

Base Court V Hampton Court Palace



**Historic Buildings Recording
and Investigation**



June 2015

Client: Historic Royal Palaces

Issue No: 1

OA Job No: 5698

NGR: TQ 15698 68483

Client Name: Historic Royal Palaces
Document Title: Base Court V, Hampton Court Palace
Document Type: Historic Buildings Recording and Investigation
Issue Number: 1
Grid Reference: TQ 15698 68483
OA Job Number: 5698
Site Code: HCP110
Invoice Code: HCP110BS
Prepared by: Deirdre Forde
Position: Historic Buildings Archaeologist
Checked by: Ben Ford
Position: Project Manager
Approved by: Julian Munby Signed.....
Position: Head of Buildings Department
Date: June 2015
Document File Location: \\Server21-db\buildings\Projects Ongoing\HCP Base Court Phase V\Report\Base Court V Report.odt
Illustrated by: Julia Collins

Disclaimer:

This document has been prepared for the titled project or named part thereof and should not be relied upon or used for any other project without an independent check being carried out as to its suitability and prior written authority of Oxford Archaeology being obtained. Oxford Archaeology accepts no responsibility or liability for the consequences of this document being used for a purpose other than the purposes for which it was commissioned. Any person/party using or relying on the document for such other purposes agrees, and will by such use or reliance be taken to confirm their agreement to indemnify Oxford Archaeology for all loss or damage resulting therefrom. Oxford Archaeology accepts no responsibility or liability for this document to any party other than the person/party by whom it was commissioned.

© Oxford Archaeology Ltd 2015

Oxford Archaeology

Janus House

Osney Mead

Oxford OX2 0ES

t: (0044) 01865 263800

e: oasouth@oxfordarch.co.uk

f: (0044) 01865 793496

w: www.thehumanjourney.net

Oxford Archaeology Limited is a Registered Charity No: 285627

Base Court V, Hampton Court Palace

Historic Buildings Recording and Investigation

Written by Deirdre Forde

Table of Contents

Summary.....	1
1 Introduction.....	3
1.1 Background.....	3
1.2 Aims and objectives.....	3
1.3 Methodology.....	3
1.4 The Brick Typology.....	3
1.5 OA Brick Keys.....	5
2 Historical background.....	6
2.1 The Area north of the Anne Boleyn Gatehouse.....	6
3 Description of Elevations.....	6
3.1 Introduction.....	6
3.2 Description.....	6
3.3 Discussion.....	13
4 Description of Roofs.....	14
4.1 Introduction and general description.....	14
4.2 The Main Roof (Figure 18 - 20).....	14
4.3 Flat Roof (Figure 21).....	15
4.4 Discussion.....	16
5 Summary of Dendrochronology by Dr D.W. Miles.....	17
5.1 The Main Roof.....	17
5.2 The Flat Roof.....	17
6 Additional Lithographies by Ruth Shaffrey.....	18
6.1 Introduction.....	18
6.2 The Buttery (Figure 23).....	18
6.3 East facing Elevation – Clock Court (Figure 24).....	18
6.4 Clock Court Parapet.....	19
6.5 Turret 12 (Figure 25).....	19
6.6 Discussion.....	19

7 Conclusion.....	19
Appendix A. Bibliography.....	21
Appendix B. Brick Typology Sizes.....	22
Appendix C. Schedule of Carpenter's Marks in the Base Court V Area.....	25
Appendix D. Dendrochronological Results for the Base Court V Conservation Area (Extracted from Hampton Court Palace Dendrochronology Summary) ByDr D.W. Miles....	26
Appendix E. Lithological Survey of the Base Court (East) and Clock Court (West) Elevations, Hampton Court Palace by R.W. Sanderson.....	34

List of Figures

- Fig. 1 Site location map
- Fig. 2 Plan of Hampton Court Palace showing area of conservation works
- Fig. 3 Plan of area of conservation works
- Fig. 4 Great Hall West facing elevation – Part 1
- Fig. 5 Great Hall West facing elevation – Part 2
- Fig. 6 West Facing Elevation of Base Court – Part 1
- Fig. 7 Buttery West Facing Elevation, Base Court – Part 2
- Fig. 8 Buttery Internal Parapet Elevations
- Fig. 9 West Facing Elevation of Base Court – Part 3
- Fig. 10 West Facing Elevation – Part 3, Parapet Internal Elevation
- Fig. 11 East Facing Elevation of Clock Court
- Fig. 12 East Facing Elevation of Clock Court, Parapet Internal Elevation
- Fig. 13 Turret 16 Elevations
- Fig. 14 Turret 12 Elevations – Part 1
- Fig. 15 Turret 12 Elevations – Part 2
- Fig. 16 Roof level and Turret 12 Return Elevations
- Fig. 17 Elevation T
- Fig. 18 Plan of the Main Roof
- Fig. 19 Section through the Main Roof showing north face of Truss 2
- Fig. 20 Section through the valley of the Main Roof, looking east
- Fig. 21 Plan of the Flat Roof
- Fig. 22 Detail of Truss 2 of the Flat Roof showing carpenter's marks
- Fig. 23 Lithographies of the Buttery
- Fig. 24 Lithographies of the East Facing Elevation of Clock Court
- Fig. 25 Lithographies of Turret 12

List of Plates

- Plate 1 Base Court area of conservation, looking north east
- Plate 2 West Facing Elevation of the Great Hall, looking east
- Plate 3 Detail of the West Facing Elevation of the Great Hall, looking north east
- Plate 4 Base Court – West Facing Elevation Part 1, looking north east
- Plate 5 West Facing Elevation of the Buttery, looking east
- Plate 6 View of parapet of the Buttery, looking east
- Plate 7 West facing Elevation Part 3, Base Court, looking east
- Plate 8 Detail of diaper work on West facing Elevation Part 3, Base Court

- Plate 9 Internal parapet and chimney stack of West facing Elevation Part 3, Base Court, looking south west
- Plate 10 East Facing Elevation of Clock Court
- Plate 11 Detail of brickwork on East Facing Elevation of Clock Court
- Plate 12 Parapet of Turret 16, looking north west
- Plate 13 Detail of Turret 12, looking north east
- Plate 14 Turret 12 (left) and the Buttery return wall (right), looking north
- Plate 15 Detail of Buttery Return Wall, looking south
- Plate 16 Detail of Buttery Return Wall, looking south
- Plate 17 Buttery Return Wall, looking north
- Plate 18 Buttery Return Wall, looking north west
- Plate 19 Buttery Return Wall showing plaster and impression of skirting on north face, looking south west
- Plate 20 Buttery Return Wall showing plaster and impression of skirting on north face, looking south east
- Plate 21 Detail of Elevation T
- Plate 22 The Main Roof, looking south east
- Plate 23 The exposed timbers of the Main Roof, looking south
- Plate 24 The south face of Truss 1 in the Main Roof, looking north east
- Plate 25 Common rafters of Bay 2 of the east side of the Main Roof, looking south
- Plate 26 Common rafters of Bay 2 of the west side of the Main Roof, looking north
- Plate 27 View from above of the Upper and Lower structures of the Flat Roof
- Plate 28 The Upper and Lower structures of the Flat Roof, looking south east
- Plate 29 Carpenter's marks on the south side of Tie Beam 3 and its joists, the Flat Roof, looking north
- Plate 30 Carpenter's marks on the south side of Tie Beam 3 and its joists, the Flat Roof, looking north
- Plate 31 Carpenter's marks on the south side of Tie Beam 3 and its joists, the Flat Roof, looking north
- Plate 32 The Upper and Lower structures of the Flat Roof, looking east
- Plate 33 The south end of the Flat Roof where it meets Turret 16, from above
- Plate 34 Baltic Marks on the east and under side of joist in Bay 2 of the Upper Structure of the Flat Roof
- Plate 35 Baltic Marks on the east and under side of joist in Bay 2 of the Upper Structure of the Flat Roof
- Plate 36 Doorway of Turret 12, viewed from the interior, looking east



Base Court V, Hampton Court Palace

Summary

Oxford Archaeology (OA) was commissioned by Historic Royal Palaces to carry out an archaeological investigation and buildings recording during conservation works around and within the east range of Base Court to the north of the Anne Boleyn Gatehouse. The main objective of this report was to enhance our understanding of this area of the palace through a thorough investigation of the elevations as well as their associated roof structures and the arrangements within the range. Investigation of the brickwork in the elevations has re-affirmed what was already believed about their sequence of construction and has enhanced as well as supported the brick typology survey created by Daphne Ford for English Heritage (Ford 1991).

The range immediately to the north of the Anne Boleyn Gatehouse was likely to have been built by Cardinal Wolsey and the exterior elevations up to second floor level have changed little. The roof structure dates to the 17th century alteration or heightening of the range from second floor level. However, evidence of blocked windows were detected on the Clock Court side of this range at second floor level meaning that there may have been accommodation here during Wolsey's tenure at the palace. This may have subsequently been altered to create more room and raise its status.

To the north of this range, the Great Hall, the Buttery and their associated turrets and small elevations all have primary brickwork of Brick Type C, meaning that they were built during Henry VIII's extensive building works. Through past investigation of the Great Hall and adjoining structures to the north (Oxford Archaeology 2012, 2012 & 2015), we have identified more than one phase of building during Henry VIII's tenure at the palace, as well as reuse and alteration of various parts of Wolsey era structures. Dendrochronology on the roof of the Buttery and on stair lintels in Turret 16, however, have revealed that they are the same phase of works as the Great Hall.

The investigation revealed some features of significance which shed light on a possible previous, more open arrangement of the range at roof level. The evidence of rebuilding in the return wall between the range to the immediate north of the Anne Boleyn Gatehouse and the roof of the Buttery, suggests a relationship between these two spaces that no longer exists. It may have been that there was access between these areas for maintenance purposes or for passage from the Buttery, through Turret 12, to the Main Roof space. The presence of a plastered wall and the skirting on the north face of the return wall would lead us to believe that at one point this was a covered area with enough space to provide access for people. All these features hint at a previously unknown purpose for this area that is now obscured by its alteration.





1 INTRODUCTION

1.1 Background

- 1.1.1 Oxford Archaeology (OA) has been commissioned by Historic Royal Palaces to carry out an archaeological investigation and recording during conservation works undertaken by Daedalus Conservation and Martin Ashley Architects in the area around and within the range between Base Court and Clock Court. The current project, Base Court V, is intended to increase our understanding of the evolution of the structures immediately to the north of the Anne Boleyn Gatehouse within their context primarily through the investigation of their exterior elevations and roof structures.
- 1.1.2 The methodology closely follows previous investigations undertaken by OA, including Phase I and II of the Great Hall Court works and the Buttery Stairs conservation project as well as the Anne Boleyn Gatehouse to the south of the range.

1.2 Aims and objectives

- 1.2.1 The main aim of the project was to take the opportunity afforded by the conservation works to interpret and record areas of the range and associated structures and elevations, which were either temporarily exposed or made temporarily accessible by the scaffolding. The recording also covers elevations on the west and south side of the Great Hall adjacent to the range as well as Turrets 12 and 16.
- 1.2.2 The main objective of the project is to add to our existing knowledge of the range between Base Court and Clock Court, which is informed by past investigations of the area around the Great Hall and will be further enhanced by future investigations of the range to the south of the Anne Boleyn Gatehouse.

1.3 Methodology

- 1.3.1 The site recording consists of three main elements: a drawn record, a descriptive, written record and a photographic record (detailed further below). Particular attention was paid to elements that had the potential to enhance our understanding of the construction history of the range and how it relates to the wider construction history of the buildings surrounding Base Court and Clock Court as well as the Great Hall. Any evidence relating to the primary or historic use was recorded and interpreted to inform the overall understanding of the site.
- 1.3.2 The photographic record is intended to act as a general record of the historic building. It includes both general photos (exterior and interior) of accessible areas as well as detail photos of items/features of archaeological significance.
- 1.3.3 The drawn record comprises annotated scaled drawings to explain, describe and interpret the building and archaeological features in terms of construction, development and phasing. They include plans and elevations.
- 1.3.4 The written record provides additional descriptive analysis of the building, in terms of its architecture, setting construction, development and use. It provides a detailed description of the range in terms of phasing, relationship with other parts of the complex, evolution, significance and construction.

1.4 The Brick Typology

- 1.4.1 A brick typology for Hampton Court was produced following extensive research by Daphne Ford for English Heritage (Ford 1991). After surveying, coupled with building works archive and excavation records research, each elevation of the palace was phased

and allocated a brick type (listed from A to W in chronological order). These were presented on a series of phased elevations numbered AS2/98 – AS2/124 and brick data type sheets setting out the description of each brick and the associated mortars. The Typology elevations AS2/120 and AS/ were used as a base for this report along with visual inspection during the course of the conservation works.

- 1.4.2 The recording of brickwork for this investigation involved the completion of OA brick data sheets. These ensured that all categories included within the typology were accounted for during investigations, and enabled easy cross referencing to the brick typology as well as other elements of the recording programme (photographic, drawn and written).
- 1.4.3 The following information was included in the sheets:
- Brick measurements- arris to arris, width and depth (in mm).
 - Brick type and date- according to the typology.
 - Description/ Features- description of brick colour, inclusions, diaperwork, etc.
 - Bond and pointing
 - Mortar
 - Further comments.
- 1.4.4 Previous research by OA on brickwork projects at Hampton Court has produced results generally comparable with the existing Typology, the only difference occasionally occurring within the measurements as the archaeological recording includes measuring brickwork after the raking out process. Areas of brick in the current study have been identified using the Typology coding, however bricks of the same type may make up different phases of construction in areas of the range. These are identified and explained within the written description.
- 1.4.5 The following is a short description of each brick type identified in the Great Hall Court as outlined in the Hampton Court Brick Typology by Daphne Forde. For the Brick Typology spreadsheet with dimensions, see Appendix B.
- 1.4.6 **Brick Type A** This is a pre-Wolsey and Wolsey stock brick which pre-dates 1528. The bond is English but adapts to diaper work if necessary. It is usually orange or brown in colour with a very uneven, friable surface with occasional pebble inclusions. Straw imprints and stock impression can occasionally be seen on the brick. The original mortar for this brick type is usually a fine textured, creamy sandy coloured lime mortar with frequent large lime granules. Occasionally the bed mortar is a rich-brown, very sandy mortar. The mortar, where well preserved, is double struck.
- 1.4.7 **Brick Type C** This is a Henrician stock brick and the most common brick type in the Great Hall Court. It dates from 1529 to 1566. The bond is English but adapts to form diaper work if necessary. The colour varies from brown orange to dark orange or dark rose (maroon) and it has a very uneven, friable surface with occasional pebble inclusions. It has no frog and the stock impression can be seen on the brick. Random vitrified bricks are included and degrees of vitrification varies. The original mortar varies from a sandy colour to grey/white and is fairly friable with lime granules. The mortar, where well preserved, is double struck.
- 1.4.8 **Brick Type E** This is a late 16th to early 17th century stock brick. They are dark orange brown to orange in colour with an uneven, slightly friable surface texture. They have no frog and diaper does not appear in the brickwork but occasionally, there will be some

random vitrified headers. The associated mortar is generally a pale grey and gritty in texture with occasional white lime inclusions and can be double struck. It is found around the east range of Base Court as well as the Apartment 39 area and the easternmost kitchen structure.

- 1.4.9 Brick Type I** These are bricks dating to the late 17th and early 18th century and were selected by Wren during his work at the palace for their rich, dark colour. They have hard uneven surface texture with a slight gold patina. They are coursed in both Flemish and English bonds, depending on location and pointed with a pale sandy lime mortar, gritty in texture, with occasional lime granules. They can mainly be found in the King's Stairs in Fountain Court, The Round Kitchen in Kitchen Court, Tennis Court Lane, the Barrack Block and some refacing in the Great Kitchen.
- 1.4.10 Brick Type Q** This is known as a "washed stock" or "grey stock" brick and dates from the late 18th to the 19th centuries. The bond can be English or Flemish, depending on which is necessary to bond it to earlier brickwork. It can be pale yellow to ochre or pale rose to wine in colour and has a very hard, smooth surface with a sharp arris. Bricks feature a rudimentary frog of uneven shape particles of cinders. They are never vitrified and the brick features striations left by the strike. The original mortar is a white/ grey cementitious mortar with flat, occasionally penny rolled or scored, mortar.
- 1.4.11 Brick Type S** This is a rough stock brick dating to the 19th century. It is orange to light brown in colour with a rough surface texture. It features no frog and no vitrification. It can be seen mainly in workman's cottages dating to the 19th century.
- 1.4.12 Brick Type T** This is a red face brick dating from the 19th century. The bond can be English or Flemish. It is a rich orange/ brown and the surface is hard and uneven (unless rubbed) with a sharp arris. The frog is unknown and there is no vitrification. Original mortar is a gritty, hard grey/ white lime mortar and is penny pointed.
- 1.4.13 Brick Type V** This is a late 19th century to early 20th century stock brick. It varies from orange and pale rose to light brown in colour and has a rough friable surface texture with particles of dark orange and pale orange clay. It is generally coursed in an English bond and features a grey, gritty lime bedding mortar and a grey, gritty cementitious surface mortar. It can mainly be found in the Anne Boleyn Gatehouse, the Buttery and parts of Tennis Court Lane and the Great Kitchen.

*Please see **Appendix B** for full Schedule of brick dates and sizes*

1.5 OA Brick Keys

- 1.5.1** OA keys include both phases and brick types. Areas of brickwork where historic brick types have been extensively reused, or areas where one brick type has been heavily repaired with another type have been given their own key in an attempt to identify significant phases of work. Various bricks that have been studied and recorded during OA's investigation of the elevations surrounding and associated with the Great Hall are modern, dating to the mid to late 20th century, and therefore are not identified by the Brick Typology. An attempt has been made to phase some of the more prominent types to known phases of work in the 1950s and the 1980s and have been recorded in accordance with the conventions of the Brick Typology.



2 HISTORICAL BACKGROUND

2.1 The Area north of the Anne Boleyn Gatehouse

- 2.1.1 The area to the north of the Anne Boleyn Gatehouse is part of a wider complex of buildings which form the Base Court, Clock Court and the Great Hall area. In a relatively condensed area of the palace, structures built for service stand side by side with high status hospitality buildings such as the Great Hall. Cardinal Wolsey is accredited with the plan of much of what we see today in the early 16th century, although much of his work is thought to be replaced by Henry VIII's subsequent redesigning of the palace just a few years later. Henry VIII began an extensive programme of rebuilding when his tenure began, and the years that followed saw him re-shape the area around the Great Hall to meet his needs.
- 2.1.2 The main subjects of the current investigation is the Buttery to the immediate west of the Great Hall and the range that houses the south staircase into the Great Hall, accessed from the Anne Boleyn Gatehouse. The range that houses the south staircase into the Great Hall is likely to have also functioned as a stores space underneath the staircase, and may have had an apartment above. It was built by Wolsey sometime between 1514 and 1529 and was likely to have provided access the his Great Hall.
- 2.1.3 The Buttery was a service room where 'butts', or barrels and bottles of beer were stored before being served in the Great Hall. The Buttery was generally found to one side of the screens passage of a Great Hall and this is where Henry built his between 1529 and 1533, with access to the north service door at the top of the Buttery Stairs. This area was a hive of activity with the Buttery Stairs providing access to the Great hall from the Great Kitchen, the Scullery and the Undercroft amongst other services.

3 DESCRIPTION OF ELEVATIONS

3.1 Introduction

- 3.1.1 As a part of the archaeological investigation and recording of the area, the elevations undergoing conservation work were examined before and after raking out. Historic brickwork was recorded and mortar samples were taken from areas of significance. The area of investigation included the following elevations:
- The west gable of the Great Hall (3.2.1)
 - The west facing elevations of Base Court, to the north of the Ann Boleyn Gatehouse, including their parapets (3.2.5, 3.2.6 & 3.2.11)
 - The east facing elevation of Clock Court, to the north of the Ann Boleyn Gatehouse, including its parapet (3.2.16)
 - The elevations of the surrounding turrets. Turret 12, Turret 16, including their parapets (3.2.20 & 3.2.22)
 - Adjacent small elevations within and relevant to the area of investigation (3.2.23 & 3.2.25)

3.2 Description

- 3.2.1 **Great Hall – West facing Elevation** (Figures 4 & 5)
- 3.2.2 *Location:* The west face of the Great Hall starts at 3rd floor level over the roof of the Buttery and faces west onto Base Court.



- 3.2.3 *Description:* It is a flat broken pitched gable end, dominated by a large four pointed Tudor gothic window with cusped arch tracery. Above this are two small four pointed arch windows (Plates 1 & 2).
- 3.2.4 *Phasing:* The existing Great Hall was built by Henry VIII, on the footprint of Cardinal Wolsey's Great Hall. Large areas of its facing and some of its ornament date to the 19th and 20th centuries.
- 3.2.5 *Architectural description:* The west gable of the Great Hall is one of the most striking features of Base Court. The tracery of the large west window is finely moulded with a naturalistic style characteristic of the period of Henry VIII's tenure at the palace. The upper windows have twin gothic arched lights. A parapet with a central pinnacle sits on the upper pitch of the gable and four stone griffins sit on each side of the lower pitch. The elevation is flanked by Turret 11 on the north side and Turret 16 on the south side. Unlike Elevation K, the previously recorded east facing gable of the Great Hall, where the one flanking turret (Oxford Archaeology, 2012), Turret 21, is flush with the face of the gable, the turrets on the west side stand proud from the gable.
- 3.2.6 *Brickwork:* Like Elevation K, its primary phase is Brick Type C, the Tudor stock brick. However, here only small irregular patches remain within substantial refacing with a modern brick at either side and under the sill of the large west window. This modern brick varies from bright orange to deep purple in colour and is smooth and squared. It is coursed in an English bond and pointed with a yellowy cream cementitious mortar with large inclusions.
- 3.2.7 Just above the springing of the arch of the large west window, the brickwork changes (Plate 3). Almost the entire upper level of the elevation is faced with Brick Type T, a 19th century red facing brick. It has a consistent rich dark orange colour and is coursed in a Flemish bond. The cementitious mortar is pale and course with pebble inclusions and where it meets the mortar of the modern brick below, it is behind it.
- 3.2.8 Above the hood mould of the large west window and below the sills of the two smaller windows is an area of refacing with a modern brick that dates to the 1950s or 1960s. This is a dark brown, rose and vitrified brick, uniform in shape and texture and coursed in an English bond. The mortar is a smooth yellowish lime mortar with small dark pebble inclusions. This brick type has been recorded on Elevation K, where it faces the entire upper elevation, on the crenellations of Elevation A, the north elevation of the Great Hall and Elevation G, the south facing elevation of the Great Watching Chamber (Oxford Archaeology, 2012). It also appears in various places as patching and repair on the Great Hall and surrounding elevations, and represents a phase of maintenance works in the mid 20th century.
- 3.2.9 **Base Court – West Facing Elevation Part 1** (Figure 6)
- 3.2.10 *Location:* The northern most of successive west facing elevations of the east range, running north to south, is a small triangular shaped elevation at second floor level behind the parapet of the north range.
- 3.2.11 *Phasing:* It is contemporary with the rest of the Buttery building, which was built in the 16th century by Henry VIII.
- 3.2.12 *Architectural description:* It is a part of the second floor of the Buttery and the pitched roof of the north range abuts it. Squeezed between the parapet and the pitch of the roof is a small two light Tudor casement and above this is flat stone coping.
- 3.2.13 *Brickwork:* This elevation is faced with Brick Type C, the Henrician stock brick (Plate 4). Above this, and underneath the coping stones of the elevation, is nine courses of

Brick Type T, the Victorian refacing brick, laid in a stretcher bond. Within Type C brickwork, is an occasional V Type brick, a 19th - 20th century repair brick.

3.2.14 **The Buttery – West facing Elevation Part 2** (Figures 7)

3.2.15 *Location:* Location The west face of the Buttery is the northern most elevation of the east range of Base Court and is located under the west elevation of the Great Hall.

3.2.16 *Description:* It is a three storey elevation with a crenellated parapet and the main entrance to the undercroft from Base Court is in the ground floor (Plates 1 & 5).

3.2.17 *Phasing:* The Buttery was built by Henry VIII in the 16th century and is likely to be a part of the same phase of works as the Great Hall.

3.2.18 *Architectural description:* The ground floor features a central four centred arch doorway. To the right of this is another four centred arch but this is blocked with Wren era stock bricks and a pointed casement window. At the left hand side of the ground floor is a small two light Tudor casement window. There are two three light Tudor casement windows in the first floor and above in the second floor, there are two smaller two light Tudor casement windows. A large central chimney breast stands proud from the elevations at second floor level underneath the cornice of the parapet. A column of Brick Type C, to the right of the chimney breast and reaching from the string course of the parapet to the level of the arched doorways on the ground floor, appears to have been removed and replaced with cementitious mortar for the insertion of a flue.

