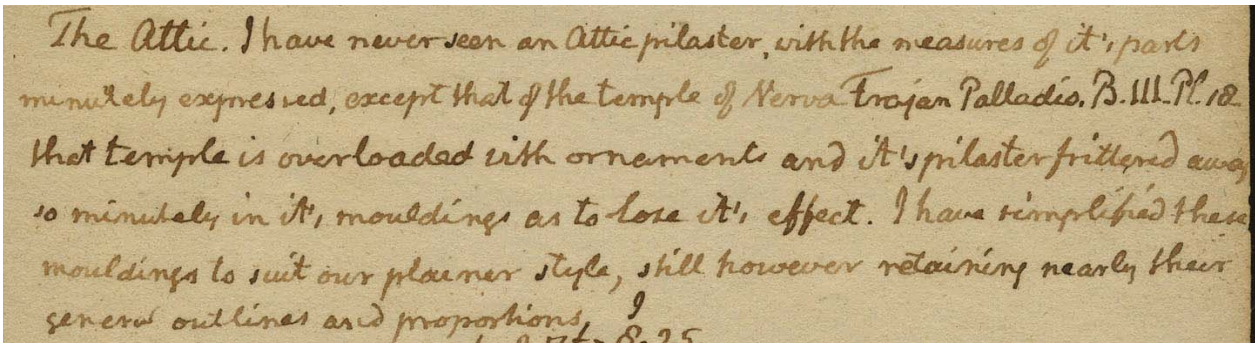

The Attic. I have never seen an Attic pilaster, with the measures of it's parts minutely expressed, except that of the temple of Nerva Trajan Palladio. B. III. Pl. 18. that temple is overloaded with ornaments and it's pilaster frittered away so minutely in it's mouldings as to lose it's effect. I have simplified these mouldings to suit our plainer style, still however retaining nearly their general outlines and proportions.

Figure 11.

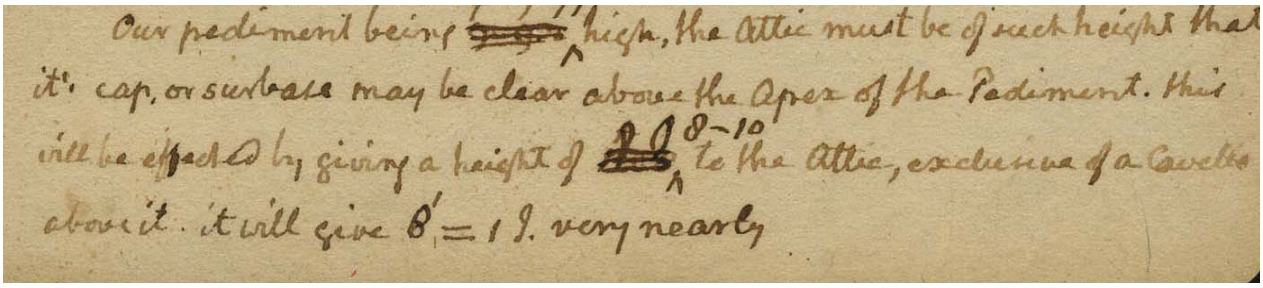

Our pediment being ~~[illegible]~~ high, the Attic must be of such height that it's cap, or surbase may be clear above the apex of the Pediment. this will be effected by giving a height of ~~[illegible]~~ 8-10 to the Attic, exclusive of a Cavetto above it. it will give 8' = 1 I. very nearly

Figure 12.

when studying Palladio's drawings for the Temple of Nerva Trajan (Book IV, Chap. VIII) (Figures 9+10). It is possible that he felt the large Doric order should appear to support a weighty feature, and it is equally possible that he desired to conceal the sloped roof beyond the front pediment. In any event, the use of this feature is an illustration that Jefferson's long experience with the classical orders gave him the confidence to mix and modify various architectural features found in his pattern books to arrive at a composition pleasing to his eye. Near the bottom of his specifications, Jefferson noted that

"I have never seen an Attic pilaster, with the measures of it's parts minutely expressed, except that of the temple of Nerva Trajan Palladio. B. III. Pl. 18. that temple is overloaded with ornaments and it's pilaster frittered away so minutely in it's mouldings as to lose it's effect. I have simplified these mouldings to suit our plainer style, still however retaining their general outlines and proportions." (Figure 11)

This quote reveals that Jefferson was forced to use an Attic feature from a Corinthian temple on his Doric building because there was simply no other model described well enough in Palladio for him to use (Figure 12). It is also very interesting to note that Jefferson had no qualms about simplifying a Palladian drawing to suit his more austere sensibilities. However, this statement should be understood within the context of his other buildings, where he was known to "simplify" his moldings. This essentially means that the molding profiles and proportions remain the same, but the ornament carved into them as depicted on Palladio's plates is eliminated.

Jefferson was clearly not reluctant to proportion the Attic story as he pleased to fit harmoniously with the rest of his elevation. His specifications for the rest of the Attic read

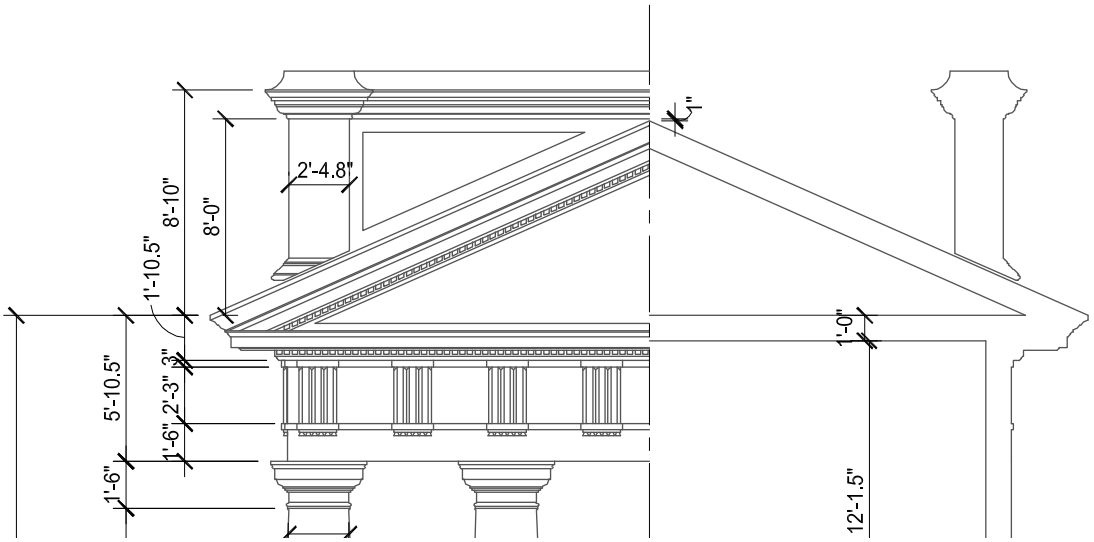


Figure 13. Detail of parapet at apex of pediment. Note the 1" clearance of the molding at peak.

"Our pediment being 7 f – 8.25 I high, the Attic must be of such height that it's cap, or surbase may be clear above the Apex of the Pediment. this will be effected by giving a height of 8-10 to the Attic, exclusive of a Cavetto above it. it will give 8f – 1 I. very nearly"

As the accompanying elevation shows, the Attic parapet was designed to allow the upper molding profiles to miss the apex of the pediment by about one inch (Figure 13). Jefferson's figures for the actual size of the parapet reveals that he simply proportioned the Attic parapet to fit his overall desired dimension in the same way that we would manipulate the size of an image on a copy machine. The "minutes" of the proportional system of the Attic story have no relationship whatsoever to the proportional system of the Doric order below, except that the width of the pilasters within the parapet was specified to be the same as the width of the diminished diameter of the Doric columns.

The parapet was removed from the building sometime in the early 1890s, but one photograph survives that shows the front third portion of the parapet as it extends out over the portico (Figure 14 + 14a) This photograph informs us that there were panels within the dado of the parapet, and the width of the margins of the dado is discernable. Unfortunately, there are no known early photos of the north and south sides of the pavilion, but John Nielson's drawing of the south elevation of the Academical Village (N-354) not only shows the parapet but also shows a large panel situated along its center portion (Figure 15 +15a). Since the rendering closely matches those portions of the parapet captured in the early photograph of the building, there is no reason to believe that Neilson's depiction of the remainder of the parapet is not equally accurate.

There appear to be two sets of floor plans prepared by Jefferson's hand that survive (Figure 16 +16a). These plans are nearly identical, and one plan is more fully rendered with shaded walls and stove outlines. On the first and second floor levels, both plans show a three bay fenestration pattern along the front of the pavilion and a five bay arrangement at the back. The simpler plan shows only four windows along the back; one is missing at the top of the stairs where symmetry would dictate a window should be. At the cellar level, both plans show two windows in the front (presumably the front stoop for the main floor center door would have prevented placing a window at this location), and two windows and a door at the rear. The square jambs at the center opening at the rear reveal that this was planned to be a door centered on the rear elevation, while the more rendered plan places the door to the northern edge of the elevation. Judging from the plan actually constructed, these drawings must have been early schemes because the fenestration of the constructed building greatly differs from these drawings. In fact, the pavilion itself is not three bays but five bays in front, and only three bays in the rear. It has been previously mentioned that the width of the pavilion is greater than the calculations made by Jefferson in his building specifications, and this greater width allowed him to create a five bay elevation composition on the front elevation that worked extremely well with his tetrastyle portico. Moreover, the three bay arrangement at the rear placed the southernmost window in a comfortable location in relation to

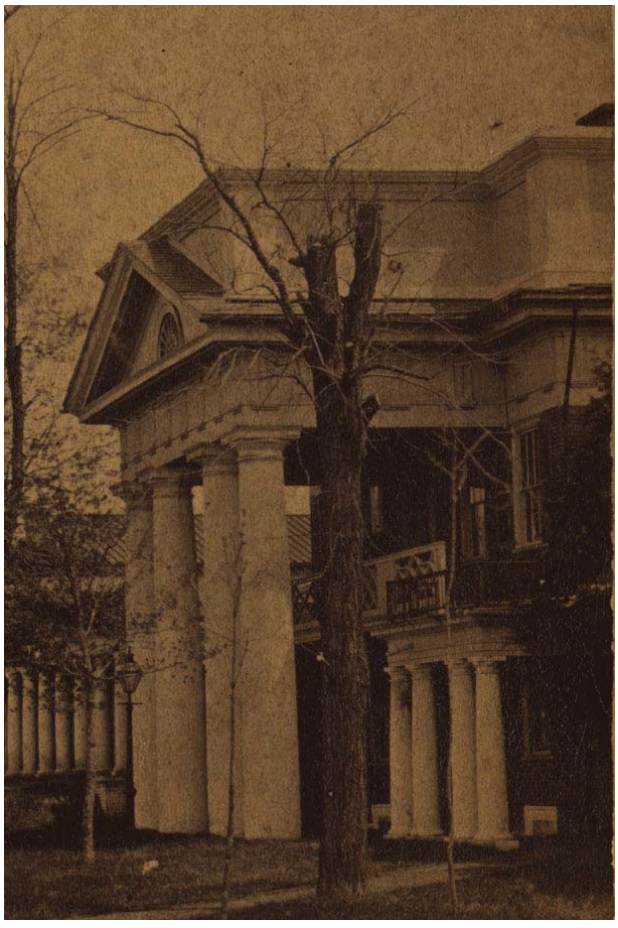


Figure 14 and 14a. View of the Lawn. Before 1896. Pavilion X at the right edge of image. Detail (left) showing the parapet in situ. Albert and Shirley Small Special Collections Library, University of Virginia.

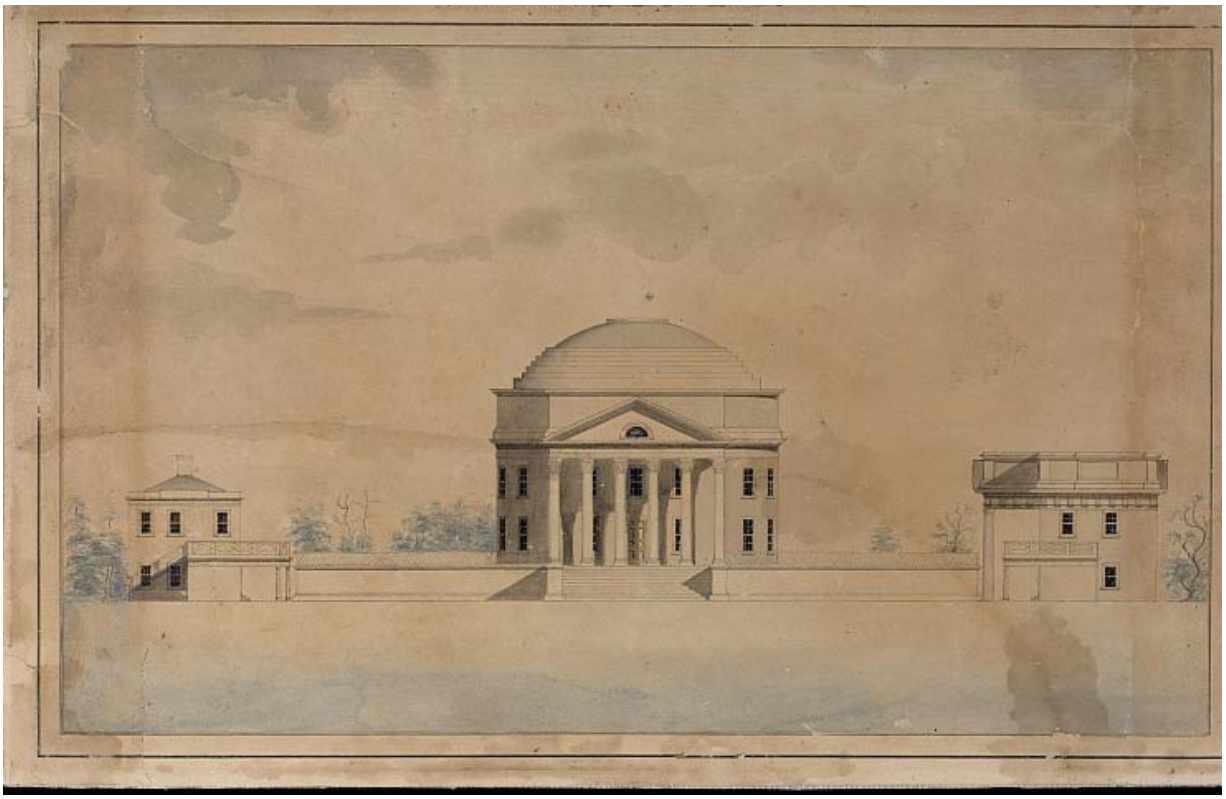


Figure 15. John Nielson's drawing of the south elevation of the Academical Village. Pavilion X on right. Albert and Shirley Small Special Collections Library, University of Virginia.

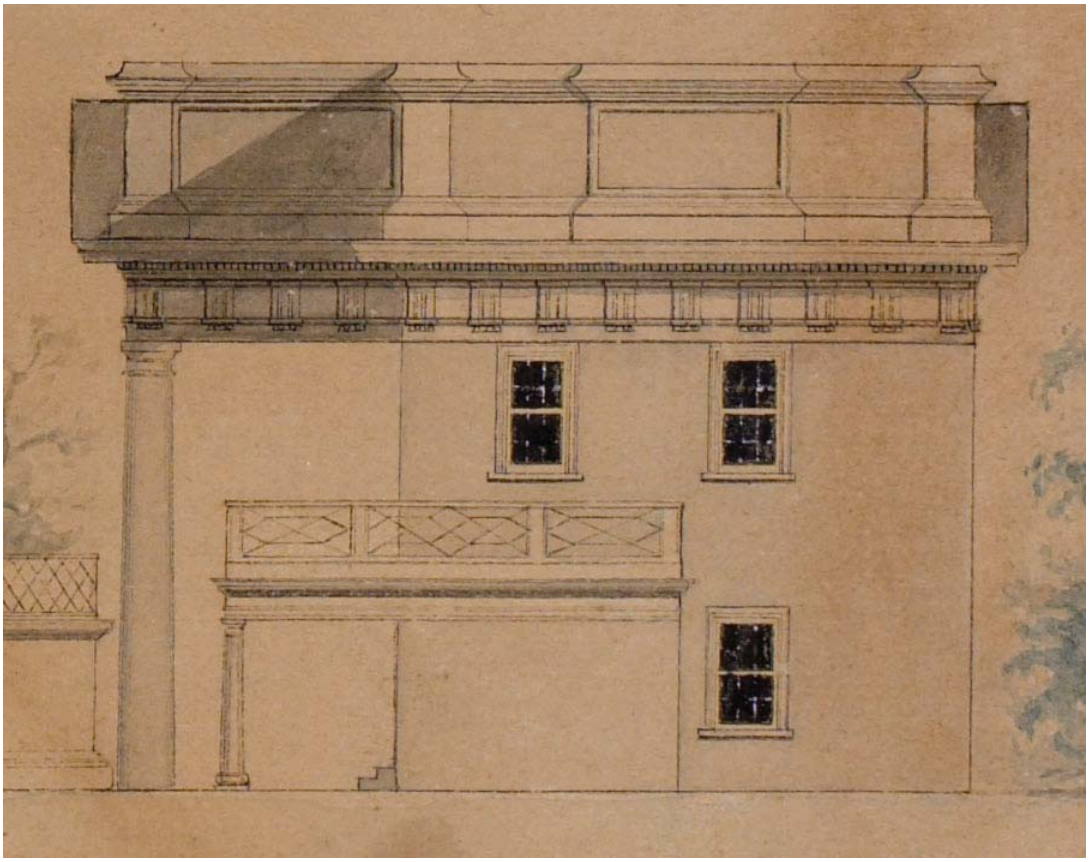


Figure 15a. Detail of Pavilion X from John Nielson's drawing of the Academical Village. Albert and Shirley Small Special Collections Library, University of Virginia.

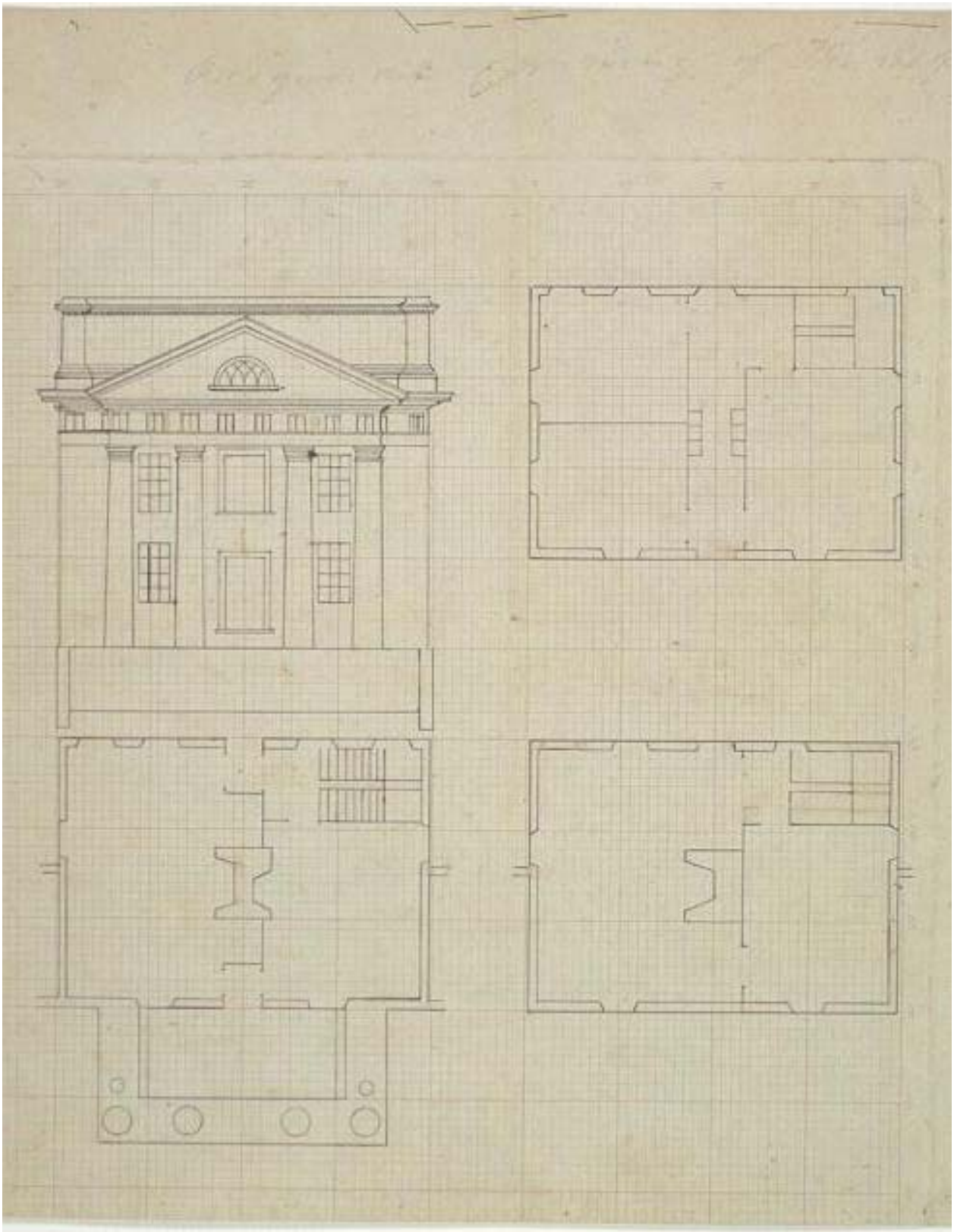


Figure 16. Thomas Jefferson's plans and elevations for Pavilion X, carpenter's copy. This is the only known workman's copy of plans known to survive. N326A. Albert and Shirley Small Special Collections Library, University of Virginia.

