

The Keep Tregantle Fort Antony Cornwall



Building Recording and Investigation



April 2008



Client: Defence Estates

Issue N^o: 2nd Draft
OA Job N^o: 3523
NGR: SX 3862 5332

Client Name: Defence Estates
Document Title: The Keep, Tregantle Fort, Antony, Cornwall
Document Type: Building Recording and Investigation
Issue Number: Draft

National Grid Reference: NGR SX 3862 5332

OA Job Number: 3523
Site code: ANTREG 07
Invoice code: ANTREGBS

Archive location: Defence Estates

Prepared by: James Mumford
Position: Project Officer
Date: 25 March 2008

Checked by: Jonathan Gill
Position: Senior Project Manager (Historic Buildings)
Date: 25 March 2008

Approved by: Julian Munby Signed

Position: Head of Buildings Archaeology

Date: 25 March 2008

Document file location: Server1/Buildings/Projects ongoing/Tregantle Keep/Report/Tregantle.doc

Graphics file location: \\Servergo\invoice codes a thru h\A_invoice codes\ANTREGBS

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 Archaeological Unit Ltd 2008

Oxford Archaeology

Janus House

Osney Mead

Oxford OX2 0ES

t: (0044) 1865 263800

f: (0044) 1865 793496

e: info@oxfordarch.co.uk

w: www.oxfordarch.co.uk

Oxford Archaeological Unit Limited is a Registered Charity No: 285627

The Keep, Tregantle Fort, Antony, Cornwall***HISTORIC BUILDING RECORDING AND INVESTIGATION*****CONTENTS**

SUMMARY	1
1 INTRODUCTION	2
1.1 BACKGROUND.....	2
1.2 AIMS AND OBJECTIVES	2
1.3 METHODOLOGY.....	3
2 HISTORICAL BACKGROUND	5
2.1 TREGANTLE FORT BRIEF HISTORY	5
3 TREGANTLE FORT GENERAL DESCRIPTION	5
4 DESCRIPTION OF KEEP	7
4.1 EXTERNAL DESCRIPTION	7
4.2 ROOF TOP DESCRIPTION.....	7
4.3 INTERNAL DESCRIPTION: GENERAL.....	8
4.4 FITTINGS AND FIXTURES	10
4.5 INTERNAL DESCRIPTION: WEST SIDE.....	15
4.6 INTERNAL DESCRIPTION: EAST SIDE.....	20
4.7 INNER COURTYARD	29
5 KEEP GALLERIES AND MAGAZINE STORES	29
5.1 DESCRIPTION OF GALLERIES AND LIGHTING PASSAGE.....	29
5.2 DESCRIPTION MAGAZINES AND CLEARING LOBBY.....	30
6 CONCLUSIONS OF THE SURVEY OF THE KEEP	31
7 THE SOUTH WEST CAPONIER	33
7.1 EXTERNAL DESCRIPTION.....	33
7.2 INTERNAL DESCRIPTION UPPER TIER	33
7.3 INTERNAL DESCRIPTION LOWER TIER	34
7.4 SOUTH-WEST CAPONIER CONCLUSION	35
8 THE NORTH-WEST DOUBLE CAPONIER	35
8.2 INTERNAL DESCRIPTION UPPER TIER	37
8.3 INTERNAL DESCRIPTION LOWER TIER	38
8.4 DOUBLE CAPONIER CONCLUSION.....	39
9 THE NORTH-EAST CAPONIER	40
9.1 INTRODUCTION.....	40
9.2 INTERNAL DESCRIPTION UPPER TIER	40
9.3 INTERNAL DESCRIPTION LOWER TIER	41
9.4 NORTH-EAST CAPONIER CONCLUSION	42
10 CONCLUSION	42
10.2 USE OF THE KEEP AND CAPONIERS.	42
10.3 FITTINGS	43
APPENDIX I <i>Bibliography</i>	45
APPENDIX II <i>'32pr Smooth Bore Breech Loading Gun' by David Moore</i>	47
APPENDIX III <i>Summary of Site Details</i>	48
APPENDIX IV <i>Glossary</i>	49

LIST OF FIGURES

- Figure 1 Site location
Figure 2 Site plan of fort, range and location of camps to the east of the fort.
Figure 3 Plan of fort showing areas of the survey.
Figure 4 Plan of Keep roof
Figure 5 Plan of ground floor of Keep
Figure 6 Plan of magazines
Figure 7 Plan of Keep galleries flanking moat and ditch
Figure 8 Plan of passage 19 from room 15 to roof top
Figure 9 Plan of South-west Caponier Upper Tier
Figure 10 Plan of South-west Caponier Lower Tier
Figure 11 Plan of North-west Double Caponier Upper Tier
Figure 12 Plan of North-west Double Caponier Lower Tier
Figure 13 Plan of North-east Caponier Upper Tier
Figure 14 Plan of North-east Caponier Lower Tier
Figure 15 The ground floor of the Keep in 1937
Figure 16 Two forms of Chimney pots on Keep roof
Figure 17 Layout of embrasures and windows in Keep
Figure 18 Iron shutters of embrasures
Figure 19 Window and frames of embrasures and loopholes
Figure 20 Window and frame above embrasure
Figure 21 Room 1 timber partition into toilets
Figure 22 Smaller of timber partitions
Figure 23 Larger of timber partitions
Figure 24 Door of timber partitions
Figure 25 Doorway frame into passage from passage B
Figure 26 Sliding doors from room 8 into room 9A
Figure 27 Panelled sash window in room 14
Figure 28 Right Keep door inside elevation
Figure 29 Upper window facing onto inner courtyard
Figure 30 Panelling of passageway from room 13 to room 17A
Figure 31 Door from doorways from inner courtyard to rooms 11, 12, 13, 14 and a later hatchway
Figure 32 Fireplaces
Figure 33 Fireplaces

LIST OF PLATES

- Plate 1: View from bridge into Keep showing counterscarp loopholes and trace of drop ditch.
Plate 2: Chimney in earth rampart of Keep roof.
Plate 3: Gun store in earth rampart of Keep roof.
Plate 4: The Worcestershire Regiment badge over the main entrance to Keep.
Plate 5: Weather vane on the Keep roof.
Plate 6: Brick arch ready stores behind embrasures on Keep roof.
Plate 7: Iron railing around the top of the inner courtyard.
Plate 8: Drawbridge gearing mechanism.
Plate 9: Officer Mess painted over doorway.
Plate 10: Toilet cubicles of room 1B.
Plate 11: Fireplace with the VR over crown on the cast iron surround.
Plate 12: Wood blocks on floor for rifles in rack.
Plate 13: Board on wall for bell pull system.
Plate 14: Doorway into room 8 from footbridge across ditch with the sockets in wall below.
Plate 15: Sliding doors between room 8 and room 9A.
Plate 16: Doorway between rooms 9A and 9B.
Plate 17: Door and window facing into passage B from room 10.
Plate 18: Window in room 12 opened into doorway into inner courtyard.

- Plate 19: Panel work surviving in arch of central passageway.
 Plate 20: Small cast fireplace and range with cast-iron sink to left in room 17B.
 Plate 21: Fireplace in room 18B.
 Plate 22: View along passageway (room 19) to blocked doorway onto Keep roof.
 Plate 23: View along galleries flanking Keep ditch.
 Plate 24: View of galleries facing along ditch with flanking loopholes.
 Plate 25: Entranceway into lighting passage of magazine.
 Plate 26: Entranceway into the No1 magazine showing tin covered doorframe and light recess above.
 Plate 27: Fitting for bell pull system along side fireplace.
 Plate 28: Wood cover over vent from store into passage.
 Plate 29: A ceramic vent in end of pipe from store into passage.
 Plate 30: The drawbridge and sallyport from the south-west caponier.
 Plate 31: Hinge of drawbridge protected by metal plate.
 Plate 32: Iron shutter of caponier embrasure, showing wood back, slit and brackets.
 Plate 33: View across drawbridge from passage to NW Double caponier up steps to Chemin de Ronde.
 Plate 34: Cast iron bracket of shelf in caponiers.
 Plate 35: Galvanized sign in upper tier of double caponier.
 Plate 36: Galvanized sign in Upper tier
 Plate 37: Galvanized sign in Lower tier
 Plate 38: Racer tracks and pivot for mounting the 32pdr SBBL in north-west caponier.
 Plate 39: Pivot lug and smaller racer track in north-east caponier.
 Plate 40: Pivot lug and repair to mounting in north-west caponier from the trails.
 Plate 41: External view of repair to damage in north-west caponier from the trails.
 Plate 42: Damage to the south-west drawbridge from the trails.
 Plate 43: Air vent in the top of loophole in lower tier of double caponier.
 Plate 44: Metal grill of caponier embrasure in place behind later blocking.
 Plate 45: Graffiti on wall next to fireplace in upper tier of north east caponier.
 Plate 46: Wood partition in lower tier of north-east caponier dividing gallery and WC from caponier.
 Plate 47: View of the south west caponier showing the granite embrasures and flanking loopholes.
 Plate 48: The removed gun platforms from the Keep roof stacked in the field outside the Keep.

GENERAL PHOTOGRAPHS OF THE KEEP AND CAPONIERS

- Plate 49: Aerial view of Tregantle Fort showing the entrance and the Keep.
 Plate 50: Aerial view of Tregantle Fort showing the Moat range and remains of the camp to the east of the fort.
 Plate 51: View of the Keep's entrance over bridge.
 Plate 52: View of the Keep from the upper parade.
 Plate 53: Detail of external view of the Keep embrasure and flanking loophole.
 Plate 54: The south-east face of the Keep from the bridge into the fort.
 Plate 55: View of the Keep from the site of the hut camp east of the fort.
 Plate 56: Inner court of the Keep looking towards the entrance passage.
 Plate 57: Rooms flanking the entrance of tunnel to the North-west Double caponier.
 Plate 58: Tunnel into the North-west Double caponier with remains of iron gate.
 Plate 59: Passage of upper tier with entrance to caponier on the left and entrance from tunnel on right. Railing on right are over stairs into the lower tier.
 Plate 60: Collapsed floor of upper tier showing layout and construction of caponier.
 Plate 61: View along ditch towards north-east caponier of double caponier showing later range butt and protective ricochet wall.
 Plate 62: Detail of butt against east face of caponier showing blocked embrasures and loopholes.
 Plate 63: The flanking faces of the North-west Double caponier with modern backstop of the moat range behind.
 Plate 64: View of the flank of the North-east caponier with Keep in back ground along ditch.
 Plate 65: View of the North-east caponier showing the embrasures with drop ditch in front.
 Plate 66: Gallery off the tunnel to the North-east caponier before entering the caponier.