3.2.19 *Brickwork:* The primary phase of brickwork on this elevation is the Tudor Brick Type C, coursed in English bond, and the doors and fenestration are characteristic of this period. It has however been subject to a lot of brick repair and replacement. The blocking in the doorway on the ground floor appears to date to the late 17th and early 18th century. It is blocked with a Wren stock brick, Brick Type I, coursed in English bond, and these can be seen in panels of refacing at either side of the central doorway also. The bond changes from Flemish in the blocking to English outside, suggesting that they may not be contemporary works. The small iron framed, multi light casement window within the blocking is probably contemporary with it.

3.2.20 The 19th century stock brick, Brick Type T, has been used extensively for repair on this elevation. Two panels of Brick Type T can be seen above and below the left ground floor window, coursed in English bond, and used for a moulded brick corbel under the second floor chimney breast. Although this brick is generally used for refacing, here, unusually, it has been used more for extensive replacement of Type C bricks. As a result, a large area of the elevation between the ground and second storeys, towards the south side, is a mixture of both brick types.

3.2.21 The crenellated parapet above the cornice is entirely faced with Brick Type V, a late 19th and early 20th century stock brick. It varies from orange and pale rose to light brown in colour and has a rough friable surface texture with particles of dark orange and pale orange clay. It is irregularly coursed in an English bond and features a grey, gritty cementitious mortar.

3.2.22 The internal parapet of the Buttery, like its exterior, is faced entirely with Brick Type V, with the exception of that over the West facing Elevation Part 1, which is faced with Brick Type T (Figure 8). The mortar is a grey gritty cementitious mortar.

3.2.23 **Base Court – West facing Elevation Part 3** (Figure 9)

3.2.24 *Location:* This west facing elevation in Base Court is situated between the west facing elevation of the Buttery and the Anne Boleyn Gatehouse (Plates 1 & 7).

Description: It is a three storey elevation that stands to a greater height than the west elevation of the Buttery as it houses the Great Staircase and an apartment above. This elevation is set back from the elevation of the Buttery and Turret 12.

Phasing: Two-storey Wolsey Chamber raised to three storeys in 17th century, with 17th / 18th-century roof and 19th-century restoration of chimneys

- 3.2.25 *Architectural description:* This is a three storey elevation with floors divided by two string courses and featuring brick crenellations with stone coping. In the ground floor is a small two light Tudor casement window on the left hand side and above this, towards the right hand side of the first floor, are two large four light Tudor windows which illuminate the Great Staircase. In the second floor, there are two small casement windows with leaded glass, which are later in style and are characteristic of 17th century changes at the palace. A chimney breast protrudes from the elevation at second floor level and extends to just above the level of the crenellations with two large, ornate Victorian chimney pots.
- 3.2.26 *Brickwork:* The ground and second floor levels are dominated by a Wolsey or pre-Wolsey stock brick, Brick Type A, notable for its almost unbroken diaper work (Plates 7 & 8). This has been heavily repaired with what appears to be a 19th century stock brick, within and around the diaper work, which appears to be original. The underlying mortars are of two types, a primary creamy coloured lime mortar with large lime inclusions and a hard black ash mortar over. The brickwork on the plinth is later Wren refacing, Brick Type I, with some patching of 19th century and 20th century bricks. Here was a primary beige lime mortar with pebble inclusions with a hard black ash mortar applied thickly over it.
- 3.2.27 The second floor, which was lifted in the 17th century, is almost entirely faced with Brick Type E, a late 16th early 17th century stock brick. This features a pale lime mortar with pebble inclusions and a thick black ash mortar over it. The crenellations on the right hand side of the chimney breast, like the ground and first floors, have been heavily repaired with a 19th century stock brick. The upper right hand corner of the elevation, where it meets the north west turret of the Anne Boleyn Gatehouse, has been subject to much repair and patching. Here we see a large patch of modern brick refacing underneath an area of miscellaneous reused bricks with a hard beige mortar with pebble inclusions. The chimney breast is faced entirely with Brick Type T, the Victorian refacing brick and black ash mortar.
- 3.2.28 The internal parapet of the West Facing Elevation Part 3, like its exterior is faced almost entirely with Brick Type E (Figure 10). The exceptions to this are the first four courses of brick under the chimney pots and a patch of brick on the crenellation to the immediate south, which are Brick Type T (Plate 9). The fact that the structure of the chimney on this side is faced with Brick Type E means that it is likely to date to the early 17th century. The mortar is a hard beige lime mortar with pebble inclusions.
- 3.2.29 **East Facing Elevation of Clock Court** (Figure 11)
- Location:* This east facing elevation is located in Clock Court immediately to the north of the Anne Boleyn Gatehouse and to the south of the Great Hall.
- 3.2.30 *Description:* It houses the Great Staircase leading to the south main entrance of the Great Hall, as well as the apartment above, and makes up the east face of the range with the corresponding West Facing Elevation Part 3 in Base Court (Plate 10).
- 3.2.31 *Phasing:* A two-storey Wolsey Chamber raised to three storeys in 17th century, with 17th / 18th-century roof.

- 3.2.32 *Architectural description:* A three storey elevation with floors divided by two string courses and featuring brick crenellations with stone coping. On the ground floor is a doorway towards the right hand side which has been converted from a window, probably dating to the Tudor period. Underneath what would have been sill level, the stones are later and the door lacks the four centre arch of Tudor doorways, having a square lintel instead. The conversion of the window into a doorway may date to the 17th century lifting of the range to accommodate the apartment on the second floor. On the extreme left is a four centre arched Tudor doorway that makes up a little porch leading into the north east Turret of the Anne Boleyn Gatehouse. In the first floor of the elevation, illuminating the Great Staircase, are two large four light Tudor windows. Like the second floor of the West Facing Elevation Part 3 in Base Court, this elevation features two small casement windows with leaded glass, which are later in style than those below and are characteristic of 17th century changes at the palace. The crenellations on this side of the range differ to those on the west facing Base Court side in that on their sides, they have vertical coping, or quoining. The range to the south of the Anne Boleyn Gatehouse features this inconsistency also.
- 3.2.33 *Brickwork:* This elevation is dominated by a Wolsey or pre-Wolsey stock brick that appears to be Brick Type A, with a primary creamy lime mortar with large lime inclusions. This was heavily repointed with a Victorian black ash mortar. The brick plinth has largely been refaced with the Victorian Brick Type T. Although the brickwork has diaper work over a larger area, it is not as consistent as that on the Base Court side (Plate 11). The parapet above the level of the second floor window lintels is faced with Brick Type E, a late 16th early 17th century stock brick, that corresponds with the facing on the crenellations on the west facing Base Court elevation. As the Brick Type A extends to a greater height on this side of the range, it may indicate how high the primary build was before the apartment was built. The 17th century windows are inserted into the earlier A type brickwork but immediately to the right of both windows are areas of possible blocking. The bricks are the same but the bonding is less regular and there are some closers present. Furthermore, the mortar is slightly different with the presence of more dark inclusions. It is worth noting that although the mortar of the A type bricks extends to the level of the window lintels, the diaper work stops at the sill level even outside the possible blockings.
- 3.2.34 The internal parapet of the east facing elevation of Clock Court is faced with Brick Type E and the hard beige mortar is consistent on this side (Figure 12).
- 3.2.35 **Turret 16** (Figures 13)
- 3.2.36 *Location:* Turret 16 is located on the south west corner of the Great Hall (Plate 1, centre background).
- 3.2.37 *Description:* It is a hexagonal corner turret entered from the south staircase of the Great Hall to the left of the main doorway, providing access to the Minstrel's Gallery and the roof of the Great Hall.
- 3.2.38 *Phasing:* Turret 16 is 16th century build, contemporary with the Great Hall.
- 3.2.39 *Architectural description:* The turret is featureless except for a small blocked Tudor window in the south west elevation and a doorway in the east elevation providing access to the roof of the Great Hall behind the parapet of the south elevation. The window is situated under the roof level and within the attic space of the Main Roof, that over the range immediately to the north of the Anne Boleyn Gatehouse. This suggests that the roof that the current structure replaces was not built to this level and that the lower part of the turret was previously exterior.

- 3.2.40 *Brickwork:* The turret has a primary phase of C type brickwork and is contemporary with the structure of the Great Hall. The mortar is the characteristic creamy brown lime mortar with lime and small coloured inclusions. Brick Type V is present but unlike the extensive refacing of Turret 12, it exists only in patches and replacements on the corners of the elevations. The parapet of this turret, like Turrets 11 and 21, the north west and north east turrets of the Great Hall, is faced entirely with modern brick (Plate 12). Unlike other turrets, Turret 16 retains its C type brick on the interior of its parapet.
- 3.2.41 **Turret 12** (Figures 14 & 15)
- 3.2.42 *Location:* Turret 12 is situated in Base Court, forming the south west corner of the Buttery (Plate 1, centre foreground).
- 3.2.43 *Description:* It is a hexagonal corner turret entered from first floor of the Buttery and provides access to the second floor. A chamber with a doorway in the east elevation above roof level suggests that it also once provided access to the roof or a structure once existed at this level.
- 3.2.44 *Phasing:* The turret is contemporary with the 16th century Buttery with areas of refacing dating to the 17th, 19th and 20th centuries.
- 3.2.45 *Architectural description:* It is crenellated and has small Tudor windows in the north west, south west and south elevations as well as the stone Tudor doorway in the east elevation over the roof of the Buttery.
- 3.2.46 *Brickwork:* It features Brick Type C as its primary phase of brickwork and is contemporary with the Buttery as well as perhaps being part of the same phase of works as the Great Hall. There are some areas of modern brick patching on its south west side (Plate 13) and its brick plinth is refaced with the Wren stock brick, Brick Type I. Above the string course, and below the parapet, the turret is almost entirely faced with Brick Type V, a late 19th, early 20th century refacing brick. C type bricks remain scattered on the east and north east elevations over the flat roof of the Buttery and around the doorway into the turret. Here we see evidence that the turret is sewn into the returning wall between the west face of the Buttery and the West Facing Elevation Part 3. The V type bricks of the turret, abut the C type brickwork of the returning wall on the south side but effort has been made to sew them in. The crenellations above the string course of the parapet are entirely faced with 20th century bricks, both externally and internally.
- 3.2.47 **The Buttery Return Wall elevations** (Figure 16)
- 3.2.48 *Location:* These elevations are the north and south faces of the return wall behind Turret 12 where the Buttery stands proud from the west facing range.
- 3.2.49 *Description:* The south elevation reaches from crenellation level of the West Facing Elevation Part 3 to the ground and the north elevation is, that which overlooks the roof of the Buttery
- 3.2.50 *Phasing:* This wall is contemporary with the 16th century Buttery and Turret 12.
- 3.2.51 *Architectural description:* The south face of the wall has a plinth with stone coping and a string course as well as one merlon on its parapet. The north elevation of this return forms the south wall overlooking the flat roof of the buttery between Turret 12 on the west side and Turret 16 on the east side. It is crenellated over the return but extends for approximately a metre eastwards creating a small dividing wall between the Main Roof area to the north of the Anne Boleyn Gatehouse and the Flat Roof over the Buttery. On the west side is a small recess with a shallow segmental arch accommodating the east

facing doorway of Turret 12, which may have once provided access from the Buttery to the roof space (See Section 4.3.7).

- 3.2.52 *Brickwork:* The primary phase of brickwork here is Brick Type C and is built with a creamy brown lime mortar with lime inclusions. The coursing matches the coursing of Turret 12 where C type bricks are present but there is evidence of historic repair where the turret has moved away from the return wall (Plate 14). This is consistent from the plinth up to to eight courses of brickwork below the crenellations, where the facing changes to a modern brick and a cementitious mortar. Above the coping of the plinth is a straight joint in the brick which carries up through eleven courses and features a change in coursing from one side to another and six closers, possibly representing an old repair or even the closing of an opening. The brickwork of the plinth is the Wren stock brick, I. The later brickwork of Turret 12, brick Type V, is not sewn into the Henrician brickwork and the modern crenellations abut the turret. Where it meets the West Facing Elevation Part 3, it abuts it.
- 3.2.53 Although Brick Type C does not remain on the east side of Turret 12 and the V type brick is not sewn into it, the primary Henrician turret is probably contemporary with this wall, at least at this end. Although the north face is a relatively small elevation, it seems to have been subject to some change and repair, particularly on the east side, and may provide us with some evidence as to the previous arrangement between these two roof spaces. For the most part, the brickwork is Brick Type C with the exception of the crenellations, which are modern and abut Turret 12. However, the Henrician brickwork has been heavily disturbed and appears to have been roughly rebuilt or contain reused C type bricks. The coursing is almost a regular English bond until it reaches the east side where the elevation forms the dividing wall. At this point it is largely made up of headers (Plate 15). The mortar is the characteristic Henrician creamy brown lime mortar with lime inclusions but changes to a pale grey lime mortar around the headers (Plate 16). The reverse of this wall, overlooking the Main Roof, shows a clearer change in the brickwork. On the west side is a regular English bond that changes to roughly laid headers in the eastern section (Plates 17 & 18). Furthermore, the footing of the wall on the north side, below the level of the current leaded flat roof, is plastered and features the impression of simple black skirting (Plate 19 & 20). This would lead us to believe that at one point this was a covered area with enough space to provide access for people. It would appear that this wall has been roughly altered to create the dividing wall and may have at one time provided passage between the roof spaces, with the lower timber structure of the Flat Roof previously functioning as a floor (See Section 4.3). Alternatively, the presence of the plaster and the skirting may indicate that there was previously a room in this area and that the current level of the roof has been greatly altered.
- 3.2.54 **Elevation T** (Figure 17)
- 3.2.55 *Location:* Elevation T is the western most bay on the south elevation of the Great Hall. It overlooks the east side of the Main Roof, which is hipped in order not to abut it (See Section 4.2).
- 3.2.56 *Description:* The south elevation of one of seven bays making up the length of, and illuminating the Great Hall. The western most bay illuminates the Minstrel's Gallery from the sides.
- 3.2.57 *Phasing:* Elevation T was built in the 16th century as a part of the Great Hall.
- 3.2.58 *Architectural description:* It is flanked by Turret 16 on its west side and a large buttress on its east side, separating it from the next bay. It features a large four centred arch

Tudor window with stone tracery forming eight lights. Above this is a string course and a crenellated parapet. The crenellations of the parapet have, like those on the east facing Clock Court elevation, vertical coping or quoining.

- 3.2.59 *Brickwork:* The primary phase of brickwork is Brick Type C, the Henrician stock brick, but only a scattering remain. The elevation has been heavily refaced with the Victorian Brick Type T and the mortar is a hard pale grey speckled lime mortar. There is evidence that there was an attempt to paint diaper work onto the T type bricks, including some halves of stretchers (Plate 21). The crenellations have been refaced with a modern brick of undetermined date and feature a cementitious lime mortar.

3.3 Discussion

- 3.3.1 The brickwork of all the main elevations under investigation has been subject to maintenance and repair over a number of centuries resulting in the presence of a variety of bricks, both identifiable to the Brick Typology and unidentifiable. The sequence of repair and maintenance on the Buttery elevation suggests that it was more often subject to irregular brick replacement and isolated repair rather than the more consistent refacing seen on the other elevations.
- 3.3.2 The brickwork of the West Facing Elevation Part 3 and its corresponding East Facing Elevation in Clock Court show that this range was subject to structural alteration as well as refacing. The parapets and the crenellations of these elevations seem to be 17th century builds and could be the evidence of a heightening of the range. No brickwork earlier than Brick Type E, the late 16th, early 17th century stock brick was detected on the inner parapets of the elevations. Currently the roof of the range between the Anne Boleyn Gatehouse and the Great Hall runs north to south but this may replace a similar roof that ran east to west, with gables facing onto Base Court and Clock Court. The two possible blockings in the second floor of the east facing Clock Court elevation may indicate where windows were set into these gables. The presence of a small blocked window under the gable in Turret 16 and the notable hip of the east side of the roof under the window of Elevation T further supports the idea that a roof line, the end of a south to north descending pitch for example, would have existed below the current level.
- 3.3.3 The primary brickwork of the elevations under investigation would suggest that the west gable of the Great Hall, the Buttery, and their associated turrets and adjacent elevations, are later than the range to the immediate north of the Anne Boleyn Gatehouse. This range mainly features Brick Type A, a pre-Wolsey or Wolsey stock brick while those north of it are built with a primary phase of Brick Type C, the later Henrician brick. We know that the main body of the Great Hall was built by Henry VIII. Through past investigation of the Great Hall and adjoining structures to the north (Oxford Archaeology 2011, 2012 & 2014), we have identified more than one phase of building during Henry VIII's tenure at the palace, as well as reuse and alteration of various parts of Wolsey era structures. Therefore, although it is highly likely that the Buttery is contemporary with the Great Hall, it cannot be ruled out that the current arrangement was not all part of one phase of works.
- 3.3.4 The evidence of rebuilding in the return wall between the range to the immediate north of the Anne Boleyn Gatehouse and the roof of the Buttery suggests a previously relationship between these two spaces that no longer exists. It may have been that there was access between these areas for maintenance purposes or for passage from the Buttery to the Anne Boleyn Gatehouse. The presence of the plastered wall and the skirting hints at a purpose for this area that is now lost.

4 DESCRIPTION OF ROOFS

4.1 Introduction and general description

4.1.1 The area of investigation is made up of two roof structures, described here for the purposes of the survey as the Main Roof and the Flat Roof. The Main Roof is situated between the Anne Boleyn Gatehouse and the south side of the Great Hall. It almost certainly replaces an earlier structure, either at the time of the 17th century alteration of this range between Clock Court and Base Court or at a later date. The Flat Roof is situated directly in front of the west gable of the Great Hall at a slightly lower level to the Main Roof. It is the roof over what is believed to have been Henry VIII's Buttery. There is evidence that both roof levels changed at some point in their history but not necessarily at the same time. This is discussed further below in Section 4.4.

4.2 The Main Roof (Figure 18 - 20)

4.2.1 The Main Roof is situated over the range immediately north of the Ann Boleyn Gatehouse, between Base Court and Clock Court and sits over Apartment 30A. It has a pine double pitched roof, M-shaped in section, orientated north to south with three bays and is, for the most part, gabled (Plate 22). The northern end of the east half is hipped to sit under and accommodate the window in Elevation T, the western most bay of the south elevation of the Great Hall.

4.2.2 This roof is more modern than other surveyed roofs in the area of the Great Hall and the Buttery, most notably, the flat roof adjacent to it (See 4.3). The existing structure features M-shaped trusses with a valley ridge beam running the full length of the roof north to south under the downward point in the centre (Plate 23). This sits on east west running horizontal beams, or collars, of the trusses, which are tenoned into the outer principal rafters. It is further supported with braced king posts between the collars and tie beams (Plate 24). There are four large pegs where the braces are tenoned into mortices in the king posts. In between the trusses are large braces, which are tenoned into mortices in the tie beams at the bottom and meet at the ridge beams at the top. The southern most bay is larger than the central and northern bay, therefore here, there is a gap between the braces.

4.2.3 Common rafters sit on the ridge beam in the centre with birds mouth openings and are nailed onto fixed wall plates inside the parapets of the Clock Court and Base Court elevations to the east and west. Purlins are half lapped and nailed to the inner sides of the common rafters on the outer sides of the roof. The purlin is lower in the central and north bay of the west side of the roof where it is built around the chimney stack.

4.2.4 Some structural elements within the roof add further to the framework of the structure. Partitions in the south bay separate a landing area that acts as an entrance to the attic space of the roof are made up of vertical studs cutting off the area in the south bay. This may be a later addition to the roof at the time of the refurbishing of Apartment 30A. Archived survey drawings for proposed work to the apartment dating to the 1930s and the 1950s may suggest that some of the later elements in the roof structure date to the 20th century. A framework for the support of a large water tank towards the south end of the east side of the roof is likely to be later than the current structure and date to the upgrading of the accommodation below.

4.2.5 Original carpenter's marks are represented on the common rafters of the roof as simple Roman numerals inscribed with a race knife and newer marks, presumably from a later reassembly of the structure, are roughly cut with a saw (Plate 25, older mark on left). The marks are cut into the north face of the rafters on the east side of the roof and the south face on the west side of the roof. Although the later marks on pairs of rafters are

consistently matching, they are not always in sequence. The roof contains later timbers, which probably date to its reassembly. Pairs of original rafters seemingly retain their match but not their sequence within the roof and modern timbers are sometimes paired with original timbers by using the same carpenter's mark (Plate 26). The reassembly or repair of the roof may have been a part of 20th century works.

Please see Appendix C for Schedule of Carpenter's Marks

4.3 Flat Roof (Figure 21)

4.3.1 The Flat Roof is an oak roof situated over the area known as Henry VIII's Buttery. It is under and immediately to the west of the west gable of the Great Hall and behind the crenellations of the west facing elevation of the Buttery in Base Court. The roof is orientated north to south and has a slight west to east incline. During works, its lead cover and areas of sarking boards were removed, allowing for a closer inspection of both structures underneath, the Upper and the Lower (Plates 27 & 28).

4.3.2 The earlier Lower structure features four tie beams between 5 bays and for ease of description, have been numbered north to south. It sits just below the level of the plastered and skirting on the return wall between turrets 12 and 16 meaning it is the associated floor structure of this space. On the west side, an inner brick ledge of Q type bricks, which holds the Upper structure, is built around the ends of the tie beams. On the east side, the tie beams sit into the brick work of the west elevation of the Great Hall. An average of thirteen joists are tenoned and pegged into the tie beams with haunched tenons, with the exception of the smaller southern most Bay 5. This bay has eleven joists which sit into a heavily plastered brick ledge under the return wall between Turrets 12 and 16. The three eastern most joists sit into the brickwork of Turret 16. Occasionally, tie beams have empty mortises, which would suggest that they are reused. Tie Beam 1 has two, equidistant from the edges at each side. They seem to be mortices for queen posts and are straight on the inside, although the eastern mortice is smaller than the western mortise. Unusually, Tie Beams 2 and 4 have one mortice each. That on Tie Beam 2 is on the west side and that on Tie Beam 4 is on the east side. These mortices do not line up with each other from north to south when looked at in plan. Due to these inconsistencies, and the fact that Tie Beam 3 has no redundant mortises, it cannot be said that this is a complete altered or reused roof structure but rather contains reused elements.

4.3.3 Dendrochronological sampling revealed felling dates of 1531/1532 for the structural timbers of the floor and 1531/1532 for the lintels sampled from Turret 16 that the joists are set into (See Section 5.2). These results show that that the roof of the Buttery was built in the early 1530s at the same time as the Great Hall.

4.3.4 Assembly marks are only visible on the south side of Tie Beam 3 and on its joists on the south side (Plates 29 – 31, Figure 22). These appear as modified Roman numerals and, although they do not appear on every joist, or are obscured, from the fourth joist from the west they are in sequence. Three of the joists include a circular mark, made with a race knife, which is a type of tag, and probably denotes which side of the joist it is, or which side of the tie beam it belongs to.

Please see Appendix C for Schedule of Carpenter's Marks

4.3.5 The Upper pine structure is later and results of the dendrochronological sampling show that it dates to the early 19th century, with felling dates of winter 1817/1818 detected (See Section 5.2). Like the Lower structure, it has five bays with tie beams resting on timber wall plates built into the Q type brick ledge on the west side. On the east side, sockets with timber sills are cut into the brickwork of the Great Hall (Plate 32). Joists rest on and

are nailed into the tie beams with half lapped joints and rest of timber supports built against the brickwork to the north and south (Plate 33).

- 4.3.6 Notably, here are reused elements in this structure that, through dendrochronological sampling, have been dated to the earliest phase of Cardinal Wolsey's works. One dated to the Spring of 1515 while another dated to the Winter of 1515/1516. One of these early joists, in the second bay from the north, has Baltic marks on its east and under side (Plates 34 & 35). Some of the marks are full depth and others are half depth, indicating that there may be two sets of marks. One set of symbols may be a confirmation of information in the original symbols (size of wood and origin/destination), known as bracker's marks, made by customs in shipping (Kelly 2006).