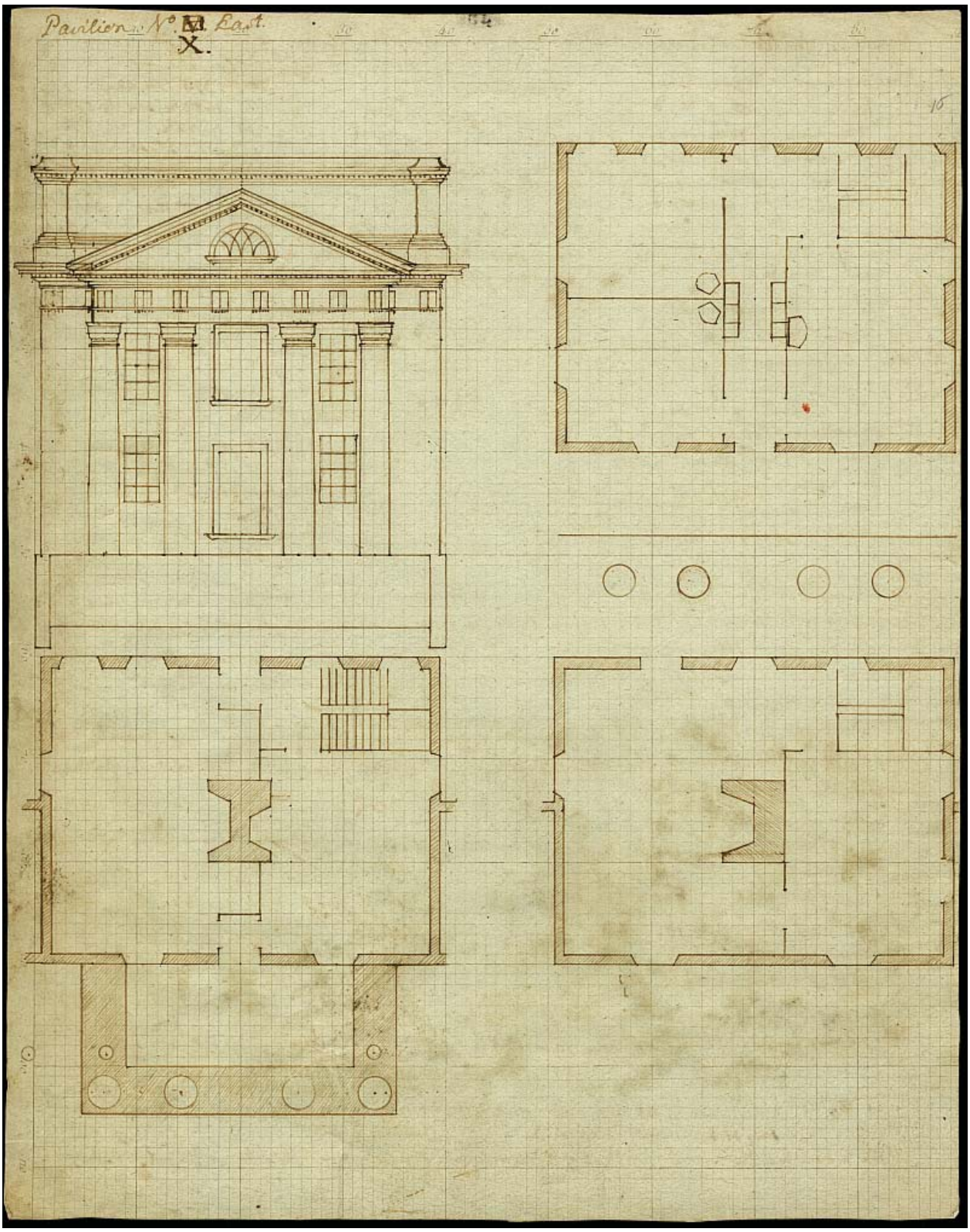


Figure 16a. Thomas Jefferson's plans and elevations for Pavilion X. N326. Albert and Shirley Small Special Collections Library, University of Virginia.

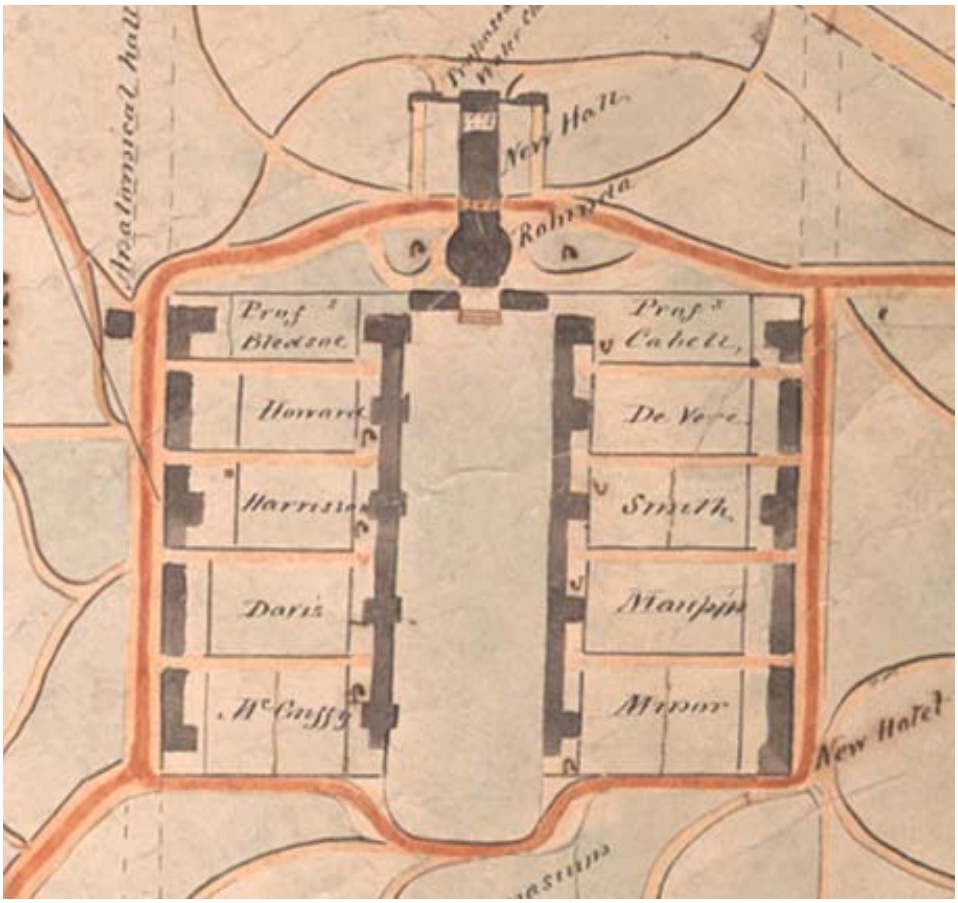


Figure 17a. William A. Pratt 1856 map "Plan of University Cleared Land". Detail of the plan of the University of Virginia. Albert and Shirley Small Special Collections Library, University of Virginia.

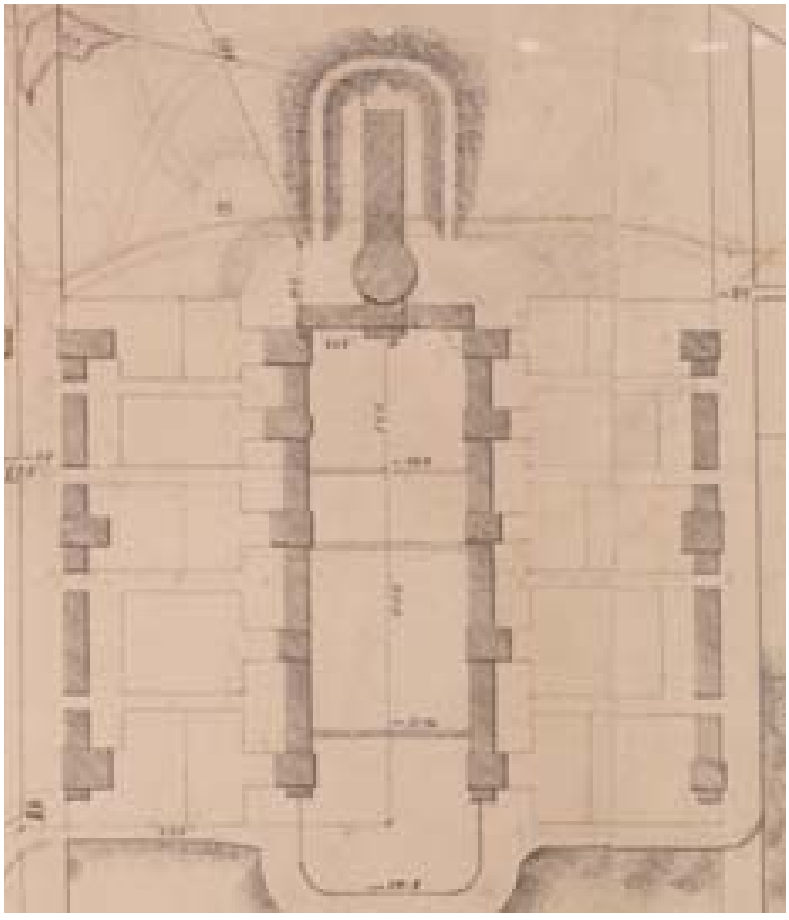


Figure 17b. Charles Ellet Jr. October 1856 map "A Map of the University of Virginia and its Vicinity". Detail of the plan of the University of Virginia. Albert and Shirley Small Special Collections Library, University of Virginia.

Figure 18. Kaigiro Sugino 1895 map "Map of the University of Virginia Showing Gas, Water and Sewer Systems". Detail of the plan of the University of Virginia. Albert and Shirley Small Special Collections Library, University of Virginia.

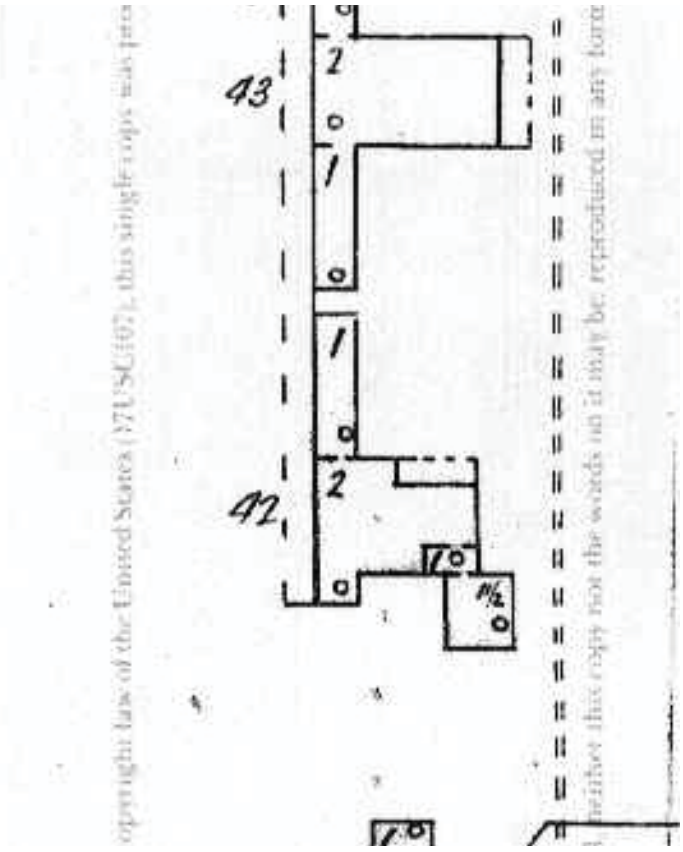


Figure 19 1896 Sanborn Fire Insurance Map. Detail of Pavilion X. Albert and Shirley Small Special Collections Library, University of Virginia.

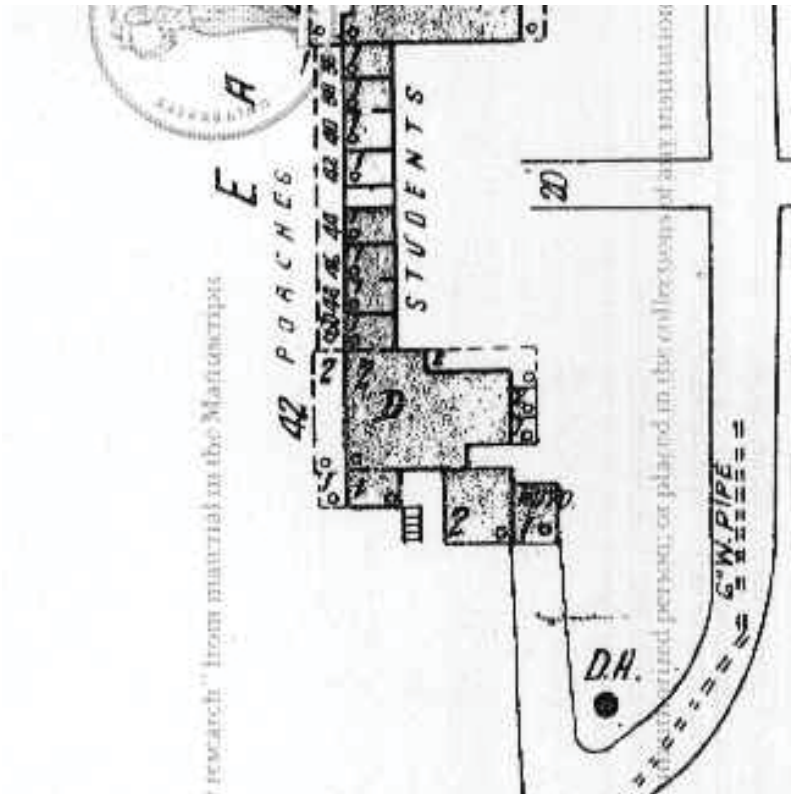


Figure 20a. 1920 Sanborn Fire Insurance Map. Detail of Pavilion X. Albert and Shirley Small Special Collections Library, University of Virginia.

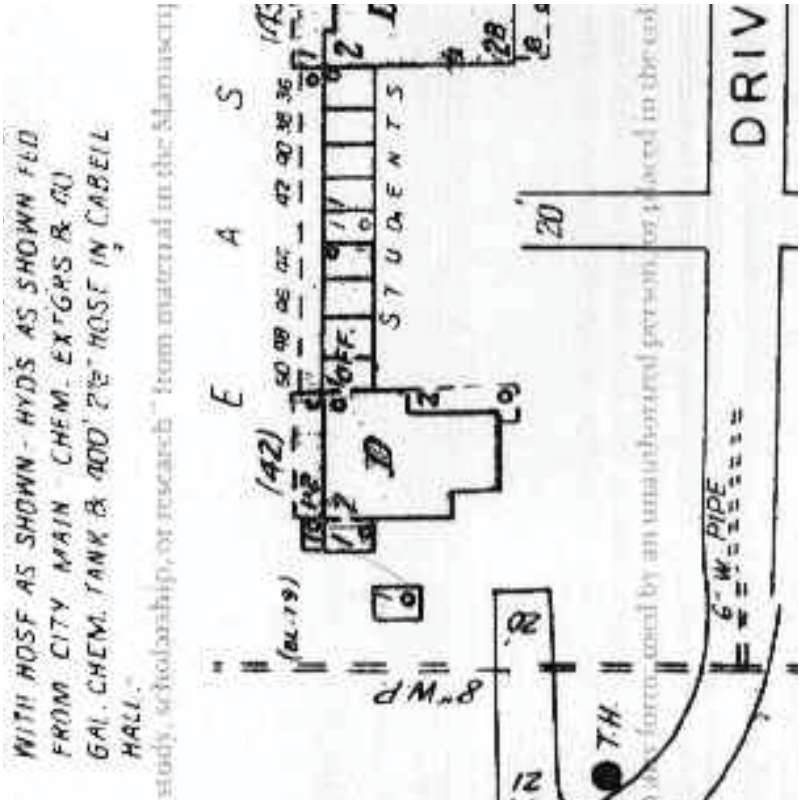
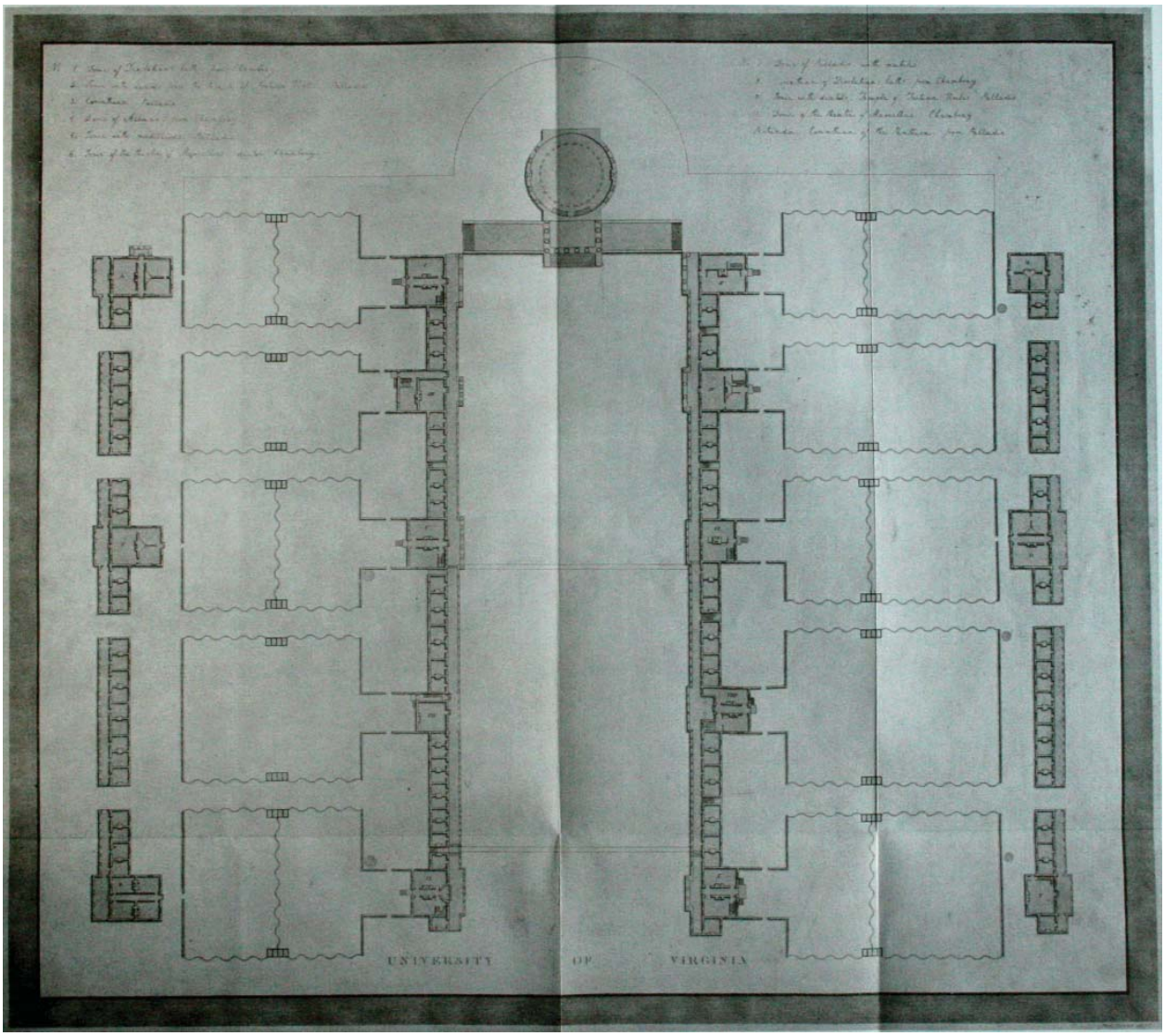
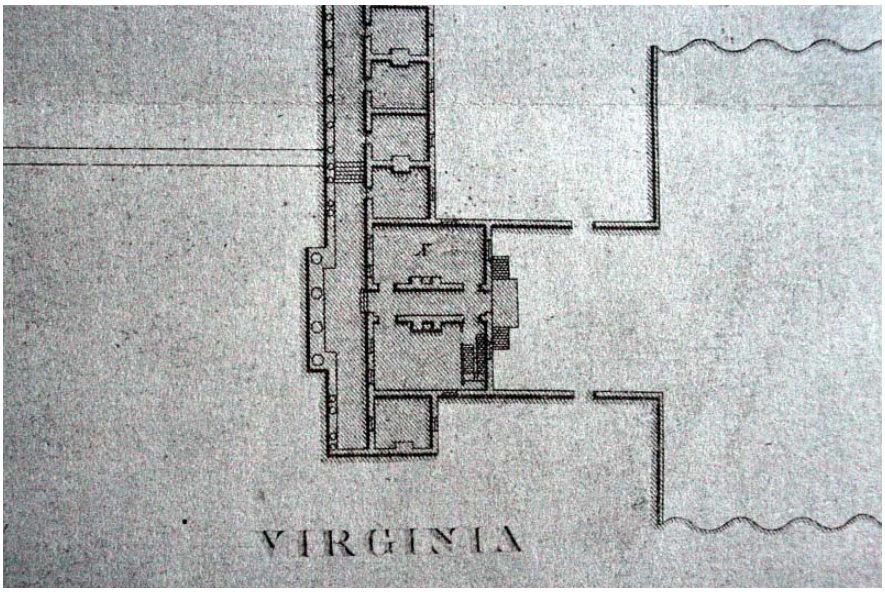


Figure 20b. 1941 Sanborn Fire Insurance Map. Detail of Pavilion X. Note doors to student rooms. Two rooms to the north used as offices. Albert and Shirley Small Special Collections Library, University of Virginia.



21



21a

Figure 21 + 21a. Plan of the University of Virginia and Detail of Pavilion X. Printed by Peter Maverick, 1825.

the stair so that no windows would have to be eliminated on that elevation. At the cellar level, the three bay arrangement followed Jefferson's earlier plans, and he kept the entry door in the center opening.

Archival evidence suggests that the east addition at the rear of the pavilion was not constructed until the late 1870s. Early maps of the Academical Village do not show known additions to any of the pavilions until Sanborn maps were prepared in 1896 (Figures 17-20). Minutes from the Board of Visitors records that the approval for the first addition made to Pavilion X occurred on July 17, 1831. The minutes record that it was resolved that

"it shall be the duty of the Proctor under the directions of the Executive Committee to cause to be erected in the rear of Professor Emmet's Pavilion an addition to the basement story for the accommodation of Domestics similar to those already annexed to the Pavilions of Professor Tucker, Bonnycastle, and Harrison…"

If the addition was indeed annexed to the pavilion itself, the later period addition that now exists appears (at least on the surface) to have wiped clean any evidence of it. Presumably, this addition would have also displaced the earlier porch serving the main floor east door. The Maverick plan shows this porch having the form of a central platform with two flanking steps running along the east façade (Figure 21). The reconstruction drawings of this feature illustrate that such an arrangement would have meant that the steps ran in front of the cellar windows. A review of these windows revealed that blind pintles were only found on one side of the window jambs; the side opposite the area where the stairs would have presumably interrupted their operation. This is substantiating evidence that the stair did indeed pass in front of a portion of these windows (Figures 22 & 23).