The Keep, Tregantle Fort, Antony, Cornwall

HISTORIC BUILDING RECORDING AND INVESTIGATION

SUMMARY

In March and April 2007 Oxford Archaeology carried out a programme of historic building recording and investigation on the Keep and SW, NW and NE caponiers of Tregantle Fort, Antony, Cornwall on behalf of the Defence Estates. The purpose of the survey was to record the current state of the Keep and caponiers and increase the understanding of the buildings. Tregantle was one of only three known Palmerston Forts to have had a purpose built Keep. A detailed record of features and fixtures of the Keep was also produced with the aim of helping to produce replicas in the weather proofing works and securing the Keep's historic integrity within its long term preservation.

Tregantle was constructed between 1859 and 1864 and it was intended to be one of three forts on the Antony line defending the western side of Plymouth Dockyard. Only two of these forts were constructed, the other one being Scraesdon. The fort was intended to be armed with 87 guns but it appears that a relatively small proportion of these were actually fitted. By 1895 it is known that six 64 pdr rifled muzzle-loading guns had been installed in the Keep, five of which were on the roof and the other is thought to have been fitted in Room 16A to cover the drawbridge. In 1903 the Fort became an infantry battalion headquarters and in the Second World War it was used by the US Army.

Although the condition of the Keep's main structure (stone walls and barrel vaulting) is good the timber elements (suspended joist floors and joinery) have suffered considerably from damp and prolonged disuse. However, examples do survive of most of the main internal features such as doors, windows, panelling, fireplaces etc so that a reasonable understanding can be gained of the Keep's historic form and it should be possible to reconstruct good replicas of these items.

Although some of features or elements are clearly secondary (breeze block infilling embrasures, some brick walls, plant from electrical generator room) the large majority of the surviving joinery is believed to be essentially primary. This does not necessarily mean that it was all installed in a single phase in the 1860s when the fort was completed. By the time many Palmerston Forts were completed they had become partly obsolete and they were no longer required for their intended function. This is why the majority of the guns were not fitted at Tregantle and it may be that it took many years for the Keep to be fitted out as there was no longer an urgency to complete it. There is some evidence to suggest that the eastern half was fitted out later than the western half (painted ceilings beneath former partition lines) but this does not necessarily mean that these partitions replaced a previous arrangement.

The curved western half of the Keep appears to retain much of its original basic layout and it has undergone much less alteration than the two ranges in the eastern half. The layout of almost all the rooms to this side have undergone changes, the principal phase of which appears to have been undertaken in the early 20th century when the fort became an battalion headquarters and the Keep became mainly used for storage. At this time several brick walls were inserted to alter the plan and the partitions which are believed to have flanked the central corridor (much like the western half) were largely removed. However there does also appear to have been a further phase after the original construction of the Keep but before it was being largely used for storage. During this phase, in the late 19th and very early 20th centuries, several of the plain primary fireplaces appear to have been replaced by slightly more elaborate ones possibly reflecting a use with a higher status (eg Officers accommodation). These fireplaces are distinctly different to the original ones and must

represent a second phase although it may have been shortlived before the Keep was given over to storage.

The investigation of the caponiers has identified the two mounts a 32pdr Single Bore Breech Loading (SBBL) gun which was tested in a series of trials between 1885 and 1892. These mounts are in the lower tier of the double caponier.

1 INTRODUCTION

1.1 Background

1.1.1 In March and April 2007 Oxford Archaeology carried out a programme of historic building investigation and recording on the Keep and SW, NW and NE caponiers of Tregantle Fort in Cornwall. This was on behalf of Defence Estates (DE) who through the Sustainable Development in Government framework is committed to reducing the number of 'Buildings at Risk' (BAR) included in the English Heritage published annual list, on its estate, and as identified in the DCMS Biennial Conservation Report (2001-3), by securing their sustainable future.

1.1.2 Tregantle Keep at the Antony Training Area in Cornwall is one such BAR that is both a Scheduled Ancient Monument and a Grade II listed building. It forms part of the larger Tregantle Fort, but only the Keep is currently on the Buildings At Risk register. However there are other structures, notably the caponiers, which may be considered to be BARs in the future, and so investigation has also been undertaken there as part of this work; nonetheless the Keep has been given priority in the recording works.

1.2 Aims and objectives

1.1.1 There were three principal purposes to the works:

- to investigate and increase understanding of the Keep and caponiers;
- to provide for posterity a general record of the Keep and caponiers in their current form;
- more specifically, to provide a detailed record of historic features and fittings which would assist in the production of replicas. This included features that require urgent reinstatement (e.g. windows) and features such as fireplaces whose reinstatement is a desirable future objective rather than an immediate requirement. Items included (but were not limited to): windows and window frames, doors, fireplaces, banisters, ironwork, wood items, stone work, military fixtures (such as iron loops in caponiers) and wooden partitions.

1.3 Methodology

- 1.3.1 The recording work was undertaken on the Keep and caponiers (as opposed to the rest of the fort) including the ring of rooms at ground floor level, the roof platform, the basement rooms (magazine etc) and a ring of tunnels below and immediately surrounding the keep
- 1.3.2 The main works divided into two principal elements:
- a general record of the structures
 - more detailed recording of the fixtures and fittings.
- 1.3.3 The general record was based on existing plans of the Keep and caponiers and involved adding descriptive and interpretative annotation to the plan to explain the history, development and use of the building. This identified distinct phases in the structures as well as highlighting evidence relating to former features. It provided a comprehensive basic record of the current form of the Keep and the caponiers. Existing plans were printed out at a suitable scale and traced onto archivally stable permatrace. This element of the project included a general photographic survey including general views of each room, specific features of interest and the overall external form of the structure. The general record broadly equated to an English Heritage Level II/III recording survey as defined in *Understanding Historic Buildings: a guide to good recording practice* (English Heritage, 2006).
- 1.3.4 The detailed record concentrated on fixtures and fittings of the building particularly those which will require replica-reinstatements to make the structure weather tight (windows and external doors) and features which could be reinstated as part of a possible future refurbishment/conversion programme.
- 1.3.5 Each distinct feature was photographed and (where appropriate) drawn in sufficient detail to assist in the construction of 'replica' features (i.e. based on the historic form) to be made. For example elevations of external doors and windows were drawn. Similar detailed drawings were made of partitions (largely no longer in-situ), internal wall panelling, and shutters, although these would not require immediate reinstatement to remove the Keep from the BAR register.
- 1.3.6 Although this document should assist in the production of replicas it is not intended as a complete specification of works containing all the information a specialist joiner would need to create all the required features. It is assumed that such a joiner would visit the site, take samples of joinery, make their own sketches and label up items as deemed necessary. This document identifies surviving historic joinery as well as its location in the building and it should give the joiner a good indication of the form and character of what survives.

- 1.3.7 Outline recording was also undertaken on fireplaces, chimney pots, a weather vane, iron railings, foot scrapers, air vents/grilles, a 'Worcester' regimental plaque above the entrance to the Keep and a gearing mechanism adjacent to the main entrance to the Keep, which presumably operated the drawbridge.
- 1.3.8 Many of the features were repeated throughout the building and in these situations only a single good example of each feature was drawn, although the locations of other examples was marked on the plan
- 1.3.9 In addition basic recording and interpretation was undertaken on a series of stone slabs which are currently carefully stacked in a pile outside the fort.
- 1.3.10 The photographic element of both the general and detailed recording was undertaken using black and white print film and with a digital camera. Where possible and appropriate each image included a suitable scale such as a ranging rod (although in some instances such as photographing the undersides of ceilings that was not possible) and they were generally taken 'square on' to the main subject.
- 1.3.11 The extent of the recording was limited in certain areas by health and safety considerations. In some areas the floor is severely rotten and clearly unsafe and temporary barriers have been erected in some areas to prevent access due to safety concerns. Where there are features (eg fireplaces) within the cordoned-off areas it was only possible to photograph these features remotely.
- 1.3.12 Historical documents on Tregantle (and other Palmerston Forts) were consulted at the National Monuments Record (NMR) and the Public Record Office of the National Archives to enhance understanding of the structure. In addition the Palmerston Forts Society was contacted about the structure and the principal secondary sources were also studied (Appendix 1 and 2). David Moore from the Palmerston Forts Society has kindly allowed the reproduction of his article on the 32 pdr SBBL Gun. Fort Nelson (Royal Armouries) near Portsmouth was also visited by OA to allow comparison of features. Fort Nelson is of similar date to Tregantle and although it has a different plan (with a redan rather than a Keep) it has many similar features which help in the understanding of Tregantle.
- 1.3.13 A programme of historic paint analysis was also undertaken by Lisa Oestreicher (Historic Paint Specialist) to identify the original (and historic) colour schemes used within the Keep. This was particularly undertaken on the historic joinery but areas of surviving paint on walls were also investigated where possible. The paint analysis report is included as Appendix V at the rear of this report.
- 1.3.14 Due to the number of specialist terms used to describe particular elements of the fort a glossary has been provided at Appendix IV.

2 HISTORICAL BACKGROUND

2.1 Tregantle Fort brief history

2.1.1 Following public concern for the perceived military threat posed by France, and the Royal Commission of 1859 to investigate the defences of the Dockyards and Arsenals, expenditure was approved for renewed defences in England, Wales and Ireland, with particularly notable fortifications placed around the approaches to Plymouth and Portsmouth (Saunders 1989; Dyer 2003).

2.1.2 Tregantle Fort was constructed between 1859 and 1864 and formed one of two forts (together with Scraesdon) on the ‘Antony Line’ guarding the western defences of Plymouth dockyard. These formed a line across the spur of land from St Germans River and the coast to prevent the highlands from being captured and the potential bombardment of the dockyards. Another fort was planned between Tregantle and Scraesdon, but it was not built. The fort is situated on a hill of natural Slate Dunstone overlooking Whitsand Bay at a height of 360ft allowing it commanding views to the west, the north and of Scraesdon Fort. It is situated south of the main road (B3247) from the west to Maker Heights.

2.1.3 The works resulted from the commission overseen by the then Prime Minister, Lord Palmerston whose name is now used as a general label for the forts constructed in this period. They were hugely expensive and frequently took so long to build that by the time they were finished the French threat had dissipated that they are also sometimes called ‘Palmerston’s Follies’ (somewhat unfairly, since he was dead by 1865, and had vigorously pruned the proposed budget).

2.1.4 Later history: By 1903 the fort became an infantry battalion headquarters and a number of firing ranges for small arms were added to the existing one for the fort’s garrison, firing out to sea to the west and south-west of the fort. The fort remained in army use and was used as a training school for air defence and gas training from 1938 until 1942 when it was taken over and used by the US army. Major works were carried out by the US army on the south and east barracks which removed the protective soil covering the roof to allow repairs to be undertaken. It has remained exposed to the present day. After the war the fort returned to the MOD and the lower half of the fort continuing to be used for accommodation and training as part of the Tregantle training area. The upper half of the fort is locked up and unused.