Please see Appendix C for Schedule of Carpenter's Marks

- 4.3.7 The doorway through the east elevation of Turret 12 at Flat Roof level leads to a small room underneath its parapet and lead roof. The room is plastered and largely featureless except for two flues protruding from the north east side. The ceiling is a cover of 20th century timber and panel boards and the floor is boarded and appears to be of an earlier undetermined date. Graffiti on the plaster, where legible, ranges in date from the 18th to the 20th century. The two flues, appear to be from different phases. The one on the east side, which partially obscures the north jamb of the doorway appears to be late 18th or early 19th century yellow stock bricks, perhaps Brick Type Q and has a hard grey lime mortar. The north east flue abuts it and appears to be a later orange Victorian stock brick, and may be Brick Type S. The mortar is a Victorian style hard coarse grey lime mortar with dark speckle inclusions. The later flue has a small iron hatch in it. In the south west wall is a blocking. It is heavily pointed with a hard grey cement obscuring the bricks, which appear to be modern. The doorway is characteristically Tudor with a moulded stone four centre arch and jambs (Plate 36). The moulding is a hollow chamfer with a roll. Below this room is a modern timber staircase leading from the first floor of the Buttery to the second floor. It is likely that this replaces an older staircase that may have provided access to this doorway at the level of the Flat Roof.

4.4 Discussion

- 4.4.1 The Main Roof dates to the 17th century and is probably contemporary with the alteration and possible raising of the range in the 17th century for the purposes of creating the accommodation below. Unfortunately, dendrochronological sampling on the timbers proved inconclusive (See Section 5.1). There is no evidence of an earlier roof remaining and, as the east and west parapets are later too, how it may have been structurally arranged. As discussed above (See 3.3.2), some of the evidence in the elevations may provide important clues, such as the height to which the A Type bricks extend to in the Clock Court elevation. It is likely that the earlier structure was lower and it is possible that it was made up of east to west orientated double gables.
- 4.4.2 The existing 19th century Upper structure of the Flat Roof is also a replacement for an earlier structure, the floor of which remains below as the Lower structure. The Lower structure dates to the building of the Great Hall. As discussed above (See section 3.3.23) there is evidence that the south end of the roof area was changed at some point and that there may have been a room or a passage previously against the southern return wall. It is also possible that an earlier roof was pitched like a lean-to against this wall, so as not to obscure the large ornate western window of the Great Hall. Evidence in the southern return wall suggest that it may have once been open on the east side, creating a more open arrangement between the two roof spaces and the entire range. The opening may have been blocked at the time of the 17th century alteration and a passage was no longer



necessary or practical with the re-orientation. Alternatively, it may have been blocked in the 19th century when the roof over the Buttery became a flat roof. As both the Flat Roof and the Main Roof replace earlier roofs, and little evidence remains of either their level or their structure, it is difficult to build an accurate picture of what this may have looked like.

5 SUMMARY OF DENDROCHRONOLOGY BY DR D.W. MILES

5.1 The Main Roof

5.1.1 Thirteen timbers were sampled from this roof, and two samples were taken from one timber to get the maximum length of sequence (**hcp214a** and **hcp214b**). These were combined to form the mean **hcp214**. The various samples were all compared with each other, and three individual combined sequences were formed: Sample **hcp211** and **hcp213** were combined to form the 54-ring mean **hcp2113**. Samples **hcp214**, **hcp215**, and **hcp223** were combined to form the 140-year mean **hcp21423**. And samples **hcp217**, **hcp218**, and **hcp222** were all combined to form the 140-year mean **hcp21722**. All three of these combined mean sequences were compared with each other, and the other individual sequences, but no further cross-matching was found. These and the other individual sequences were compared with the pine database but no conclusive dating was found. It is hoped that some of these might date in the future with the acquisition of further pine chronologies.

5.2 The Flat Roof

5.2.1 This flat low-pitched shed roof outside the great west window of the Hall has long been an enigma. Having its own stair turret, it clearly had once been floored and used as some sort of storage or accommodation in association with the Hall and Minstrel's Gallery. Seven structural timbers including main beams and joists were sampled from the intact floor frame, which included two floor joists, three floor or tiebeams, and two lintels set within the SW stair turret. Only one of the tiebeams dated to **1509-41**, and two joists to **1492-1524** and *circa 1532-3*. Apart from the slightly earlier joist (possibly reused from Wolsey's work?) these dates correlate well with the **winter 1531/2** and **spring 1532** for the two integral turrets. So it would look like this floor was constructed at the same time as the Great Hall, in the early 1530s.

5.2.2 A series of three reused timbers in the present monopitch roof dated to the time of Wolsey. One dated to the **spring 1515** whilst another two date to the **winter 1515/16**. These either came from the roof framing over the extant floor, or from some other building within the Palace which was being taken down at the time the monopitch roof was being constructed. In any event, they are clearly earlier than the floor below and have been reused from one of the earliest phases of Wolsey's work at Hampton Court, but just there before that we do not know.

5.2.3 Finally we have sampled some nine pine timbers making up the framing of the monopitch roof. Five were from principal rafters, three from binders, and one was a pine floorboard on the existing floor joists. Three principal rafters **hpc143**, **hpc146**, and **hpc147** all matched together to form the same site master **HCPx8**. This was constructed spanning the years 1623-1817. Two of the principal rafters had bark edge and were felled in the winter of **1817/18**. As they had come from the same parent tree as **hpc143**, it too could be ascribed the **1817/18** felling date same as the others. A fourth sample, **hpc142**, also dated individually to the **winter of 1817/18**. It was from a binder and may well have been a different source to the dated tiebeams above. Given that all pine timbers from this

roof dated to the **winter of 1817/18**, it is likely that this was reconstructed in **1818** or within a year or two afterwards.

*Please see **Appendix D** for the Table of Tree Ring Dating at Hampton Court Palace*

6 ADDITIONAL LITHOGRAPHIES BY RUTH SHAFFREY

6.1 Introduction

6.1.1 A general survey of the walls of the east and west elevations of Base court V were undertaken to establish where there were gaps in the lithological surveys previously prepared (Sanderson 2006). This revealed a number of gaps and additional recording was carried out on the elevations below. All other Base Court 4 elevations had been completely recorded by Sanderson.

6.2 The Buttery (Figure 23)

6.2.1 *HCP-clock1-8.dwg* The string courses, windows and door surround had not been recorded on this elevation. The string courses were found to comprise a mixture of Bath stone and Wheatley limestone, which is in keeping with the previously recorded sections.

6.2.2 *TY-HCP-BCT-E-E-Stone-520* The highest section of the archway had not been recorded. A movable scaffold was erected so that this survey could be completed. The main component of the underside of the arch was found to be Caen stone, however, there is a band of Wheatley limestone running through the arch. The arch also has a number of patched replacements, also Wheatley limestone and it is likely the two components are contemporary replacements of decaying Caen stone.

6.2.3 *TY-HCP-BCT-E-E-Stone-521* The underneath of the triple window has not been recorded but was still not accessible during this survey and *remains unrecorded*.

6.2.4 *TY-HCP-BCT-E-E-Stone-522* Block work around the window openings was recorded subsequent to some cleaning. These were found to include blocks of Caen stone, Bath stone (or possibly Taynton – the colour looks rather orange for Bath stone, but might have suffered some discolouration) and Wheatley limestone. Wheatley limestone is the predominant stone in this section of the elevation forming the bulk of the window and string courses. However, there are lesser elements of Caen stone, Bath stone as seen during this phase of recording as well as Reigate stone and Clipsham stone as seen during previous phases.

6.2.5 *TY-HCP-BCT-E-E-Stone-525* A string course and parapet on the Turret had not been accessible during the 2006 survey and was therefore completed now. This was found to be formed entirely of Bath stone. Two blocks are a slightly different variety that is more orange in colour – this might be Taynton stone or a discoloured Bath stone.

6.3 East facing Elevation – Clock Court (Figure 24)

6.3.1 *HCP-CC-06-TyS-W-01* Three blocks in the string course have been identified as Bath stone, Caen stone and Wheatley limestone.

6.3.2 *HCP-CC-06-TyS-W-01A* The blockwork around two window openings was recorded during this phase of work. Both openings are constructed of Bath stone entirely. A string course under the window is formed of mainly Weldon stone with one block of Clipsham. The parapet wall on the top of this elevation was recorded on another drawings.

6.3.3 *HCP-CC-06-TyS-W-02* A window at the top left of this elevation had not been recorded but is all of Bath stone, as with the other windows at the same height.



6.3.4 *HCP-CC-06-TyS-W-06* The highest section of the archway had not been recorded. A movable scaffold was erected so that this could be completed. Two blocks were found to be Wheatley limestone and the remainder Caen stone. Both stone types had already been recorded as having been used elsewhere in the arch.

6.3.5 *HCP-CC-06-TyS-W-17* A Single block at the end of the elevation had not been recorded. It has now been identified as Portland stone. On the opposite face, the lower block is Bath stone and the upper block is Clipsham stone.

6.4 Clock Court Parapet

6.4.1 *HCP-CC-06-TyS-W-16* A section of the blockwork on this parapet wall has been recorded as Bath stone. This is in contrast to the other half, which was identified as Weldon limestone, but in keeping with other areas of Bath stone at the Palace.

6.5 Turret 12 (Figure 25)

6.5.1 *HCP-CT-06-TyS-E-24* Two missing blocks are of Clipsham and Weldon limestone. Clipsham is already present in this section. Weldon is not present but does occur in other parapet walls (see above).

6.6 Discussion

6.6.1 A discussion of the petrology of the stone types used in these elevations was prepared by Sanderson. Other than the replacement of Caen stone with Wheatley limestone in the large archway of the east elevation, which requires a separate comment, the patterns of usage are consistent with those observed by Sanderson and no other discussion is required.

Please see Appendix E for Robin Sanderson's report on the Lithographies

7 CONCLUSION

7.1.1 The main objective of this report was to enhance our understanding of this area of the palace through a thorough investigation of the elevations as well as their associated roof structures and the arrangements within the range. Investigation of the brickwork in the elevations has re-affirmed what was already believed about their sequence of construction and has enhanced the survey created by Daphne Ford for English Heritage in 1991.

7.1.2 The range immediately to the north of the Anne Boleyn Gatehouse was likely to have been built by Cardinal Wolsey and the exterior elevations up to second floor level have changed little. The Great Staircase within this range was probably inserted by Henry VIII, perhaps replacing an earlier similar structure, and the apartment above dates to the 17th century, meaning that Cardinal Wolsey's original arrangement is lost. The roof structure dates to the 17th century alteration of the range. Currently it runs north to south but this may replace a similar roof that ran east to west, with gables facing onto Base Court and Clock Court. The two possible blockings in the second floor of the east facing Clock Court elevation may indicate where windows were set into these gables. If this is the case, it would mean that the current crenellations are a 17th century affectation. The presence of a small blocked window under the gable in Turret 16 and the notable hip of the east side of the roof under the window of Elevation T further supports the idea that a roof line, the end of a south to north descending pitch for example, would have existed below the current level.



- 7.1.3 To the north of this range, the Great Hall, the Buttery and their associated turrets and small elevations all have primary brickwork of Brick Type C, meaning that they were built during Henry VIII's tenure at the palace. Through past investigation of the Great Hall and adjoining structures to the north (Oxford Archaeology 2011, 2012 & 2014), we have identified more than one phase of building during Henry VIII's tenure at the palace, as well as reuse and alteration of various parts of Wolsey era structures. Evidence of a restlessness and indecision has been detected in his shaping of the palace for his purposes, where structures were built only to be changed a few years later. Therefore, it can't always be assumed that structures with a primary brickwork of Brick Type C are contemporary. In this case, however, dendrochronological sampling has revealed that the Lower Structure of the Flat Roof of the Buttery is contemporary with the building of the Great Hall in the early 1530s.
- 7.1.4 The investigation revealed some features of significance which shed light on a possible previous, more open arrangement of the range at roof level. The evidence of rebuilding in the return wall between the range to the immediate north of the Anne Boleyn Gatehouse and the roof of the Buttery, suggests a relationship between these two spaces that no longer exists. It may have been that there was access between these areas for maintenance purposes or for passage from the Buttery, through Turret 12, to the Main Roof space. The presence of the plastered wall and the skirting on the north face of the return wall would lead us to believe that at one point this was a covered area with enough space to provide access for people. All these features hint at a previously unknown purpose for this area that is now obscured by its alteration.

Deirdre Forde

June 2015



APPENDIX A. BIBLIOGRAPHY

Published Sources

Foyle J A Reconstruction of Thomas Wolsey's Great Hall at Hampton Court Palace,
in *Architectural History*, Vol. 45 2002

Thurley S *Hampton Court; A Social and Architectural History* 2003

Thurley S The Sixteenth Century Kitchens at Hampton Court, in *The Journal of the
British Archaeological Association* 1990, p1-29

Unpublished Sources

Ford, D *Hampton Court Palace Brick Typology* - Elevations sheet
AS2/116 and associated Brick Data Sheets, English Heritage(1991)

Kelly, A *The Setting Out Marks of Timber Frame
Buildings in York: A Study* 2006

Oxford Archaeology *The Great Hall Court Phase I, Hampton Court Palace; Historic Buildings
Recording and Investigation* 2012

Oxford Archaeology *The Great Hall Court Phase II, Hampton Court Palace; Historic
Buildings Recording and Investigation* 2012

Oxford Archaeology *The Buttery Roof Stair Conservation; Historic
Buildings Recording and Investigation* 2015



APPENDIX B. BRICK TYPOLOGY SIZES

Brick Typology Brick sizes (inches)		
Type	Date	Length (Stretcher)
A	? - 1528	9.5 - 10.25
B	c.1522 - 1528	9 - 9.5
C	1529 - 1566	8.25 - 9.25
D	c.1536 - 1537	8.25 - 9.25
E	Late C16th to Early C17th	9.25 - 9.75
F	Mid C17th	9 - 9.5
G	Late C17th to Early C18th	8.375 - 8.875
H	Late C17th to Early C18th	8.5 - 8.75
I	Late C17th to Early C18th	8.5 - 9
J	Late C17th to Early C18th	8.25 - 9
K	Late C17th to Early C18th	8.5 - 8.75
L	Late C17th to C18th	8.25 - 8.75
M	Late C17th to C18th	6.00
N	1732	8.50
O	Mid C18th	8.25 - 9
P	Mid C18th	9.125 - 9.25
Q	Late C18th to C19th	8.5 - 9.5
R (rubbed)	C17th to C18th?	8 - 8.25
R (unrubbed)	C17th to C18th?	8.75 - 9
S	C19th	8.75
T	C19th	8.75 - 9.25
U	C19th	9.25 - 9.5



V	C19th to C20th	8.75 - 9.5
W	C19th to C20th	8.75 - 9.5





APPENDIX C. SCHEDULE OF CARPENTER'S MARKS IN THE BASE COURT V AREA

**HCP110BS – Base Court V, Hampton Court Palace
Survey of Carpenter's Marks**

Main Roof

Older carpenter's marks in the Main Roof appear to be knife scribed with a race knife and the newer appear to be cut with a saw. Carpenter's Marks appear only on Common Rafter.

NV- Not Visible

Bay 1			
West Side of Roof		East Side of Roof	
West Common Rafter	East Common Rafter	West Common Rafter	East Common Rafter
V II	V II		
V I	V I		
V	V		
V III			

Bay 2			
West Side of Roof		East Side of Roof	
West Common Rafter	East Common Rafter	West Common Rafter	East Common Rafter

Bay 3			
West Side of Roof		East Side of Roof	
West Common Rafter	East Common Rafter	West Common Rafter	East Common Rafter
X II	X II	X	X
X	X	V II	V II
X III	X III	\ /	
		V	V
V I	V I	X I	X I
		V III	V III

Bay 4			
--------------	--	--	--

West Side of Roof		East Side of Roof	
West Common Rafter	East Common Rafter	West Common Rafter	East Common Rafter
	V	V	V
		V	V
X	X		
X	X	V	V
V	V	V	V

**HCP110BS – Base Court V, Hampton Court Palace
Survey of Carpenter's Marks**

Flat Roof

All carpenter's marks in the Flat Roof appear to be knife scribed with a race knife.
Carpenter's marks only appear on the Truss 3 of the 16th century Lower Structure and are numbered using modified Roman numerals with some circular tags.
Baltic marks appear on one reused timber in the 19th century Upper Structure

NV- Not Visible

UC- Unclear

Lower Structure													
South side of Truss 3													
E-W	NV	UC	UC	v↓	iv↓	iiiv↓	iiiiiv↓	iiiiiv↓	x↓	ix↓	iiix↓	iiix↓	iiiiix↓
	NV		NV		UC		NV	NV			NV	NV	NV

Upper Structure	
Bay 2, Joist 2	
East side	
Under side	



APPENDIX D. DENDROCHRONOLOGICAL RESULTS FOR THE BASE COURT V
CONSERVATION AREA (EXTRACTED FROM HAMPTON COURT PALACE
DENDROCHRONOLOGY SUMMARY) *ByDr D.W. MILES*

Details of Dendrochronological Analysis

The results of the dendrochronological analysis for the building under study are presented in a number of detailed tables. The most useful of these is the summary **Table 1**. This gives most of the salient results of the dendrochronological process, and includes details for each sample, its location, and its felling date or date range, if successfully tree-ring dated. This last column is of particular interest to the end user, as it gives the actual year and season when the tree was felled, if the final ring is present, or an estimated felling date range if the sapwood is incomplete. Occasionally it will be noted that the felling date ranges may not coincide with the precise felling dates. This is nothing to be overly concerned about so long as these are not too far apart. It must be remembered that the estimated felling date ranges are calculated at a 95% confidence level, which means that statistically one sample in 20 will have felling dates which actually fall *outside* the predicted range.

It will also be noticed that often the precise felling dates will vary within several years of each other. Unless there is supporting archaeological evidence suggesting different phases, all this would indicate is either stockpiling of timber, or of trees which have been felled or died at varying times but not cut up until the commencement of the particular building operations in question. When presented with varying precise felling dates, one should always take the *latest* date for the structure under study, and it is likely that construction will have been completed for ordinary vernacular buildings within twelve or eighteen months from this latest felling date (Miles 1997).

Table 2 gives an indication of the statistical reliability of the match between one sequence and another. This shows the *t*-value over the number of years overlap for each combination of samples in a matrix table. It should be born in mind that *t*-values with less than 80 rings overlap may not truly reflect the same degree of match and that spurious matches may produce similar values.

First, multiple radii have been cross-matched with each other and combined to form same-timber means. These are then compared with other samples from the site and any which are found to have originated from the same parent tree are again similarly combined. Finally, all samples, including all same timber and same tree means are combined to form one or more site masters. Again, the cross-matching is shown as a matrix table of *t*-values over the number of years of overlap. Reference should always be made to **Table 1** to clearly identify which components have been combined.

Table 3 shows the degree of cross-matching between the site master(s) with a selection of reference chronologies. This shows the county or region from which the reference chronology originated, the common chronology name together with who compiled the chronology with publication reference and the years covered by the reference chronology. The years overlap of the reference chronology and the site master being compared are also shown together with the resulting *t*-value. It should be appreciated that well replicated



regional reference chronologies, which are shown in **bold**, will often produce better matches than with individual site masters or indeed individual sample sequences.

Figures include a bar diagram which shows the chronological relationship between two or more dated samples from a phase of building. The site sample record sheets are also appended, together with any plans showing sample locations, if available.

Publication of dated sites are published in *Vernacular Architecture* annually, and the entry, if available, is shown on the summary page of the report. This does not give as much technical data for the samples dated, but does give the *t*-value matches against the relevant chronologies, provide a short descriptive paragraph for each building or phase dated, and gives a useful short summary of samples dated. These summaries are also listed on the web-site maintained by the Laboratory, which can be accessed at www.Oxford-dendroLab.com. The Oxford Dendrochronology Laboratory retains copyright of this report, but the commissioner of the report has the right to use the report for his/her own use so long as the authorship is quoted. Primary data and the resulting site master(s) used in the analysis are available from the Laboratory on request by the commissioner and bona fide researchers. The samples form part of the Laboratory archives.

References

Baillie, M G L, and Pilcher, J R, 1973 A simple cross-dating program for tree-ring research, *Tree-Ring Bulletin*, **33**, 7-14

Bronk Ramsey, C, 1995 Radiocarbon calibration and stratigraphy: the OxCal program, *Radiocarbon*, **37**, 425-30

Miles, D H, 1997 The interpretation, presentation, and use of tree-ring dates, *Vernacular Architecture*, **28**, 40-56

Miles, D H, 2005 *New Developments in the Interpretation of Dendrochronology as Applied to Oak Building Timbers*, Unpubl DPhil thesis, Hertford College, Oxford Univ

Miles, D H, 2006 Refinements in the Interpretation of Tree-Ring Dates for Oak Building Timbers in England and Wales, *Vernacular Architecture*, **37**, 84-96

Millard, A, 2002 A Bayesian approach to sapwood estimates and felling dates in dendrochronology, *Archaeometry*, **44** (1), 137-143

Munro, M A R, 1984 An Improved Algorithm for Crossdating Tree-Ring Series, *Tree Ring Bulletin*, **44**, 17-27



PROVISIONAL SUMMARY

M-Roof (The Main Roof) over Great Stair, between Great Hall and Anne Boleyn Gatehouse (Pine)

Thirteen timbers were sampled from this roof, and two samples were taken from one timber to get the maximum length of sequence (**hcp214a** and **hcp214b**). These were combined to form the mean **hcp214**. The various samples were all compared with each other, and three individual combined sequences were formed: Sample **hcp211** and **hcp213** were combined to form the 54-ring mean **hcp2113**. Samples **hcp214**, **hcp215**, and **hcp223** were combined to form the 140-year mean **hcp21423**. And samples **hcp217**, **hcp218**, and **hcp222** were all combined to form the 140-year mean **hcp21722**. All three of these combined mean sequences were compared with each other, and the other individual sequences, but no further cross-matching was found. These and the other individual sequences were compared with the pine database but no conclusive dating was found. It is hoped that some of these might date in the future with the acquisition of further pine chronologies.

Buttery roof at west end of Great Hall: Floor frame above (real) Buttery

This flat low-pitched shed roof outside the great west window of the Hall has long been an enigma. Having its own stair turret, it clearly had once been floored and used as some sort of storage or accommodation in association with the Hall and Minstrel's Gallery. Seven structural timbers including main beams and joists were sampled from the intact floor frame, which included two floor joists, three floor or tiebeams, and two lintels set within the SW stair turret. Only one of the tiebeams dated to **1509-41**, and two joists to **1492-1524** and *circa* **1532-3**. Apart from the slightly earlier joist (possibly reused from Wolsey's work?) these dates correlate well with the **winter 1531/2** and **spring 1532** for the two integral turrets. So it would look like this floor was constructed at the same time as the Great Hall, in the early 1530s.

Reconstructed Lead Roof

A series of three reused timbers in the present monopitch roof dated to the time of Wolsey. One dated to the **spring 1515** whilst another two date to the **winter 1515/16**. These either came from the roof framing over the extant floor, or from some other building within the Palace which was being taken down at the time the monopitch roof was being constructed. In any event, they are clearly earlier than the floor below and have been reused from one of the earliest phases of Wolsey's work at Hampton Court, but just there before that we do not know.

Finally we have sampled some nine pine timbers making up the framing of the monopitch roof. Five were from principal rafters, three from binders, and one was a pine floorboard on the existing floor joists. Three principal rafters **hcp143**, **hcp146**, and **hcp147** all matched together to form the same site master **HCPx8**. This was constructed spanning the years 1623-1817. Two of the principal rafters had bark edge and were felled in the winter of **1817/18**. As they had come from the same parent tree as **hcp143**, it too could be ascribed the **1817/18** felling date same as the others. A fourth sample, **hcp142**, also dated individually to the **winter of 1817/18**. It was from a binder and may well have been a different source to the dated tiebeams above. Given that all pine timbers from this roof dated to the **winter of 1817/18**, it is likely that this was reconstructed in **1818** or within a year or two afterwards.