Figure 22 & 23 One set of pintles are located on the right side of the north cellar window on the east elevation. It is believed the rear stair passed in front of a portion of the cellar windows resulting in the condition illustrated above resulting in the need for only one set of pintles.

Figure 24 East (rear) elevation of Pavilion X. Paint ghosts support archival documentation indicating a one story porch at this elevation.

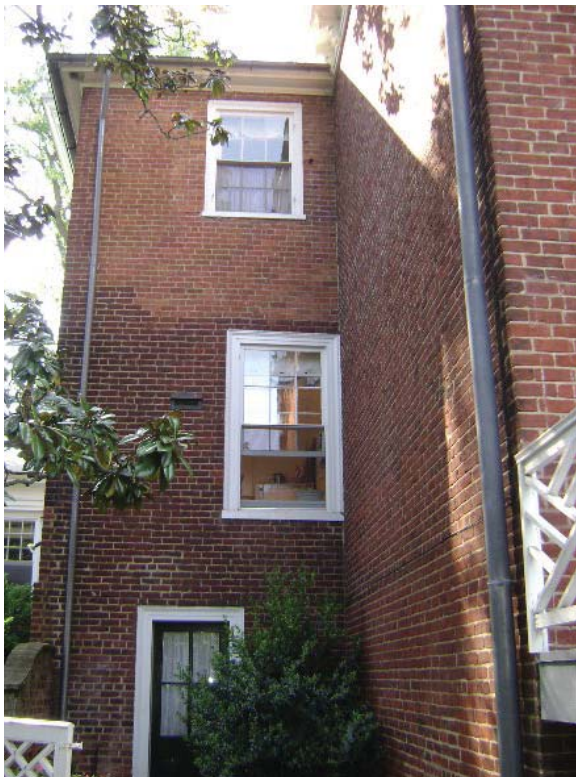
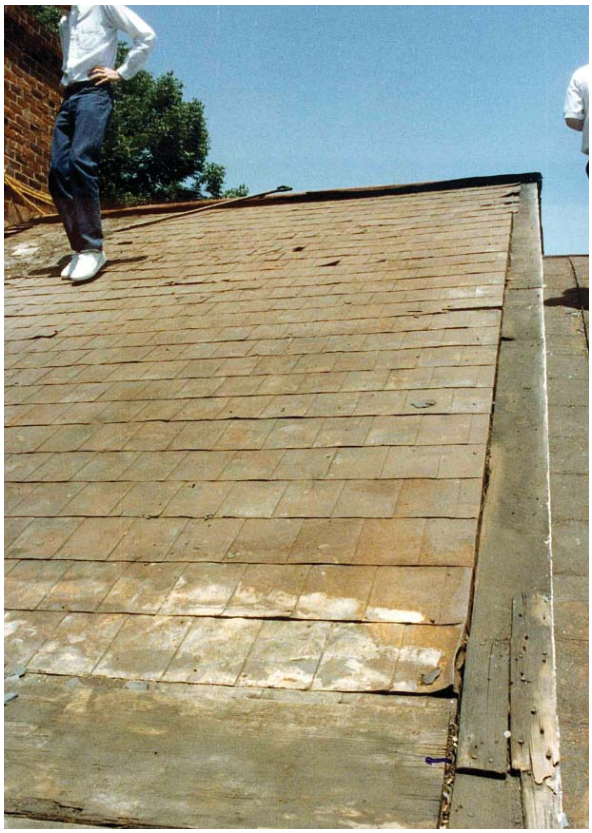


Figure 25 The clear demarcation between nineteenth and twentieth century brickwork illustrates the raising of this addition from one to two floors.

On August 13, 1836, the Board of Visitors voted to construct a "suitable kitchen" in the rear of Pavilion X. While this may imply that the building was a detached structure from the pavilion, the meeting minutes of June 30, 1873 recorded that they approved "a sum not exceeding four hundred dollars be appropriated to the enlargement & repair of the Kitchen attached to the pavilion of Professor Minor…"

No evidence has been found as to what the relationship was between the 1831 addition and the addition of 1836. In 1856 the Board of Visitors approved the funds for a back porch on the pavilion, and it is unclear exactly how this related to the two earlier additions. Although both of the earlier additions were devoted to the accommodation of domestics and the kitchen, the minutes intimate that the professors and their families living in the pavilion needed more space for their own use. In 1837, the Board of Visitors granted Professor Davis permission to occupy the "Dormitories near his Pavilion", and when Professor Minor was appointed professor of Law and given the pavilion in 1845, the Board of Visitors assigned him the two adjacent dormitories. Two years later, Minor sought permission to open a door between "his dining room & the adjacent dormitory".

The use of the dormitory rooms appeared to have satisfied Professor Minor until 1874, when he petitioned the Board for more space. In June of that year the minutes read:



Figures 26, 27, 28 Jefferson's tin plated iron roof uncovered during the removal of the later period standing seam roof. Summer 1987.

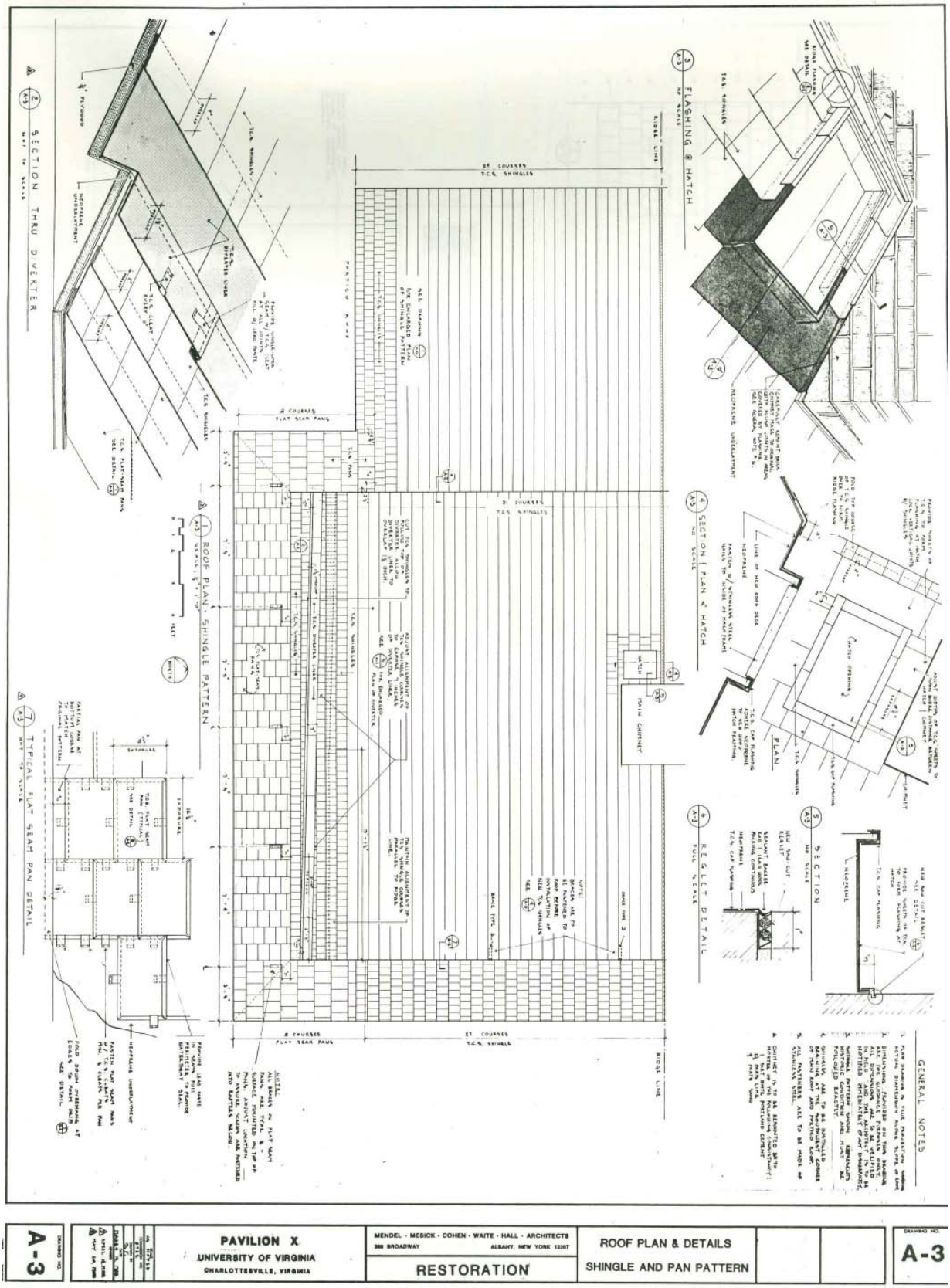


Figure 29 Pavilion X Roof Restoration. Sheet A-3 Roof Plan and Details. Shingle and Pan Pattern. Mendel Mesick Cohen Waite Hall Architects. March 1986.

Figure 30 Detail of the original Philadelphia gutter.

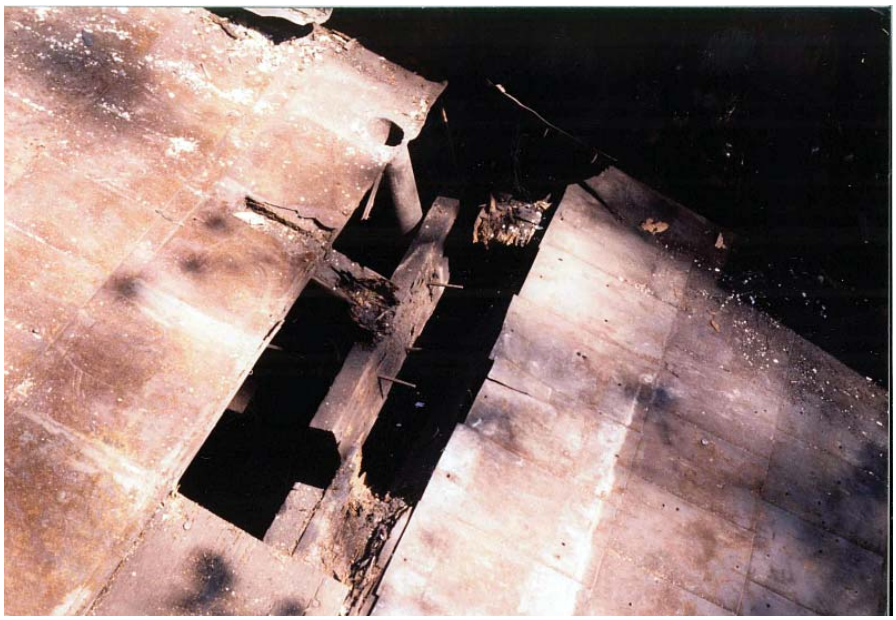


Figure 31 Detail of original downspout.

Figure 32 Fragment of an original roof bracket for the parapet.

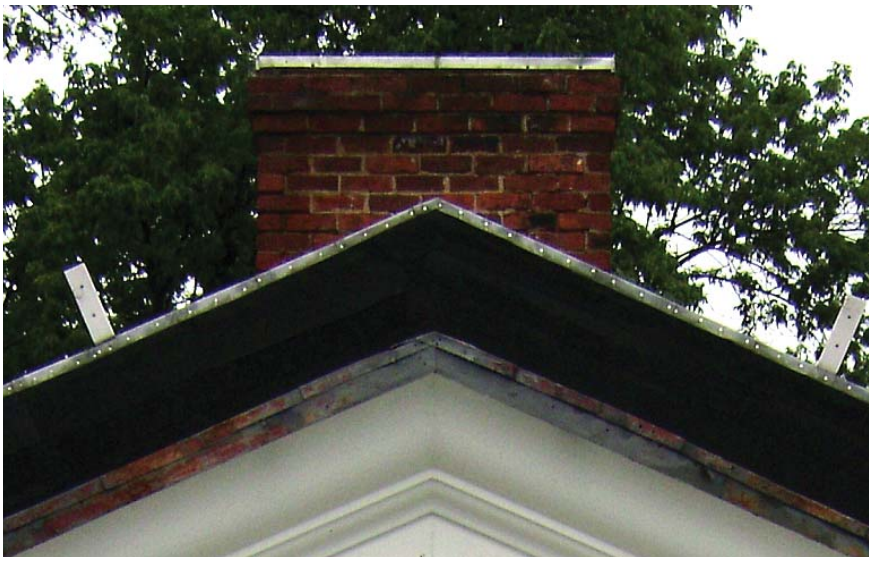


Figure 33 New stainless steel brackets were installed during the 1987 roof restoration in anticipation of restoring the parapet at a later date.

Figure 34 Pavilion X west elevation. Detail of oil struck bricks laid in Flemish bond. Colorwash and penciling still survives in sheltered areas of this elevation.

Figure 35 Attic space of student room north of Pavilion X. Portions of encapsulated brickwork survive on the north and south walls providing period examples of the original joint finish and appearance. Note the serrated roof at the bottom of the image.

"The committee being satisfied that Professor Minor absolutely needs increased accommodation for his family, recommend that the dormitory next to the room now used by him as his office be assigned to him until the necessary addition can be made to his residence."

The minutes are silent on the matter until two years later, when the minutes read:

"In reply to Mr. Minor's letter asking that his present pavilion be enlarged or that pavilion 1 may be assigned him they have to say that they have ascertained that Prof. Minor prefers waiting a reasonable time for enlargement of his Pavilion if it can be done. They would therefore recommend that the Board assure him that they will enlarge his present pavilion so soon as the same can be safely done from the income of the Institution, and they also recommend that the partition between his present office and the adjoining dormitory be removed and the floor lowered so as to enlarge his office and thus give him the two dormitories asked for."

Another year passed before the Board provided the appropriation for the work, and it is likely the building was not completed until sometime between late 1877 and 1878.

The 1877-8 addition appears to have displaced the earlier additions on the building, and some changes have been made to the addition since it was completed. The Sanborn maps show that a wood framed two story porch once existed along half the length of the north elevation, and paint ghosts on the building clearly outline this feature. No record has been found that documents when this was removed. Similarly, paint ghosts reveal that there was once a one story wood framed porch on the east elevation of the addition (Figure 24).

The Sanborn maps show the small room situated in the southeast corner of the pavilion (at the juncture of the addition and the pavilion), giving the impression that this was a part of the addition. The brickwork on the second story of this small room is modern and the windows are supported by steel lintels, so it is obvious that the small room was raised to two floors sometime in the twentieth century (Figure 25).

SUMMARY OF FIELD FINDINGS

Even a cursory examination of the pavilion reveals that the pavilion was constructed as a simple rectangle in plan. The form of this particular pavilion is easily discernible because the later period additions did not change or extrude the roof line and left the rear pediment mostly intact. From a broad perspective, the only significant changes made to this pavilion since its construction was the addition constructed to the rear (east) in the late 1870s, the construction of the 1830s roofs over the flanking student rooms (which eliminated the decks and the Chinese railings over those rooms) and the removal of the large parapet on the roof. The remainder of the pavilion building fabric appears to be otherwise nearly intact.

In 1987 the later period standing seam roof was removed and it was discovered that the original tin plated iron roof was encapsulated below (Figures 26-28). The earlier roof was carefully recorded and a new terne-coated stainless steel roof was designed to replicate the layout and original appearance of the original roof (Figure 29). The new roof once again encapsulated the historic tin shingles and a plywood separation layer and an EPDM membrane was laid down before the new shingles were installed. It was fortunate that the original roof was not removed when the standing seam roof was applied because very clear evidence survived of the original Philadelphia gutter, the locations of the original downspouts and the iron brackets that once held the enormous parapet up and off the roof (Figures 30-32). In fact, several of these brackets survived in-situ and were simply bent down before the later roof was installed. When the roof was installed, new stainless steel brackets copying the original brackets were fastened to the roof at the same locations in anticipation of the day when the parapet is restored to the building (Figure 33).

During the roof restoration project it was recorded that the later-period wood roof deck (constructed to cover over Jefferson's Philadelphia gutter) was actually made up of several boards that had once been a part of the original parapet. These boards were measured and recorded on the 1986 field notes, but it is unclear if these boards survived after they were removed from the roof.

The restoration of the roof was a part of a larger project taken on by the University that included complete stripping and repainting of the doors and windows and their frames, the window blinds, the entire entablature, the pediments on both the east and west elevations, and the underside of the ceiling of the portico. Unfortunately, the paint appeared to have been stripped using scrapers, and the aggressive techniques used to remove the paint destroyed a large percentage of the delicate molding profiles of the window sash and the door and window architraves. The giant Doric entablature fared somewhat better because the moldings are so large it is difficult to destroy them with a paint scraper.

The brickwork of Pavilion X essentially matches the brickwork of the other pavilions. The front elevation was laid up in Flemish bond using oil struck bricks (Figure 34). These bricks were slightly rubbed to smooth down any obvious imperfections, and laid in lime mortar. A great deal of information regarding the manufacture of these kinds of bricks is found in the Pavilion IV historic structure report, so there is no reason to repeat those findings in this study. However, it should be pointed out that the brickwork along the entire front façade (as well as that of the student rooms) was colorwashed and penciled. The penciling is somewhat cruder on the student rooms. It is obvious that the mason laying the front façade walls had intended to pencil that façade because the joints are cut in or double struck with the trowel to emphasize the penciling. The other facades of the building are laid in running bond using sand struck un-rubbed bricks. The running bond exhibits header bond courses at locations that vary throughout the building. On one elevation they may be four, six and eight courses apart. Alternating stretcher/header bond courses may also be

Figures 36 & 37 Details of the “serrated lath” type roof over th1e student rooms.

Figures 38 Scars and ghosts show the location of where the original Chinese rail joined the side-walls of Pavilion X.

Figure 39 A portion of the original sill for the window in figure 37 remains buried in the masonry wall.

Figure 39a East elevation, north window. This window was modified when the 1877-8 addition was built. The window was turned into a door providing access to a wood porch and later converted back into a window.

found on the building.

With the exception of the front façade, most of the mortar joints appear to have been re-pointed with Portland cement mortar. This work is relatively crudely done and does not match the original pointing on the building (excellent examples of the original joint finish were found beneath the encapsulated roofs of the student rooms), but for the most part it is in good condition and does not appear to be causing any damage to the brick (Figure 35). Even later period pointing has been performed in small areas on the building that is truly objectionable and should be replaced for aesthetic reasons.

Other than the removal of the parapet, the most obvious change to the pavilion from the lawn side occurred in the 1830s, when the student room serrated roofs were covered over with gabled slate roofs. As our earlier Chinese rail study demonstrates, the design of the gable roofs consumed a great deal of original fabric, including the front half of the serrated roofs, a portion of the rear of the serrated roofs, all of the decking over the student rooms, the ceiling and its supporting structure above the colonnades in front of the student rooms and the entire Tuscan entablature including its support structure. It is possible that the moldings forming the entablature were re-used during the

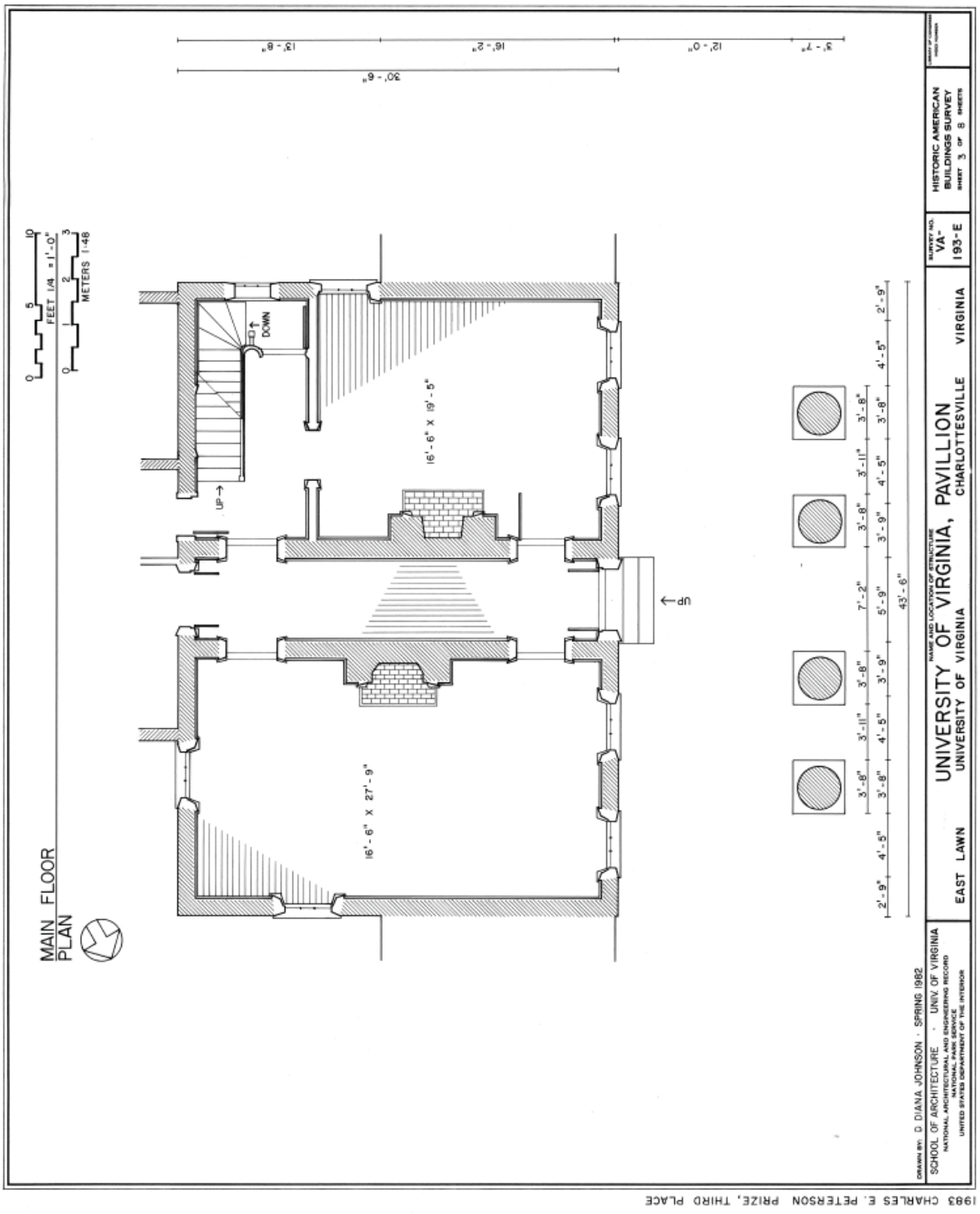


Figure 40 Historic American Buildings Survey (HABS) first floor plan of Pavilion X. Sheet 3. Note the locations of the door and window openings on the original east elevation (left side of drawing).

renovation work, but the beams supporting those moldings were replaced. During this study, both gabled roofs were opened to gain access to the serrated roofs within, and it was clear that all of the framing for the gabled roofs was modern and probably constructed in 1987 when the rest of the pavilion was being refurbished (Figures 36 & 37). The original serrated roof above the student rooms was a "serrated lath" type, very closely matching that type found over the student rooms to the south of Pavilion III and encapsulated within the attic of Pavilion V. Once again, the shaved tops of the ridges revealed that a deck was once placed over the serrated roof, and measurements revealed that this deck was at the same elevation as the portico deck. As the Chinese rail report mentioned, holes were found where the original Chinese rails were mortised into the flanks of the pavilion, and these aligned within an inch of the existing railings at the front portico (Figure 38). It is not clear how the rear Chinese rail related to the Tuscan cornice of the student rooms to the north. The elevations indicate that the student rooms to the north of the pavilion step up several feet after the first student room flanking the pavilion, and the Chinese rail along the back may have been somehow anchored to the cornice where they meet. Unfortunately, it appears that the student room Tuscan cornice has been reconstructed at that location.