3 TREGANTLE FORT GENERAL DESCRIPTION

3.1.1 The fort has a hexagonal plan containing an upper and lower parade divided by a central traverse with a number of utility buildings (stables, stores and toilets) around the edges. The southern and western edges of the fort contained the earth-covered

and bomb-proof casement barracks and the later south-west battery, which was built in 1869 on the recommendations of a visiting Russian General, Count Todleben (the engineer responsible for the defences of Sebastopol). This battery was in the form of six Haxo casement positions along the south-west face of the fort facing out to sea. The upper parade provided access to the gun positions along the north and north-west edges of the fort. These consisted of three stone embrasures, two single Haxo casements, two Moncrieff emplacements and two later 1890s concrete emplacements.

- 3.1.2 In front of these was a *chemin de ronde* accessed by an entrance from the north-west caponier and an entrance on the north-east rampart just north of the Keep moat. The *chemin de ronde* topped the 20ft deep rock cut ditch, which surrounded all but the south side of the fort and was protected by four single and a double two-storey caponier.
- 3.1.3 On the east side of the fort was the main entrance into the site across a bridge over the ditch with the fort's Keep on its north side. Of all the forts constructed in the 19th century Tregantle is one of only three known to have had a purpose-built Keep. The others were at Fort Brockhurst in Gosport and Fort Grain in the Thames/Medway (which has now been demolished). The Keep has a semi-circular plan with roof-top embrasures covering the east side of the fort. The first floor has embrasures covering the internal parades and providing access to the fort's main magazines beneath the Keep.
- 3.1.4 The fort's ditch passed the east side of the Keep and an internal moat surrounds the Keep's west side from north to south. The ditch and moat were covered by counterscarp galleries and musket galleries across the ditch which face the north-east and south-east caponiers. Count Todleben was very appreciative of the fort and approved of the Keep as a check on a successful assault on the main body, but did not see it a 'Keep of last resort'; his only criticism was the exposed masonry of the Keep to battery fire and lack of glacis to cover it. This was not rectified due to the area of ground a glacis would take up within the fort (Saunders, 1989).
- 3.1.5 Armaments: The fort was intended to be armed with 87 guns but, perhaps due to the diminished threat posed by France, these were never fully installed. By 1885 it was armed with six 64 pdr RML, 7" RBL and ten 32 pdr SBBL. In 1895 the fort mounted three 64 pdr RML and three 7" RBL on the north face, a 64 pdr RML and 7" RBL on the north-west, one 7" RBL on the salient and six 64 pdr RML in the south-west battery. Also six 64 pdr RML were mounted in the Keep. No 32 pdr SBBL were fitted to the caponiers, even though one was tested in a series of tests from 1885 to 1892 (Hogg 1974, 196, Moore 2003).

4 DESCRIPTION OF KEEP

4.1 External description

4.1.1 The Keep is D-shaped in plan with the flat side of the D facing the east. The flat side has two faces at an obtuse angle to each other, facing north-east and south-east. The walls are vertical and built of grey rough-faced, local stone and laid in irregular, but level courses. All the doors, embrasures and loopholes are lined with granite with semi-circular granite coping around the top.

4.1.2 Most of the rooms are arranged with a central gun embrasure flanked to each side by a vertical rectangular loophole and with a narrow horizontal window above the embrasure to be used as a vent. The curved face of the Keep, facing west, comprises 12 sets of these four openings as well as the main entrance to the Keep. Each set of openings is beneath a stone relieving arch which forms the outer end of the barrel-vaulted ceilings of the rooms within the Keep. The base of the walls are set in the bottom of a dry moat (8 m wide by 5 m deep) around the west side and an upper dry moat flanked by galleries on the east side. The trace of a partially in-filled drop ditch in front of the loopholes facing into the west moat can be observed (Plate 1).

4.2 Roof top description

4.2.1 The roof of the Keep is flat and there is a protective earthen rampart around the curved outer edge from the north-west corner to the south-west (Fig. 4). The earthen rampart slopes up from the granite coping and measures 11 m wide by about 2.5 m high. It is retained at the rear by a fire step (0.95 m high) of rectangular hewn stone and a granite top step. There are seven chimneys radiating around the rampart from the rooms below and consist of four with a single chimney pot and three with four chimney pots (Plate 2). These are all cast-iron pots (0.22 m diam. x 0.45 m high). Set into the inner face of the rampart 11.5 m from the south-west corner is a small stone-built equipment store (Plate 3) for the five 64pdr RML guns mounted on the roof. It measures internally 0.9 m wide, 1.82 m in depth and is 1.15 m high with a brick vaulted arch ceiling. Its outer face has a pair of cast-iron hinges set each side of the doorway for a pair of outward opening doors. A stone-slab, shallow pitched roof with plain corbels is above the door and set back into the rampart. The surface of the Keep roof was re-laid in the later 20th century with asphalt.

4.2.2 *Regimental Badge:* Set into the outer face of the earthen rampart over the entrance to the Keep is a (2.87 m high x 1.68 m wide) badge of the Worcestershire Regiment (Plate 4). It is cast in concrete and dates from when the fort was an army barrack. The Worcestershire Regiment had a number of Battalions serving at the fort during the First World War. New recruits and wounded troops would have been based here awaiting redeployment to battalions serving at the front. The 2nd Battalion Worcestershire Regiment was stationed in Plymouth from 1929 to 1931 and was awarded new colours in 1930. The 1st Battalion Worcestershire Regiment was stationed in Plymouth after its return from overseas duty in 1931 for a period (W R

website; Mills, 2006). To the north-west of the badge on top of the rampart is a wrought iron weather vane (Plate 5).

4.2.3 *Outer Parapet:* The north-east and south-east facing sides of the roof are fronted by a stone parapet (2.44 m high x 1.52 m thick) with five granite stone embrasures for the roof-mounted guns. One embrasure is in the centre of the wall where the two faces meet and there are two further embrasures in each face. These would have been for five 64 pdr RML guns mounted on a garrison carriage. The guns would have been on a wedge shaped garrison platform of stone behind each embrasure. These had been removed during re-roofing of the Keep in the late 1960s, but were identified in the 1941 and 1964 aerial photographs and are now stored in front of the Keep (Plate 48). Spaced between the gun embrasures is a 0.95 m fire step for troops to fire over the parapet. Along the top of the parapet and mounted in the centre are eight chimney pots from the fireplaces in the rooms below, all except two are the cast-iron type observed around the earthen rampart, but the other two are of a ceramic type of which the tops have been damaged (Fig. 16). The two embrasures on the north-east face are concealed behind two water tanks: one modern and one dating from the Second World War. These are situated in the space behind the parapet and a shorter inner parapet protecting the inner courtyard and containing access from the central stairwell. The scar from the excavation for the water pipe from the water tanks to the fort can be seen cutting through the earthen rampart.

4.2.4 *Inner parapet:* This contains the landing from the top of the spiral staircase which gives access to the rooftop. This has a brick vaulted ceiling with a central ring for block and tackle to pull ammunition up from the magazine below to the guns on the roof through a central shaft 1.64 m in diameter. This inner parapet is 3.5 m thick and stands 2.5 m high to protect the inner courtyard. Three chimneys from the rooms below are mounted on the top of each face of the inner parapet. The outer face of this parapet contains three open brick arches (Plate 6) each measuring 1.10 m wide, 1.50 m high and 1.80 m in depth. At the end of the south-east face of the parapet a small blocked archway can be seen. This is the upper half of a doorway from a passageway linking the rooftop to room 15 below and was blocked when the present asphalt was added. The top of the inner courtyard is protected by a two bar iron railing around the edge fixed to cast-iron posts the same as other railings around the fort (Plate 7).

4.3 **Internal description: general**

4.3.1 The ground floor plan of the Keep divides into two principal areas: the segmental shaped section facing west into the fort, and the straight ranges facing east and out of the fort (for the purposes of the description 'east' and 'west' will be used for either the inner or outer faces of these ranges as appropriate. The curved segmental-plan section is divided into nine bays by stone structural walls supporting barrel vaulted ceilings which narrow and taper towards the centre of the Keep. The two

outer bays are circulation passages [Passage **A** and **B**] and each of the seven bays between [Rooms **1** to **7**] was divided into two rooms [1**A** facing out on west and 1**B** facing in on east] by a central passageway radiating around the Keep although the partitions which created this corridor only partially survive (detailed further below).

- 4.3.2 The eastern side, constructed with straight walls, has rectangular rooms [Rooms **9** to **16**], similarly divided by a central corridor into two. The two rooms at the central angle [**17** and **18**] are of necessity triangular, meeting at a circular stair on the inner (west) end.
- 4.3.3 The arrangement of doors and passages represents the primary design of the Keep, and later changes have been minimal, largely the replacement of fireplaces and the conversion of shuttered loops to glazed windows. All the rooms are of the same construction with similar fittings; each of the rooms facing out from the Keep was intended to be fitted with a gun, and the inner rooms were more domestic in character. They are numbered as shown on plan (Fig. 5), and the tabulation in the following text indicates former names and room uses.
- 4.3.4 *Materials:* The rooms are all of a regular coursed, rough-faced stone block with a rubble core and bonded with a coarse lime mortar bond. All the walls have a 0.025 m plaster finish except in rooms 9A, 9B, 12A, 17A, 18A, Passage A and Passage B which had been painted.
- 4.3.5 *Vaulting:* The walls all support a brick barrel-vaulted ceiling, and in the case of the rooms facing out of the curved face of the Keep the ceilings slope down towards the outer face. The top of the wall and start of the vaulting is 3.1 m from the floor level and it slopes down to 2.1 m from floor level. In all the rooms along the north-east and south-east faces (rooms 10, 11, 12, 13, 14, 15, 17 and 18) the ceilings were horizontal and 2.55 m from floor. In the centre of the ceiling 2 m (6'6") from all the embrasures is an iron loop for mounting guns if required. Traces of timber partitions can be observed on the ceiling in the form of paint lines and plugholes.
- 4.3.6 *Heating:* Fireplaces of varying types are built into some of the walls depending on the room size. In front of the fireplaces mounted on a stone plinth at floor level, is a stone slab approximately 1.3 m x 0.60 m with a 0.10 m wide timber surround. Above almost all the fireplaces is an iron lined vent opening into the chimney to control the draw of the fireplace.
- 4.3.7 *Gun embrasures:* The external face of each room consists of a gun embrasure flanked by a loophole. The embrasures and loopholes facing out of the Keep have been recessed and fitted with removable window frames (Figs 17 and 19) mounted on 1/2" bolts fixed in the masonry and held by a nut, covered by a wood plug in the frame (Frame type 1). Two possible later embrasure window frames were noted without the holes for the bolts and held in place by wedges. This is similar to window frames in other parts of the fort, best example in the Guard Room. The embrasure window have a pair of iron shutters (iron-clad timber boards) with a single view/fire slit (Fig. 18). The embrasures window and shutters for rooms 16 A

& B and 9 A & B are similar but smaller sized. Above the embrasure in the top of the arch was a rectangular window, which pivoted in the middle to give extra light and ventilation to the rooms (Fig 20). The frame was fixed into the recess of the wall by a large screw behind a wooden plug in a wood wall plug. This is likely to be replacing an original shutter to supply ventilation during firing.