Summary of Tree Ring Dating

v.Base Court V, Hampton Court Palace

Buttery roof at west end of Great Hall Floor frame above (real) Buttery

hcp131	c	Floor joist 5 th from W, Bay 1 F	1463-1518	1518	H/S + 15C NM	56	2.11	0.53	0.193	c 1532-3
hcp132	c	Floor joist VI, Bay 1 C	1376-1483	1483	H/S	108	1.25	0.54	0.181	1492-1524
hcp133	c	Tiebeam Truss2 H	1446-1500	1500	H/S	55	2.44	0.89	0.214	1509-41
hcp134	c	Tiebeam Truss3 L	-		H/S	53	1.93	1.00	0.204	
hcp135	c	Tiebeam Truss 4 P	-		H/S	85	1.58	0.34	0.162	
hcp136	c	N lintel SW turret M	1355-1531	1483	48¼C	177	1.12	0.58	0.164	Spring 1532
hcp137	c	S lintel SW turret N	1432-1531	1511	20C	100	1.39	0.37	0.170	Winter 1531/2
Reconstructed Lead Roof										
hcp138	c	Reused joist 6 th joist from A	1439-1515	1493	22C	77	1.13	0.34	0.163	Winter 1515/16
hcp139a	c	Reused joist B4 from west K	1431-1510	1494	16	80	1.76	0.66	0.189	
hcp139b	c	ditto	1483-1515	1494	21C	33	1.35	0.53	0.191	
hcp139		Mean of hcp139a + hcp139b	1431-1515	1494	21C	85	1.70	0.63	0.180	Winter 1515/16
hcp140a	c	Reused joist Bay 5 O	1404-1485			82	1.43	0.28	0.175	
hcp140b	c	ditto	1434-1512	1496	16	79	1.15	0.35	0.192	
hcp140c	s	ditto	1503-1514		12¼C	12	0.79	0.13	0.190	
hcp140		Mean of hcp140a + hcp140b + hcp140c	1404-1514	1496	18¼C	111	1.26	0.37	0.177	Spring 1515

Key: *, § = sample included in site-master; c = core; mc = micro-core; s = slice/section; g = graticule; p = photograph; ¼C, ½C, C = bark edge present, partial or complete ring; ¼C = spring (last partial ring not measured), ½C = summer/autumn (last partial ring not measured), or C = winter felling (ring measured); H/S bdry = heartwood/sapwood boundary - last heartwood ring date; std devn = standard deviation; mean sens = mean sensitivity



Summary of Tree Ring Dating

v.Base Court V, Hampton Court Palace

Sample number & type	Timber and position	Dates AD spanning	H/S bdry	Sapwood complement	No of rings	Mean width mm	Std devn mm	Mean sens mm	Felling seasons and dates/date ranges (AD)
Reconstructed Lead Roof (cont.)									
hcp141a	c Principal rafter Truss1 (pine) E	-			133	1.13	0.91	0.282	
hcp141b	c ditto	-			123	0.51	0.23	0.338	
hcp141	Mean of hcp141a + hcp141b	-			212	0.88	0.80	0.305	
hcp142a	c Binder, Bay 2 (pine) B	1693-1801			109	1.32	0.67	0.291	
hcp142b	s ditto	1757-1817		C	61	0.87	0.41	0.354	
hcp142	Mean of hcp142a + hcp142b	1693-1817		C	125	1.22	0.67	0.293	Winter 1817/18
* hcp143	c Principal rafter Truss 2 (pine) D	1623-1739			117	1.77	1.38	0.258	(Winter 1817/18)
hcp144	c E binder B3 (pine) G	-		C	123	1.20	0.57	0.201	
hcp145	c W binder B3 (pine) J	-			108	1.25	0.64	0.187	
* hcp146	c Principal rafter Truss 3 (pine) I	1629-1817		C	189	1.08	0.91	0.249	Winter 1817/18
hcp147a	c Principal rafter Truss 4 (pine) S	-			59	2.34	0.82	0.232	
hcp147b	c ditto	1670-1741			72	0.88	0.50	0.221	
hcp147c	c ditto	1701-1817		C	117	0.55	0.20	0.269	
* hcp147	Mean of + hcp147b + hcp147c	1670-1817		C	148	0.71	0.41	0.259	Winter 1817/18
hcp148	c Principal rafter Truss 5 (pine) R	-			101	1.43	0.84	0.214	
hcp149	s Pine floorboard Bay 1 Q	-			62	1.27	0.56	0.200	
* = HCPx8	Same-tree mean hcp143 + hcp146 + hcp147	1623-1817				1.95	1.21	1.08	0.237 Winter 1817/18



Summary of Tree Ring Dating

v.Base Court V, Hampton Court Palace

Sample number & type	Timber and position	Dates AD spanning	H/S bdry	Sapwood complement	No of rings	Mean width mm	Std devn mm	Mean sens mm	Felling seasons and dates/date ranges (AD)
M-Roof over Great Stair, between Great Hall and Anne Boleyn Gatehouse (Pine)									
hcp211	c Collar, 1 st truss from the S	-			45	2.69	0.58	0.225	
hcp212	c East principal rafter, 1 st truss from the S	-			44	1.40	0.51	0.246	
hcp213	c West purlin at north end of west roof	-		+4 NM	54	2.13	0.62	0.252	
hcp214a	c 6 th common rafter from N end, W roof (II)	-		+14 NM	34	0.82	0.12	0.130	
hcp214b	c ditto	-		+20 NM	117	0.98	0.41	0.155	
hcp214	Mean of hcp214a + hcp214b	-			117	0.98	0.41	0.147	
hcp215	c West common rafter 7 th (I), west roof	-			51	1.31	0.31	0.200	
hcp216	c Collar, 2 nd truss from S	-			63	2.03	0.77	0.211	
hcp217	c 6 th common rafter E from T1, W roof (X11 1V)	-			102	0.75	0.32	0.180	
hcp218	c 6 th common rafter W from T1, W roof (XII)	-			106	0.76	0.39	0.244	
hcp219	c 5 th common rafter E from T1, W roof (X)	-			76	1.26	0.44	0.176	
hcp220	c 4 th common rafter W from T1, W roof (XIII)	-		+c 50C NM	121	0.72	0.28	0.173	
hcp221	c East principal rafter 2 nd truss from E, E roof	-		+2-3C NM	62	1.61	0.61	0.313	
hcp222	c 1 st common rafter S of T2, E roof	-		C	79	0.63	0.27	0.214	
hcp223	c 3 rd common rafter N of T2, E side, E roof	-		C	108	0.70	0.36	0.185	
hcp2113	Mean of hcp211 + hcp213	-			54	2.38	0.56	0.231	
hcp21423	Mean of hcp214 + hcp215 + hcp223	-			140	0.93	0.47	0.155	
hcp21722	Mean of hcp217 + hcp218 + hcp222	-			140	0.77	0.36	0.203	

Key: *, § = sample included in site-master; c = core; mc = micro-core; s = slice/section; g = graticule; p = photograph; ¼C, ½C, C = bark edge present, partial or complete ring; ¼C = spring (last partial ring not measured), ½C = summer/autumn (last partial ring not measured), or C = winter felling (ring measured); H/S bdry = heartwood/sapwood boundary - last heartwood ring date; std devn = standard deviation; mean sens = mean sensitivity



Explanation of terms used in Table 1

The summary table gives most of the salient results of the dendrochronological process. For ease in quickly referring to various types of information, these have all been presented in Table 1. The information includes the following categories:

Sample number: Generally, each site is given a two or three letter identifying prefix code, after which each timber is given an individual number. If a timber is sampled twice, or if two timbers were noted at time of sampling as having clearly originated from the same tree, then they are given suffixes 'a', 'b', etc. Where a core sample has broken, with no clear overlap between segments, these are differentiated by a further suffix '1', '2', etc.

Type shows whether the sample was from a core 'c', or a section or slice from a timber's'. Sometimes photographs are used 'p', or timbers measured *in situ* with a graticule 'g'.

Timber and position column details each timber sampled along with a location reference. This will usually refer to a bay or truss number, or relate to compass points or to a reference drawing.

Dates AD spanning gives the first and last measured ring dates of the sequence (if dated),

H/S bdry is the date of the heartwood/sapwood transition or boundary (if present). This date is critical in determining an estimated felling date range if the sapwood is not complete to the bark edge.

Sapwood complement gives the number of sapwood rings. The tree starts growing in the spring during which time the earlywood is produced, also known also as spring growth. This consists of between one and three decreasing spring vessels and is noted as *Spring* felling and is indicated by a $\frac{1}{4}$ C after the number of sapwood ring count. Sometimes this can be more accurately pin-pointed to very early spring when just a few spring vessels are visible. After the spring growing season, the latewood or summer growth commences, and is differentiated from the proceeding spring growth by the dense band of tissue. This summer growth continues until just before the leaves drop, in about October. Trees felled during this period are noted as *summer* felled ($\frac{1}{2}$ C), but it is difficult to be too precise, as the width of the latewood can be variable, and it can be difficult to distinguish whether a tree stopped growing in autumn or *winter*. When the summer growth band is clearly complete, then the tree would have been felled during the dormant winter period, as shown by a single C. Sometimes a sample will clearly have complete sapwood, but due either to slight abrasion at the point of coring, or extremely narrow growth rings, it is impossible to determine the season of felling.

Number of rings: The total number of measured rings present on the samples analysed.

Mean ring width: This, simply put, is the sum total of all the individual ring widths, divided by the number of rings, giving an average ring width for the series.

Mean sensitivity: A statistic measuring the mean percentage, or relative, change from each measured yearly ring value to the next; that is, the average relative difference from one ring width to the next, calculated by dividing the absolute value of the differences between each pair of measurements by the average of the paired measurements, then averaging the quotients for all pairs in the tree-ring series (Fritts 1976). Sensitivity is a dendrochronological term referring to the presence of ring-width variability in the radial direction within a tree which indicates the growth response of a particular tree is "sensitive" to variations in climate, as opposed to complacency.



Summary of Tree Ring Dating

v.Base Court V, Hampton Court Palace

Standard deviation: The mean scatter of a population of numbers from the population mean. The square root of the variance, which is itself the square of the mean scatter of a statistical population of numbers from the population mean. (Fritts 1976).

Felling seasons and dates/date ranges is probably the most important column of the summary table. Here the actual felling dates and seasons are given for each dated sample (if complete sapwood is present). Sometimes it will be noticed that often the precise felling dates will vary within several years of each other. Unless there is supporting archaeological evidence suggesting different phases, all this would indicate is either stockpiling of timber, or of trees which have been felled or died at varying times but not cut up until the commencement of the particular building operations in question. When presented with varying precise felling dates, one should always take the *latest* date for the structure under study, and it is likely that construction will have been completed for ordinary vernacular buildings within twelve or eighteen months from this latest felling date (Miles 2006).

Felling date ranges are produced using an empirical estimates using the appropriate estimate (Miles 1997). However, these can sometimes be reduced using a new sapwood estimation methodology which uses the mean ring width, number of heartwood rings, known H/S boundary date, and the number of surviving sapwood rings, if present (Miles 2006). These are used after the empirical range and are shown in brackets (OxCal followed by date range). Combined felling date ranges for a phase of building is shown at the end of the phase to which it relates.



**APPENDIX E. LITHOLOGICAL SURVEY OF THE BASE COURT (EAST) AND CLOCK COURT (WEST)
ELEVATIONS, HAMPTON COURT PALACE BY R.W. SANDERSON**

**LITHOLOGICAL SURVEY OF THE
BASE COURT (East) & CLOCK COURT (West)
ELEVATIONS,**

HAMPTON COURT PALACE.

R. W. Sanderson, B.Sc., C.Geol., F.G.S.

4th September 2008

**LITHOLOGICAL SURVEY OF THE BASE COURT (East) & CLOCK COURT (West)
ELEVATIONS,**

HAMPTON COURT PALACE.

R. W. Sanderson, B.Sc., C.Geol., F.G.S.

4th September 2008

Introduction:

This report was requested by Ms Patricia Leš, who requested the identification of the stone types and their possible sources. The elevations are shown in figs 1 & 2, and Plates 1 & 2, below. Details are marked on the photogrammetric plots listed below.

Base Court, eastern side. HCP/BCT/516 to HCP/BCT/525 inclusive.

Clock Court, western side. HPclock01 to HPclock08 inclusive.

Clock Tower upstanding part. HCPclock09 and HCPclock10.

Parapets. HCPclock22 to HCPclock25, HCPclock27 to HCPclock30, EparaWF13, sheets 11, 13, 14, 15.

Identifications were effected by *in-situ* examination prior to maintenance and repair works. No samples were removed for further analysis. Much of the stonework is thickly patinated and in a number of instances stone identification is tentative or has not been possible. This dense brown and varnish-like patination is most intense on Bath stones and Wheatley Limestone (see Plates 3 & 8) and may result from dressing with boiled linseed oil to help blend 19th century repairs with old dirtied stone, as happened in the Master Carpenters' Court (Thurley, 2003. p.302). Apart from some admixture of Yorkstone in modern brickwork, stone masonry is restricted to the dressings of the parapets' coping, string courses, windows and door surrounds. Thirteen lithological types were noted, all but two being of English origin. These are, with CAD plot identifiers in brackets, as follows -

- | | |
|--|---------------------------------|
| 1. Bath Stones (B) Combe Down Oolite and
Stoke Ground Base Bed. | 6. Portland stone (P) |
| 2. Beer stone (Be) | 7. Reigate stone (R) |
| 3. Caen Stone (C) | 8. Weldon Stone (LW) |
| 4. Clipsham Stone. (LC) | 9. Wheatley Limestone (W) |
| 5. Guiting stone (G) | 10. Yorkstone (Y). |
| | 11. Unidentified limestones (U) |
| 12. Granite. | |

The brick typology surveys by Daphne Ford (1991) (Figs 1 & 2) give useful information for dating the stone features. Most of the brick structure dates from the times of Cardinal Wolsey and King Henry VIII, with later 17th century additions and modern reconstruction of the parapets and chimneys.

Identification of the Stones.

1. Beer stone.

Near white crumbling limestone form the lintels of two second floor windows of the Clock Court northern section. The jambs and sill have been replaced by Bath stone (Plate 4). This is identified as Beer stone, a coarse shell detritus variety of Chalk (White Chalk Subgroup, Holywell Nodular Chalk Formation) from South Devon. It forms a lenticular stratum of restricted extent between Beer on the coast, and Wilmington, some 10km inland. Beer stone has been exploited since the 11th century for local use, and exported to London since at least the 13th century (Masey, 1882, Salzman, 1952). It does not well resist the weather, and these two lintels are rare survivals of its exterior use in the London region. Sir Christopher Wren employed it as interior wall facing at St Paul's Cathedral during the later part of the 17th century, a time agreeing with the presumed pre 1674 date for the windows.

2. Bath Stones. (Middle Jurassic. Great Oolite Group limestones)

More or less shelly matrix prominent oolitic limestones, sometimes showing fine lamination. These stones form new features, repairs and replacement dressings to the windows, doors, string courses and of the northern and southern sections of the Base Court elevation. They are unusually pale coloured where not showing densely patinated surfaces.

At least two variants may be distinguished, relating to different phases of repairs (Plate 3). Most probably derive from the Combe Down Oolite of the Great Oolite Group. At Hampton Court Palace it is probably all of 19th century date. The sills of some ground floor windows have been repaired by an unpatinated, more compact nodular type which is identified as from the Base Bed of the Stoke Hill quarry, Limpley Stoke (Stoke Ground Base Bed). This stone first came into production in 1982, previously having been considered too hard for economic hand working. It is recorded as having been used for repairs at Hampton Court completed in 1982 (Leary, 1983, p.19). Presumably the sills date from that time.

Bath Stone was not brought to London until the R. Avon was made navigable from Bath to Bristol in 1727. Little seems to have come to London until the early 19th century, after the opening of the Kennet-Avon canal in 1810. However it is recorded as having been used for repairs to Croydon Parish Church in 1763 (Parish of Croydon Trustees) and many of the early/mid 18th century garden ornaments at Lord Burlington's Chiswick House may also be of Bath Stone.

Caen stone.

Pale cream coloured fine grained limestone from Caen, Normandy.

This stone was used for the more prestigious features, such as the arches of Anne Boleyn's gateway, the windows of the Clock Tower, and survives as remnants in some of the first floor windows of the southern part of the Base Court elevation (Plates 5, 8, 9). It was imported until the later 19th century, but here all seems to be original 16th century material.

The southernmost first floor window of the Base Court side is very unusual in that the exterior face is currently mostly composed of Portland stone, but with small remnants of Caen stone in structurally weak positions (Plate 9). This suggests that the Portland stone may only be a superficial exterior restoration or reconstruction.

Clipsham stone type. (Middle Jurassic, Upper Lincolnshire Limestone Formation)

Coarse grained rough weathering peloidal shelly limestones, identified as Clipsham Stone from the Middle Jurassic Inferior Oolite, Lincolnshire Limestone, near Grantham, Lincolnshire, is found used for all the parapet coping and also the

Clipsham Stone appears mostly to have been a mid 20th century introduction to the London area. It does not figure in an authoritative 1923 account of the building stones of London (Elsden & Howe). It is here a common stone in the reconstructed parapets of the turrets (but not the NE & SE turrets of the Clock Tower, which are of Bath stone), and the accommodation ranges.

However, similar stone is present, mixed with Ketton Stone (another of the Lincolnshire Limestones) in the parapets' and chimney stacks' dressings of the Bloody and Wakefield Towers, HM Tower of London (Sanderson, 2004, 2006). These occurrences appear to be continuations of the 1886 rebuilding campaign of the Lanthorn Tower and the connecting South Inner Curtain, where the dressings seem to be all of Ketton Stone (these areas have yet to be surveyed in detail)

Granite.

Two bollards of grey coarse grained granite are situated, one on either side of the Clock Court entrance to Anne Boleyn's Gateway. Granites began to come to London as paving setts during the later 18th century, with larger blocks and greater quantities arriving from the early 19th century. These bollards are of South-West English types, and most probably 19th century additions perhaps related in time to the repaving of the Base Court carriageway with granite setts (Sanderson, 2008).

Guiting stone. (Middle Jurassic, Inferior Oolite Formation)

A few pieces of pale yellow, shell poor oolitic limestones, are tentatively identified as Guiting stone from the north Cotswolds. It differs from the similar Bath stone, with which it is

associated, in colour and poorer preservation. It is seen in the dressings of the 4-flue Henrician chimney stack in Clock Court, and is also present as small indents in the Bath stone copings of the Clock Tower eastern turrets.

Portland stone. (Upper Jurassic, Portland Formation)

White even grained oolitic limestone from south Dorset.

It is most prominent as the frame to the Base Court clock (Plate 14), the parapet and window sills of the south side Clock Tower, and as door steps in the Clock Court. The latter are of the first half of the 19th century. The Base Court clock and dial, dating from 1799, was brought from St James's Palace and reinstated here in 1835. However a view of the Clock Tower dated 1826 (Thurley, 2003, p.18) shows a clock face of very similar design

Reigate Stone. (Lower Cretaceous Upper Greensand)

Pale green-grey fine grained glauconitic 'malmstone' from Surrey, is seen as poorly preserved remnants in the dressings of the much restored ground floor windows of the south range in both the Base and Clock Court elevations (Plate 3) and the Buttery entrance (Plate 11). A single piece is present in the jamb of a tall 1st floor window (second to the south of the Clock Tower). Reigate Stone was commonly used by both Cardinal Wolsey and King Henry VIII for ashlar and dressings at Hampton Court Palace, and possibly also by Lord Daubeney at an earlier date (see the blocked door? arches in the exterior recess at the east end of the Great Kitchens. Its use by Wren, in the fountain Court cloisters, probably reflects re-use of salvage from the end 17th century demolition of the Tudor Palace.

Weldon stone. type. (Middle Jurassic, Inferior Oolite, Lincolnshire Limestone Formation).

Grey weathering, grain prominent oolitic limestone with little intergranular cement. Abraded and micritised shell fragments are scattered throughout. The structure is macroporous.

This lithology is typical of the area around Weldon in northern Northamptonshire, where it has long been quarried. It has a very good reputation for weather resistance, and it is surprising that few other undisputed uses of this stone in the Thames Valley are known to the writer. It is recorded as having been used by the architect J. L. Pearson for major restorations at Rochester Cathedral during 1889-95 (Worssam, 2001). During the present survey it has been found as pieced-in repairs, and more significantly as the corbels to the cantilevered small "modern" chimney adjacent to the north-west turret of the Clock Tower.

Elsewhere at Hampton Court it is to be found in the Tiltyard Tower parapet (Sanderson, 2006b) where it is concentrated in the crenellation copings, in association with shell-laminated Bath Stone, and as replacement of Wheatley Stone in the weathering course below the crenellations of the interior face of the parapet. A small quantity is also to be seen pieced-in in the string course.

Welsh Cambrian Slate.

The Base Court clock dial and superimposed monogrammed roundel are of grey weathering slate marked by ovoid paler greenish-grey reduction spots (Plates 14, 15). This lithology is typical of famous slates from the Cambrian System of North Wales.

The Base Court clock and dial, dating from 1799, was brought from St James's Palace and reinstated here in 1835. The clock face is formed of two horizontally butted pieces (Plate 14). This probably reflects transportation problems as slates of almost any dimensions could be extracted from the quarries. Good wagon roads from the quarries were almost non-existent in the 18th century North Wales, and most slate was transported by horse panniers.

Wheatley Limestone. (Middle Jurassic, Corallian Group, Wheatley Limestone)

A series of slightly variable, fine to medium grained, granular to flaky shell debris, porous grey-buff limestones formerly quarried at the adjacent parishes of Headington and Wheatley, now in the outskirts of Oxford. It is not possible to distinguish between the produce of these quarries, but the Headington quarries became more important after the 14th century (Arkell, 1947).

It has a poor reputation in Oxford, but is plentiful and often well preserved at Hampton Court where it occurs in the 1535 Moat Bridge parapet and the Tiltyard Tower parapet (Sanderson, 2006b). In the Base/Clock Courts elevations it is common in the jambs of Anne Boleyn's gateways (Plate 5), window surrounds (Plate 12) and string courses (Plate 13) which continue across the Caen stone gateway arches as hood mouldings. It seems to have been used several times, and in part replaces decayed Wolsey period Reigate stone window surrounds (Plate 3), but the associations are rather ambiguous. It all seems to be of pre-19th century date – for example, the string courses commonly show replacement of decayed basal mouldings by Bath stone strips and original ground floor Reigate stone windows are much restored with Wheatley Limestone. Are the gateway jambs possibly post Wolsey/Henry VIII restorations? There is also a single block of Caen stone in the Clock Court string course. The Henrician Reigate stone doors to the Buttery have been restored with Bath stone. A late feature appears to be the worn later 18th century door in the north-west corner of the Clock Court.

The only later works using this stone near London, known to the writer, are Asgill House, Richmond on Thames and Danson House, Bexleyheath, Kent, both built by Sir Robert Taylor in the 1760's.

“Yorkstone”.

A number of brick-sized blocks of fine grained brown quartzose sandstone are randomly incorporated in the brick work of the 4-flue chimney stack of the south range, and similar stone forms a levelling? course at the rear base of the parapet by the southern turret of the Base Court

side. Similar, but laminated stone forms the sill to the window in the north side of the Clock Tower. These stones are of Coal Measures type from Yorkshire.

Unidentified stones.

The frame to the terracotts portrait roundel of Trajan is of an unidentified white even grained oolitic limestone. Apparently similar material is present as an indent to the northern 2nd floor window of the Buttery block.

References.

- Arkell, W.J., 1947. *Oxford Stone*. London.
- Elsden, J. V., J. A. Howe, 1923. *The Stones of London*. London.
- Ford, Daphne, 1991. *Hampton Court Palace. Brick Typology*. English Heritage.
- Leary, E., 1983. *The building limestones of the British Isles*. Building Research Establishment
- Masey, P. E., 1882. *Observations on Beer Stone*. Exeter.
- Parish of Croydon Trustees for Repairing the Parish Church. *Minutes of meetings 1760 -1780*.
Croydon Public Libraries' Local Studies and Archives PR 1/1/1/4/1. pp.129-30, 132-3.
- Salzman, L. F., 1952. *Building in England Down to 1540*. Oxford University Press.
- Sanderson, R.W., 2004. *Lithological survey of the masonry of the Wakefield Tower, H.M. Tower of London*. Unpublished Report 0317B for H.R.P., 8th July 2004.
- Sanderson, R.W., 2006a. *Lithological survey of the masonry of the Byward Tower, H.M. Tower of London*. Unpublished Report 0509 for H.R.P. 24th March 2006.
- Sanderson, R.W., 2006b. *Lithological survey of the masonry of the Tiltyard Tower, Hampton Court Palace*. Unpublished Report 0510 for HRP. 6th June 2006.
- Sanderson, R. W., 2006c. *Lithological survey of the masonry of the Bloody Tower parapet. Internal elevations, H.M. Tower of London*. Unpublished Report 0610 for H.R.P. 18th September 2006.
- Sanderson, R. W., 2008. *Survey of the Carriageway and Footpaths. Base Court, Hampton Court Palace*. Unpublished Report 0717 for H.R.P. 17th August 2008.
- Thurley, S. 2003. *Hampton Court. A Social and Architectural History*. Yale University Press.
- Worssam, B. C., 2001. *The building stones of Rochester Cathedral Crypt*. *Archaeologia Cantiana*, vol. 120 (for 2000), pp.1-22. (16-17)



R.W. Sanderson
4th September 2008

Brick typology & dating by Daphne Ford, 1991.