Like the west range, remnants of plaster can be observed at the former ceiling level at the colonnades above the student rooms. This is clear evidence that the ceilings in these areas were very likely plastered just as the ceiling of the main portico was plastered. It is helpful to note that most of the original plaster ceilings appear to have survived on the west range rooms (the east have not yet

Figure 41

Figure 42

been studied). This is further compelling evidence that the ceilings above the colonnades at the student rooms were also plastered.

It is also important to note that the brick pavement in front of Pavilion X and its flanking student rooms is modern. Historic photographs reveal that this area was once paved with concrete similar to that still extant along the arcades at the ranges. A removed brick paver near Pavilion X revealed that a concrete slab exists beneath the pavers, but it is difficult to determine if this is the earlier concrete pavement or if it is modern concrete installed as a substrate for the modern brick pavers.

No evidence has been found of the original paving material along the lawn colonnades; however, there is some fragmentary evidence beneath the arcade next to Hotel A that may suggest that the arcades were once paved with bricks set in a herringbone pattern. If this was the case, it is reasonable to assume that the colonnades were similarly paved. Brick pavers were certainly commonly employed in that period, and many examples have been found in the cellars and dependencies of both Monticello and Poplar Forest.

A cursory study of the front facade of Pavilion X and its nearby student rooms makes it obvious that grade has been raised within the colonnade by approximately the thickness of a course of brick. It is possible that the original brick pavers were removed when the concrete slabs were placed so that the elevation of the slabs matched the elevation of the bricks. It has been theorized that the new brick pavers were simply laid over the concrete, raising grade by a brick thickness. This theory can best be proven through archaeology.

Removal of Jefferson fabric did not end in the 1830s. When the 1877-8 addition was constructed, the northern window at the first floor of the east façade was extruded down and made into a door that evidently opened into the wood porch constructed along the north wall of the addition (Figure 39). Evidence that this was once a window is clear. The architraves of the door/window each have a joint in the woodwork at the former window sill level. Moreover, a portion of the original sill was buried in the masonry wall of the addition and simply cut off (Figure 39). It is important to note that this opening was once again turned into a window by inserting a wood panel beneath the sash. The moldings within this panel reveal that it was actually made by cutting down a door, and it is possible that the door was from the Jefferson period, however its origins are unknown (Figure 39a). A second door opening was created at the bottom of the main stair that allowed access directly to the addition from the stair hall. This opening could only have been created by cutting through the original brickwork of the east façade.

The original back (east) door together with its transom remains in place at the end of the center passage, enclosed by the later addition constructed off the rear of the pavilion (Figures 40 & 41). The cellar doors which lead from the pavilion into the basement area under the addition are also original to the pavilion's construction (Figure 42).

At the second floor level, the southern window on the east façade was also made into a door opening, but this very likely occurred in the twentieth century when the small single story portion of the addition at the southeast was raised to be two stories.

The existing double doors at the student rooms were installed in the late-1990s . At the time of their installation it was believed that the student rooms were built with pairs of paneled doors at their entry. Further research has revealed this was not the case. Inspection of an original student room door remaining in-situ on the West Range shows these doors were single-leaf, six panel doors, an example of which remains at No. 13. The door blinds here retain an original surface mounted plate latch. The latch is nearly complete; however, it is missing its knobs. Inspection of the door blinds along the West Range indicated all of the blinds were fitted with this type of latch, suggesting they may have been used throughout the Academical Village.

With the exception of the attic fan light sash and the south elliptical windows, the remaining windows and sash appear to be original (Figure 44 and 45). The cellar windows on the east elevation retain unique features from their original installation. The frame of the south window has mortise pockets along one side where wood battens would have set into, forming a grille across the opening. The architrave on the north window opening retains a single set of pintles on the north

Figure 43 Door blind at No. 13, West Range. Detail of surface mounted plate latch. While ghosts for this type of latch survive on other blinds along the West Range, this example was the only one found remaining.

Figure 44 South elliptical window. Note the crude manner in which this window was installed. The elliptical windows disrupt the original fenestration pattern and clearly read as an afterthought.

Figure 45 West attic fanlight. Inspection of the fanlights concluded that they were both later additions. Of the two fanlights the west sash appeared to be earlier, possibly dating to the late nineteenth century. The east sash appeared to date to the twentieth century.

side on the opening. As previously mentioned, this sole set of pintles here strongly suggests the rear stairs passed in front of the cellar windows.

Two window openings were cut into the south elevation, but it is unclear as to precisely when this occurred. The Board of Visitors minutes reveals that the stairway "from the 2d [floor] to the Garret story" was constructed in 1831. This may have been the motivation to cut in two elliptical windows at each landing level, but the moldings and details at these windows appear to be from the late 19th century. It may be that these windows were not installed at the time the stairway was constructed, but rather added some years later.

Questions regarding the pavement material and elevation may be linked to the original condition of the steps in front of the main entry door. All of the pavilions along the west side of the lawn have stone steps, yet all those on the east have later period wood steps with the exception of Pavilion IX. If stone steps were constructed along the east, the durability of the stones would have helped to ensure that they would have survived to this day just as those on the west have survived. The lack of evidence for any stone steps points to the strong possibility that, unlike the west, only wood steps ever existed at the pavilions to the east, and it is quite possible that they closely matched those that exist today. The wood steps now in place are clearly modern. The brickwork behind the steps appears as though it is infill; both the materials and workmanship do not match the surrounding brickwork (Figure 46). Examination of entry steps at other pavilions along the east side of the lawn revealed a late-nineteenth century window opening behind the steps at Pavilion VI. It is feasible that a similar condition existed at Pavilion X but was later filled in. Paint lines of what looks like a stair nosing can clearly been seen on the brick to either side of the infill further reinforcing the possibility that wood steps were originally located here.

It was found that the square plinths or bases of the columns were also of Portland cement based concrete, which dates these bases well outside of the original construction period. No bases can

Figure 46 The brick surface behind the entry steps is made up of later infill suggesting this space may have originally contained an opening of sorts, possibly similar that found behind the steps at Pavilion VI. Paint lines exist on the pavilion walls to either side of the infill suggesting wood steps may have butted against the wall here.

be seen in the earliest known photograph of the Pavilion and since Jefferson explicitly specified that the columns were to have no bases, it is likely that no bases existed until the very late 19th or early 20th century.

Preliminary Recommendations for Restoration

This study was undertaken with the expectation that it will be used to formulate the scope of work for the eventual restoration of the exterior of Pavilion X. Although there is an accompanying list describing the work in greater detail that will be necessary to achieve this goal there are several salient issues and features related to the restoration project that merit further description.

Based on the findings of this study we are suggesting that any future restoration program consider the following:

Restoration of the Attic Parapet

This work will include constructing a timber frame of the parapet and supporting it on the brackets installed during the 1987 roof restoration work. The parapet was very likely made out of heart pine, but any new parapet may be made of some other durable wood species like African Mahogany, Spanish Mahogany or some similar material. The single surviving photograph of the parapet shows that the wood plinth skirt board at the base of the parapet was raised above the roof surface to allow water to pass beneath it. In fact, the geometry of the intersection of the parapet with the portico roof necessitated the complete removal of the plinth board along the portico roof, and a space was left to allow the roof to drain. It is recommended that the parapet be restored with these features.

Restoration of the Student Room Roofs and the Chinese Rails

The restoration of these roofs would entail removing the modern framing forming the gabled slated roofs, installing some kind of flatter roof framing that would continue to encapsulate the original serrated roof below, and installing a new roof membrane on the new roof deck. This deck would then presumably be fitted with sleepers and a new wood deck at the same elevation and in alignment with the existing portico deck. Once the deck is installed, the Chinese rails can be erected at the same elevation of the surviving rails at the portico. Although the c1830 structural system supporting the roof above the colonnade may be removed and replaced with a new structural system, it may be possible to leave this in place and simply encapsulate it above the new plaster colonnade ceiling.

Possible Removal of the South elliptical Windows

Because there is no question that these windows were inserted in a somewhat crude manner into the wall of the pavilion, it may be desirable to remove them. The windows can be observed from the path along the south of the building, and they alter the original fenestration pattern in an unhappy way. However, once these windows are removed, all natural light will be blocked from entering the stair hall unless portions of the addition are removed from the east elevation.

Column Restoration

As the accompanying column render sample report states; ...the lower portion of the columns have been rendered with Portland cement based stucco. This is a clear indication that at least this portion of the columns were re-rendered sometime in the 20th century (certainly after c.1890). Mark Kutney, an architectural conservator at the university, tested a potion of the rendering near the top of the columns and found the same results, making it probable that the entire height of the column shafts had their original rendering removed. This is unfortunate because it was hoped that the ingredients of the original render material would possibly provide some idea of the original column color and finish. However, it is certainly possible that the Doric columns were rendered to look like stone like the columns of Pavilion VIII. If this is found

to be the case, the columns should be restored to their original appearance. In a similar way, the Tuscan columns along the colonnade should have their render restored like the two already completed along the east lawn.

Paint Restoration

The complete paint analysis results have not yet been completed, but preliminary results have revealed some yellow ochre in the earliest paint layers on the woodwork. If final results verify this fact, all of the woodwork on the pavilion should be repainted to match the original color. If earlier paint discoveries on several of the other Pavilions can be used as a guide, it is very likely that the original front doors were grained. Although the front entry doors of Pavilion X were replaced with glass the remaining panels should provide ample evidence of the original graining. If not, it may be desirable to simply replicate the graining found on the original doors discovered in the attic of that pavilion.

Preliminary paint analysis has also revealed that the blinds on the pavilion were painted a very bright green. If so, these findings would be similar to those found on a louver found in the attic of Monticello several years ago. This louver once belonged to the porticles that once flanked Jefferson's southeast piazza and the paint color found on the louver was used as the final paint color of the restored porticles.

Recommendations for work that should not be undertaken:

Complete East Façade Restoration

It is abundantly clear that Pavilion X could not easily function as a modern residence without the east addition. This addition houses a modern kitchen, bathrooms and other amenities that do not have to be situated in the original building. If the addition was removed, the original pavilion would have to be consumed to house these uses. Consideration may be given to modifying the addition housing the small southeast rooms at the juncture of the addition to the main building and modifying the modern decking on the north. Both of these areas are fairly modern and rather crudely conceived and executed. However, it is recommended (although not absolutely critical) that all of the exposed window openings on the original pavilion be restored. An example of this includes the former window that was made into a door at the first floor.

Colorwash Restoration

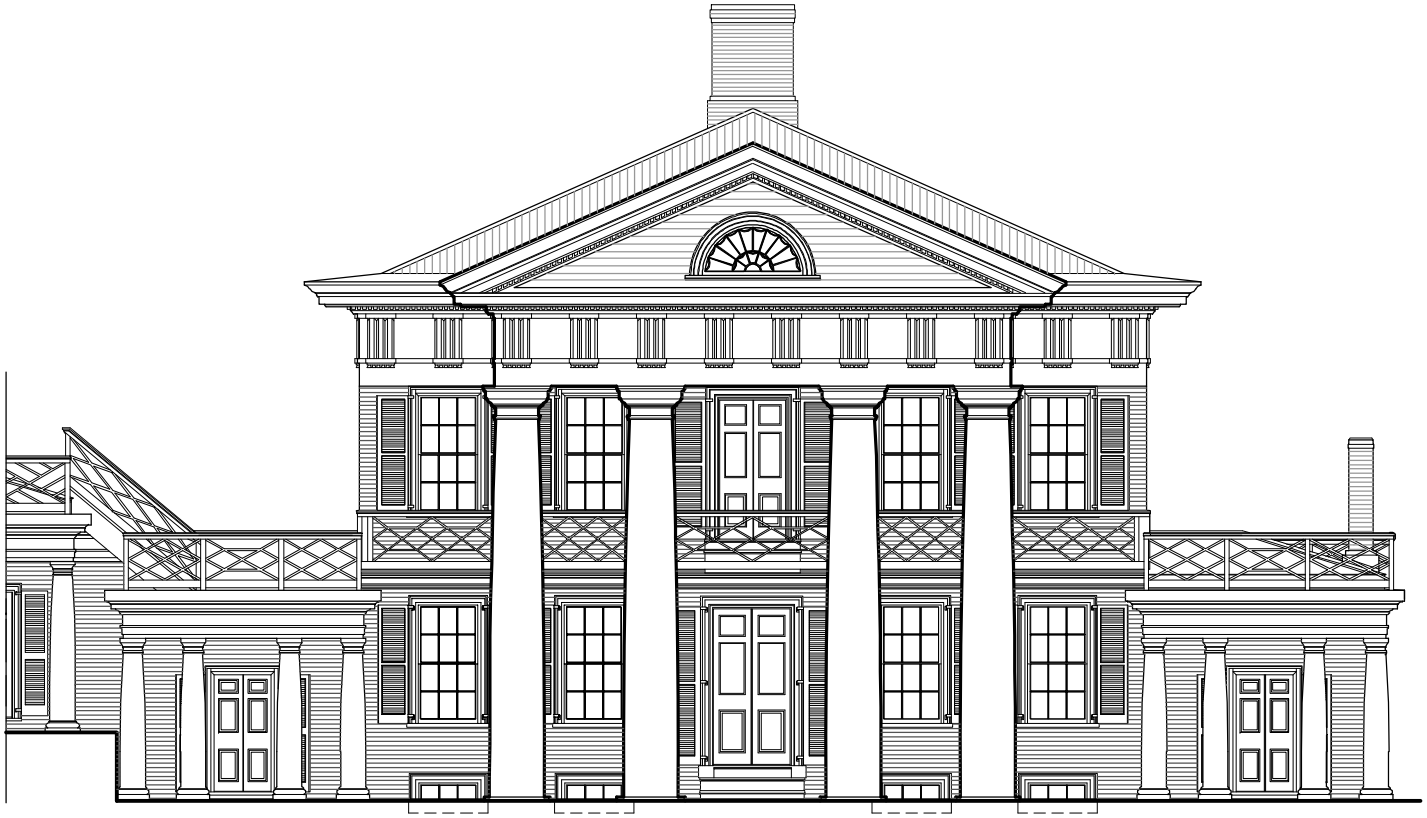
The colorwash on the front of the building is a wonderful document and a resource that will be studied for generations to come. It is fortuitous that the portico and colonnade roofs have protected this finish to such a degree. Most other sites have lost their colorwashed finishes, and if an attempt is made to reinstate new colorwash at Pavilion X, the original finish will be consumed in the process. As an aside, there are many signatures penciled into the joints of the pavilion, and many date to the early decades of the University. These are important documents themselves and should be protected from harm during any restoration work.

Further Painting and Scraping

It has been noted that the last restoration campaign has not only removed most of the original paint on the building but a fairly large amount of the wood substrate with it. Since most of the windows and doors were stripped and painted at that time, these elements should only be repainted during any future campaign.

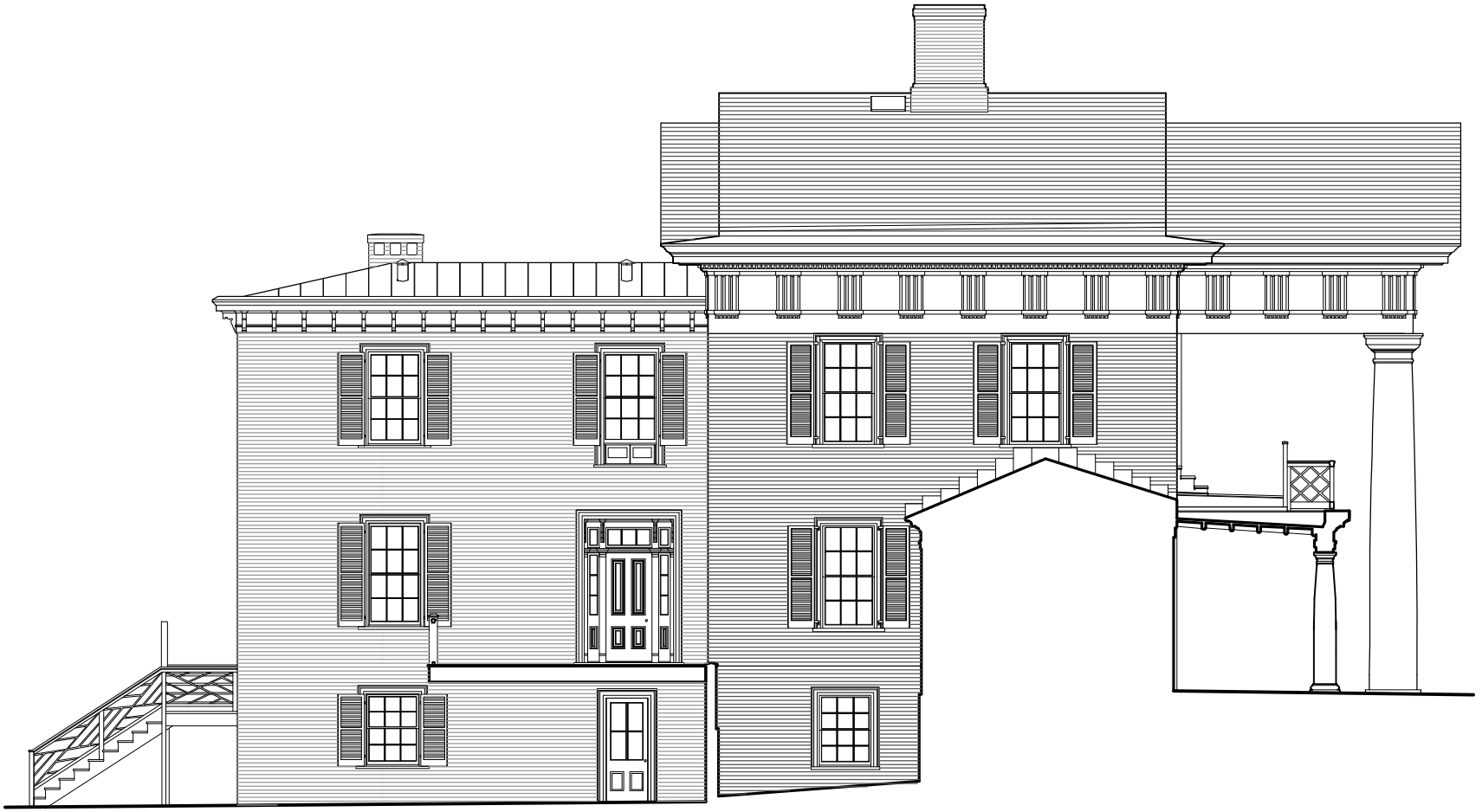
RENDERING OF
PAVILION X AND STUDENT ROOMS
RESTORED

DRAWINGS:
EXISTING/HISTORIC/PROPOSED



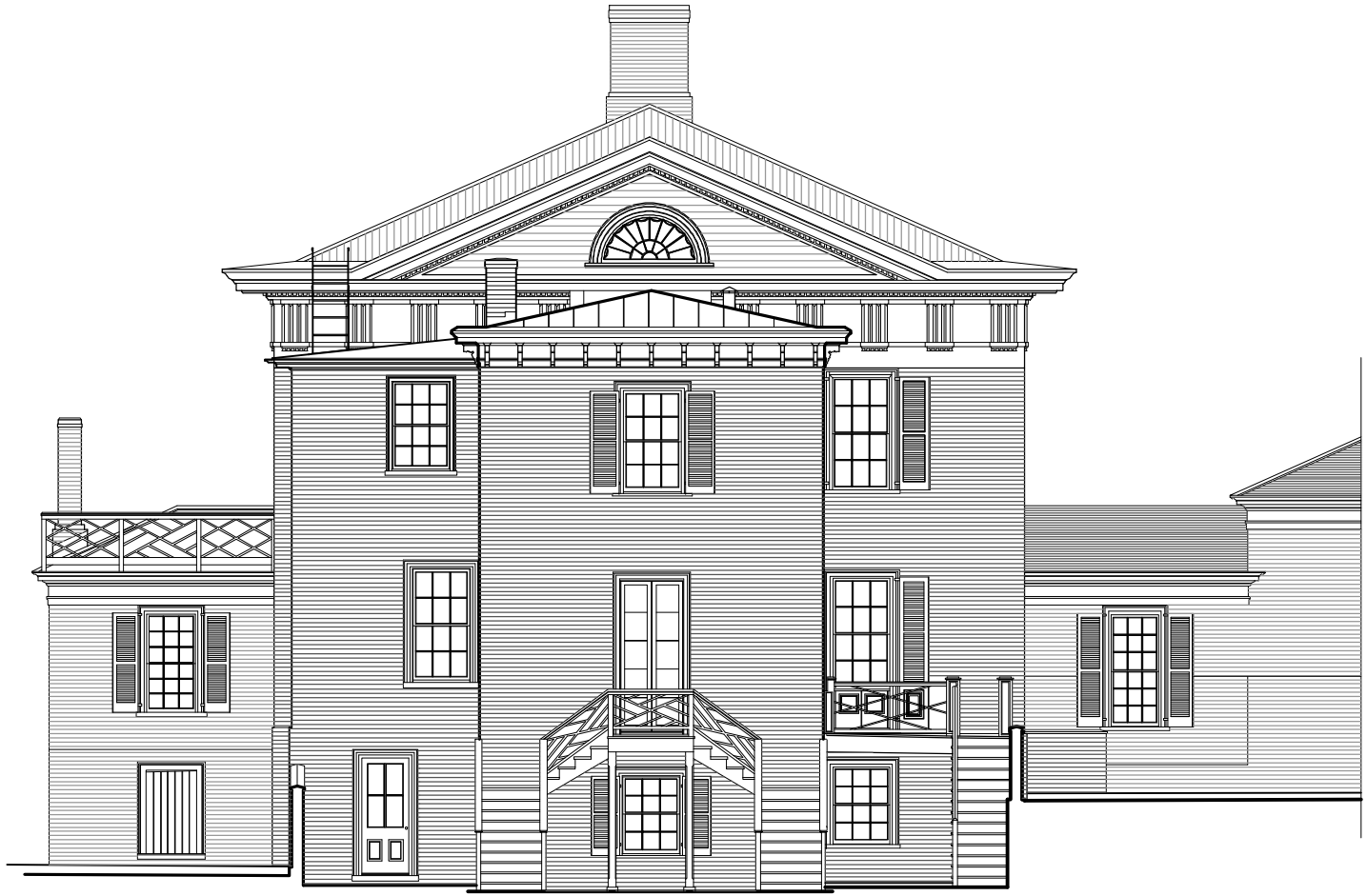
EXISTING WEST ELEVATION

3/32" = 1'-0"