4.3.8 *Floors:* The floor construction within each room comprises a suspended joist floor supported by corbels along the wall faces and a low 0.40 m high central dwarf wall of a rough stone and mortar construction. These stood about 0.70 m above an earth and rubble base and on top of vaulted ceilings from the magazines and galleries below. Where the floor approaches a gun embrasure there is a wedge shaped gun platform formed on an additional and lower set of floor joists, with heavy (50 mm) boards laid on a 1/20 slope over the dwarf wall along its centre. These heavy boards are similar to ones used in several 19th-century store buildings at the Royal Arsenal in Woolwich and these were later levelled up with the rest of the floor when the Keep and fort were converted to barracks. The only rooms not to have these gun platforms are rooms 9A and 9B, the embrasures of which face out on to the counterscarp of the Keep ditch. The other rooms not to have wooden floors are rooms 17B, western half of room 13 and the two passages.

4.3.9 *Cupboards:* Adjacent to almost all the gun embrasures is a recess measuring 3.25 m high, 0.90 m wide and 0.32 m with an arched top which would have been for a cupboard with two shelves. These are found in all rooms except 9A and B and 16 A and B and the cupboards survive best in Rooms 15 and 11. Among the other common features found widely throughout the Keep are small iron vents with vertical grilles. These are located in both the outer walls (adjacent to the gun platforms) and the inner walls facing the courtyard although many have lost their grilles or had them replaced with ceramic covers.

4.3.10 *Bell boards:* Another interesting feature found in many of the rooms is a plain board (or the imprint from a former board) high on the wall adjacent to the corridor. These appear to have been bell pulls and the fact that there is bare brick (unpainted) beneath where some of the boards are no longer in-situ suggests that they were primary. It is possible that it was intended to be a form of alarm for the gunners.

4.4 **Fittings and Fixtures**

4.4.1 *Introduction:* Most of the fittings appear to be primary, though some may have been replaced later, while a few can be recognised in War Office supply publications. A summary table provides outline details for the principal features.

4.4.2 *Doors:* Doors are mostly panelled with a simple moulding round the panels and a chamfered frame.

4.4.3 They include the following types:

- Principal door to Keep (Passage A)
- Doors to east side passages (example Passage B): door with side lights, glazed and boarded
- Doors to rooms from (example Room 1A etc): wide door set in panelled frame with tongue-and-groove boards, and a 5-light window above.
- Doors from west side to inner yard. None of these remain in-situ and it has not yet been possible to positively identify any ex-situ examples which remain in the Keep. A photograph of the inner courtyard and included in a PSA report on the condition of the Keep shows some of the doors partly in-situ (and some clearly not). In the photograph they are clearly painted an ochre/brown colour and they appear to be of simple tongue and groove construction (possibly indicating a lower status than the eastern rooms). The photograph shows the doors set in frames and immediately adjacent to a sash window.
- Doors from east side to inner courtyard (dismantled examples in store): Round-headed door set in stone reveal. The posts from the door frame are each held by a cast-iron shoe, bolted to the floor into which the post slots. The shoes are 10 cm x 10 cm x 8 cm tall. The door frame is secured with two large iron bolts to each post and a further bolt at the top of the arch.

4.4.4 *Windows*: These include sliding sashes, a few casements, and tilting windows opened with a cord. Windows filling the loops around the embrasures were secondary features replacing shutters. They include the following types:

- Windows by doors on west side (dismantled examples, shown in PSA photograph): flat headed sashes, set in frame with immediately adjacent door. When the photograph was taken all the windows had totally lost their glazing bars so it is not possible to be certain of the number of lights in each sash although they are likely to have been 6 over 6.
- Windows above doors and windows on west side (Feature H, Fig 29). Some dismantled examples remain ex-situ in Room 11 and three are shown in situ (to Rooms 3-5) in a photograph contained in the PSA report on the Fort. They have 18-lights, straight sides and arched tops and they are set in stone arched reveals.
- Windows on east side (dismantled examples, and one *in situ* in room 14): pair of sliding sashes with panelled reveals internally, set in stone arched reveals. Wedge-shaped glazing bars.
- Windows above passage doors (dismantled examples and examples surviving in partitions): five-light windows set into tongue-and-groove filled partition. Wedge-shaped glazing bars.
- Windows in ventilation slits above gun embrasures (dismantled examples): secondary windows set into rebate on internal face of masonry, wide narrow windows with an arched head.
- Windows in loops flanking the gun embrasures (dismantled examples): secondary windows set into rebate on internal face of masonry, rectangular casements with four or six lights.

4.4.5 *Fireplaces*: These seem to comprise a mixed series of cast-iron fireplaces, possibly reflecting later changes, but also differences in the primary features between plain utilitarian fireplaces in the gun chambers (Feature S) and larger fireplaces for mess or day rooms (Feature R). In the later 19th century a number of fireplaces were

inserted into several rooms, presumably to replace the plainer primary features and this reflects a higher status and a change of use (possibly to officers accommodation). This must have been shortlived as by 1937 the Keep was almost entirely used for storage.

4.4.6 The fireplaces include the following types:

- Small square iron surrounds, near flush with wall, with rolled outer lip.
- Ditto with **VR** and crown on upper piece.
- Larger fireplaces with cast-iron surround and mantelshelf.
- Ditto with tiles in side panels.

4.4.7 *Partitions:* Other than the main structural walls the internal arrangement of the Keep would have been created with stud partitions clad in panelling. Almost none of these survive in the eastern half (although a section has been moved in Room 11) but the primary arrangement of these tongue and groove partitions largely survives in the western half. It is interesting to note that in the western half (Rooms 1-7), where approximately half the partitions no longer survive in-situ, there is bare brickwork (neither plastered nor painted) immediately above where the partitions formerly abutted. This confirms that the partitions must have been primary features although there is render on the walls where the partitions abut here. This implies that once the main structure of the keep was constructed the walls were rendered (at least in this area), then the partitions were erected and then the ceiling was whitewashed. In the eastern half of the Keep, where none of the partitions survive, there is the clear imprint from former partitions but these strongly appear to have earlier whitewash on the vaulting above where the partitions would have abutted. Therefore the ceilings must have been painted before the partitions were installed and this implies that the partitions could be secondary alterations. However, it is very possible that all the ceilings in this area were whitewashed as soon as the main structure was complete and this was only a very short time before the soft fit (where the partitions were installed) began.

Summary Table of principal features recorded

Feature	Type	Fig	Brief description
A	Door	28	<p>Primary double hardwood doors forming main entrance to Keep (to Passage A). Each leaf had six panels with a simple bead moulding (with flush panels) detail similar to that found elsewhere in the Keep. The doorway has an arched head and the doors are hung on two long iron hinges. There is an iron bolt to fix the door and it would have been additionally secured with an iron bar.</p> <p>Neither door remains in-situ but each has been located in the Keep: one is in Passage A while the other is in Room 18A. The primary door frame is also not in-situ but it would have been c.12 cm wide.</p>
B	Shutters	18	Shutters to either side of the gun embrasures found throughout Keep. Timber doors with iron lining facing the external side. Arch headed, each door comprises four vertical boards fixed with two long, iron

			hinges and bolted to iron plates. The shutters would have been fixed closed by a long, centrally pivoted iron bar which would have slotted into two simple catches.
C	Window	19	Softwood casement window.
D	Window	20	Softwood framed windows which were inserted into the horizontal ventilation openings above the gun embrasures. The openings would probably originally have been unglazed (partly because the glazing would have shattered when the guns were fired) and these windows were inserted in the late 19th-century alterations when the Keep was converted to accommodation (partly) and then storage. Shallow arch headed, central pivots to allow it to open horizontally. Loop at centre of arch would have allowed a cord to be fixed to the window to open it from below. Windows have four lights and ridge glazing in some. Windows are fixed into openings with bolts into circular, lead-filled plugs. None remain in-situ.
E	Window	19	Secondary windows inserted into embrasures and flanking loopholes when the intended primary function of the Keep changed and the decision was taken not to install guns. The embrasure windows (none of which remain in-situ) were vertically hung casements (some with 2 lights to each casement, some with three). The windows have 2 hinges and a partially surviving brass slide lock to the upper part of the arch although this appears to have been superceded by a a more substantial iron bolt fixed over (the imprint of which remains visible on the frame). The windows also have brass finger loops and two circular fixing plugs to each side of the frame. The loophole windows have four lights and the frames are again fixed into the openings with a circular plug to each side. These windows have a simple circular brass latch and a loop at the base for a catch.
F	Door	31	External doors facing the courtyard from rooms in eastern half of Keep (Rooms 11, 12, 13, 14). Segmental arched doors with vertical boards fixed by three horizontal members. Primary features.
G	Panelling	30	This is the only surviving section of wall panelling and lines the sides of the passage between Room 13 and 17A. The panelling continues to either side of the opening and over the segmental arched head. The panelling is of softwood and the sides have six panels with curved moulding (*add better description of moulding) found in a number of features at the Keep (eg Features J, L).
H	Window	29	Tall arched 18-light window which would have spanned over each of the seven openings in the west side of the Keep facing into the courtyard (ie the eastern side of Rooms 1B, 2B, 3B, 4B, 5B, 6B, 7B). Each would have been over a door and sash window (none of which remain in situ). At least one of these incorporates a louvre light in the upper row.
I	Doors	26	Sliding doors found between Rooms 8 and 9A. Primary. Six flush panels with simple bead moulding the same as in other joinery found elsewhere in Keep. Inner side (facing Room 8) has plain non-moulded, recessed panels. Iron loop for latch to centre of post. Formerly bolts at top and bottom but these removed. The plates from the former base runners remain intact.
J	Window	27	Sash window with panelling in Room 14 facing into the courtyard. The sashes themselves are no longer in-situ but the frame and panelling remains. Each of the windows on the eastern side facing into the court would have been similar to this feature. Six over six sashes with upper sash arched. The jambs are splayed and each has four panels with moulding detail similar to that found elsewhere in the Keep. Beneath the opening for the sashes are three panels.
K	Door	25	Primary, 19th-century door frame in opening between Room 7 and Passage B. Doors no longer in-situ but softwood frame remains intact with shallow arched head and margin lights, the upper ones of which would have been glazed but now have simple boards. The lower panels