A & B - pre 1528

C - 1529 - 66

E - Late 16th - early 17th century.

T - c. 19th century.

Subject sites of illustrations are numbered.

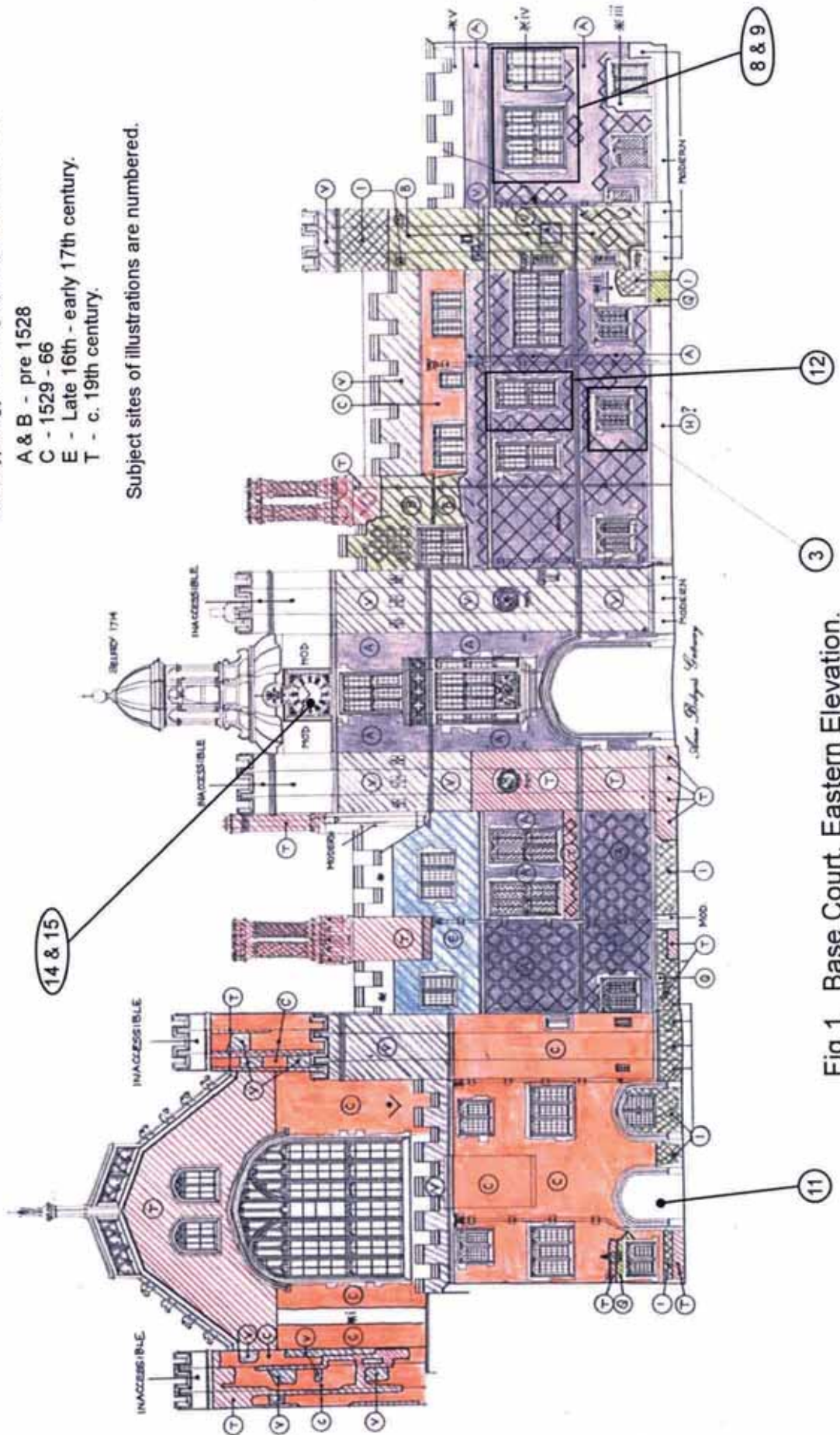


Fig. 1. Base Court, Eastern Elevation.

Brick typology & dating by Daphne Ford, 1991.

A & B - pre 1528

C - 1529 - 66

E - Late 16th - early 17th century.

T - c. 19th century.

Subject sites of illustrations are numbered.

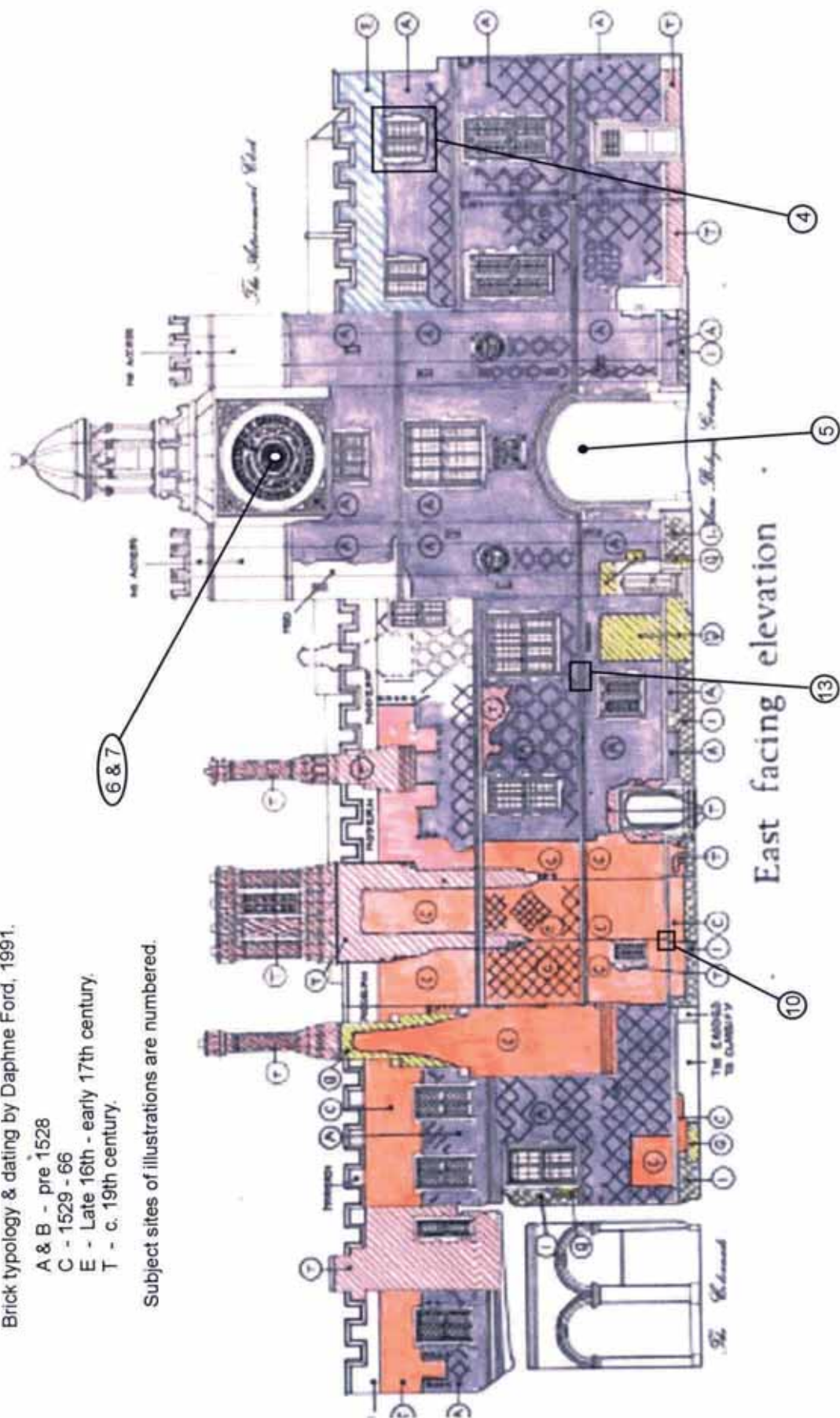


Fig. 2. Clock Court, Western elevation



Plate 1. Base Court, west facing elevation.



Plate 2. Clock Court, east facing elevation.



Plate 3. Base Court, ground floor window showing four phases of construction and repair. In order - Reigate stone (grey), Wheatley Limestone (grey-brown), Bath stone (brown), 20th century Bath Stoke Ground Base Bed (sill).



Plate 4. Clock Court, north-west corner 2nd floor window with Beer stone lintel & Bath stone jambs and sill.



Plate 5. Clock Tower, east entrance showing Caen stone arch and Wheatley Limestone jambs.



Plate 6. Astronomical Clock. Earlier dial of Caen stone normally hidden behind astronomical dial.



Plate 7. Detail of Plate 6. The yellow outer stone of the surround is a 20th century Clipsham stone restoration.



Plate 8. Base Court 1st floor windows at south end of range. Remnants of Caen stone (C) in jambs.



Plate 9. Detail of right hand window of Plate 8.



Plate 10. Clock court, 4-flue chimney stack plinth. Yellow Guiting stone? replacement in Bath stone offset course.



Plate 11. Base Court. Buttery door. Reigate stone survival in inner arch.



Plate 12. Base Court, south range.
1st floor window of Wheatley
Limestone.

Plate 13. Clock Court. Tile levelling
course below Wheatley Limestone
string course.





Plate 14. Base Court clock dial. Welsh Cambrian slate.



Plate 15. Reduction spots in slate. Detail of Plate 14.



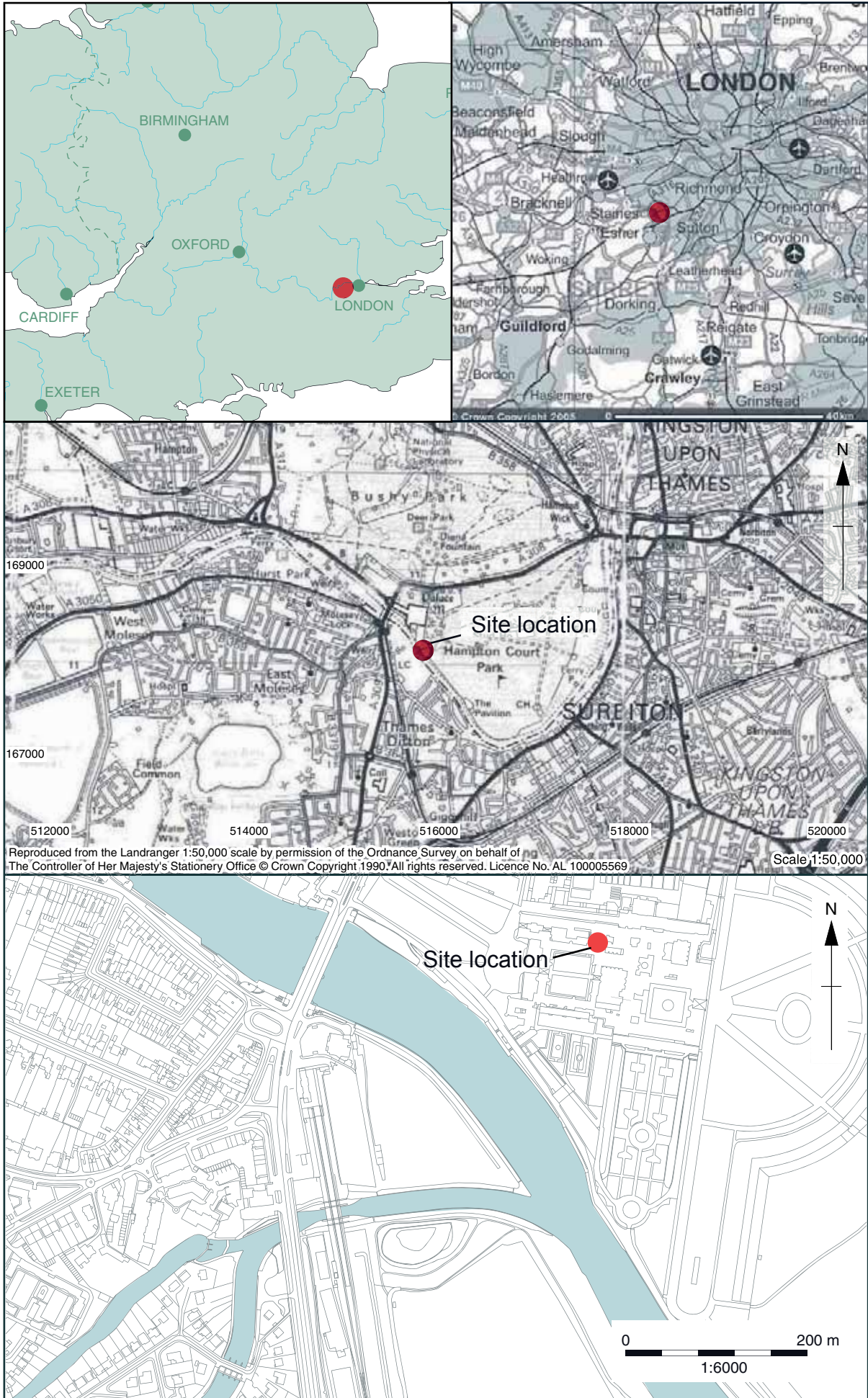


Figure 1: Site location

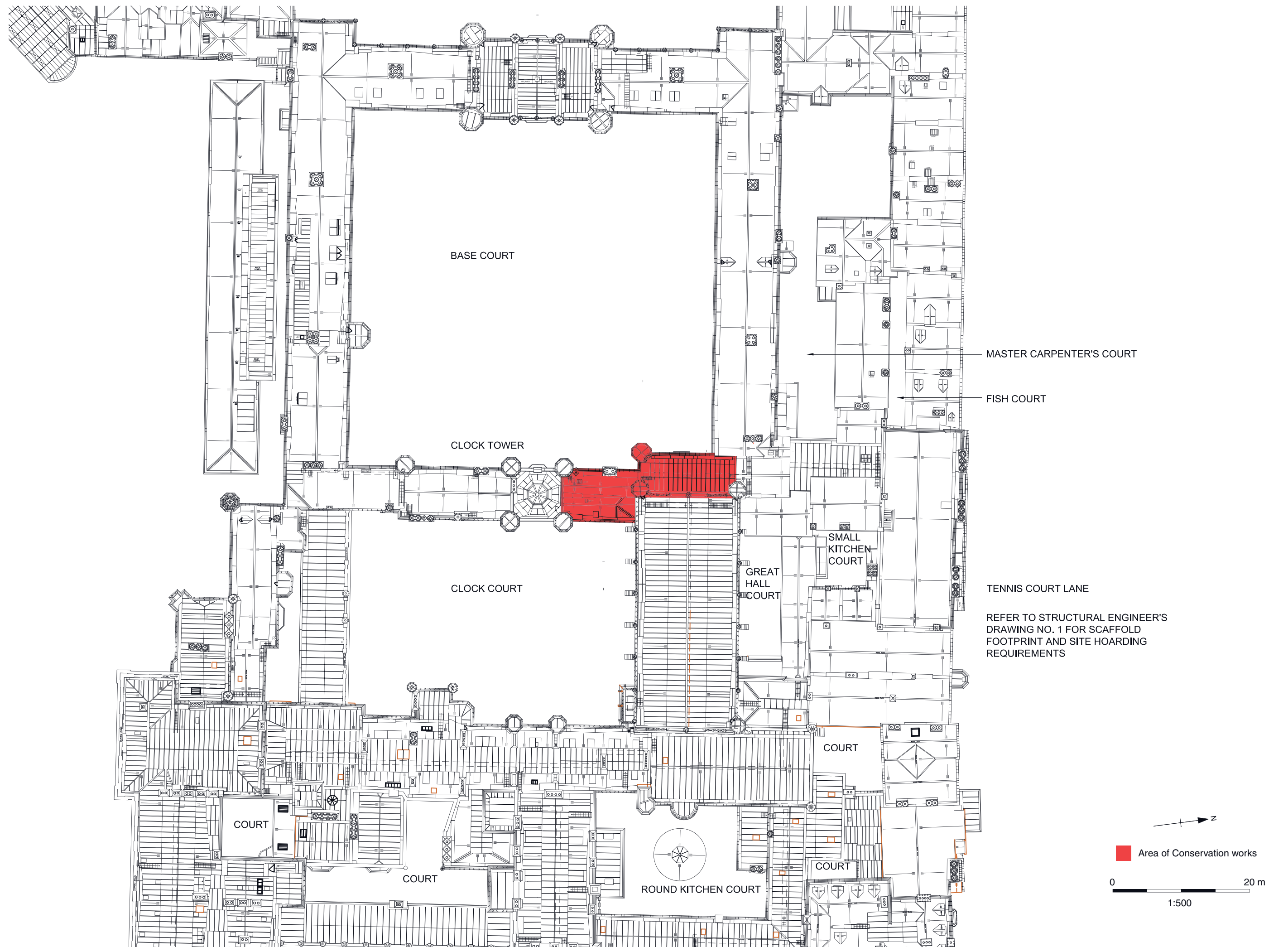


Figure 2: Hampton Court Palace, Base Court V, Plan of Hampton Court Palace showing area of conservation works

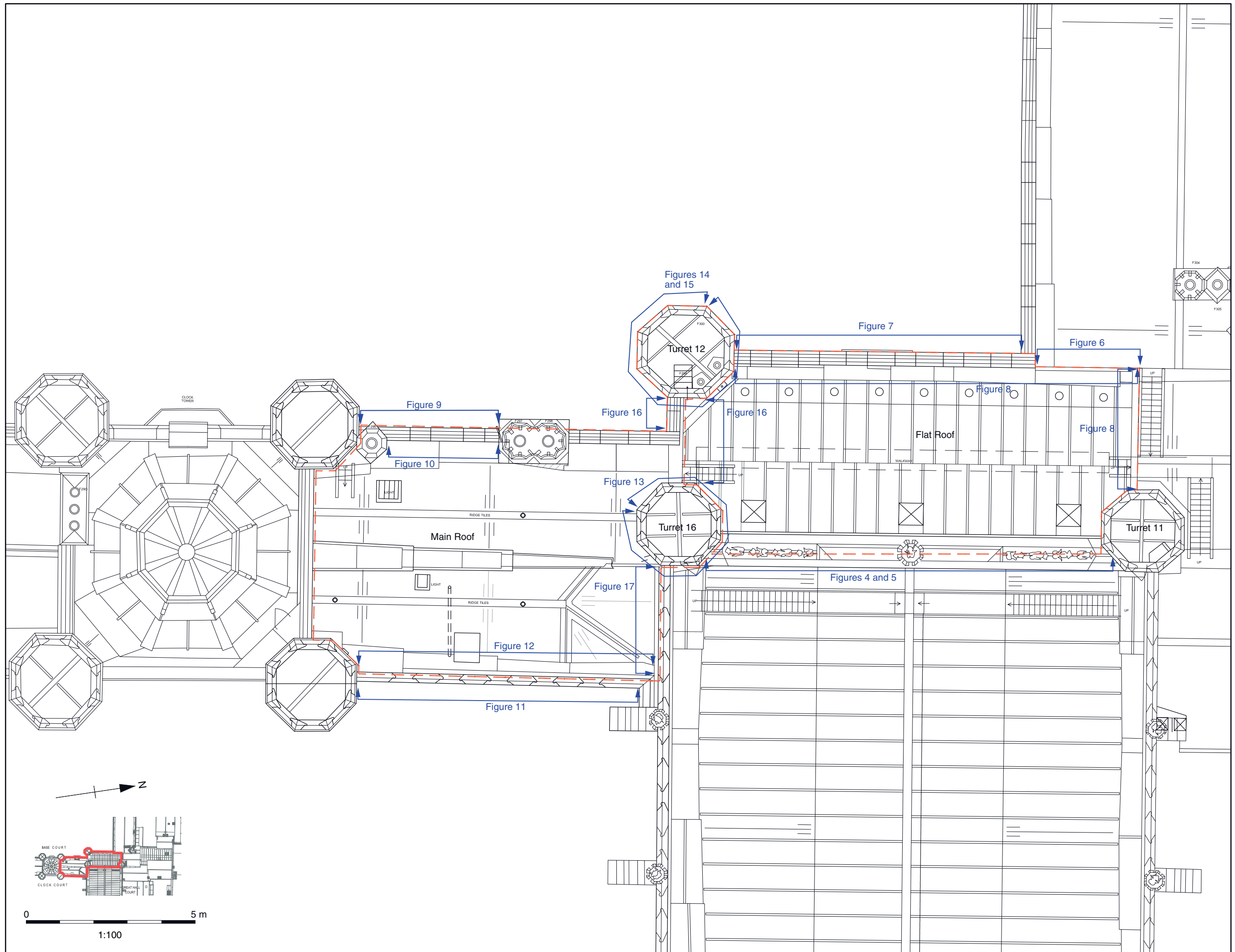
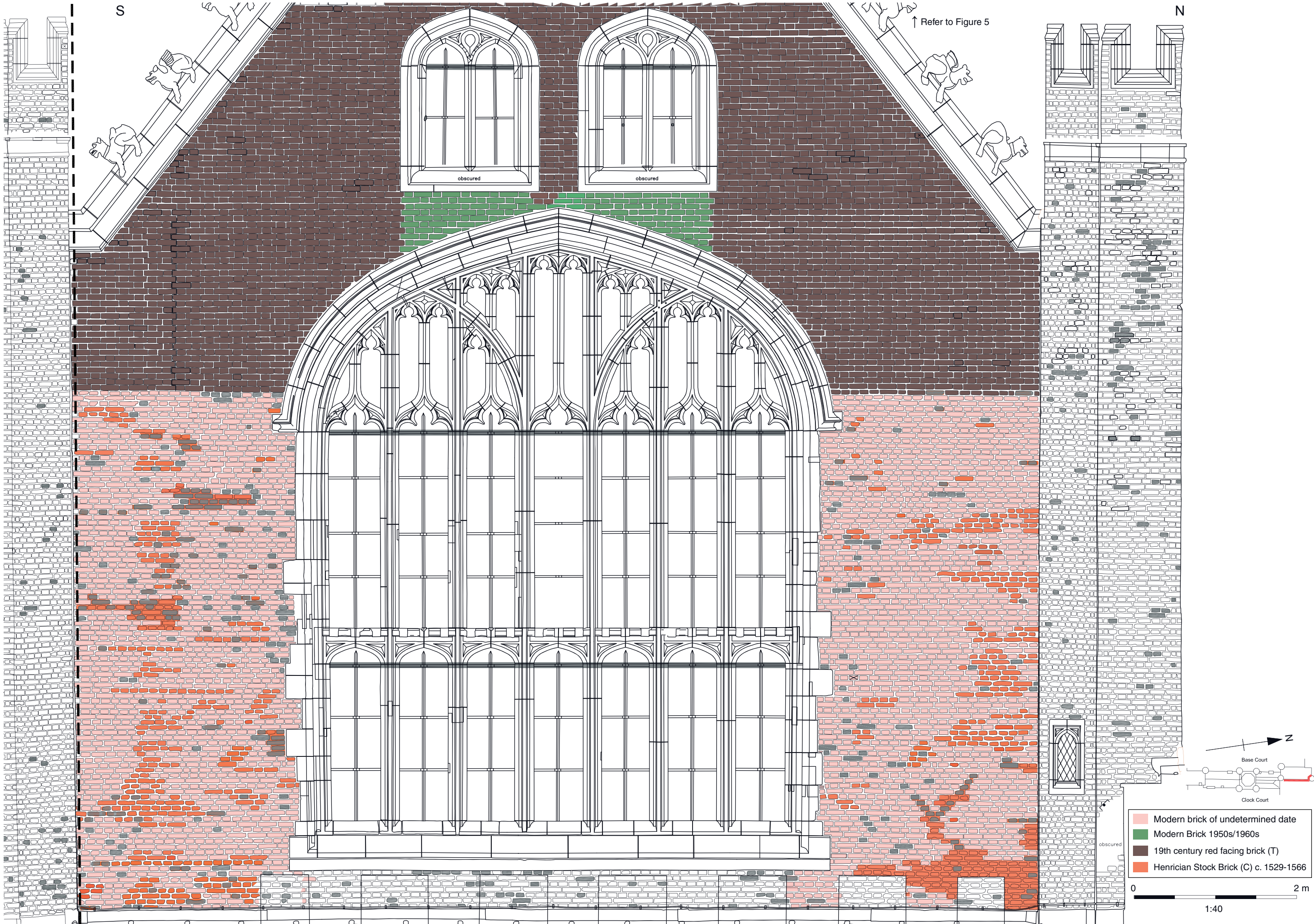