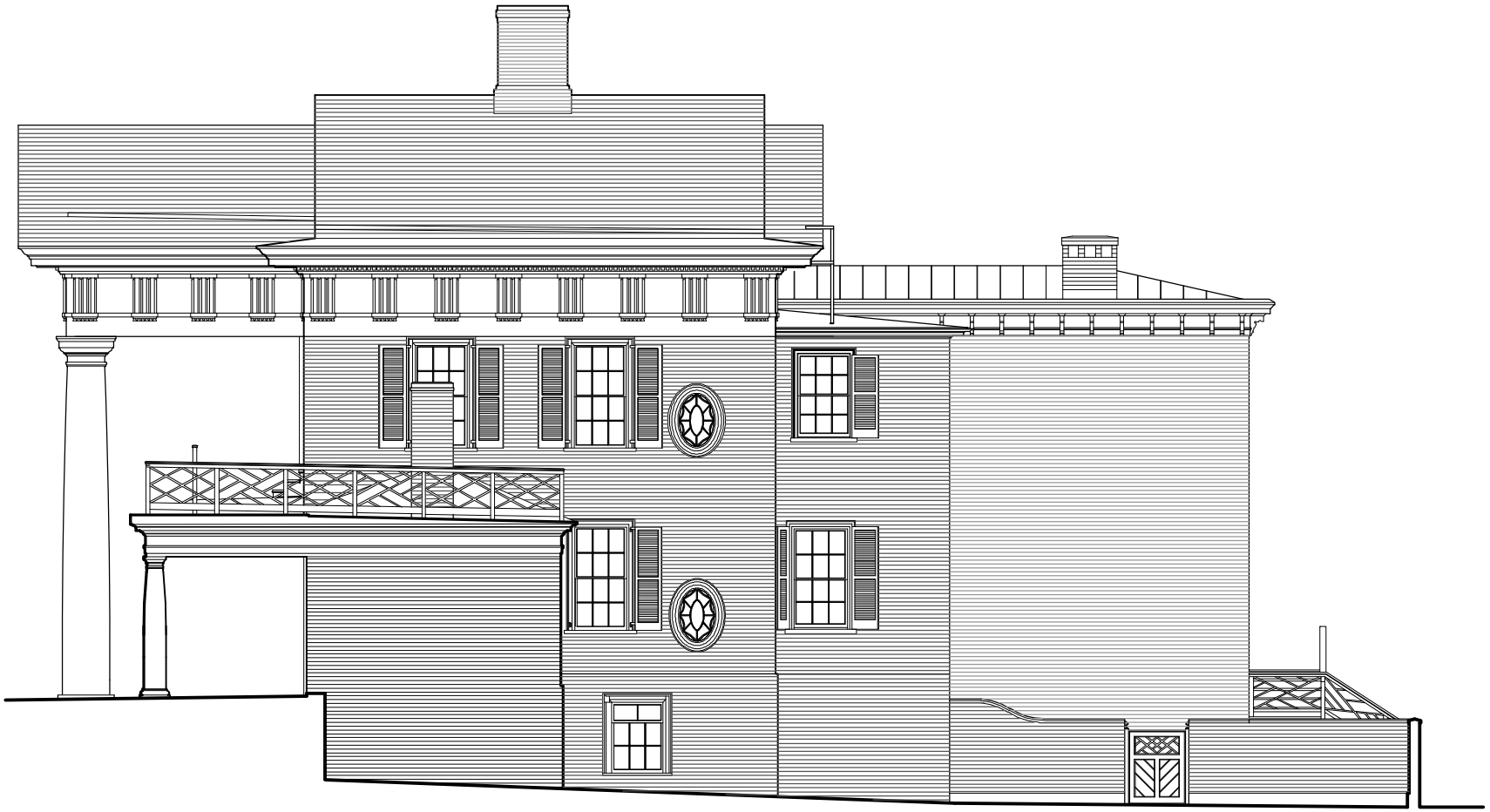
EXISTING NORTH ELEVATION

3/32" = 1'-0"



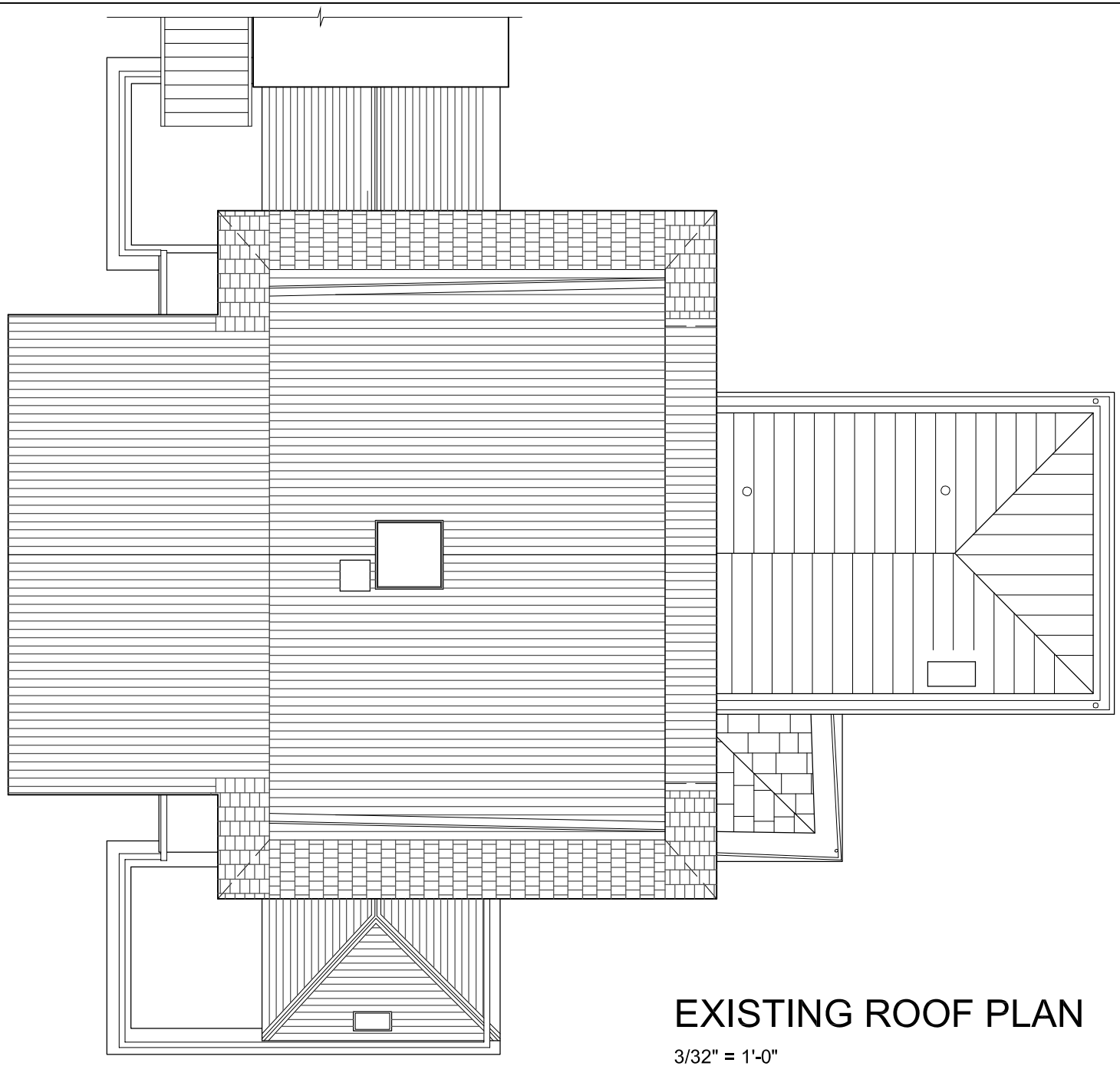
EXISTING EAST ELEVATION

3/32" = 1'-0"



EXISTING SOUTH ELEVATION

3/32" = 1'-0"

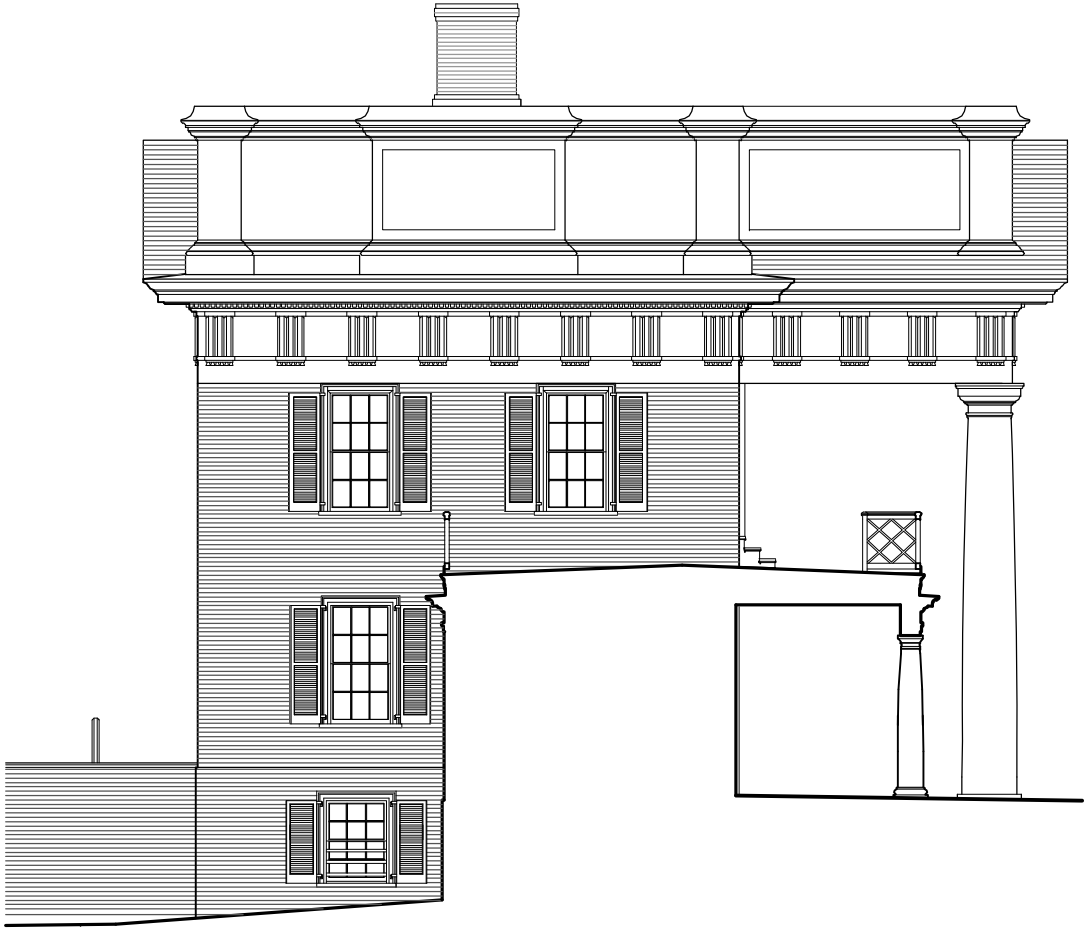


EXISTING ROOF PLAN

3/32" = 1'-0"

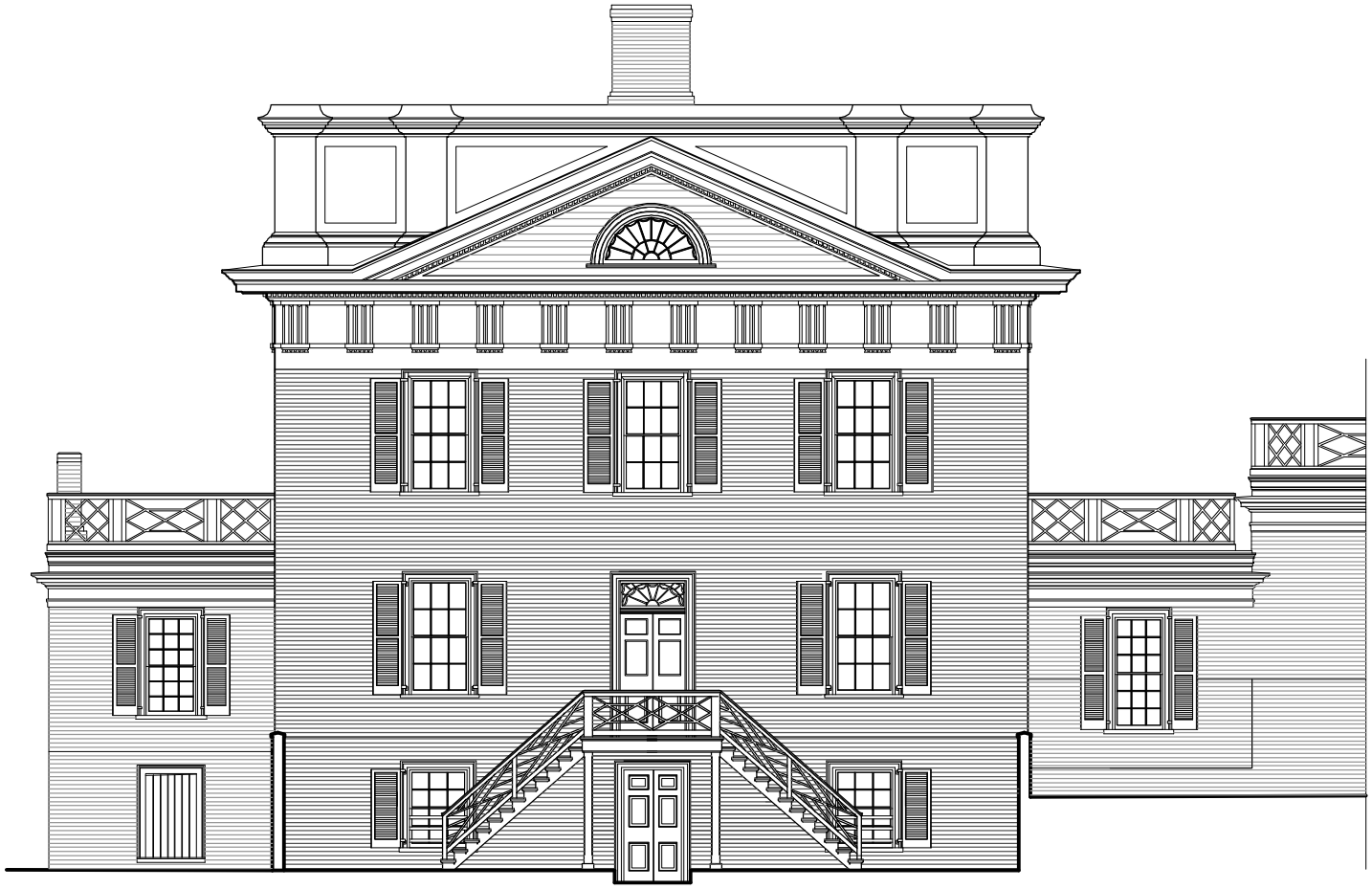
HISTORIC WEST ELEVATION

3/32" = 1'-0"



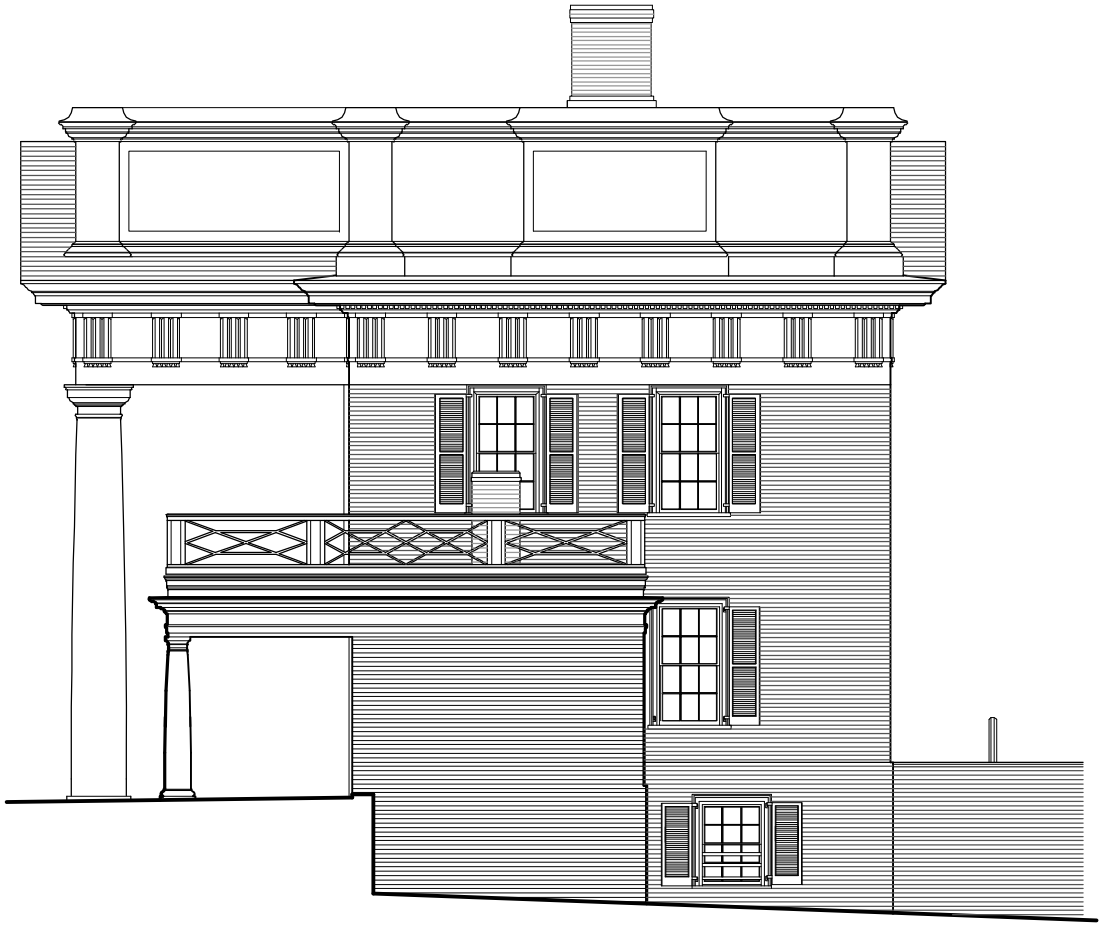
HISTORIC NORTH ELEVATION

3/32" = 1'-0"