			to each side of the door have simple bead detailing to the 'outer' side (facing the passage) with flush panels and plain, non-moulded panels to the inner face. Iron hinges. The central imprint is visible in the upper arch from the former latch into which the doors could have been bolted. At the base of the posts are iron fixings sunken into the stone tread and to which the posts are bolted. The posts have simple chamfered edges similar to that found on other primary joinery throughout the Keep.
L	Door	24	Six-panel, softwood central door from partitions in west side of Keep. Several of these doors remain in-situ while others remain within ex-situ sections of panelling. The outer side (facing the corridor) of each has moulded panels (same moulding as Feature G) but the inner face has plain, non-moulded panels.
M	Panelling partitions	23	Tongue and groove boarded stud partitions lining the outer side of the passageway in the western side of the Keep (ie forming Rooms 1A, 2A, 3A, 4A, 5A, 6A, 7A. Primary features. Vertical tongue and groove boarding with arched upper section above rail and central doorway beneath five lights. Simple chamfered detail to posts and other principal members. Rails for coat hooks
N	Partitions panelling	22	Primary tongue and groove partitions the same as Feature M but smaller as they lined the inner side of the corridor.
O	Partitions panelling	21	Primary tongue and groove partitioning to Room 1B. Essentially of the same construction as Features M and N but it has an additional 8-light window to the side of the door.
P	Fireplace	33	Tall fireplace with timber mantelpiece found in Room 1A. Probably inserted in c.1900 and appears to be a Bratt Colbran variant.
Q	Fireplace	33	Secondary fireplace, more elaborate than primary ones, found in Room 3 and probably inserted in late 19th century to replace previous plainer type (S). Reflects the change in use of the room from a gun room (as originally intended) to possibly accommodation for an Officer (before the Keep became largely used for storage. Late 19th-century Messrs Yates Haywood & Co stove and mantel for Officers Quarters 1742 (List and Drawings of Pattern Articles to be adopted by War Dept Works and Buildings 1898).
R	Fireplace	33	Primary fireplace, probably installed in 1860s. Simple cast iron design with VR cast into chimneypiece and stepped reveals. Larger than the other most common type of primary fireplaces (S) This type is found in two of the 'inner' rooms of the western half of the Keep
S	Fireplace	33	Small primary cast-iron fireplace with no mantelpiece and sloped reveals. Probably dating to the 1860s and found in four rooms adjacent to the proposed guns (three of which are in the western half).
T	Fireplace	32	Probably secondary cast-iron fireplace (later 19th century)
U	Fireplace	32	Small, primary cast-iron fireplace. Very similar to Feature S (but slightly taller). Only found in Room 9A but type S is found in several rooms. Probably dates to 1860s.
V	Fireplace	32	Tall, slender chimneypiece in Room 18B. Probably added in the early 20th-century. It is illustrated in the War Office Pattern Book (1912) and is a Bratt Colbran & Co slow combustion grate No. 1 (28 inches wide).
W	Fireplace	32	Cast iron, Only found in Room 17b. The chimneypiece has VR cast into it and is probably primary (1860s) but it appears to have a later range added to it. The range has a separate cistern to the left and is very similar to a range for Married Soldiers Sculleries in the List and Drawings of Pattern Articles to be adopted in War Department (1898). ¹

¹ Extracts from the War Office Pattern Books which have been used in this table were provided by Michael Turner, Inspector of Ancient Monuments at English Heritage.

4.5 **Internal description: west side**

4.5.1 **Entrance Passage A** is the main entrance passage into the Keep from the drawbridge. The passage is wedge shaped, tapering from 6.25 m to 1.74 m, and opens into the inner courtyard. The floor of the passageway is concrete with a 1.40 m square pit to the left of the entrance, which contains the gearing mechanism for the drawbridge. This was photographed in-situ (Plate 8), but needs to be cleared out for further investigation and recording due to build-up of debris in the base of the pit. On the right side of the doorway is a small rectangular pit for the counter-balance weight of the drawbridge (above which the pulley is still in situ). Both of these would have been covered by stone slabs, of which the pair over the gearing mechanism pit survives against the wall.

4.5.2 Opening onto the passage on the west side is the entrance to a central passage to rooms 1 to 7. On the east side is the doorway to room 16A, and the door and window to room 15, over which is painted ‘Officers Mess’ (Plate 9). There are no surviving door frames or features in the passage, although the door and frame to room 16A was located and drawn, and the right leaf of the main Keep door is lying against the inner wall and has been recorded (Fig. 28). The left leaf of the door was also located covering a hole in the floor in room 12A giving access to the magazines. The passage has a series of paint layers over it consisting of eggshell and light blue, with later layers of white wash and a brown/beige on the lower 1.2 m sector of wall.

4.5.3 **Room 1A** is the first of the rooms that radiate around the face of the Keep and is on the left as you enter the central passage from the main entrance. The room’s timber partition is still in situ, but its door has been removed and the upper curved panel is missing. Its original room number 1 is still visible over the doorway. This was the same as the larger partition in room 3 (Fig. 23) and two wooden boards are fixed to the rear of the partition for hooks. These are badly corroded and appear to be of 20th-century date, as is a timber work bench placed against the partition. The room has been re-plastered at some point, which covered the vents to the room, and it has a tall fireplace (probably dating to c.1900) still in-situ in the south-east wall (Feature P, Fig. 33). Neither the iron shutters nor window frames are any longer in-situ. In the floor two ringbolts are fixed to each side of the new levelled gun platform. The room appears to have been used as a barrack room and later a store room in the Keep.

4.5.4 Phasing and fittings

<i>Name in 1937</i>	Royal Engineers Store
<i>Original fittings</i>	Partition screen (Feature M see Fig. 23) although arch not in-situ. Ring bolt in ceiling for gun, two rings in floor either side of gun platform;
<i>Secondary fitting</i>	?fireplace (Feature P, see Fig 33); wall hooks; bench
<i>Ex-situ fittings</i>	Embrasure shutters; section of skirting board
<i>Former features</i>	Cupboard with shelves in alcove Loophole shutters either side of embrasure

4.5.5 **Room 1B** is the smaller part of room 1 on the opposite side of the central passage. Its timber partition is still in place with later modification to the doorway (the insertion of a side-light) (Fig. 21) and room number 14 is still visible over the door. The north-east wall, which faces out onto the inner courtyard, is set back 1.32 m from a single large step across the opening. The wall is constructed of brick with a flush finish cement render with three small rectangular windows from the toilet cubicles. In the room the wooden floor has been cut for two stone piers to support a water tank and a concrete slab in the southern corner of the room. At the north-east end of the room are three cubicles divided by timber partitions (1m wide x 2.13 m depth x 2.15 m high) and each fitted with a ceramic toilet basin (one missing, others broken) (Plate 10). On top of the cubicles are mounts for a cisterns fed by pipe from a water tank (now removed) on the roof through five 6" ceramic pipes set into the brick vault ceiling. Various holes for fixings and filled in patches can be seen in the wall plaster. This appears to have been the Keep's original latrine and improved to its present more permanent condition in the late 19th century with later plumbing added in the 20th century. It is marked as the Officers toilets on the 1937 plan of the Keep.

4.5.6 Phasing and fittings

<i>Name in 1937</i>	Officers WCs
<i>Original fittings</i>	Partition (Feature O, Fig. 21) WCs
<i>Secondary fitting</i>	Relacement plumbing
<i>Former features</i>	Cupboard with shelves in alcove 18-light arched window into courtyard (Feature H, Fig 29)

4.5.7 **Room 2** has no surviving timber partitions in situ although the trace from the former partition is clear. The room is now a single space and was recorded as such although for ease of reference in this report the western section (the gunroom) is called 2a while the 'inner' eastern half is called 2b. Both its fireplaces have the cast-iron surrounds intact and that in 2b has the initials VR over a crown (Fig. 33). The plaster is intact and the ceiling is whitewashed, no other fittings are in place in the room although one iron shutter is on the floor. On the south wall to the left of the passageway a wooden rail with six cast-iron hooks is fixed below a board for a bell pull system. At the western end of the south wall is a semi-circular headed alcove (the same as in many of the rooms) and although the former shelves are no longer intact a fragment from a bead moulding detail does survive which formerly ran around the outer edge of the alcove. The imprint survives from a former skirting board in 2a although the board itself is no longer intact. At the north-east end just the low stone wall with granite window sill and the doorway on the right with two granite steps into the inner courtyard survive. The wall measures 1.15 m long and stand 0.56 m high from the floor with an air brick vent in the centre 0.20 m above the floor. The stone lintel above this opening (facing the yard) supports an upper arched window frame (Fig. 29). This is repeated in rooms 3 to 7, except for room 4

where the door was on the left side as the Keep's well was between rooms 3 and 4 in the courtyard. The floor at the north-east end of the room has collapsed and is severely rotten around the edges.

4.5.8 Phasing and fittings

<i>Name in 1937</i>	Royal Engineers Store (2a, outer half); Quartermasters Store (2b, inner half)
<i>Original fittings</i>	Ring bolt in ceiling for gun Fireplace in 2a (Feature S, Fig 33). Fireplace in 2b (Feature R, Fig 33) Vent over fireplace (R)sd
<i>Secondary fitting</i>	Coat hook rail on wall
<i>Ex-situ fittings</i>	Partition on floor in 2b (Feature N, Fig 22)
<i>Former features</i>	Cupboard with shelves in alcove 18-light arched window into courtyard (Feature H, Fig 29) Door to courtyard (possibly simple tongue and groove) Sash window (probably 6 over 6 lights). Loophole shutters either side of embrasure

4.5.9 **Room 3** has both its timber partitions surviving in-situ with the original room numbers 3 and 12 (Figs 22 and 23). The outer timber partition still has its door fitted (Fig. 24) and the fireplace to this part of the room is intact with a cast-iron frame and tiles (Fig. 33, Feature Q) with traces of a bell pull next to the fireplace. This fireplace is a late 19th century addition and is more elaborate than the plainer primary fireplaces (eg Types R and S) suggesting that it was added to reflect a change in use for the room from a gun position (as intended) to accommodation (possibly for an Officer). This higher status use must have been relatively short lived because by the 1937 plan this room was a Target Store. The two iron shutters are still mounted each side of the embrasure. The floor has started to rot around the edges and some of the skirting board is in place. The inner half of the room (3b) is bare with no surviving windows or doors facing onto the inner courtyard. The fireplace has been removed and a water/gas pipefitting can be observed in the south wall along with a number of in-filled holes. Also in the top of the north wall next to the partition a board survives for the bell pull system.