Figure 3: Hampton Court Palace, Base Court V, Plan of area of conservation works



- Modern brick of undetermined date
- Modern Brick 1950s/1960s
- 19th century red facing brick (T)
- Henrician Stock Brick (C) c. 1529-1566

0 2 m
1:40

Figure 4: Hampton Court Palace, Base Court V, Great Hall West facing elevation - Part 1

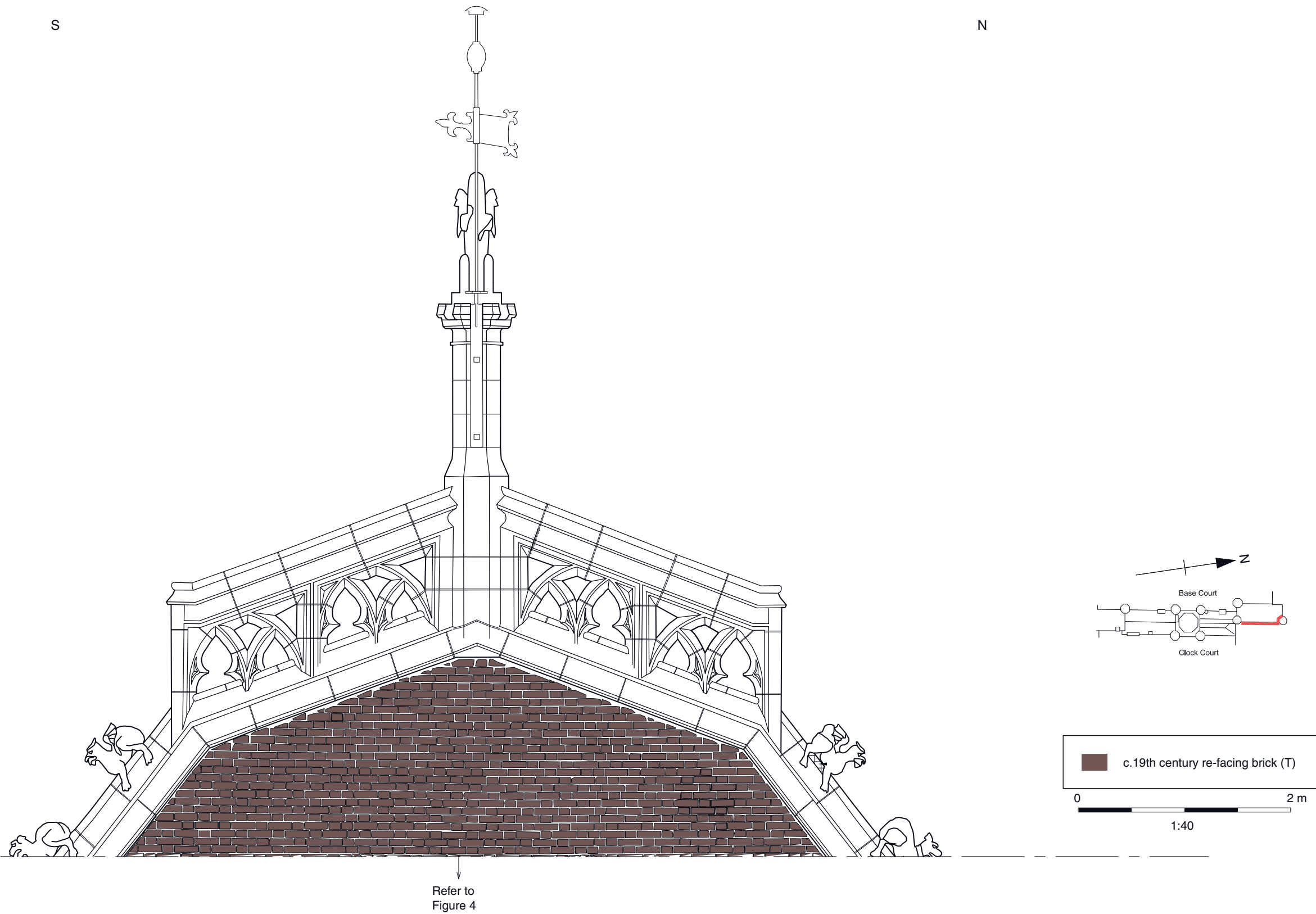
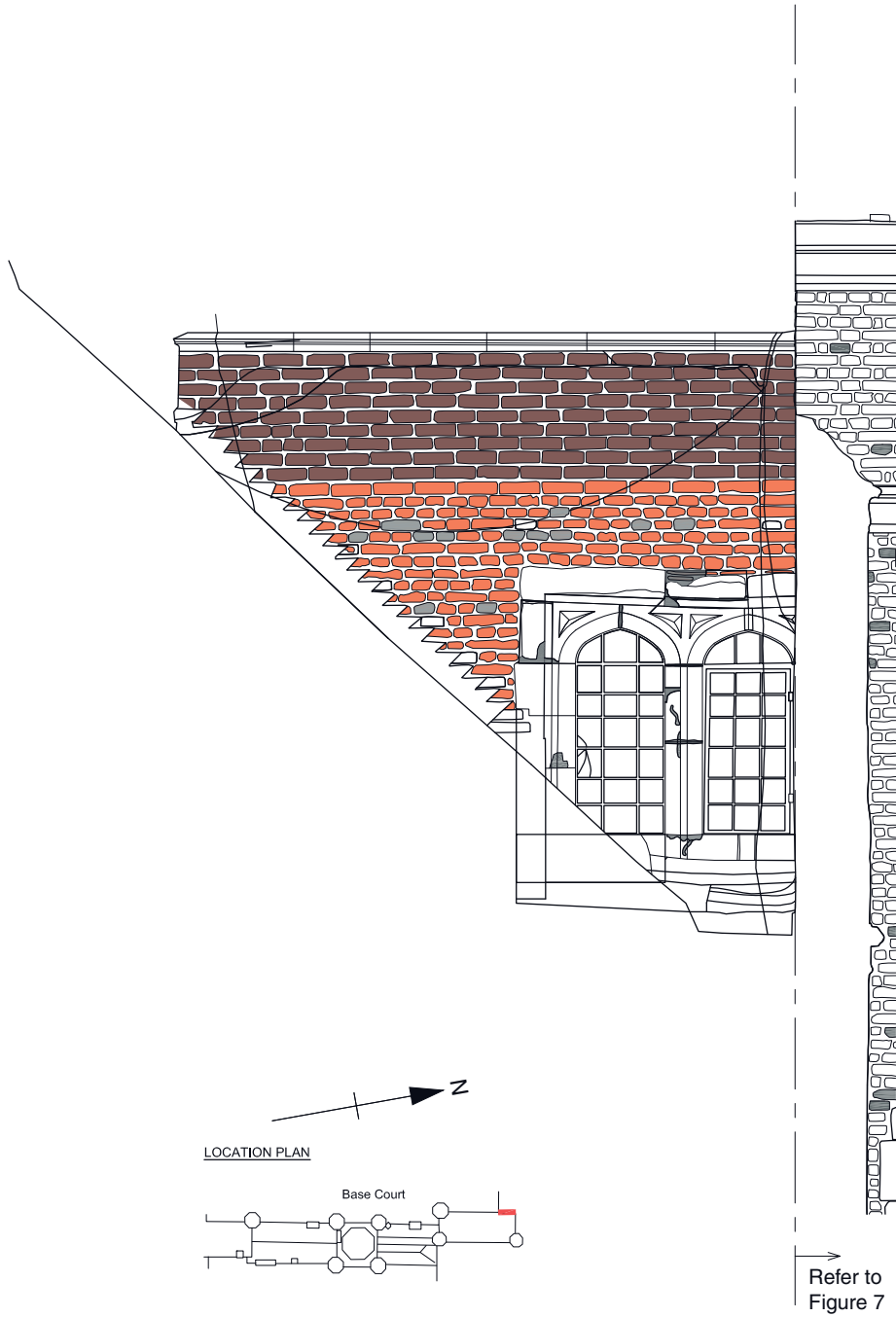


Figure 5: Hampton Court Palace, Base Court V, Great Hall West facing elevation - part 2

S

N



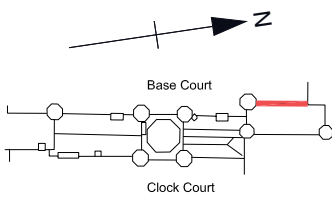
Refer to Figure 7

Figure 6: Hampton Court Palace, Base Court V, West Facing Elevation of Base Court - Part 1



Refer to Figure 9

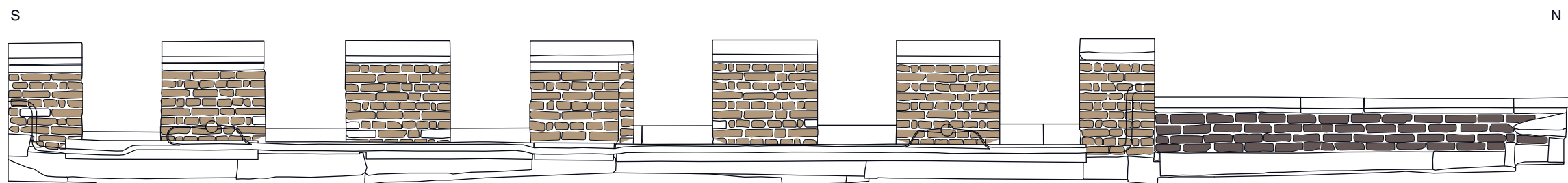
- Henrician stock brick (C)
- Reused Tudor stock brick
- Tudor stock brick 19th century repair
- Wren stock brick (I)
- Late 17th century stock brick (E)
- 19th century re-facing brick (T)
- 19th- 20th century stock brick (V)



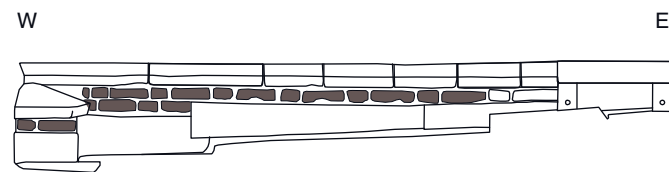
0 2 m

1:40

Figure 7: Hampton Court Palace, Base Court V, Buttery West Facing Elevation, Base Court – Part 2



East Elevation Internal Parapet



South Elevation Internal Parapet

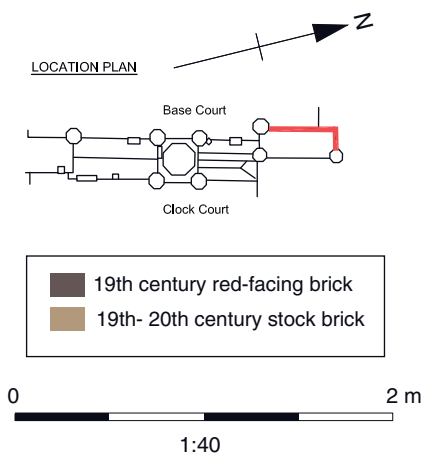










Figure 8: Hampton Court Palace, Base Court V, Buttery Internal Parapet Elevations



 Late 17th century stock brick (E)	 Wren stock brick (I)
 Pre Wolsey and Wolsey stock brick (A) and 19th century brick (T)	 19th - 20th century stock brick (V)
 c.19th century re-facing brick (T)	 Mixture of Late 17th century brick with 19th century rough stock brick repair
 Modern brick of undetermined date	 Miscellaneous reused bricks

0 2 m
1:50

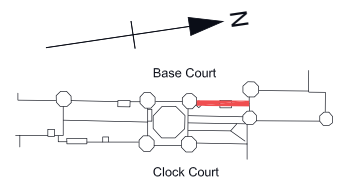


Figure 9: Hampton Court Palace, Base Court V, West Facing Elevation of Base Court – Part 3

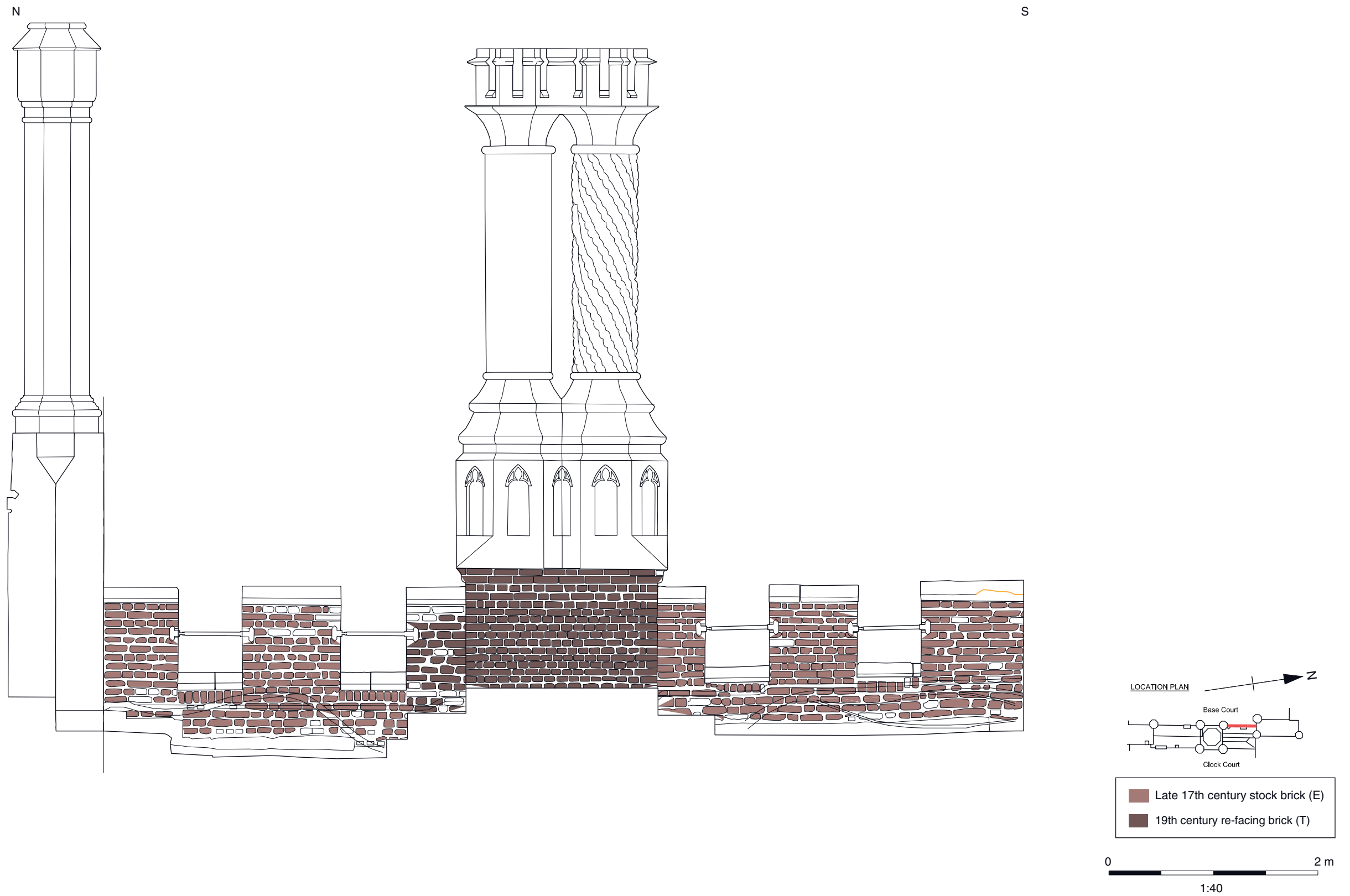
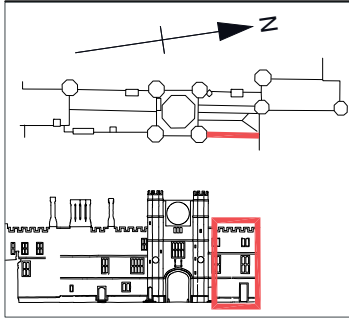


Figure 10: Hampton Court Palace, Base Court V, West Facing Elevation – Part 3, Parapet Internal Elevation



- Pre Wolsey and Wolsey stock brick (A)
- 16th - 17th century stock brick (E)
- Modern brick of undetermined date
- 19th century re-facing brick (T)
- Possible blocking
- Painted diaper work



0 2 m
1:40

Figure 11: Hampton Court Palace, Base Court V, East Facing Elevation of Clock Court

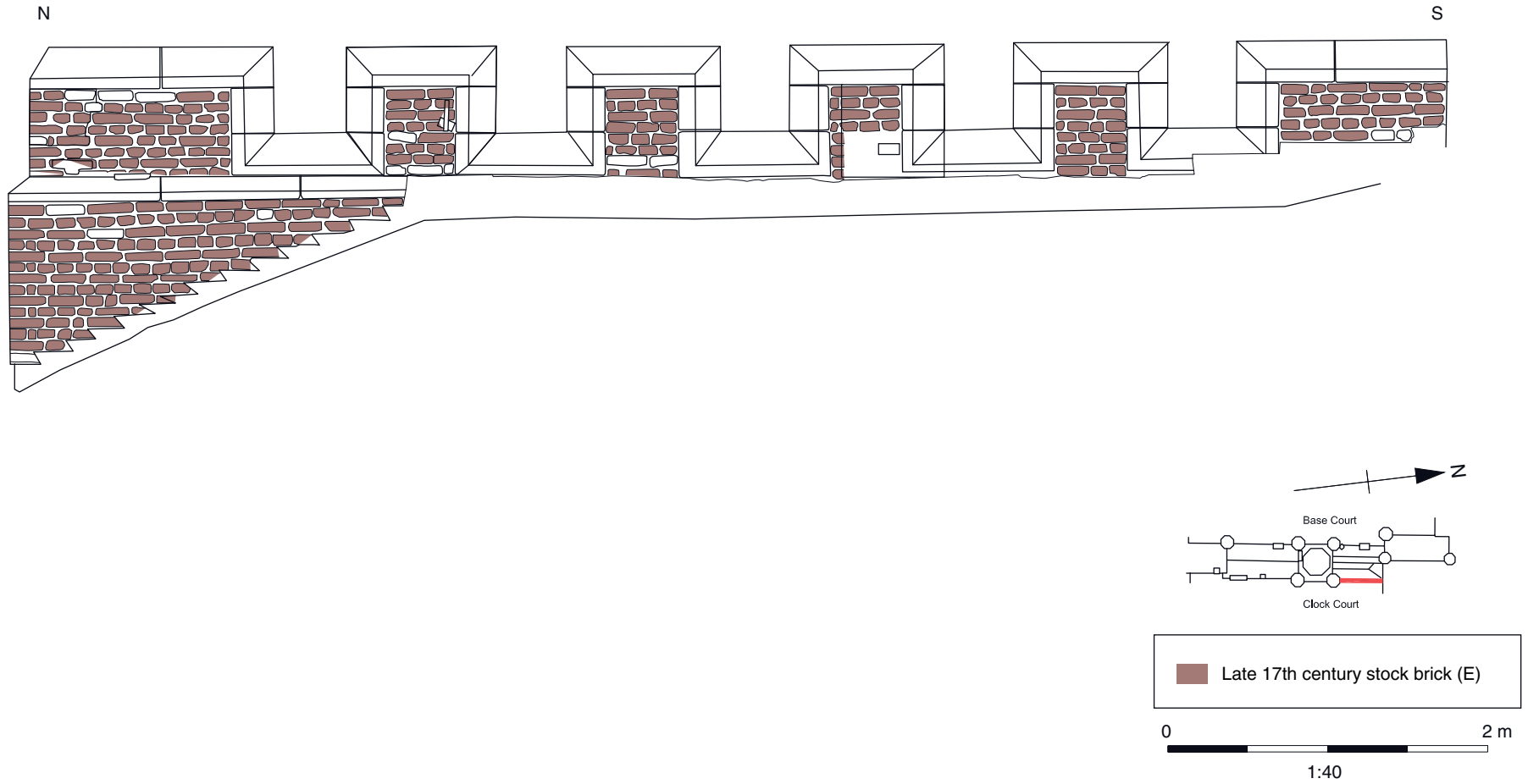


Figure 12: Hampton Court Palace, Base Court V, East Facing Elevation of Clock Court, Parapet Internal Elevation

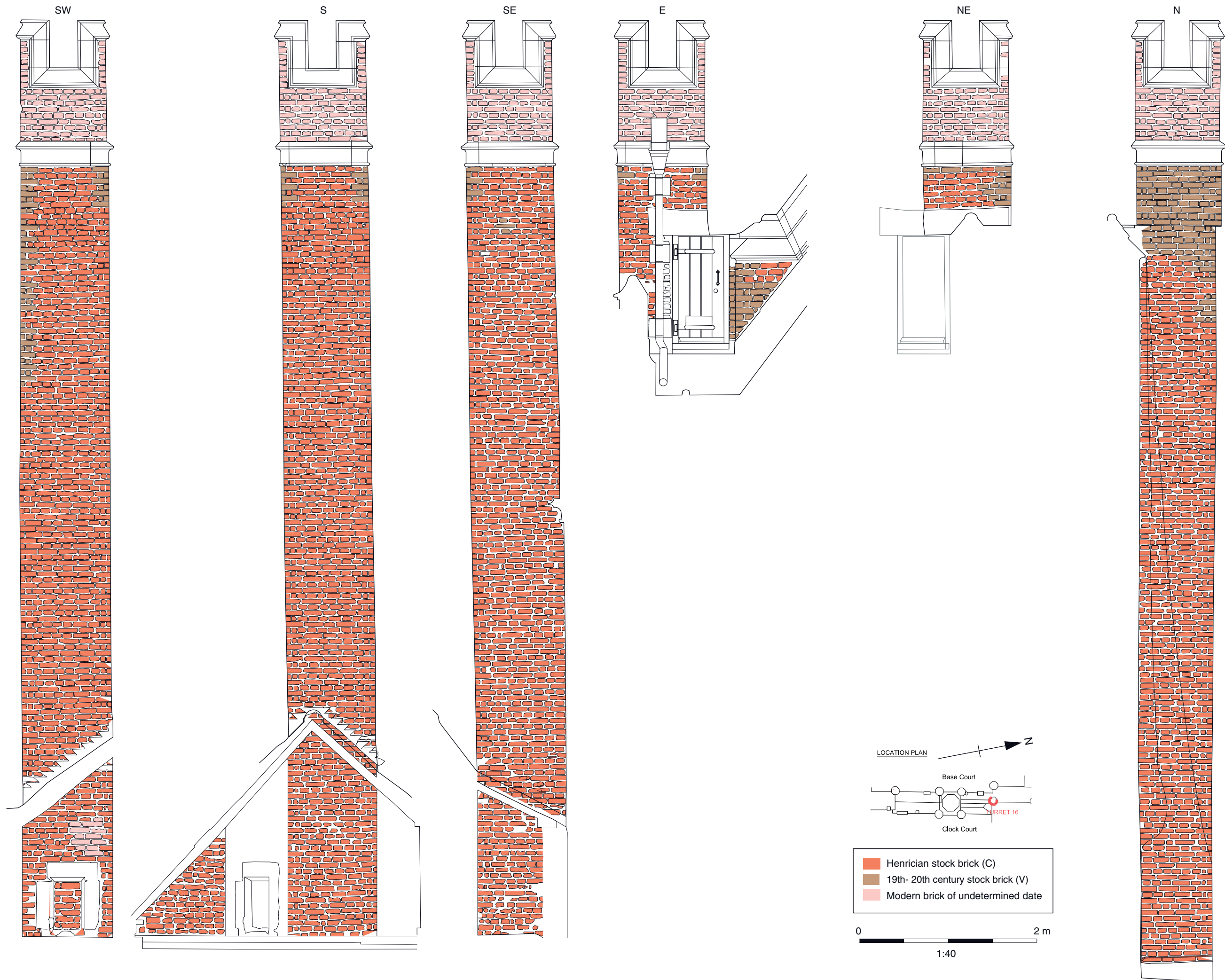


Figure 13: Hampton Court Palace, Base Court V, Turret 16 Elevations



N

NW

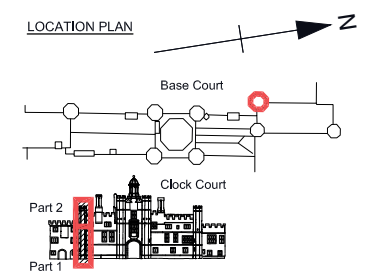
W

SW

S

SE

LOCATION PLAN



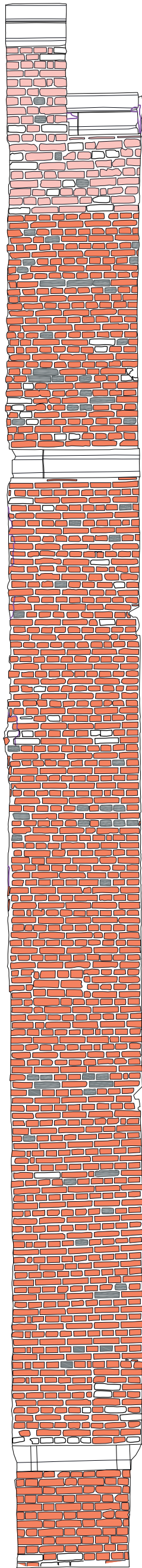
- Henrician stock brick (C)
- Wren stock brick (I)
- Modern brick of undetermined date