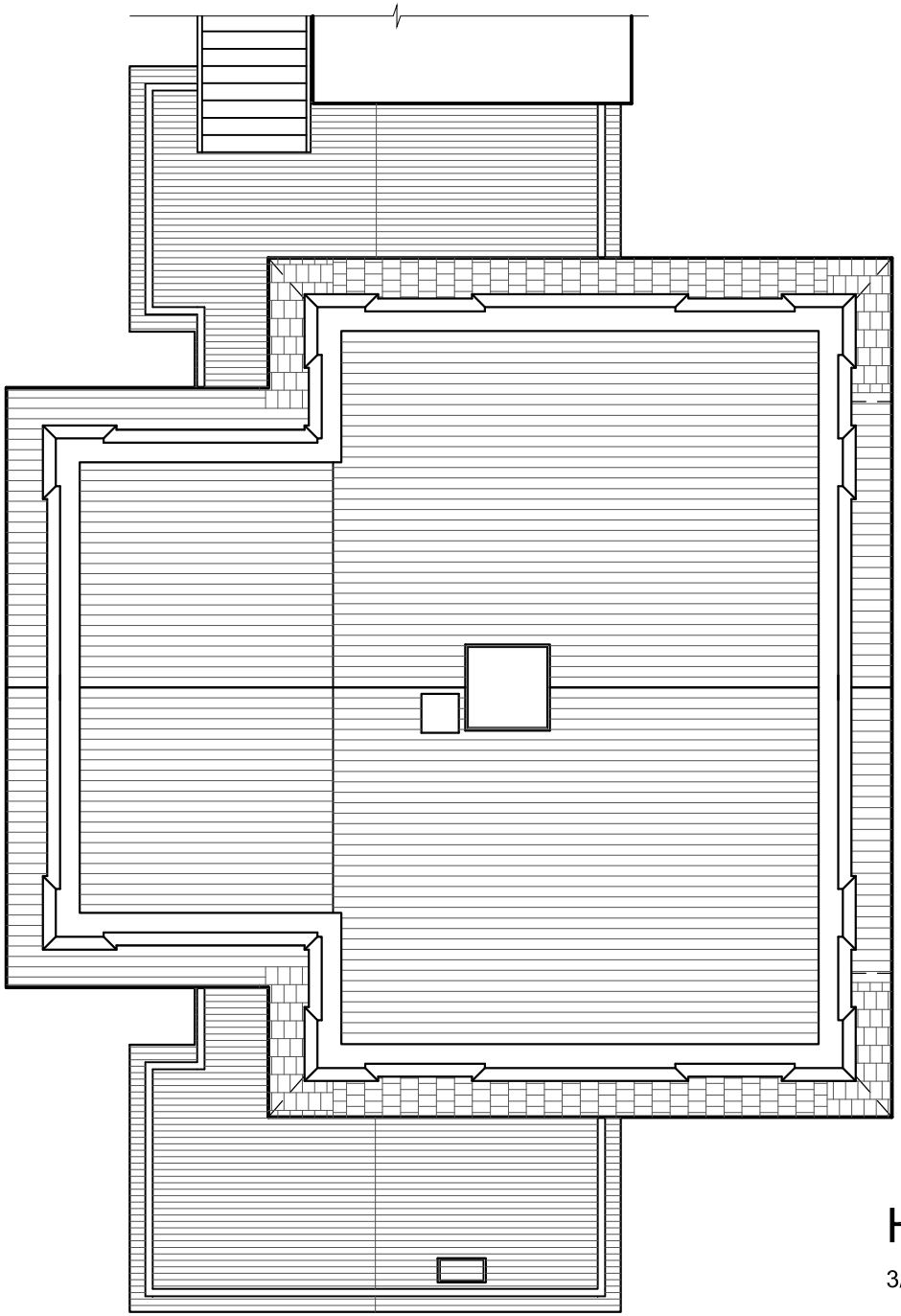
HISTORIC EAST ELEVATION

3/32" = 1'-0"



HISTORIC SOUTH ELEVATION

3/32" = 1'-0"

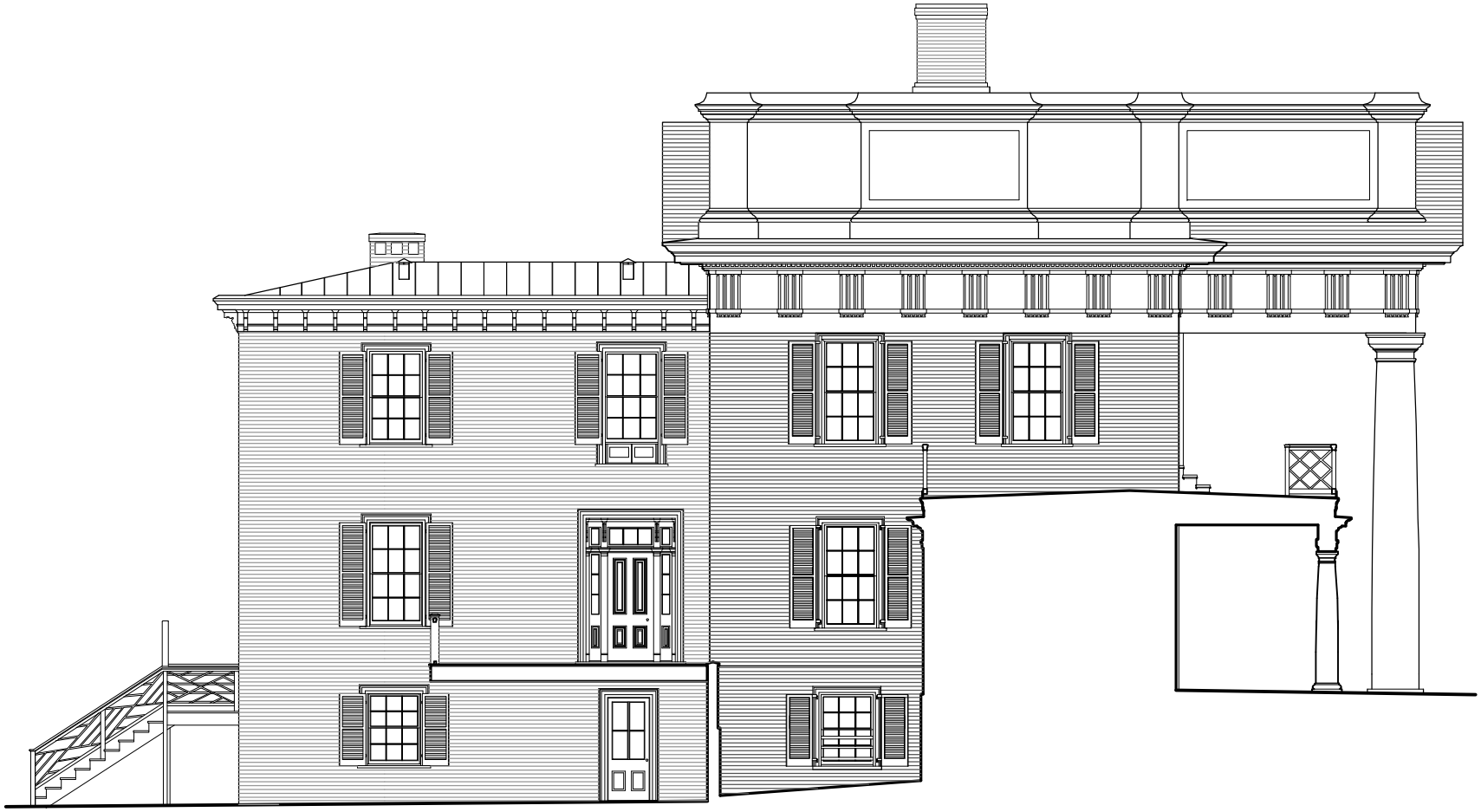


HISTORIC ROOF PLAN

3/32" = 1'-0"

PROPOSED WEST ELEVATION

3/32" = 1'-0"

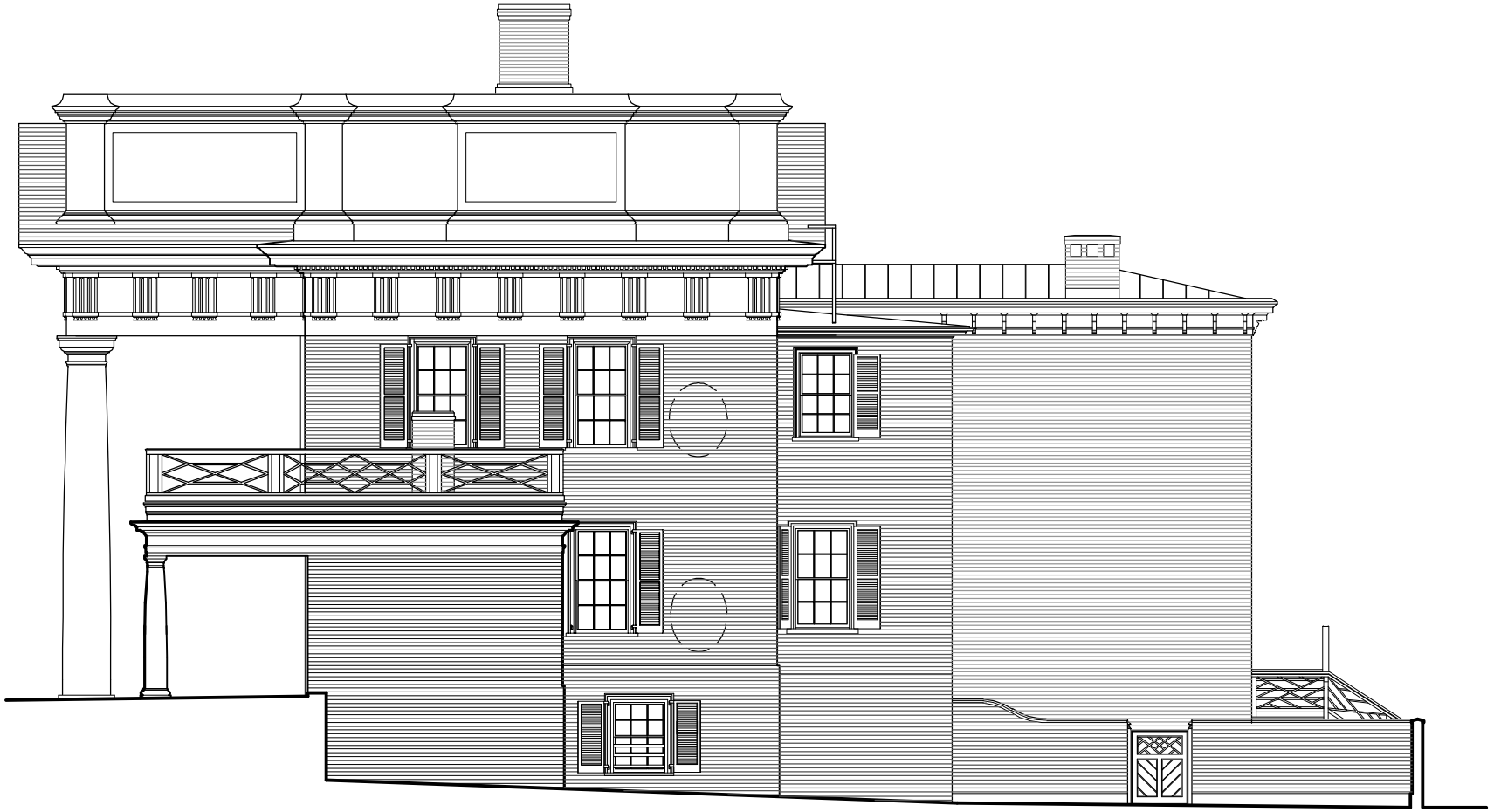


PROPOSED NORTH ELEVATION

3/32" = 1'-0"

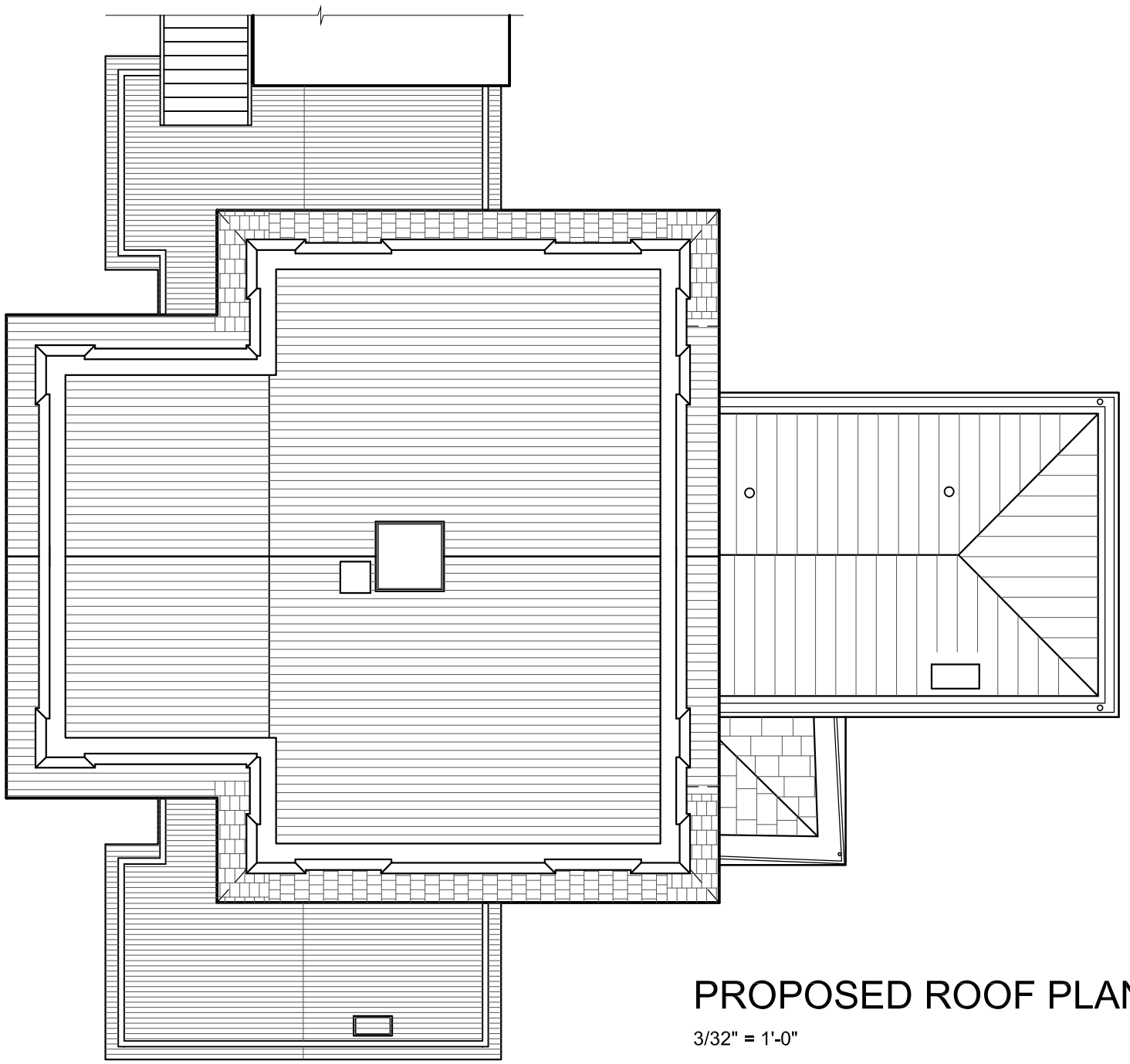
PROPOSED EAST ELEVATION

3/32" = 1'-0"



PROPOSED SOUTH ELEVATION

3/32" = 1'-0"



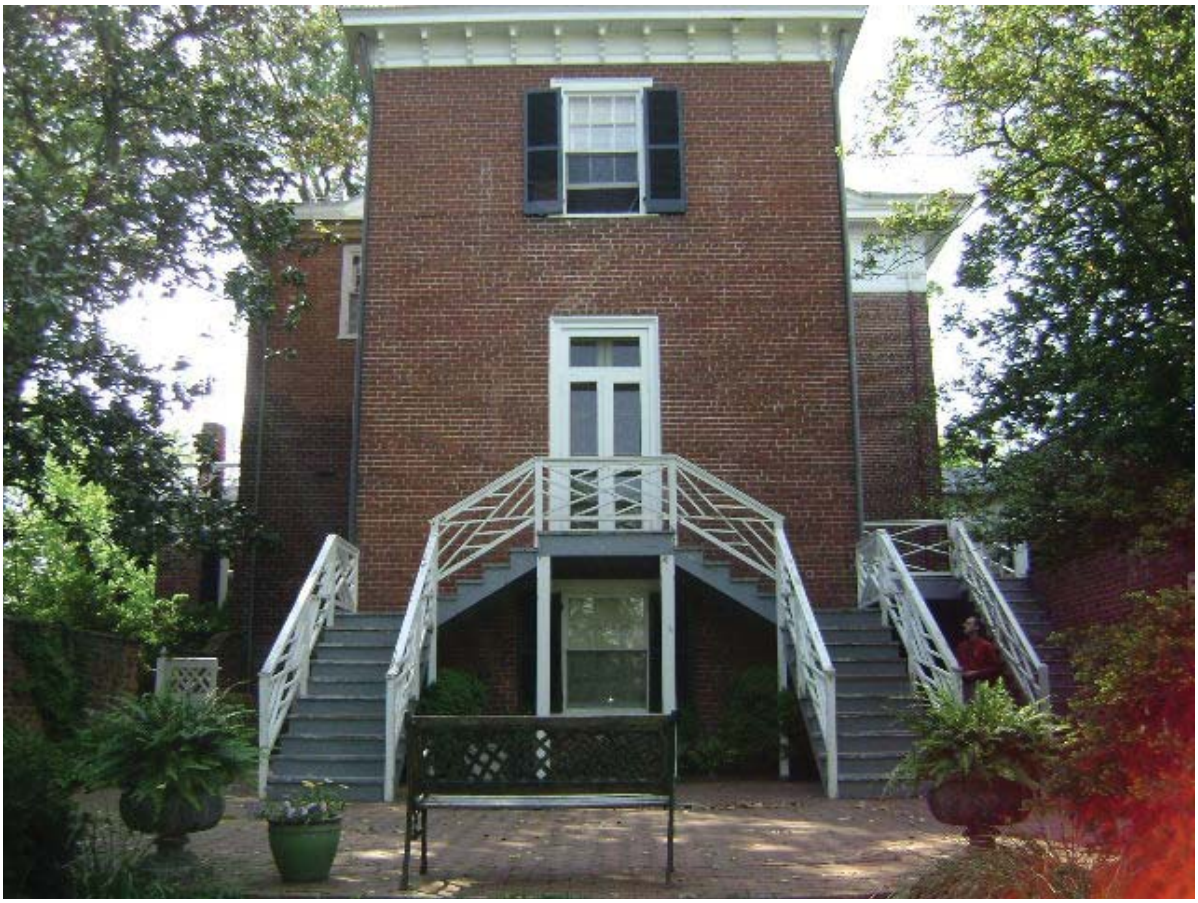
PROPOSED ROOF PLAN

3/32" = 1'-0"

PHOTOGRAPHS:

EXISTING CONDITIONS 2007

West (front) elevation



East (rear) elevation

West end of north elevation from terras deck.

East end of north elevation from terras deck.

East pediment. Detail of fanlight in tympanum.

Detail of cornice and frieze of entablature.

Upper left: Detail of entablature
Upper right: North window opening on east elevation.
Bottom left: East door opening

Detail of raking cornice. West elevation.

Chimney stack.

Southeast plane of roof.

Roof of east addition.

Survey of Pavilion X
Window Blinds

Survey of Blinds and Hardware
at Openings of Original Pavilion.
Pavilion X
March 2008

WEST

Opening	N. Blind	S. Blind	N. Pintel	S. Pintel	N. Hinge	S. Hinge	N. Dog	S. Dog	Foot Bolt	Head Bolt
Second Floor - Far North Window	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	NA	NA
Second Floor - North of Door Opening	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	NA	NA
Second Floor - Door Opening	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	NA	NA
Second Floor - South of Door Opening	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	NA	NA
Second Floor - Far South Window	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	NA	NA
First Floor - Far North Window	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	C. Iron	C. Iron	NA	NA
First Floor - North of Door Opening	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	C. Iron	C. Iron	NA	NA
First Floor - Door Opening	Orig.	Orig.	3 - Orig.	3 - Orig.	3 - Orig.	3 - Orig.	Orig.	Orig.	Original	Original
First Floor - South of Door Opening	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	C. Iron	Orig.	NA	NA
First Floor - Far South Window	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	C. Iron	NA	NA

SOUTH

Opening	E. Blind	W. Blind	E. Pintel	W. Pintel	E. Hinge	W. Hinge	E. Dog	W. Dog	Catch
Second Floor - Far West Opening	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.
Second Floor - Middle Opening	Modern	Modern	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	None
First Floor - West Opening	Modern	Modern	Orig.	Orig.	None	Orig.	New	None	None

EAST

Opening	N. Blind	S. Blind	N. Pintel	S. Pintel	N. Hinge	S. Hinge	N. Dog	S. Dog	Catch
Second Floor - Far North Opening	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Unknown
First Floor - Far North Opening	c. 1870	c. 1870	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	NA
Basement Floor - Far North Opening	Modern	None	Orig.	None	Modern	None	Missing	None	NA

NORTH

Opening	E. Blind	W. Blind	E. Pintel	W. Pintel	E. Hinge	W. Hinge	E. Dog	W. Dog	Catch
Second Floor - East Opening in Pavilion	Modern	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	None
Second Floor - West Opening in Pavilion	Modern		Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Broken
First Floor - East Opening in Pavilion	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Orig.	Broken

GLOSSARY

C. Iron	c. 1900
[Tee hinge]	Brackets indicate hardware is missing but evidence of its presence remains
Catch	Arrowhead catch wth notch on bottom
C. I. - #	Cast Iron Hinges - Quantity

Pavilion X Exterior Restoration Plan
Scope of Work for Preliminary Cost Estimate

University of Virginia
Pavilion X Exterior Restoration Plan
Scope of Work for Preliminary Cost Estimate
March 2008

ITEMS BY CSI DIVISION	Estimated Cost
Division 02 – Existing Conditions:	
• Remove slate and metal roof from Student Rooms (north/south)	$15,000
• Remove column rendering from 4 portico columns and stabilize brick	$20,000
• Remove column rendering from 8 colonnade columns & stabilize brick	$20,000
• Scaffolding	$65,000
Subtotal:	*$120,000*
Division 03 – Concrete:	
• None	
Division 04 – Masonry:	
• Reconstruct large portico brick column bases to correct height (added 3 courses) (4 total)	$195,000
• Reconstruct column rendering for 4 portico columns	$75,000
• Reconstruct column rendering for 8 colonnade columns	$75,000
• Restore brick path under colonnade in areas of column restoration	$ 5,000
• Repoint 25% of brick joints with matching mortar	$40,000
• Reconstruct brick chimney over south student room from roof line up approx. 5’	$12,000
Subtotal:	*$402,000*
Division 05 – Metals:	
• Provide/install stainless steel tie back rods and brackets for Chinese rail support	$ 9,500
• Provide/install additional steel structure to support and stabilize new 9’ high parapet	$ 15,000
• Lightning protection	$25,000
Subtotal:	*$49,500*
Division 06 – Wood, Plastics, and Composites:	
• Construct new wood 3x10 joist structure to support new flat roof deck in between existing/original TJ serrated roof.	$15,000
• Install new 1x4-6 (variable width) wood deck to support new single ply membrane	$30,000
• Construct and install new Chinese rail over colonnade and student rooms	$70,000
• Reconstruct Chinese rail at portico balcony – 95% reconstruction	$10,000
• Construct wood paneled 9’ wood parapet on all perimeter of Pavilion X roof	$60,000
• Misc. wood repair on northeast and east wood porches	$ 5,000
• Construct and install 2 six panel doors for student room entry doors	$ 7,000
• Fabricate and install new wood blinds and custom hardware	$15,000
• Student Rooms entablature reconstruction	$30,000
• Misc. repair of wood cornice at east addition roofs	$10,000
• Reframe colonnade ceiling for new lath and plaster	$ 8,000
• Reconstruct wood steps to upper level on north	$ 7,000
Subtotal:	*$267,000.00*

Division 07 – Thermal and Moisture Protection:	
• Install new single ply EPDM roofing and flashings on both student room roofs	$60,000
• Flashings:	$25,000
Subtotal:	*$85,000*
Division 08 – Openings:	
• Reconstruct 2 new fanlight sash for east and west pediments	$20,000
• New wood panels installed in front doors	$ 4,000
• Graining of front doors	$ 2,000
Subtotal:	*$26,000*
Division 09 – Finishes:	
• Provide new paint finish to all entablatures	$15,000
• Provide new paint finish to all window sash, frames and architraves	$15,000
• Provide new paint finish to all new railings and parapets	$ 5,000
• Provide new paint finish to all new wood decks over student rooms	$ 8,000
• Provide new paint finish on all blinds	$10,000
• Install plaster ceiling in colonnade	$ 9,000
Subtotal:	*$62,000*
Estimated construction cost:	$1,011,500
Project supervision/General conditions: (10%) + $101,000	$1,112,500
Estimating Contingency: (10%) + $111,300	$1,223,800
Escalation to Project Midpoint: (12/08) 10% $122,400	**$1,346,200**
ALTERNATES:	
1. Remove oval sash in stair hall and infill with brick and joints to match existing	$ 20,000
2. Remove herringbone brick walk in student rooms/Pavilion X colonnade and replace with new brick at new level – 3 courses lower than existing	$ 35,000

PAVILION X EXTERIOR PAINT ANALYSIS

Pavilion X Exterior Paint Analysis

The initial goal of the study was to develop a baseline history of the oldest portion of the structure. With this established, researchers could then develop an approximate period for any later additions or elements. From visual inspection and institutional memory, its clear a fairly thorough stripping of the paint buildup occurred in the early 1980s, making finding a complete history more difficult. This is most readily apparent on the window architraves and sashes, where little to no paint history survives and the surfaces are marked with tool gouges. Fortunately, a number of areas were found which seemed to survive surface restoration. These include the balcony railing, the entablature, and the portico ceiling trim.