4.5.10 Phasing and fittings:

<i>Name in 1937</i>	Target Store to outer half (3A); Royal Engineers Store to inner half (3B)
<i>Original fittings</i>	Partitions (Features M to 3a and N to 3b, see Figs 22, 23) inc door (Feature L Fig 24) Embrasure shutters Ring bolt in ceiling for gun Skirting board partly in-situ (in 3A)
<i>Secondary fitting</i>	Fireplace (Feature Q, Fig 33)
<i>Former features</i>	Cupboard with shelves in alcove 18-light arched window into courtyard (Feature H, Fig 29) Door to courtyard (possibly simple tongue and groove) Sash window (probably 6 over 6 lights). Loophole shutters either side of embrasure

4.5.11 **Room 4** is an open room with no surviving in-situ partitions although the imprint of the former partitions is clear on the vaulted ceilings. In addition the ex-situ remains of the two partitions remain in the room. The room has been re-plastered and this covers the vents to the room. In the south wall (4A) a set of six 2” square wood plugs are fitted on which to mount shelves and there are 1” square holes for four shelves above the embrasure at the room’s west end. Both the fireplaces have been removed but a cast-iron shelf set above the east fireplace (4B) survives. Also traces of the bell pull system beside the west fireplace can be seen. Only one iron shutter remains and the windows and door (4B) to the inner courtyard have been removed.

4.5.12 Phasing and fittings

<i>Name in 1937</i>	Coir bedding store to outer half (4A); Royal Engineers Office to inner half (4B)
<i>Original fittings</i>	Skirting partially in-situ Ring bolt in ceiling for gun
<i>Secondary fitting</i>	Ceramic vent in east wall of 4B to inner courtyard
<i>Ex-situ fittings</i>	Partitions to 4A and 4B (Features M and N, Figs 22, 23) Embrasure shutters
<i>Former features</i>	Cupboard with shelves in alcove 18-light arched window into courtyard (Feature H, Fig 29) Door to courtyard (possibly simple tongue and groove) Sash window (probably 6 over 6 lights). Loophole shutters either side of embrasure

4.5.13 **Room 5** is bare with one surviving timber partition. There are no surviving windows or doors and only one iron shutter hanging in the embrasure. The 5A fireplace has been largely removed but the 5B fireplace is intact with small square cast-iron facing with the initials VR over a small crown in the centre (Fig. 32 and Plate 11). This fireplace is probably primary. The floor has started to rot away around the edges, but screwed on the floor against the inside of where the west timber partition stood are three blocks of wood. These were carved for rifle butts to be racked against the partition (Plate 12).

4.5.14 Phasing and fittings

<i>Name in 1937</i>	Coir bedding store to outer half (5A) Barrack Store to inner half (5B)
<i>Original fittings</i>	Partition to 5B Rifle mount blocks One embrasure shutter Metal vent grill in E wall of 5B into yard Ring bolt in ceiling for gun Fireplace in 5B (Feature T, Fig 32)
<i>Secondary fitting</i>	~
<i>Former features</i>	Cupboard with shelves in alcove 18-light arched window into courtyard (Feature H, Fig 29) Door to courtyard (possibly simple tongue and groove) Sash window (probably 6 over 6 lights). Loophole shutters either side of embrasure

4.5.15 **Room 6** is a bare room with no windows or doorframes; one iron shutter on and one off. A small pulley for the upper window facing the inner courtyard survives in the centre of the ceiling. Also the (best-preserved) board for the bell pull system survives in 6B mounted in the top on the north wall right of the passage (Plate 13). Both the fireplaces have been removed with fragments of the small cast-iron uprights in 6A. The floor has collapsed in places and the remains of the timber partition have been placed against wall with several frames. The imprint from a former skirting board is visible in 6A.

4.5.16 Phasing and fittings

<i>Name in 1937</i>	Hospital bedding and clothing store to outer half (6A); Barrack store to inner half (6B)
<i>Original fittings</i>	One embrasure shutter Metal grill vent cover in 6B Bell board with single central plate (in 6B)
<i>Secondary fitting</i>	~
<i>Ex-situ fittings</i>	One embrasure shutter
<i>Former features</i>	Partitions to 6A and 6B (Features M and N) with door Cupboard with shelves in alcove 18-light arched window into courtyard (Feature H, Fig 29) Door to courtyard (possibly simple tongue and groove) Sash window (probably 6 over 6 lights). Loophole shutters either side of embrasure

4.5.17 **Room 7** is a bare room with no window or door fittings (except the passage door, see below), and the iron shutters have been removed from the embrasure. The 7B fireplace is intact with the cast-iron frame and shelf (Fig. 32). The 7A fireplace was small but has been removed and the floor is rotting away, but fragments of skirting board survives. The iron vents in the north-west wall are exposed and not plastered over as in other rooms.

4.5.18 Phasing and fittings

<i>Name in 1937</i>	Utensil store to outer half (7A); Barrack store to inner half (7B)
<i>Original fittings</i>	Partition to Passage B (Feature K, Fig 25) Ring bolt in ceiling Grille vent by gun
<i>Secondary fitting</i>	Fireplace in 7B (Feature T, Fig 32)
<i>Ex-situ fittings</i>	Embrasure shutters
<i>Former features</i>	Cupboard with shelves in alcove 18-light arched window into courtyard (Feature H, Fig 29) Door to courtyard (possibly simple tongue and groove) Sash window (probably 6 over 6 lights). Loophole shutters either side of embrasure

4.5.19 **Passage B** is opposite to Passage A in the other corner of the inner courtyard. It is shorter in length being 9.1 m long and gives access to the central passage through rooms 1 to 7 and into room 8. The door frame into the passageway from Room 7 still survives, with boarded side lights (once glazed) (Feature K, Fig. 25). Also the doorway and window of Room 10 opens into the passage. The passage has stone

block walls supporting a sloping brick barrel vaulted ceiling and a smoothed concrete floor. These are all painted white with the lower 1.2 m dado painted brown/beige over earlier whitewash. The layout of this part of the keep remains the same as that shown on the 1937 map.

4.5.20 The north wall divides Room 8 from Passage B and was a 0.25 m thick brick-built wall with a flushed sand cement render on a footing of rough stone. Only the door frame survives and is tall, rectangular and with a shallow arch top supporting a concrete lintel. A wide rectangular window above this measures 1.14 m x 0.90 m with four panes of glass, giving light to Room 8 from the passage. The fact that this wall is of brick, together with the detailing of the window, suggest that it was a secondary insertion, probably of early 20th-century date. The 1937 map shows that it had been constructed by this date.

4.5.21 **Room 8** is at the north end of Passage B and is a continuation of the walls and ceiling ending in the north-west wall, containing the embrasure and flanking loopholes. It has a levelled-up gun platform in the wooden floor, but the southern half (rear) of the floor has collapsed. In the south-west wall is a small, cast-iron fireplace (Feature U, Fig. 32) and one of the iron shutters is still in-situ. This gun embrasure has been altered at a later date and been opened into a doorway 2 m high and 1.03 m wide with the sides of the wider embrasure in-filled. The doorway has now been infilled with breeze block. The sockets for the beams for a small footbridge across the moat can be observed cut into the Keep face (Plate 14). This footbridge was a secondary insertion but it is known to pre-date 1937 (being shown on the plan of that date). It was presumably added in the early 20th century when the Keep had lost its primary defensive function and when controlling access to the structure was no longer of prime concern. In the north-east wall of room 8 is a large low arched doorway giving access to rooms 9A and B.

4.5.22 Phasing and fittings

<i>Name in 1937</i>	Bedding store
<i>Original fittings</i>	Fireplace (Feature U, Fig 32) Ring bolt in ceiling from gun One embrasure shutter
<i>Secondary fitting</i>	~
<i>Former features</i>	Cupboard with shelves in alcove Loophole shutters either side of embrasure

4.6 **Internal description: east side**

4.6.1 **Room 9A and 9B** are two small square shaped rooms in the north corner of the Keep. They have stone built walls and brick barrel vaulted ceilings with an embrasure and flanking loopholes in each room. The embrasures are smaller in size than in the main rooms but they are the same as those in the rooms at the southern corner of the Keep (16A and 16B). The wood floors are plain with no gun platform built into them although the embrasures suggest that they were intended to have guns fitted into them. The opening from Room 8 has two sliding doors (Feature I,

Fig. 26 and Plate 15) in a shallow primary rectangular recess and the door between the two rooms has a broad arched door frame (Plate 16). The iron shutters are in place in 9A and one in 9B (other against wall). In room 9A there is a fireplace in the south wall with part of its cast-iron surround in-situ and in the south wall of 9B are a series of sockets in the wall for shelves. There was formerly a door into room 9A from room 10, but it has been infilled with breeze blocks. The 1937 plan shows an alcove at this location (facing south into Room 10) and labels it 'coal' suggesting this was a coal store.

4.6.2 Phasing and fittings

<i>Name in 1937</i>	9A and 9B were Soldiers Quarters for 19 men.
<i>Original fittings</i>	Sliding doors between 9A and 9B Fireplace (Feature U, Fig 32) Both embrasure doors in 9A One embrasure shutter in 9B
<i>Secondary fitting</i>	~
<i>Former features</i>	Loophole shutters either side of embrasure

4.6.3 **Room 10** is a large rectangular room (14.3 m x 6.1 m) with a primary embrasure and flanking loopholes in the east wall. The north wall is plain with a blocked door from Room 9A which is shown as a coal store on the 1937 Keep plan. The west wall faced out into Passage B (Plate 17) with a large arched doorway and primary frame (2.13 m x 1.20 m wide) intact. Next to the door is a large arched window opening (2.05 m high x 1.60 m wide x 0.30 m in depth) with splayed jambs which had a sash window with sash box and cover. The sash window is no longer in-situ but the weights remain. The south wall contains two fireplaces each side of a central passage, which have both been removed. The floor of this room is unstable and collapsing in places and a concrete pad and new flooring in front of the east fireplace can be seen. The ceiling has a brick barrel vault which has been whitewashed, but the traces of former partitions dividing the area into two main rooms with a central passage are visible. This arrangement is shown on the 1937 plan with each room forming a barrack store. The ceiling is whitewashed beneath the partitions (unlike the partitions in the west half of the Keep) suggesting that these divisions were secondary additions. Two rectangular shapes in the plaster in the top of the wall each side of the central passage in the south wall can be seen. These are thought to be from the bell pull system observed elsewhere in the Keep. A WC is shown in the north corner of the 1937 plan, but no trace can be found today. The two rooms were shown on the plan as stores (Fig. 15).