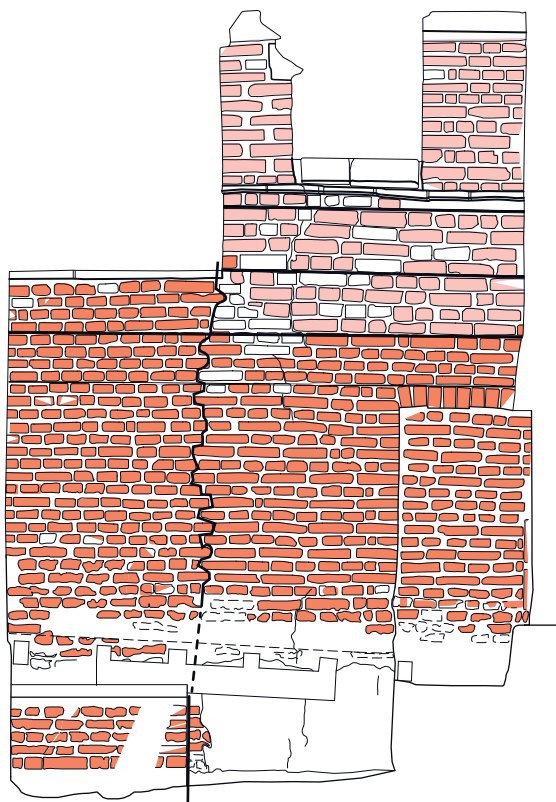
Figure 14: Hampton Court Palace, Base Court V, Turret 12 Elevations – Part 1



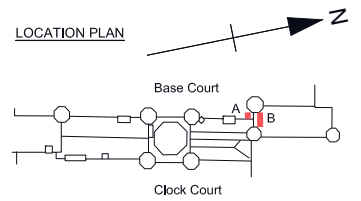
Figure 15: Hampton Court Palace, Base Court V, Turret 12 Elevations – Part 2



A



B



Modern brick of undetermined date
Henrician stock brick



Figure 16: Hampton Court Palace, Base Court V, Buttery Return Wall Elevations



- Modern brick of undetermined date
- c.19th century red facing brick (T)
- Henrician Stock Brick (C)
- Tile
- Micellaneous reused bricks
- Painted diaper work

0 2 m
1:40

Figure 17: Hampton Court Palace, Base Court V, Elevation T

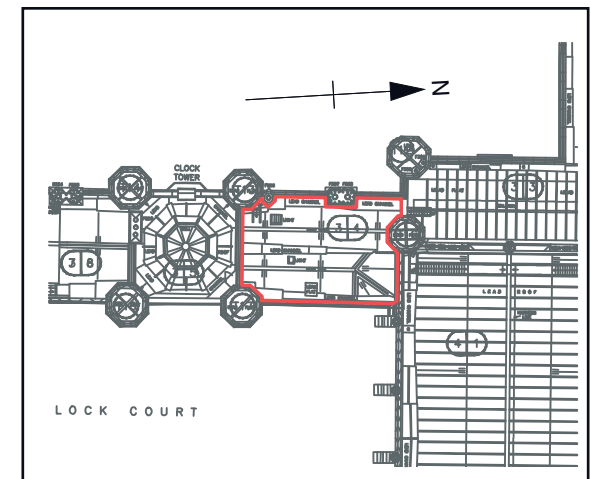
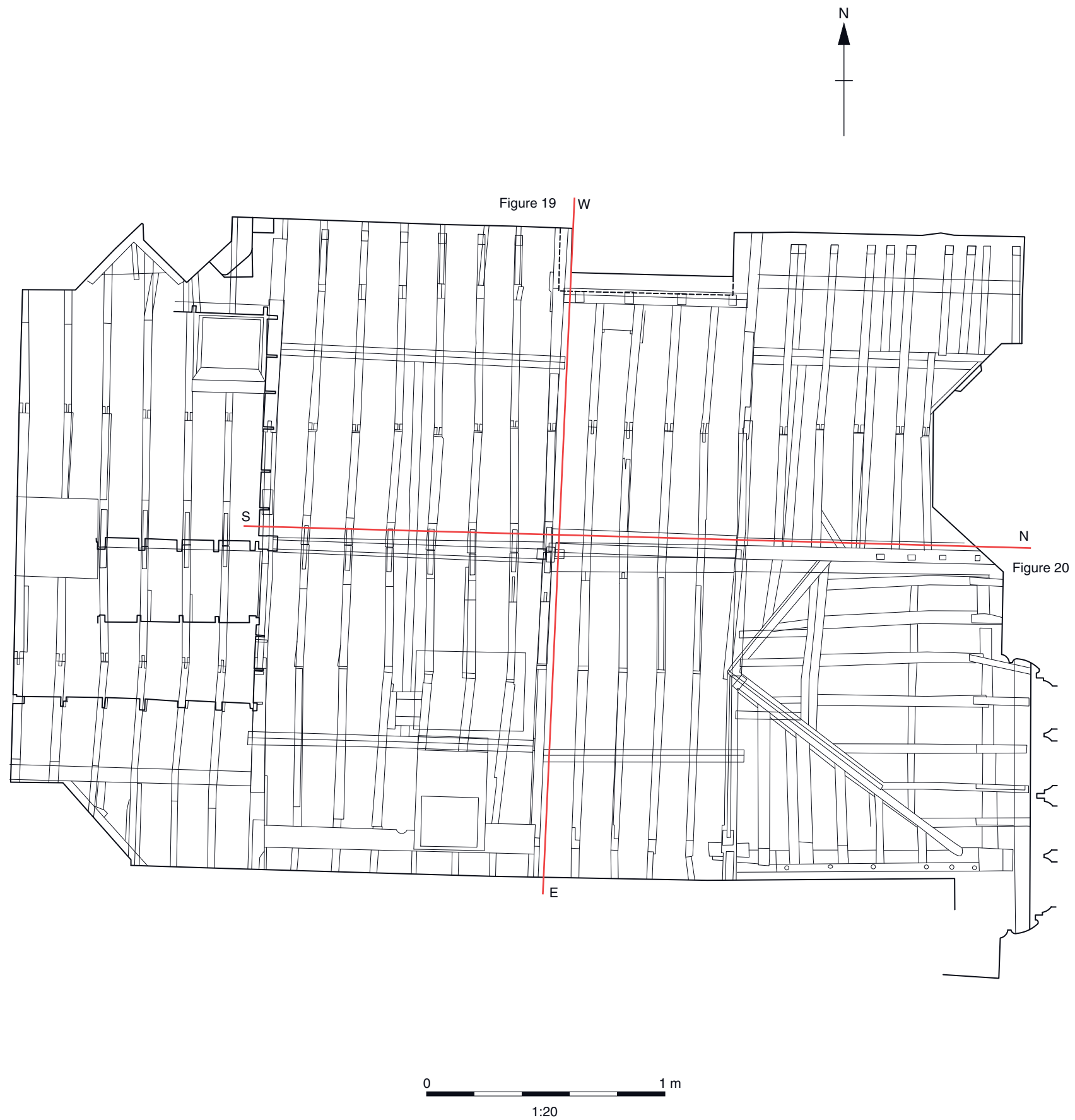


Figure 18: Hampton Court Palace, Base Court V, Plan on main roof

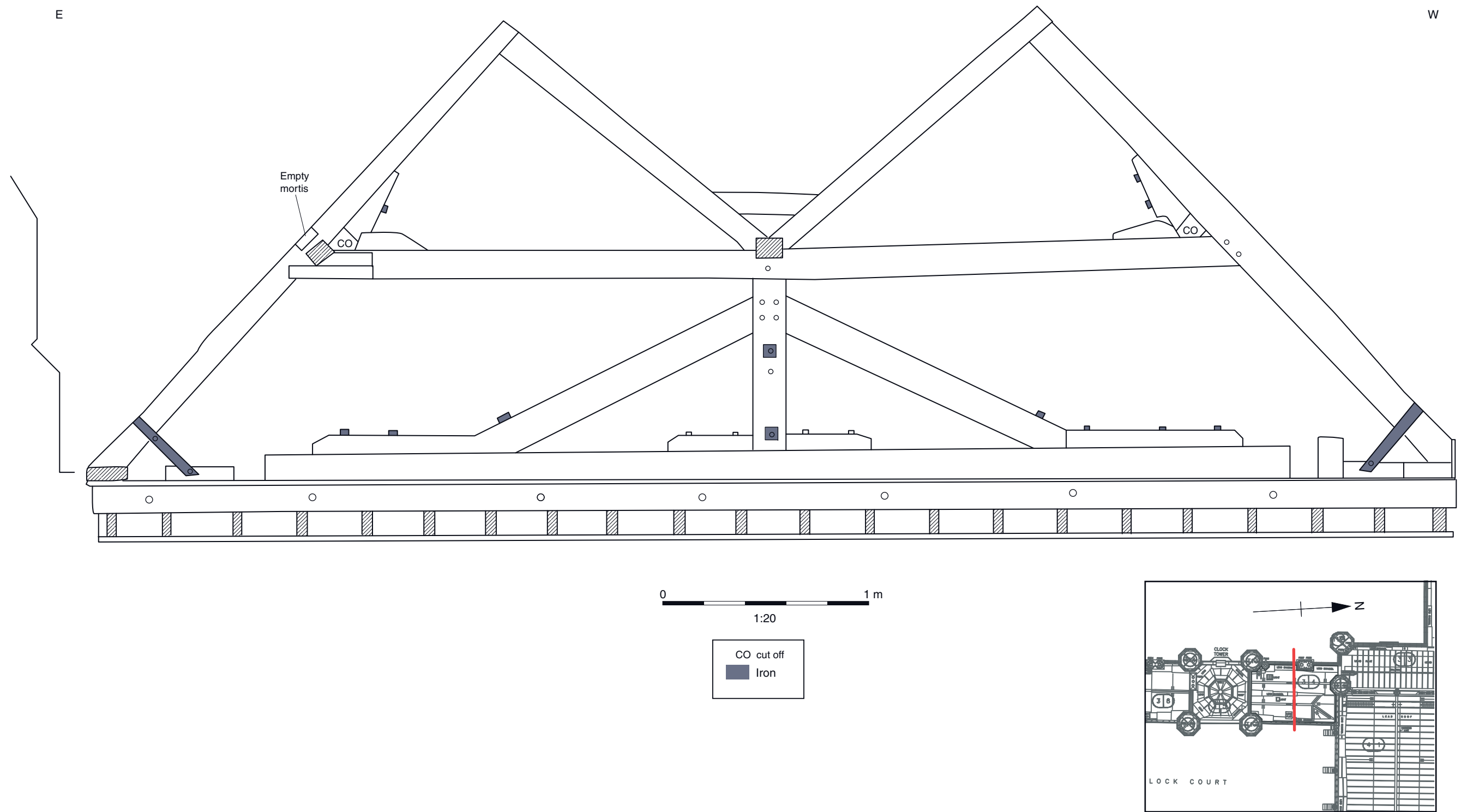


Figure 19: Hampton Court Palace, Base Court V, Section through the Main Roof showing north face of Truss 2

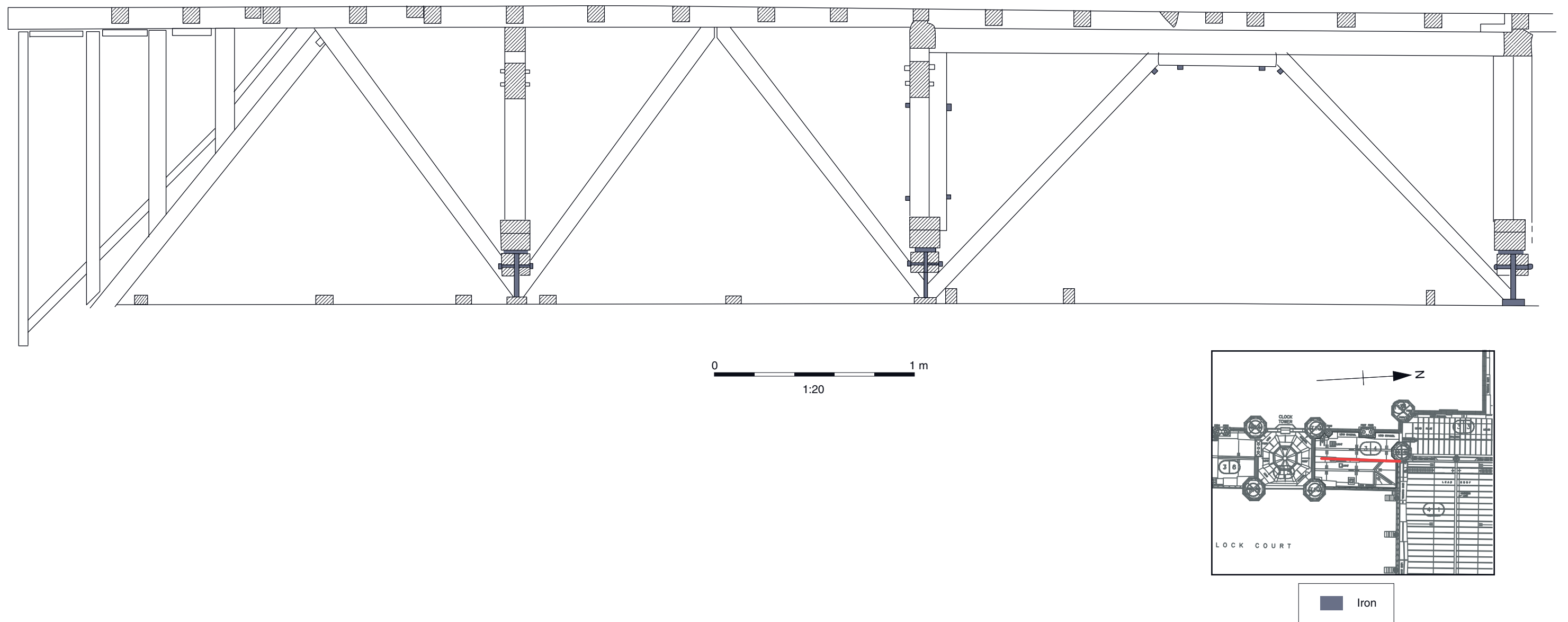
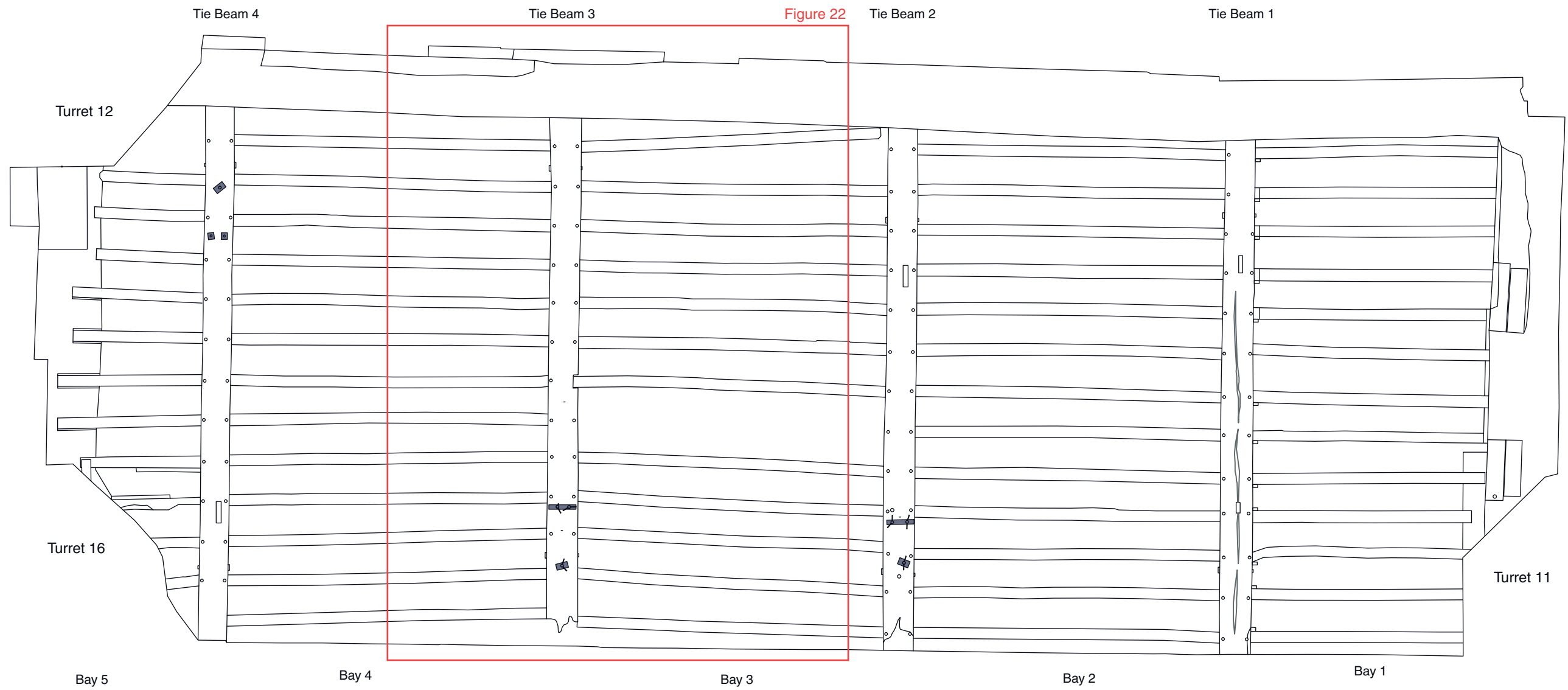


Figure 20: Hampton Court Palace, Base Court V, Section through the valley of the Main Roof, looking east



The Great Hall

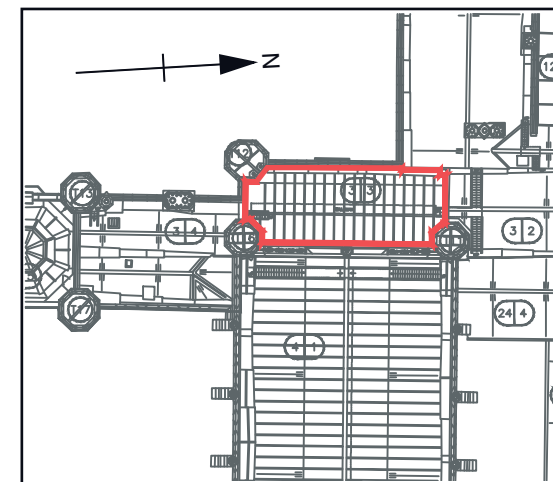
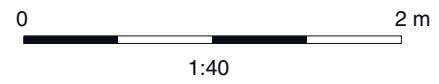


Figure 21: Hampton Court Palace, Base Court V, Plan of the Flat Roof

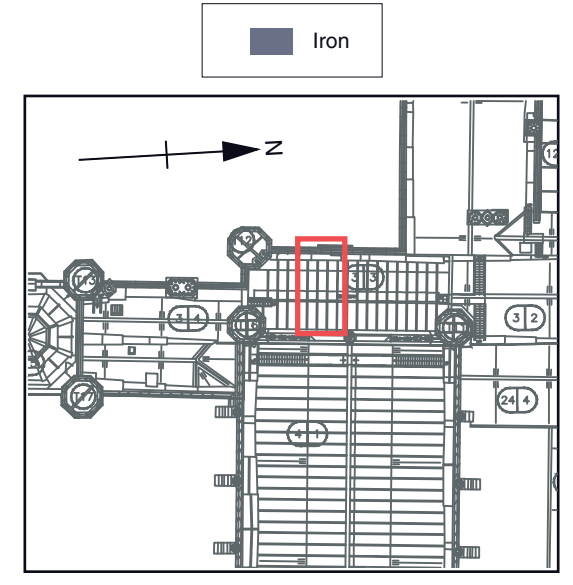
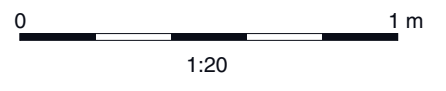
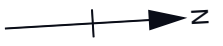
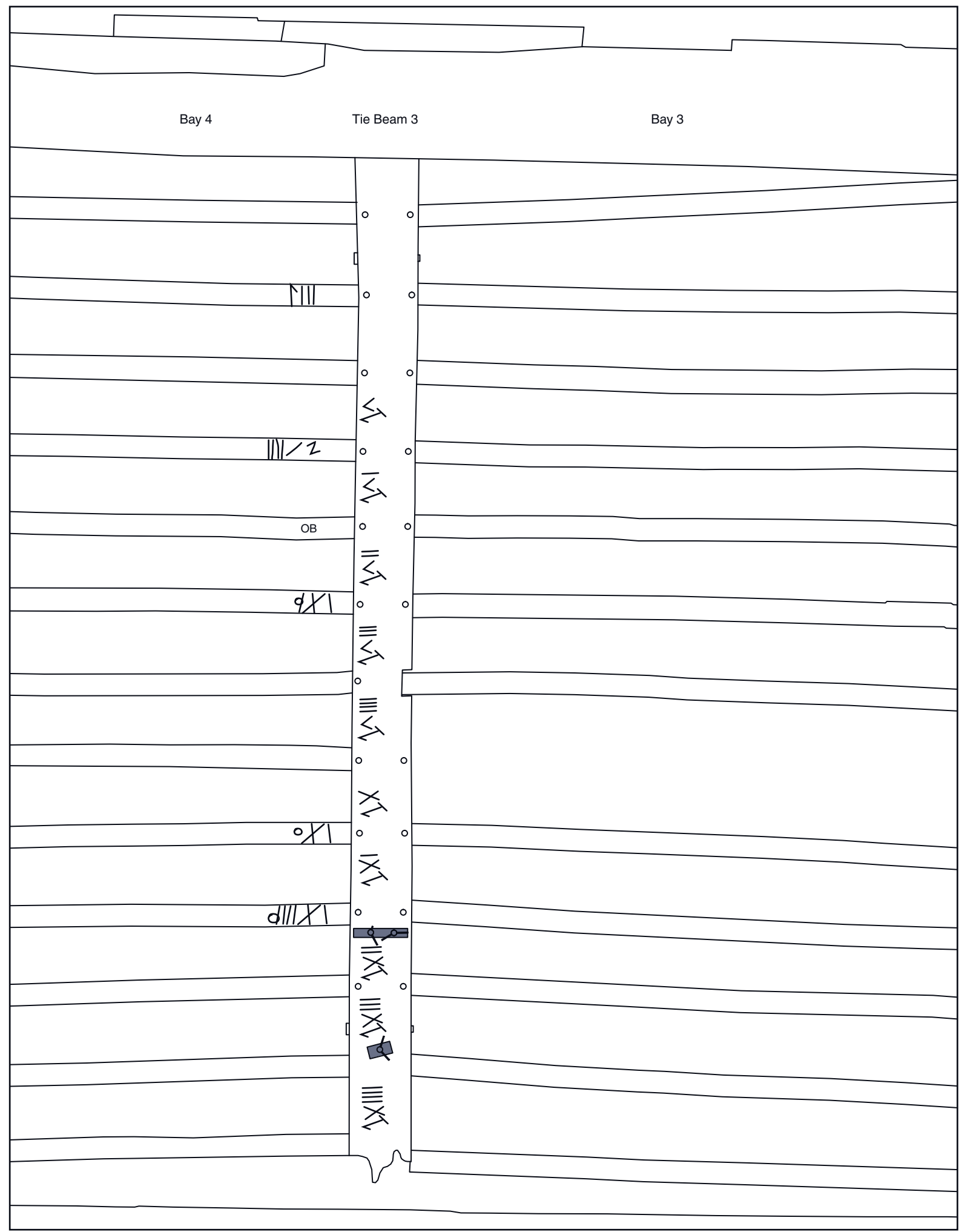
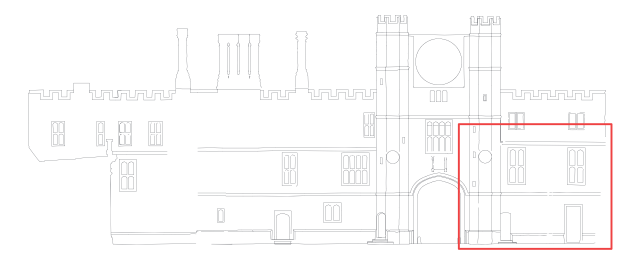
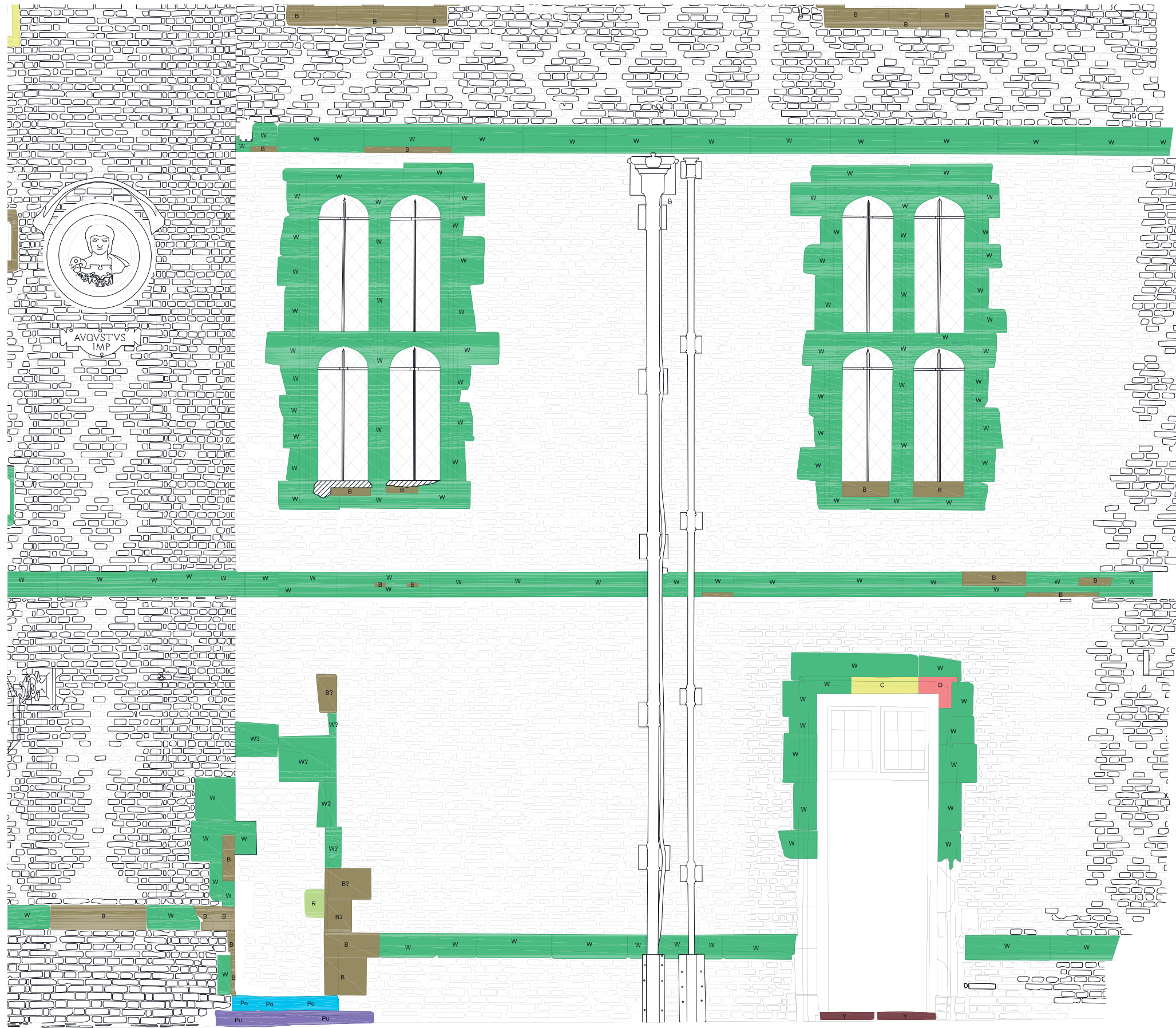