Although the Chinese railing on the balcony has had some newly replaced elements, a large portion of it is original and still contains its complete paint history. Of all the surfaces examined on the Pavilion, the railing appears to have received the most painting activity throughout its life. One sample displayed 23 finishes in 37 total layers. This high number may be due to its easy access, a higher traffic impact or that it simply collected dirt very quickly, or a combination of all three. In contrast, the portico inner cornice displayed a much lower painting activity, probably due to its more difficult access. Although only 15 finished were found on these surfaces, they included the earliest and latest paint campaigns as found elsewhere. For example, where the Chinese railing displayed three initial campaigns of buff color, the cornice displayed only one.

Similar to the cornice, the lead leaf elements on the entablature soffit display a relatively low number of paint layers, but also show an undisturbed full paint history. This is very likely due to their soft nature, sculptural quality, and the shear number of them, making surface preparation and painting very difficult and tedious. Of all the samples taken, the two lead elements sampled provided some of the best information about the nature of the first finish on the wood trim.

Overall, it appears that this first color for the wood trim was more like a stone color, herein described as buff. A visual approximation of this finish in one of the fragments is Munsell 2.5Y 9/4. The body of this finish has a yellowish cast to it. It is highly likely that at least a portion of this yellow coloration is due to the yellowing of the oil component of the paint, which takes place in the dark or after a finish is hidden by later paint applications. Reproduction of the first period color should take this yellowing into account. The final color would therefore be somewhat less yellow.

A very small amount of red, orange, brown and yellow pigments are commonly observed in the first finish, as well as several subsequent finishes before the color becomes a more pure white. This confirms an intent to present an off-white trim color in the earliest appearance of the Pavilion. Identification of the pigments in the first finish will be performed in phase II of the analysis in order to help define and more accurately reproduce this color.

Window sashes: All the window sashes appear to have been aggressively stripped in the recent past, making finding a complete paint history difficult. The adjacent student rooms have new sashes. The most well preserved exterior sash evidence is represented by a transom sash located above the original rear door opening of the main building. Once the late 19th century addition is built, this element escapes the harsh exterior environment and later restorations to the building. Sample #34 from this surface displays 24 layers. Judging by the contrasting levels of deterioration and dirt deposition, the first 9 layers represent an exterior exposure and are consistent with the earliest evidence found on other trim. The initial finish layer displays an occasional yellow pigment, and a rather large chunk of red pigment that appears to be red ochre.

The window sashes on the 1st floor east elevation, adjacent to the rear door, also display an early paint chronology consistent with the interior transom sash. This window was at one point changed to a door, and later back to its current configuration as a window with exterior wood panels below the sill.

The best sample from the addition was significantly disturbed and displayed only four layers.
Both adjacent student rooms have new window sashes.

Window architraves: as above, these surfaces have been heavily stripped in the recent past. For the student rooms, paint evidence was found under the aluminum mounts for the window screens.
Main – the best evidence may be from the attic window architrave. Although sample #11 was incomplete, a more recent sample was acquired from the west attic window that looks more promising.
Addition – reliable sample not yet found.

Student room: Although the trim on these windows has been thoroughly stripped of paint history, evidence from both room #50 and #52 was found that confirms these elements were painted the same as the trim on Pavilion X.

Door architraves: Samples were also collected from the door trim on rooms #50 and #52 because the evidence on the window trim appeared to be very disturbed. Although these surfaces have also been thoroughly scraped in the past, good evidence was found on the jambs for both rooms and the architrave for room #50. The paint evidence on the architrave was consistent with that found on the window architraves and the Pavilion X trim.

Although it appears the first four finish campaigns on the door jambs (buff three times, then white) are very similar to the evidence seen on the trim for the Pavilion, the fifth campaign is a rusticated finish made up of quartz (sand) particles suspended in an off-white paint. Evidence of this finish can be seen on the jamb heads in the form of a textured surface on most of student rooms on the east lawn. Although a fairly thorough scraping campaign has removed almost all of the paint evidence from the lawn room exterior trim, the jamb head is the one surface that commonly seems to have been spared. A rusticated surface also shows up as the initial finish on the 1857-1858 Varsity Hall exterior trim, but this time in a light gray finish.

After the rustication campaign, the finish goes to brown, red, and then green, before going to off-white. This same brown also shows up in the colonnade ceiling as the third finish campaign.

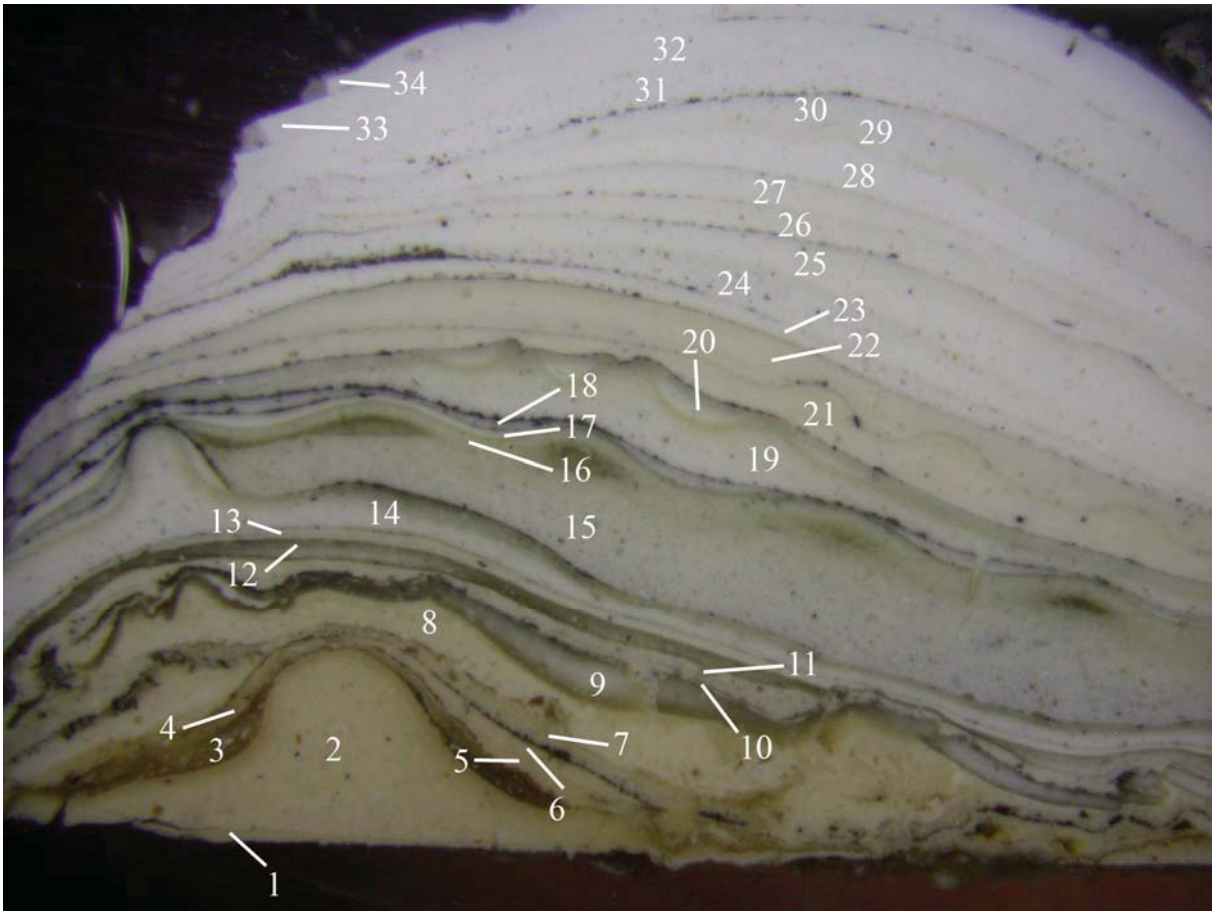
Front and rear doors: both display the same initial graining campaign, followed by numerous green finishes. The second finish, first green finish, is a bluish-green, which shows up as the 12th layer on the original blind sampled. While the front door goes back to graining in its current finish, the rear door simply stays green. Rather than suggest the front door dates to the period of the rear addition, a more plausible explanation would suggest the earlier finishes were stripped from the door at the time of the addition, when both doors were grained. It also appears the surface of the front door was sanded smooth at the time of the most recent graining, as demonstrated by the disturbed history below this latest finish. This activity is consistent with the tradition of preparing a smooth surface for the application of the graining layers.

An additional sample from the exterior of the front door may reveal evidence of the missing early paint history. Also, comparing a sample from the interior side of the door to the adjacent trim should answer whether or not the door was replaced at the time of the addition, or simply had its surface cleaned of earlier paint evidence. Both adjacent student rooms have modern replacement doors.

The **Chinese rail** displays a total of 34 layers representing 23 finish generations. The earliest finish matches Munsell 2.5Y 9/4 and can be described as pale yellow. The paint has an overall yellowish

coloration, which may be due in part to yellowing of the oil component. While this may account for a portion of the yellow tint, the presence of a small amount of red, brown and yellow pigment clearly demonstrates an intent to exhibit a yellowish white color. Red lead and earth pigments were most often observed. Polarized light microscopy will be carried out to further define the pigment in this finish. While the Munsell designation listed represents the current appearance of this finish, further work is needed to eliminate the amount of yellowing to this material that wasn't part of its original appearance. The original color may have been paler in appearance.

The 2nd and 3rd finish generations appear to be a repetition of this initial generation. The following 2-3 generations are still clearly tinted away from pure white and may be more accurately described as off-white. The remaining finishes are all white, with the modern and most recent finishes being the most purely white.



Sample #28: balcony, Chinese railing

Portico ceiling: Based on evidence from samples removed from three areas of the ceiling, it has received a severely reduced amount of paint activity. Because the earliest layers appear to be whitewashes, it is difficult to associate them with finishes on adjacent surfaces. In any case, there is much less paint evidence then would be expected for this surface to be original. Two points of interest are that the white plaster coat appears to contain very course red ochre pigment, and that the third layer appears to be a blue tinted wash.

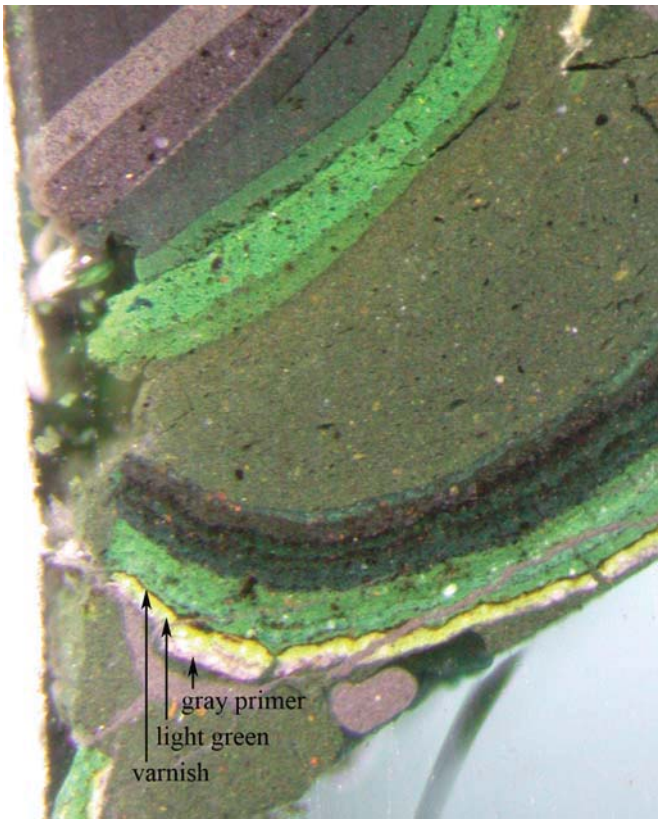
The elements in the adjacent cornice display paint evidence consistent with the overall history as seen on the balcony railing, except that there appears to be less overall paint activity. This would make sense given the relative accessibilities of the two locations. The first three layers are buff in color and appear to represent the first paint generation. Under higher magnification, occasional yellow and red

pigments are visible, proving that the color was intentionally tinted away from white. Some portion of the overall yellowish tint would be expected to be caused by the yellowing of the paint binder.

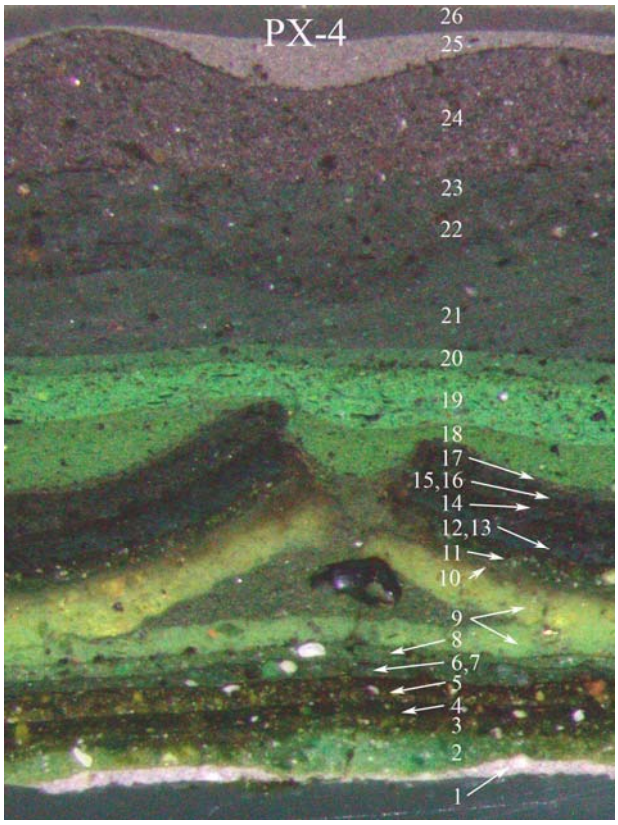
Blinds: Samples from the blinds on the main Pavilion, its addition, and the adjacent student room to the south (#52) all displayed good surviving paint evidence. The blinds on the student room to the north (#50) appeared to be later additions, so a sample was collected from the next student room to the north (#48).

All samples displayed the same gray primer, followed by green. Room 48 displayed a very well preserved light green paint followed by a varnish, which would have provided a glossy appearance. Only a tiny fragment of the light green survived in the sample from room 52. The first green in the sample from the main Pavilion blind is degraded to the point where this first color ranges in appearance from light green to dark brown.

Layers 2-9 in the Pavilion X blind sample are degraded to the point where their true appearance has been lost. This does not appear to be the case in the sample from Room 48. Sampling additional Pavilion X blinds, as well as other student room blinds would help support which form of this early green the reproduction color should take. In any case, it should be a light to medium green, and therefore much different from what is currently displayed. Further analysis, including pigment identification, will be carried out in order to accurately reproduce this color.



Student room #48 blind



Pavilion X blind, west elevation

Addition blinds: A sample from a blind on the addition displays an initial finish made up of an off-white primer followed by a medium green finish that lines up with the 9th or 10th layer on a sample from one of the original blinds.

Color wash/brickwork: Samples taken from west elevation, balcony level display single, initial application of red wash and white penciling (no dirt or mold accumulation beneath). Samples taken

from the areas behind the blinds on both adjacent student rooms confirm the survival of a single campaign of wash and penciling.

Portico deck boards: This particular sample was taken within an inch of its front edge. It appears from the sample strata, and from current practice, that the front edge of the deck boards beyond the railing were painted white like the surrounding trim. This appears to have been the practice from an early, but not original, period. The first three finish colors on the deck boards are brown, brown, and gray. The darkened and degraded appearance of the wood beneath the first color suggests that the first finish may have been pitch or tar that survived for quite some time before being painted for the first time.

Portico terras edge architrave: As determined by the paint chronology, the flat portions of this element are contemporary with the first period of construction. The complete backband appears to be a modern replacement.

Main columns and student room columns: Upon investigation, the shafts of the main columns appear to have been completely restored in the recent past with a new layer of pargeting containing Portland cement.

The student room columns seem to have survived without such a restoration. The best evidence found on the columns in front of rooms #50 and #52 displays an initial finish which appears to imitate the color of the render. This finish is repeated before becoming a straight whitewash. At various points in the stratigraphy, an oil based finish is applied. Other samples showed an untinted whitewash above the render.

Due to the temporary nature of lime based finishes, or whitewashes, and lime based renders, it's very unrealistic to expect to obtain a reliable picture of the earliest history of finishes on these columns without expanding the number of samples and columns examined. Any attempt to study and reproduce the original appearance of the columns on the lawn should consider all the columns as a group, instead of only those in front of rooms #50 and #52.

Student room colonnade ceilings: Although samples from the ceiling framing in front of room #50 displayed 9 finish layers, better surviving evidence was observed on the colonnade ceiling members at Pavilion IX during the railing replacement project. The initial finish is off-white or buff color, followed by white, brown, and then two to three pale green finishes before becoming white. These first three finish campaigns are seen as the 3rd, 4th and 5th finish campaigns on the student room #52 door jambs.

The pargeting above the door, adjacent to the ceiling, shows an almost identical history. The only difference is the pargeting displays a few more layers of modern white, and a late layer of thin plaster, very likely associated with a repair.

Addition entablature: The entablature has been completely stripped of early paint evidence. Only a tiny section of this element retains early paint evidence on the soffit, fascia and bed molding. This area survives behind the last bracket before the entablature runs out into the sloping roof on the south elevation. Analysis of three samples taken from this location showed 9-11 finish layers. This is in contrast to the 15 to 23 finishes layers displayed in the most complete samples from the earliest part of the Pavilion. The first finish layer in the addition samples appears to line up with the 9th or 10th finish layer in samples from the balcony railing

COLUMN RENDERING ANALYSIS

TESTWELL LABORATORIES, INC.
47 Hudson Street, Ossining, NY 10562
www.testwelllabs.com
Phone: (914)762-9000
Fax: (914)762-9638

MORTAR ANALYSIS REPORT

Client:	Mesick Cohen Wilson Baker Architects, LLP	**Lab #:**	MOU-004AA
Project:	University of Virginia Pavilion X	**Report #:**	OPCL001/MOU-004
Location:	Charlottesville, VA	**Date Received:**	08/20/07
Sample Type:	Hardened mortar fragment	**Report Date:**	08/29/07
Sampled by:	Client	**Petrographer:**	J. Walsh
Delivered by:	Client	**Analyst:**	M. Malaj
		Page 1 of 10	

Report Summary

- A render sample from a portico column at the University of Virginia is examined petrographically and chemically to determine components and estimate proportions.
- The mortar is determined to represent a sanded, portland cement - lime mortar with a cement to lime ratio of 1 : 0.25 and a binder to sand ratio of 1 : 2.3.
- The sand is a siliceous natural sand and no marble chips are detected.
- The estimated vintage of the render is estimated to be within the early twentieth century.
- A more detailed discussion of these findings can be found in the “Discussion and Conclusions” section on page 5 of this report.

1. Introduction

On August 20, 2007, Testwell Laboratories received one render sample reported by the client to have been sampled from a portico column at the jobsite referenced above. The location is reported as the south face of the southernmost column. The client requests a mortar analysis (ASTM C1324) to be performed on the provided sample. The requested testing includes petrographic investigation combined with chemical analysis to identify the binder components and provide an estimation of the original binder to sand ratio. A special emphasis is requested regarding the presence of any marble chips in the aggregate used to simulate stone columns. If so, a point-count analysis would be substituted for the chemical analysis in order to determine component proportions.

2. Methods of Examination

The petrographic examination is conducted in accordance with the standard practices contained within *ASTM C1324: Standard Test Method for Examination and Analysis of Hardened Masonry Mortar*. Data collection is performed by a degreed geologist who by nature of his/her education is qualified to operate the analytical equipment employed. Analysis and interpretation is performed or directed by a supervising petrographer who satisfies the qualifications as specified in Section 3 of *ASTM C856*.