4.6.4 Phasing and fittings

<i>Name in 1937</i>	Barrack store
<i>Original fittings</i>	Primary door frame Ring bolt in ceiling
<i>Secondary fittings</i>	~

<i>Former features</i>	Sash window in west wall Two fireplaces (uncertain type) Cupboard with shelves in alcove Loophole shutters either side of embrasure
------------------------	--

4.6.5 **Room 11** is a rectangular room measuring 13.65 m x 6.1 m with embrasure and flanking loopholes in the east wall with a badly truncated wooden floor and gun platform. A surviving fireplace in the north wall has been robbed of its surround and the one to the west has been filled in and plastered over with a vent. The rest of the room from the end of the gun platform was converted into an engine room for electric lighting for the fort before the war with the floor being removed and lowered and laid in concrete with bases, engine mounts, culverts and drains. The east end of the room has three brick piers built through the wooden floor for cooling tanks. This part of the room was behind a timber partition (now against the wall), which is probably a reused timber partition of the room lining the central passage (Fig. 15). This arrangement is shown on the 1937 plan. The brick vaulted ceiling is whitewashed and the trace is visible of the two partitions which created a central cross passage (removed prior to 1937 plan). There is whitewash on the ceiling along the line of where the former partitions abutted (unlike in similar areas in the western side of the Keep). This suggests that the partitions would have been secondary but it may be that in this part of the Keep the ceilings were whitewashed as soon as the main structure was completed and before the ‘soft fit’, where partitions would have been installed. There are also a number of wood batons fixing cables and pipes demonstrating the later use of the room. The main water pipe from the water tanks on the roof is set into a channel in the archway in the west side of the south wall. At the eastern end of the north wall is a semi-circular arched alcove (as found in almost all the rooms) with the best preserved cupboard and shelves in the Keep.

4.6.6 The room is currently used as a secure store for doors and windows removed from elsewhere in the Keep, and all are marked with the room where they were found.

4.6.7 Phasing and fittings

<i>Name in 1937</i>	Electric light engine Room and Cooling tanks (at East end)
<i>Original fittings</i>	In-built cupboard with two shelves, filling lower section of semi-circular arched alcove.
<i>Secondary fitting</i>	Piers, pipes and cables for electric light engine room.
<i>Ex-situ fittings</i>	<i>Principal store for ex-situ fittings from Keep</i>
<i>Former features</i>	Sash window (Feature J, Fig 27) Door (Feature F, Fig 31) Two fireplaces (type unknown) Loophole shutters either side of embrasure

4.6.8 **Room 12 and 12A** is a rectangular room (13.65 m x 6.1 m) with embrasure and flanking loopholes in the east wall with just the window frames in the embrasure and loopholes surviving, but no iron shutters in-situ. The embrasure has been filled

by breeze blocks. The north wall has two fireplaces, either side of the central archway. The west one has been filled in and plastered over and the east one removed. The trace of the bell pull system can be noted next to the fireplaces on the left side. The brick vaulted ceiling is whitewashed and the trace is visible from two former partitions which created a central cross passage. The line on the west side is now partly covered by the secondary wall (pre-dating 1937) made to form Room 12A. Room 12A is a corridor (7.85 m long x 2.1 m wide) created when the Keep was converted to Barracks to allow access from the courtyard to the stairs down to the lower level. It is interesting to note that the imprint is still visible in the ceiling (very faint) from the former partition in Room 12. The current wall that creates 12A (of early 20th-century date) would clearly have truncated this central corridor. When the corridor was created a new doorway into Room 12 was made by opening up the window next to the door (Plate 18). The original arrangement would have comprised two windows as in Room 13.

4.6.9 The south-west wall of the room consists of a tall narrow arched doorway into the inner courtyard next to two tall narrow arched sash windows with sash boxes and covers behind (now removed).

4.6.10 Phasing and fittings

<i>Name in 1937</i>	Accumulator Room (to W) and Battery Store Room (to E)
<i>Original fittings</i>	Ring bolt in ceiling from gun.
<i>Secondary fitting</i>	Window frames from embrasure and loopholes
<i>Former features</i>	Door (Feature F, Fig 31) Sash window into courtyard (Feature J, Fig 27) Two fireplaces (unknown types) Two partitions (unknown types but probably similar to Features M and N) Cupboard with shelves in alcove Loophole shutters either side of embrasure

4.6.11 **Room 13** is a rectangular room measuring 13.65 m x 6.1 m with embrasure and flanking loopholes in the east wall. It is a mirror image of room 12. The iron shutters are present ex situ. The brick vaulted ceiling is whitewashed and the two traces of the timber partitions lining the central passage, which divided the room into two are visible. Again there is whitewash on the vaulted ceiling above the line where the partitions formerly abuted. Uniquely, the passage in the centre of the north wall (to Room 17a) still retains its timber panelling (Fig. 27 and Plate 19). This shares similar detailing to other joinery in the Keep and it is believed to be primary. The room 13B in the west half was a barrack office in 1937 with a fireplace in the south-west wall (now removed). It had two tall sash windows and door in the north-west wall facing into the inner courtyard and in the same style as those in Room 12. The suspended wooden floor is rotten and collapsing in places. The imprint is clearly visible on the wall from the former board on which the bell pull (or alarm?) system was fixed. The board is no longer in-situ and the bricks beneath are neither plastered nor whitewashed confirming that the boards must have been primary.

4.6.12 *Kitchen:* The room 13A in the east half was the original kitchen for the Keep with a solid concrete floor. The traces of two large ranges built into the south-east wall are visible as is the imprint of the range on a stone floor slab measuring 2.3 m x 0.6 m x 0.08 m. These two ranges have been filled in and plastered over and a small square fire place (0.65 m wide x 0.81 m high x 0.54 m depth) has been built into the right range. The recess in the right corner of the room formed a passage into the next room 17B. By 1937 this area had been converted to a store room.

4.6.13 Phasing and fittings

<i>Name in 1937</i>	Barrack Office (to W) and two stores
<i>Original fittings</i>	Panelling lining passage to north Vent grille into yard
<i>Secondary fittings</i>	~
<i>Ex-situ fittings</i>	Two embrasure shutters
<i>Former features</i>	Two sash windows (Feature J, Fig 27) Door (Feature F, Fig 31) Fireplaces (unknown types) Loophole shutters either side of embrasure

4.6.14 **Room 14** is a rectangular room (13.65 m x 6.1 m) with embrasure and flanking loopholes in the east wall and is a mirror image of room 11. The room is bare with a suspended timber joist floor, below which the top of the brick vaulting to the magazines is visible. A stone dwarf wall sits at the top of the magazine's brick arch and the joists it supports are 9 inch x 2 inch and 1 ft apart. They rest on a plate at each end supported by stone corbels. The brick vaulted ceiling is whitewashed, but no traces of any timber partitions lining the central passage can be seen. The 1937 plan shows this as a single room and it may never have been subdivided by a corridor. A series of truncated metal fixings are visible in the ceiling of a former central feature which could have been a thin, secondary partition dividing the room into two. The two fireplaces in the north wall each side of the central passage have been removed. The window frames in the embrasure and loophole of the east wall have been removed and an iron shutter is still in place. The west wall, which faces into the inner courtyard has no door, but uniquely it still retains its tall sash window and sash box (Fig. 27 and Plate 20). Also traces of the bell pull system can be observed to the right of each fireplace, as well as traces of hooks and wooden hook supports.

4.6.15 Phasing and fittings

<i>Name in 1937</i>	Barrack Store
<i>Original fittings</i>	Sash window (Feature J, Fig 27) One embrasure shutter Ring bolt in ceiling for gun Iron lined vent above eastern fireplace
<i>Secondary fitting</i>	~

<i>Former features</i>	Cupboard with shelves in alcove Door (Feature F, Fig. 31) Skirting board Loophole shutters either side of embrasure
------------------------	--

4.6.16 **Room 15** is a large room rectangular room (14.3 m x 6.1 m) with embrasure and flanking loopholes in the east wall and is a mirror of room 10. It is known to have originally been the Officers Mess as the trace of this is still visible written above the door from Passage A although by 1937 it had been converted into a Barrack Store.

4.6.17 The embrasure window frame partly survives in place, but the other window frames have been removed and the embrasure has been infilled with breeze blocks. One of the iron shutters remains in-situ while the other remains in the room (ex-situ). The recess at the east end of the north wall has the joinery of the cupboard shelves preserved in its lower part (it appears to have been open above). The room has a suspended timber joist floor which is rotten in places and whitewashed brick vaulted ceiling with a trace of three timber partitions. One of these is close to the central line of the room while the other two are each in the western half of the room. One of these would have flanked a former set of stairs at the north-western corner of the room up to the Keep's roof. The steps within the body of the wall (and in an arched passage through the ceiling) remain in-situ.

4.6.18 The room has two fireplaces on its north wall either side of the passage from Room 14, which has been blocked up by a breeze block wall. The west fireplace has been blocked up and plastered over, but the east fireplace still retained its plain cast-iron surround and was the same as the fireplace in Room 8 (Fig. 32). The west wall facing Passage A has a large arched doorway (2.13 m high and 1.20 m wide) although the primary door is no longer in-situ and only fragments of the frame remain. These fragments include the cast iron shoes at the base of the door-frame posts. Next to the door is a large arched opening for a sash window (2.05 m high x 1.60 m wide x 0.30 m in depth) and although the window itself is no longer in-situ the sash weights remain beneath the opening.

4.6.19 Phasing and fittings

<i>Name in 1937</i>	Barrack Store (but it was originally the Officers Mess)
<i>Original fittings</i>	Alcove cupboard (partly in-situ) with shelves One embrasure shutter Fireplace in E half (Feature S, Fig. 33) Grille vent in E wall to S of gun platform. Ring bolt in ceiling
<i>Secondary fitting</i>	Embrasure window frame
<i>Ex-situ fittings</i>	One embrasure shutter
<i>Former features</i>	Sash window (similar to Feature J but wider) Door (Feature F, Fig 31) Fireplace in W half (unknown type) Loophole shutters either side of embrasure

4.6.20 **Rooms 16A and 16B** are two small square shaped rooms in the south corner of the Keep. They have stone built walls and brick barrel vaulted ceilings and each room has an embrasure and flanking loopholes facing south. These are a mirror image of Rooms 9A and 9B with the smaller size embrasures and iron shutters, but unlike the rooms at the northern corner of the Keep the wood floors of Rooms 16A and 16B have gun platforms built into them. Room 16B faces out onto the counterscarp and its platform had been levelled. Room 16A faces over the moat and covered the bridge into the Keep and the gun platform was in place suggesting that a gun mounted on a garrison carriage was installed in the room. This is thought to be one of the six 64 pdr RML recorded as mounted in the Keep, the other five being on the roof (Pye and Woodward, CCC). The door from Passage A into Room 16A is a large double door in which a gun and carriage could pass through. The door is not in-situ but a central bolt hole in the stone tread confirms that it would have been double. There is no door fitted in the archway between the rooms. In the centre of the ceiling in room 16B against north wall is a 6" hole for the chimney pipe of a stove (a section of which is nearby). Along all the walls other than the southern, which had the embrasure and loop holes, were a series of 2" square sockets for shelves and brackets for equipment and stores. The sockets in the west and east walls are 0.6 m and 1 m above the floor (6 sockets to each wall) while the ten in the north wall are at 0.75 m and 1.75 m above floor level.