Figure 22: Hampton Court Palace, Base Court V, Detail of Truss 2 of the Flat Roof, showing carpenter's marks (those on Tie Beam appear on the North face)

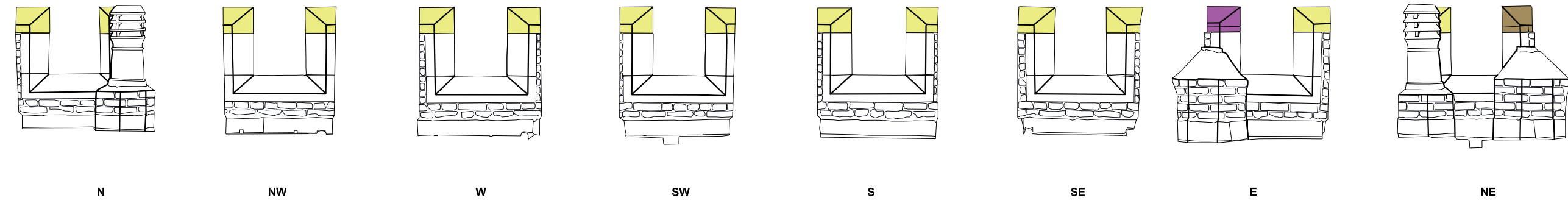


Stone Typology Key

B	Great Oolite Limestone (Bath Stone)
Be	Beer Stone
C	Caen Stone
Gr	Granite
Lc	Lincolnshire Limestone (Clipsham)
Lw	Lincolnshire Limestone (Wheldon)
Po	Portland Stone
Pu	Purbeck Limestone
SL	Welsh Cambrian Slate
R	Reigate Stone
U	Unidentified Stones
W	Wheatley Limestone
Y	Coal measures sandstone (York Stone)
///	Cement render & plastic repairs
G	Guiting Stone
?	Uncertain identifications
■	Doubling

0 2 m
1:40

Figure 24: Hampton Court Palace, Base Court V, Lithographies of the East Facing Elevation of Clock Court



TURRET 12- INTERNAL ELEVATIONS

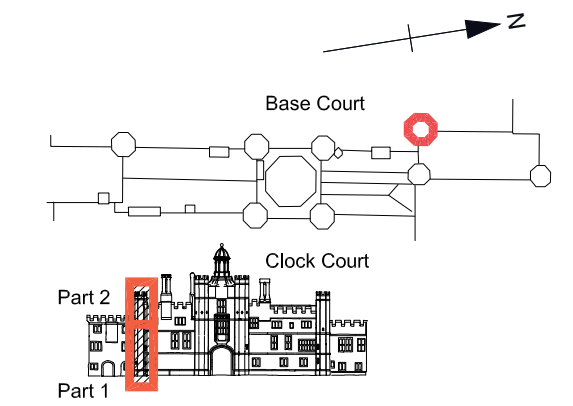
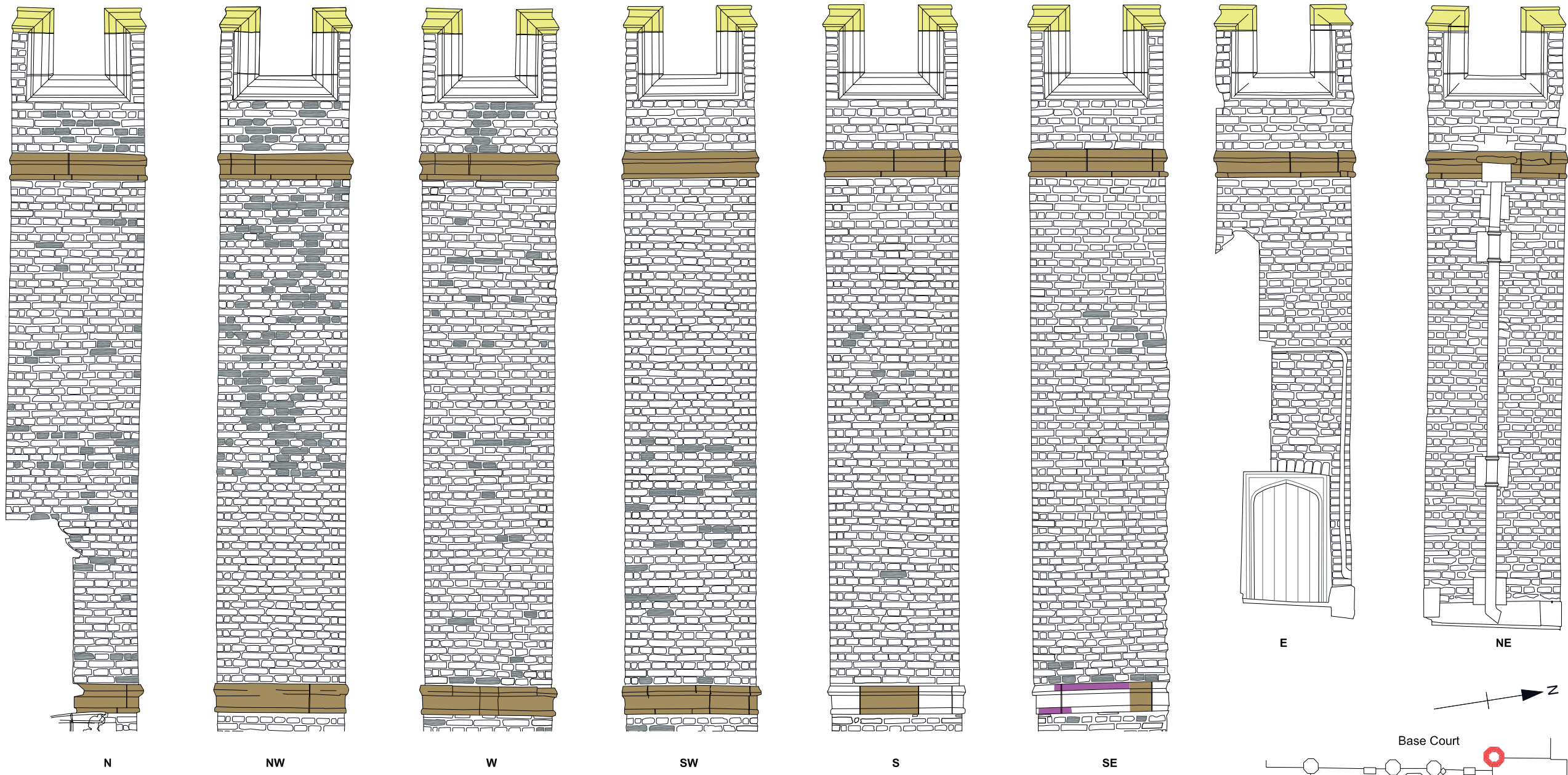


Figure 25: Hampton Court Palace, Base Court V, Lithographies of Turret 12



Plate 1: Base Court area of conservation, looking north east



Plate 2: West Facing Elevation of the Great Hall, looking east



Plate 3: Detail of the West Facing Elevation of the Great Hall, looking north east



Plate 4: Base Court – West Facing Elevation Part 1, looking north east



Plate 5: West Facing Elevation of the Buttery, looking east



Plate 6: View of parapet of the Buttery, looking east



Plate 7: West facing Elevation Part 3, Base Court, looking east

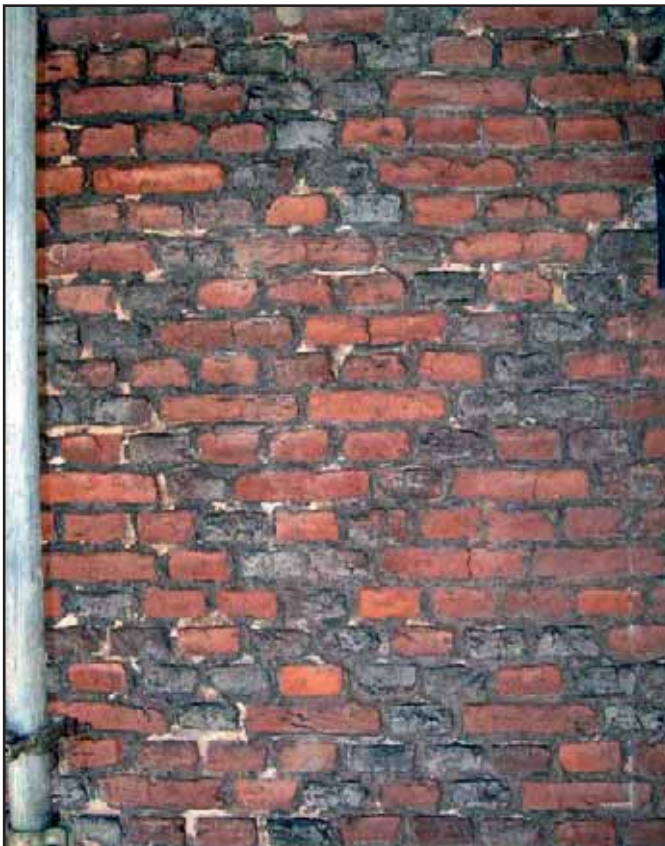


Plate 8: Detail of diaper work on West facing Elevation Part 3, Base Court



Plate 9: Internal parapet and chimney stack of West facing Elevation Part 3, Base Court, looking south west



Plate 10: East Facing Elevation of Clock Court



Plate 11: Detail of brickwork on East Facing Elevation of Clock Court



Plate 12: Parapet of Turret 16, looking north west

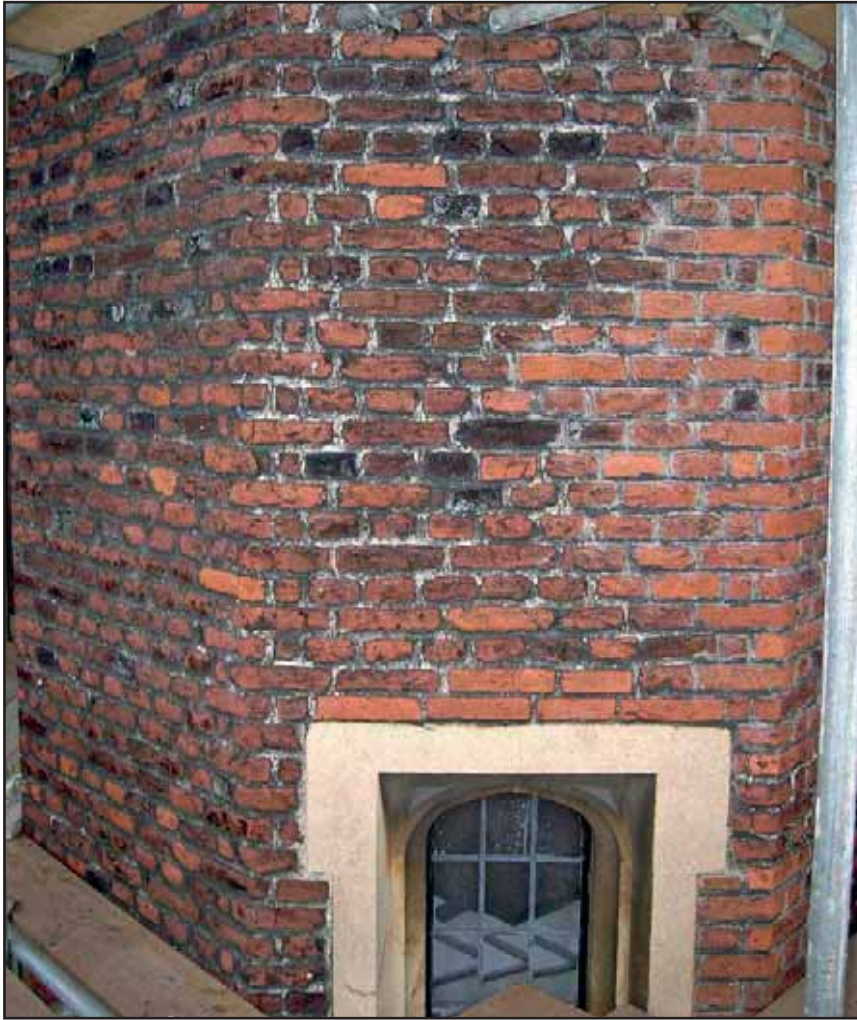


Plate 13: Detail of Turret 12, looking north east



Plate 14: Turret 12 (left) and the Buttery return wall (right), looking north

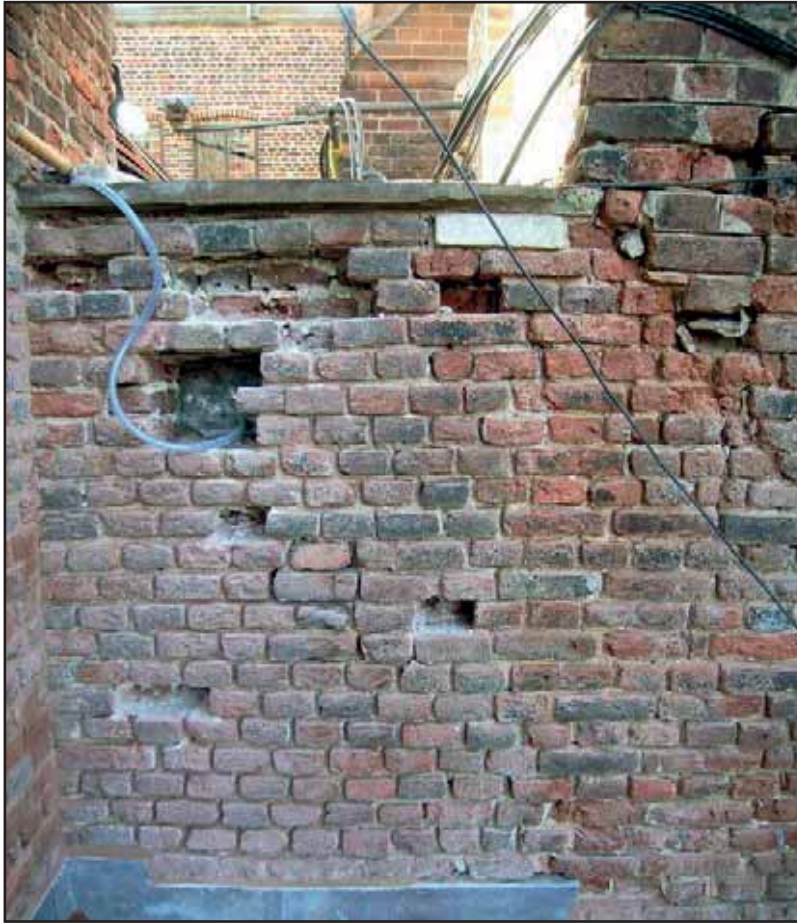


Plate 15: Detail of Buttery Return Wall, looking south



Plate 16: Detail of Buttery Return Wall, looking south



Plate 17: Buttery Return Wall, looking north



Plate 18: Buttery Return Wall, looking north west



Plate 19: Buttery Return Wall showing plaster and impression of skirting on north face, looking south west



Plate 20: Buttery Return Wall showing plaster and impression of skirting on north face, looking south east

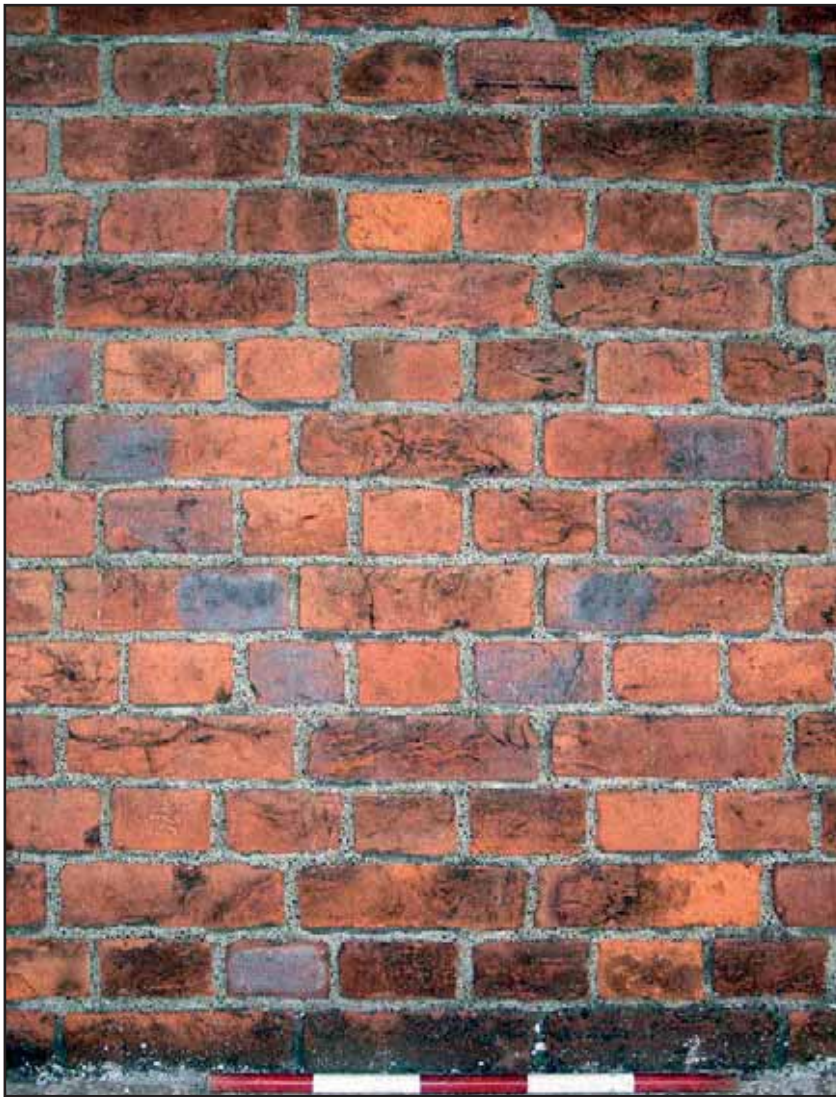


Plate 21: Detail of Elevation T



Plate 22: The Main Roof, looking south east



Plate 23: The exposed timbers of the Main Roof, looking south



Plate 24: The south face of Truss 1 in the Main Roof, looking north east



Plate 25: Common rafters of Bay 2 of the east side of the Main Roof, looking south



Plate 26: Common rafters of Bay 2 of the west side of the Main Roof, looking north



Plate 27: View from above of the Upper and Lower structures of the Flat Roof



Plate 28: The Upper and Lower structures of the Flat Roof, looking south east



Plate 29: Carpenter's marks on the south side of Tie Beam 3 and its joists, the Flat Roof, looking north



Plate 30: Carpenter's marks on the south side of Tie Beam 3 and its joists, the Flat Roof, looking north



Plate 31: Carpenter's marks on the south side of Tie Beam 3 and its joists, the Flat Roof, looking north



Plate 32: The Upper and Lower structures of the Flat Roof, looking east



Plate 33: The south end of the Flat Roof where it meets Turret 16, from above



Plate 34: Baltic Marks on the east and under side of joist in Bay 2 of the Upper Structure of the Flat Roof



Plate 35: Baltic Marks on the east and under side of joist in Bay 2 of the Upper Structure of the Flat Roof



Plate 36: Doorway of Turret 12, viewed from the interior, looking east



Head Office/Registered Office/ OA South

Janus House
Osney Mead
Oxford OX2 0ES

t: +44 (0) 1865 263 800
f: +44 (0) 1865 793 496
e: info@oxfordarchaeology.com
w: <http://oxfordarchaeology.com>

OA North

Mill 3
Moor Lane
Lancaster LA1 1QD

t: +44 (0) 1524 541 000
f: +44 (0) 1524 848 606
e: [oanorth@oxfordarchaeology.com](mailto: oanorth@oxfordarchaeology.com)
w: <http://oxfordarchaeology.com>

OA East

15 Trafalgar Way
Bar Hill
Cambridgeshire
CB23 8SQ

t: +44 (0) 1223 850500
e: [oaeast@oxfordarchaeology.com](mailto: oaeast@oxfordarchaeology.com)
w: <http://oxfordarchaeology.com>



Director: Gill Hey, BA PhD FSA MIFA
*Oxford Archaeology Ltd is a
Private Limited Company, N^o: 1618597
and a Registered Charity, N^o: 285627*