Chemical analysis was conducted according to the procedures outlined in *ASTM C1324: Standard Test Method for Examination and Analysis of Hardened Masonry Mortar*. Water, carbon dioxide and aggregate weight percentages are determined gravimetrically. Oxide weight percentages are determined by atomic absorption spectroscopy.

3. Petrographic Findings

SAMPLE ID	**South side - Southernmost column**
GENERAL APPEARANCE	
Sample Type / Dimensions	One irregularly shaped fragment with approximate dimensions of 2.5" length, 1.5" wide, and 0.75" deep.
Surfaces and Masonry	No masonry units are included with the sample. The top surface is coated with light-colored paint. The other surfaces appear to be freshly exposed during sampling.
Hardness / Friability	Hard, compact, and non-friable.
Appearance	Moderately dull luster; fresh color is a very pale brown (Munsell color designation approximately 10YR 8/2)
Visible binder grains	Traces of fine white grains are observed in hand sample but these are not positively identified as binder grains.
Cracks, deposits, etc,	No efflorescence or other visible mineral deposits are detected in hand sample. A few cracks parallel the surface at approximately 1/8" to 3/16" depth but these appear to be sampling artifacts.
AGGREGATE	
Mode and Lithology	The aggregate is a siliceous natural sand composed predominantly of quartzofeldspathic fragments and minor metamorphic fragments. No marble chips are detected.
Appearance	In hand sample, the appearance of the sand is somewhat variegated in appearance due to the presence of the feldspars and the metamorphic grains.
Size and Gradation	The sand is well graded. Most grains are found at the No. 16 sieve size and below with rare grains estimated to be retained on the No. 8 sieve. A sand recovery was not performed and quantitative data on the gradation cannot be offered.
Shape	Subangular to angular in shape and subequant in aspect on average.
Distribution	Homogeneous with a randomly oriented distribution.
Other	No cracking, coatings, or chemical reactions are detected.
BINDER MATRIX	
Hardened binder	Dense, homogeneous cementitious matrix with moderately low capillary porosity.
Calcium Hydroxide	Primary calcium hydroxide is found in moderate abundance with a somewhat heterogeneous distribution. Grains have a bimodal size distribution and are found as either very fine crystal laths or as large crystal masses.
Residual Binder Grains	Residual portland cement grains are found in moderately high abundance as relatively large belite agglomerates with interstitial ferrite. Alite is found in minor abundance usually only within the unhydrated interiors of belite agglomerates. Belite color and size tends to be somewhat variable. Residual lime is found in moderately low abundance as very fine rounded grains. Most have a texture defined by a fine homogeneous interlocking grain of hydroxide crystallites.
Residual Pozzolans	None detected.
Pigments	None detected.
AIR-VOID SYSTEM	
Estimated Air Content	Approximately 6% to 8%
Consolidation / Distribution	The mortar is well consolidated and air-voids are well distributed.
Size / Shape	Voids are generally less than 1 mm in dimension. Voids tend to be irregular in shape.
Secondary Deposits	Traces of very fine ettringite needles are observed lining voids.
AGGREGATE INTERFACES	
Details	There is a good coating and compaction of binder matrix around sand grains. No significant deposits, matrix variations, or microcracks are detected around sand boundaries.
SECONDARY REACTIONS	
Carbonation	The paste is found to be carbonated with an irregular depth of approximately several millimeters.
Other	Little evidence for other secondary reactions are detected short of very minor ettringite deposition.
CRACKING	
Details	No significant macroscopic or macroscopic cracking is detected.
MASONRY UNIT BONDING	
Details	No masonry units are included with the sample.

4. Chemical Analysis

Table 4.1: Chemical Analysis Results

SAMPLE ID	**South side - Southernmost column**
Component (wgt. %)	
SiO_2 (acid soluble)	5.11
CaO	17.19
MgO	0.84
Al_2O_3	2.27
Fe_2O_3	0.81
Insoluble residue	58.45
LOI %, to 110°C (Free water)	3.02
LOI %, 110°C-550°C (Combined water)	5.22
LOI %, 550°C-950°C (Carbon dioxide)	6.15
Totals	**99.06**

Table 4.2: Calculated Components

SAMPLE ID	**South side - Southernmost column**
Component	
Portland cement (wgt. %)	24.3
Masonry cement (wgt. %)	Not detected
Natural cement (wgt. %)	Not detected
Lime expressed as dry hydrate (wgt. %)	2.46
Ground limestone (wgt. %)	Not detected
Gypsum-based binders (wgt. %)	Not detected
Mineral addition (wgt. %)	Not detected
Sand (wgt. %)	58.4
Cement : lime ratio (by dry volume)	1 : 0.24
Binder : sand ratio (by volume)	1 : 2.3

Notes:
1) Component weight percentages are not normalized to 100% and the reported deficiencies are due to volatiles such as combined water and carbon dioxide.
2) Portland cement % is calculated assuming that the soluble silica in the cement is 21% in normal gray portland cement.
3) Hydrated lime % is calculated by subtracting calcium and magnesium due to portland cement and multiplying the remaining calcium and magnesium by conversion factors for the appropriate lime species.
4) Sand is calculated directly from the acid insoluble residue.
5) Volumetric cement/sand ratio is calculated assuming bulk weights for portland cement, hydrated lime, and sand of 94 lb./cu. ft., 40 lb./cu. ft., and 80 lb./cu. ft. respectively.

5. Discussion and Conclusions

The examined mortar is determined to consist of a sanded, portland cement - lime mortar. No other hydraulic components, pozzolans, or mineral pigments are detected. The portland cement is identified as a normal gray cement based on the presence of the iron-bearing ferrite phase. The relatively coarse grind of the residuals as well as the moderate variations in the belite color and size suggest a cement produced in the early part of the twentieth century. The lack of extreme variations in belite size and color would seem to preclude early American cements of the late nineteenth century. The lime is present as very fine residuals which in most cases have not carbonated. The fine size and texture of the residuals as well as the homogeneity of the composite hydroxide crystallites within the grains are consistent with dry lime hydrate available in the United States after about 1910. However, were the lime added as a putty, the vintage could possibly date as early as 1890 but likely not earlier. A best estimate of the mortar vintage would be between 1910 and 1930.

The aggregate is a fine to medium grained, well graded siliceous natural sand. Primary components include a variety of quartzofeldspathic materials. No marble chips are detected. The appearance of the sand is somewhat variegated due to the varied lithologic character. The sand is sharp with most grains subangular to subangular in shape.

A chemical analysis was performed on the provided mortar sample. Given normal assumptions of the original chemistry of the components, the cement to lime ratio is estimated to be 1 : 0.24 by volume. Compared to the modern day ASTM C270 specification for portland - lime mortars this would be categorized as a Type M mortar. However, it should be expected that the strength and elastic properties of early twentieth century cements were not the same as those of today. The hardened properties of the examined mortar may equate to a contemporary portland -lime mortar with a higher lime component. While the lime component may seem somewhat low by today's standards it is actually higher than that usually found in mortars of the early twentieth century. Early portland cement-based mortars were often mixed without any lime component at all or softened with about a tenth part lime by volume. The total binder to sand ratio by volume is estimated based on typical material densities and is calculated at 1 : 2.3 by volume. This is considered to be consistent with the sand distribution observed petrographically.

TESTWELL LABORATORIES, INC.

John J. Walsh
Senior Petrographer/ Geologist

Appendix I: Photographs and Photomicrographs

Microscopic examination is performed on an Olympus BX-51 polarized/reflected light microscope and a Bausch and Lomb Stereozoom 7 stereoscopic reflected light microscope. Both microscopes are fitted with an Olympus DP-11 digital camera. The overlays presented in the photomicrographs (e.g., text, scale bars, and arrows) are prepared as layers in Adobe Photoshop and converted to the jpeg format. Digital processing is limited to those functions normally performed during standard print photography processing. Photographs intended to be visually compared are taken under the same exposure conditions whenever possible.

The following abbreviations may be found in the figure captions and overlays and these are defined as follows:

cm	centimeters	PPL	Plane polarized light
mm	millimeters	XPL	Crossed polarized light
μm	microns (1 micron = 1/1000 millimeter)		
mil	1/1000 inch		

Microscopical images are often confusing and non-intuitive to those not accustomed to the techniques employed. The following is offered as a brief explanation of the various views encountered in order that the reader may gain a better appreciation of what is being described.

Reflected light images: These are simply magnified images of the surface as would be observed by the human eye. A variety of surface preparations may be employed including polished and fractured surfaces. The reader should note the included scale bars as minor deficiencies may seem much more significant when magnified.

Plane polarized light images (PPL): This imaging technique is most often employed in order to discern textural relationships and microstructure. To employ this technique, samples are milled (anywhere from 20 to 30 microns depending on the purpose) so as to allow light to be transmitted through the material. In many cases, TLI also employs a technique whereby the material is impregnated with a low viscosity, blue-dyed epoxy. Anything appearing blue therefore represents some type of void space (e.g.; air voids, capillary pores, open cracks, etc.) Hydrated cement paste typically appears a light shade of brown in this view (with a blue hue when impregnated with the epoxy). With some exceptions, most aggregate materials are very light colored if not altogether white. Some particles will appear to stand out in higher relief than others. This is a function of the refractive power of different materials with respect to the mounting epoxy.

Crossed polarized light images (XPL): This imaging technique is most often employed to distinguish components or highlight textural relationships between certain components not easily distinguished in plane polarized light. Using the same thin sections, this technique places the sample between two pieces of polarizing film in order to determine the crystal structure of the materials under consideration. Isotropic materials (e.g.; hydrated cement paste, pozzolans and other glasses, many oxides, etc.) will not transmit light under crossed polars and therefore appear black. Non-isotropic crystals (e.g.; residual cement, calcium hydroxide, calcium carbonate, and most aggregate minerals) will appear colored. The colors are a function of the thickness, crystal structure, and orientation of the mineral. Many minerals will exhibit a range of colors due to their orientation in the section. For example, quartz sand in the aggregate will appear black to white and every shade of gray in between. Color difference does not necessarily indicate a material difference. When no other prompt is given in the figure caption, the reader should appeal to general shapes and morphological characteristics when considering the components being illustrated.

Chemical treatments: Many chemical techniques (etches and stains typically) are used to isolate and enhance a variety of materials and structures. These techniques will often produce strongly colored images that distinguish components or chemical conditions.

Figure 1: Render sample as received by Testwell Laboratories for mortar analysis. The sample appears homogeneous throughout with no indication of multiple campaigns. The sample is coated with several layers of a light-colored paint.

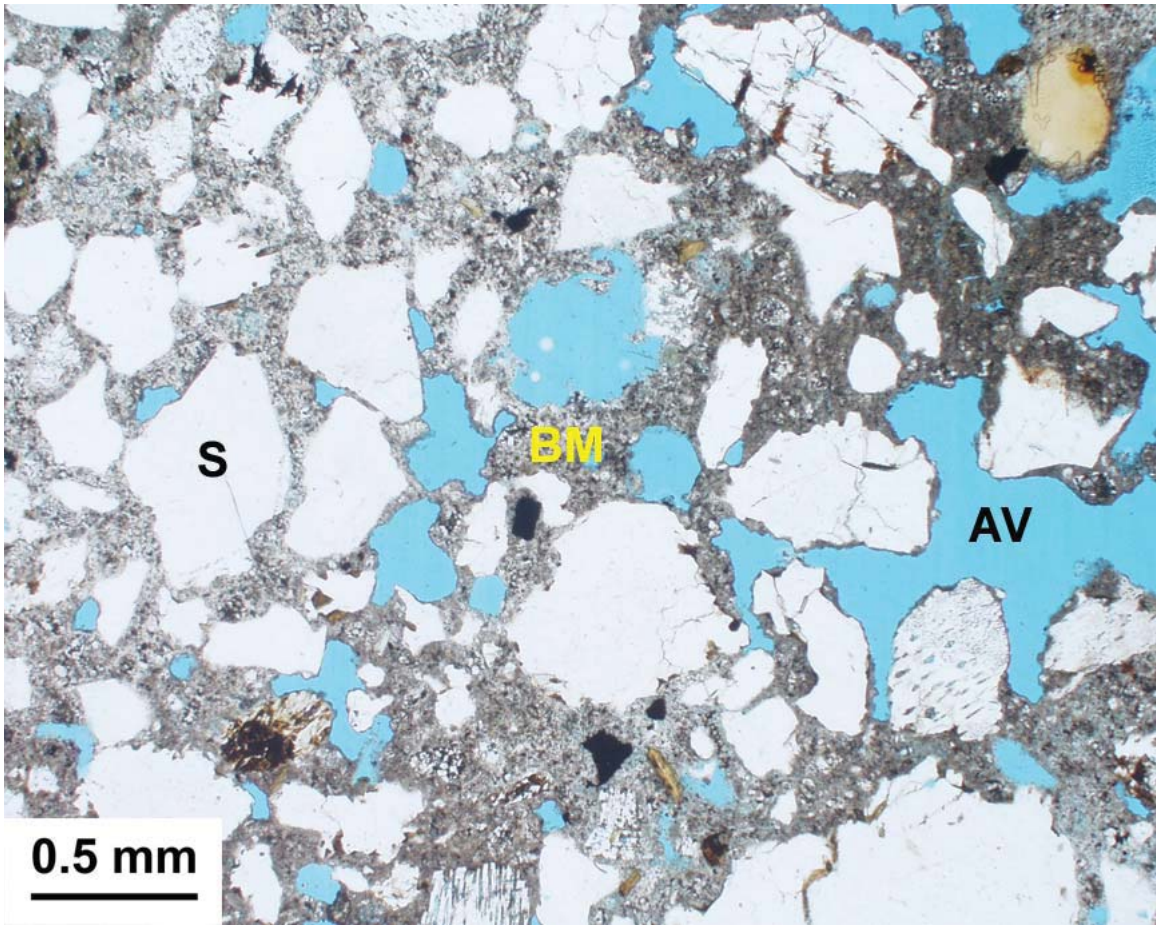


Figure 2: PPL photomicrograph illustrating the overall microstructure of the render sample. The binder matrix (BM) is a moderately dense and homogeneous cementitious matrix. Sand grains (S) are well coated with binder. Air-voids (AV) are found in moderate abundance and tend to be irregular in shape. No significant secondary deposits are observed in air-voids to suggest any significant service life distress.

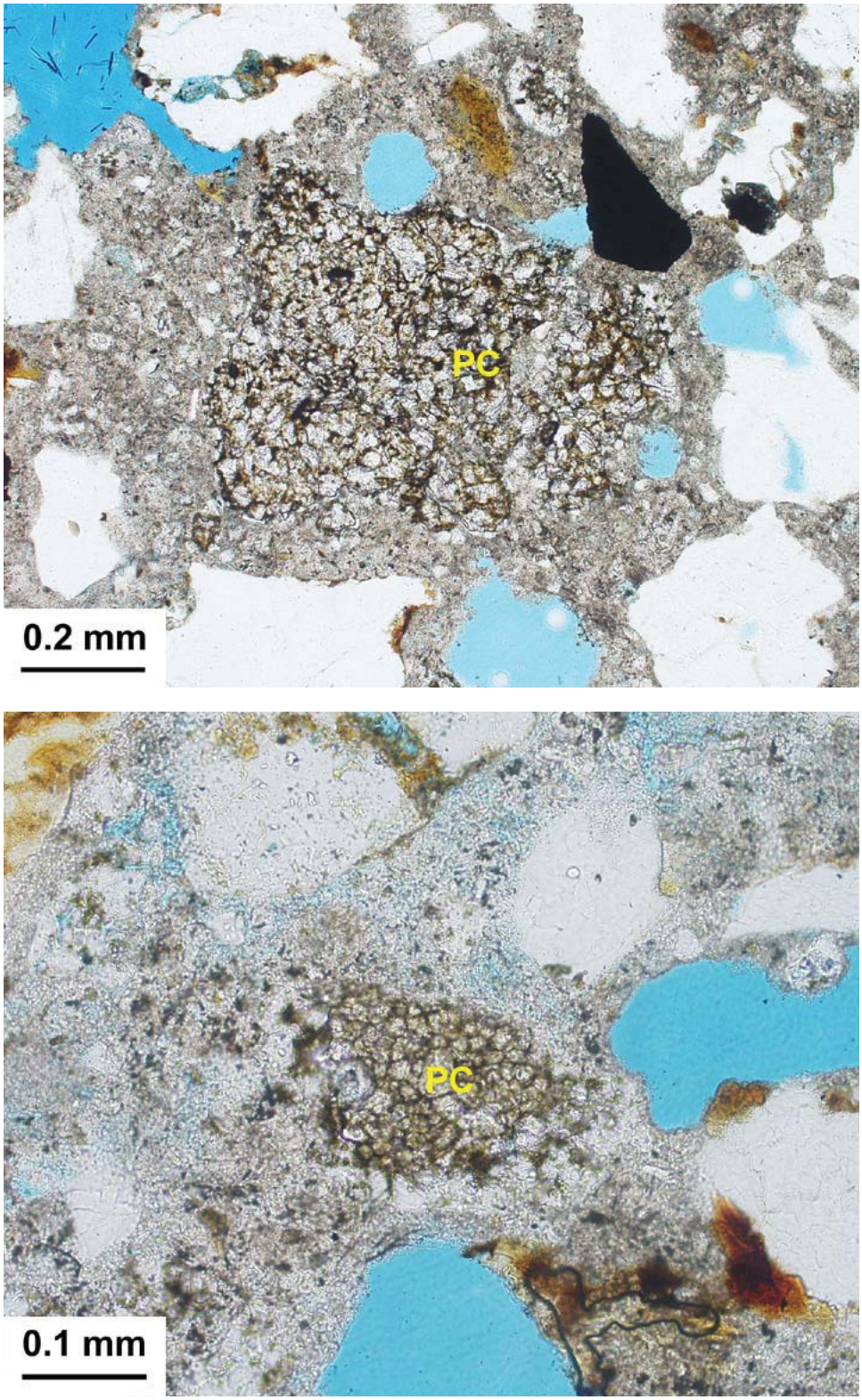


Figure 3: PPL Photomicrographs illustrating portland cement residuals (PC) in the mortar matrix. The top image illustrates a very large grain indicative of coarse cement grinds typical of the early twentieth century. The color of the individual belite crystals tends to be very light. The bottom image shows a belite agglomerate that is finer but exhibits amber belite colors. The variation of belite color is a function of variations in kiln conditions and this range is more typical of earlier cements.

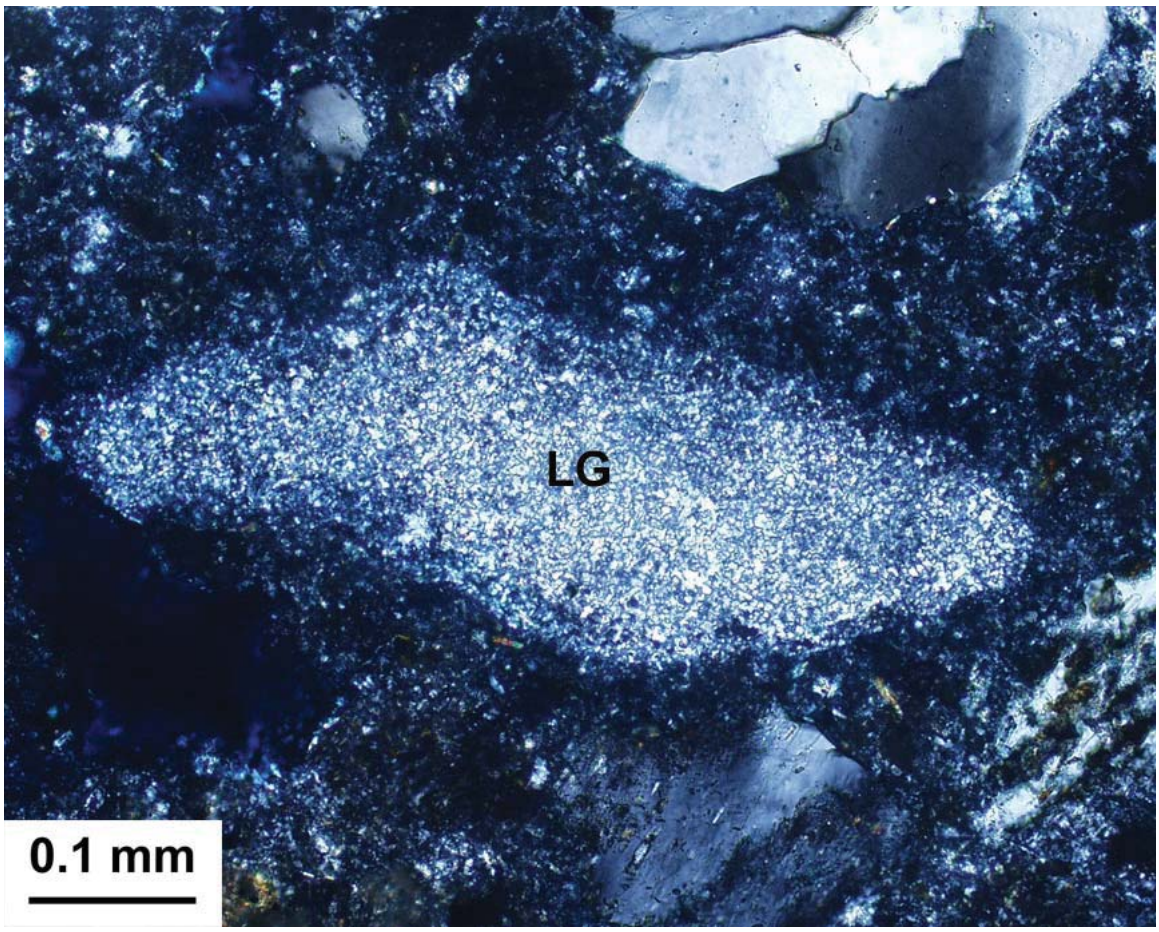


Figure 4: XPL photomicrograph illustrating a larger lime residual in the examined render. While the size is atypical of the much finer grains detected throughout, it better illustrates the internal texture of the lime. The black and white optical colors indicate the lime is not carbonated. The very fine crystallites of lime hydrate are typical of lime produced as a dry hydrate. If the lime was added as a dry hydrate, this would date the mortar after about 1910. If added as a putty, the vintage could be up to twenty earlier given the microtexture of the portland cement residuals.