4.6.21 These rooms could have been the armoury for the Keep and may have contained a gun covering the drawbridge. The 1937 plan shows the rooms as Royal Engineer stores.

4.6.22 Phasing and fittings

<i>Name in 1937</i>	Royal Engineers Store
<i>Original fittings</i>	Iron shutters in both 16A and 16B Ring bolt in ceiling
<i>Secondary fittings</i>	Partially surviving stove pipe
<i>Former features</i>	Two leaf door to Passage A (shown by central bolt) Loophole shutters either side of embrasure

4.6.23 **Room 17** is divided in two (A and B) and situated behind the central stairway at the north end of the Keep's south-east face. **Room 17A** is accessed from a door from the central stairway as well as through an opening in the north wall of Room 13. It has a whitewashed, brick-vaulted ceiling continuing into 17B and a suspended softwood joist floor supported by the north and south-west walls as well as by a central dwarf wall. The room forms an ante-room giving access to the central passage along the north-east and south-east face of the Keep as well as access to the stairway down into the galleries and lighting passages of the magazines. This is through a door with a small quarter-turn window with eight panes above. To the right of the stairway is a cupboard, formed with secondary (probably early 20th-century) brickwork and a primary doorway into Room 17B. The central passage through the north wall later has had its north side bricked up and a lamp recess (0.38

m 0.54 m) built in for illuminating the passage 12A to the magazines. The east half was bricked up to form an open shelved cupboard next to the stair well down into the galleries.

4.6.24 Phasing and fittings

<i>Name in 1937</i>	Circulation space (not named specifically).
<i>Original fittings</i>	Doorway into 17B
<i>Secondary fitting</i>	~
<i>Former features</i>	~

4.6.25 **Room 17B** is the room at the north end of the south-east face of the Keep. It has a whitewashed brick vaulted ceiling continuing from Room 17A. The floor is of stone rubble and concrete with a thin 0.02 m thick layer of tarmac with a drain in the floor running into the embrasure and out through a drain in the wall. There is also a pipe in the floor with concrete covering and the imprint of a range against the south wall to the right of the archway from Room 13. The south-east wall faces out over the moat and contains an embrasure with flanking loopholes, which has no window frames but the iron shutters are in-situ. The north wall contains a small cast-iron fireplace with VR over a crown in the centre (Feature W, Fig 32). Next to this on the left is a small cast-iron cistern in the wall (Fig. 32 and Plate 20), while the rest of the wall is covered by the brick wall built up to the ceiling for the stairwell to the galleries below. A blocked window 1.23 m high x 0.91 m wide is in the east end of this wall which would have illuminated the stairway down from Room 17A. The brickwork for this wall is believed to be primary but adjacent to it is another brick wall which creates a cupboard accessed from 17A. This brickwork does not rise to the ceiling and it is believed to be of slightly later date.

4.6.26 At the north-east corner of the room is a doorway through to Room 18A in which the door and frame remain in-situ. The joinery of this door appears primary although it could be a very early alteration.

4.6.27 Phasing and fittings

<i>Name in 1937</i>	Store
<i>Original fittings</i>	Both shutters from embrasure Fireplace (Feature W, Fig 32) Door to 18B
<i>Secondary fitting</i>	~
<i>Former features</i>	Window to light stairs (unknown type)

4.6.28 **Room 18A** is the small room (circulation space) opposite 17A. It has stone north and south walls while the west is the other side of the secondary brick wall to the central stairway.

4.6.29 The east wall is of secondary brick (probably early 20th-century) with the access stair way to the magazine stores below through a door with a small quarter curved window with eight panes above. At its south end this brickwork clearly abuts and is later than the brickwork which flanks the stairs down to the lower level. The ceiling is a whitewashed brick vault continuing into Room 18B and there is a trace of a

former timber partition which would have divided the space on the west side of the central passage to form a storage space with a vent into the central stairway. This cupboard is shown on the 1937 plan. The former passage in the south wall has been blocked with a lamp recess accessed from Room 17A. The archway in the north wall became the access route into the room from the inner courtyard after construction of 12A. The east wall is thought to have been a timber partition facing into the passage way similar to 17B, but replaced by a solid brick wall from the magazine store stairway across to the north-west wall and the new access to Room 18B from the doorway in north-east corner of Room 17B. Traces of light cable can be still observed fixed to the ceiling and the wall of room running down into the magazines.

4.6.30 Phasing and fittings

<i>Name in 1937</i>	Not named - was a circulation space
<i>Original fittings</i>	~
<i>Secondary fitting</i>	~
<i>Ex-situ fittings</i>	Half of the main door into the Keep (Passage A). Other half remains in Passage A.

4.6.31 **Room 18B** is the mirror to Room 17B at the south end of the north-east face of the Keep. It has a suspended joist floor with levelled up gun platform and whitewashed barrel vaulted ceiling. The north-east wall faces out over the moat and contains an embrasure with flanking loopholes, which have no window frames but the iron shutters are in-situ. The south wall is of stone with the brick walls of the magazine store stairway built against it to the ceiling and in the south-east corner is the new rectangular door (1.96 m x 0.94 m) with door and frame possibly re-used from an earlier timber partition. Along the north-west wall is a tall cast-iron fireplace (Fig. 32 and Plate 21) and a small corner recess to the right. A lead water pipe can be observed at floor level running under the floor and through the north-east wall.

4.6.32 Phasing and fittings

<i>Name in 1937</i>	Furniture Store
<i>Original fittings</i>	Both shutters to embrasures
<i>Secondary fitting</i>	Fireplace (Feature V, Fig 32)
<i>Former features</i>	Loophole shutters

4.6.33 **Room 19** is an access passage from an archway with steps in the ceiling from the north corner of Room 15, which turned right for a length of 5.7 m to exit through the now blocked doorway at the southern end of the inner parapet of the Keep's roof (Fig. 8 and plate 22). The passage is built of stone blocks with a narrow brick vault ceiling with granite steps at each end. In the corner of the west end of the north wall is a small narrow window (0.45 m high and tapering from 0.44 m to 0.12 m wide in middle), which opened up into the inner courtyard. Both the window and door way were blocked up with bricks and cement at the same time, probably before the Second World War when the Keep was used as a store.

4.7 **Inner Courtyard**

4.7.1 **The Inner Courtyard** is a small open area in the centre of the Keep which shares the overall D-shaped plan of the Keep. It has a raised walkway from passage A along the south-east and north-east face to passage B. This is formed of 0.10 m thick stone slabs supported on stone blocks with a set of granite steps down into the courtyard opposite the entrance to the central stairway. The walkway has a two bar iron railing around the edge which is fixed to cast-iron posts the same type as the other railings around the top of the courtyard and in the fort. The courtyard surface is a thin layer of tarmac badly damaged by weeds and there is a shallow concave surface gully which feeds into a drain in the centre just opposite the Keep's well. The well is against the west edge of the courtyard between Room 3 and 4 and the remains of a 19th century cast-iron lift pump survive on a timber board fixed to the wall adjacent to the well with a modern metal grill cover. Around the edge of the curved side of the courtyard radiate the Rooms 1 to 7 and passages. The cast-iron down pipes from the roof have hoppers with VR 1862 cast on them. Next to the doorway to Room 11 on the walkway is a cast-iron boot scraper.

5 **KEEP GALLERIES AND MAGAZINE STORES**

5.1 **Description of Galleries and Lighting Passage**

5.1.1 Beneath the main level of the Keep are a series of long galleries which are accessed via the set of steps in Room 17a of the Keep as well as via a doorway in the side of the main entrance to the fort. These galleries would have been used to defend the counterscarp of the Keep's ditch on the west side and across the main ditch facing both north-west to the north-east caponier and south-west to the south-east caponier. There are also counterscarp galleries to the high ditch in front of the Keep on its east side (Fig. 7).

5.1.2 The stairway down to the galleries from Room 17a is brick built with granite stone steps. There are two-lamp recesses which would have provided light into the magazine stairway and the room in the clearing lobby of the magazine. The stairs open out into a corridor running under the north-east and south-east face of the Keep. At the north-west end of the corridor there are steps down to the galleries across the ditch and on to steps up to a gallery which runs around the outside of the Keep's curved ditch. This ends down a set of steps at a junction between the corridor with the south-west end of the south-east face and the corridor from the main entrance to the right. Going back along the corridor to the stairs it is joined on the right by the return from the counterscarp galleries. The corridors are all constructed with flagstone floors and brick vaulted ceilings (Plate 23). The walls are constructed of pitched-faced masonry with mortar bond to stop or deflect ricochet shots. All the galleries are whitewashed. The loopholes are of two different types depending where they were positioned. The first are rectangular 1.8 m long and 0.35 m high and 1.2 m from the floor. These slope in to a 0.6 m long and 0.11 m high

narrow loop hole about 0.5 m into the wall before sloping out again. The loop holes facing along the ditch and flanking each side are upright measuring 0.6 m wide and 0.63 m tapering into a central loop hole 0.10 m wide. The outside is a 0.65 m high, 0.50 m wide and 0.50m deep stepped box with the loophole in the centre (Plate 24).

5.1.3 Along the north-east and south-east corridor, past the magazine stores, is an archway with a large wooden door measuring 2.28 m x 1.30 m x 0.05 m which could shut the galleries off from the magazines and entrance into the Keep. The doors survive against the wall, but have been removed from their mounts. Between these two doors are the magazines on the west side of the corridor with magazine 1 to the north and magazines 2 and 3 to the south. Opposite these in the corridor are upright loop holes (two along the north-east face and three along the south-east) which would have provided light and air from the high level ditch as these are set too high in the wall to be used in defence. These are opposite two narrow air vents (Fig. 6) into each magazine to allow air to circulate and reduce moisture.

5.1.4 At each end of the corridor are the entrances to the lighting passage, which runs around the sides and back of the magazines. The doorframes for each of these doors survives with Light Passage No 1 (Plate 25) over the north-east opening and Light Passage No 2 over the south east doorway. The doors have been removed and laid against a wall nearby. They are each narrow-arched, four-panel doors measuring 1.97 m high and 0.75 m wide. The passage is formed by building a 0.35 m thick brick wall 0.8 m inside the outer stone wall of the magazines and the lobby from the floor to the brick vaulted ceiling. There is a raised floor of stone slabs supported on brick piers standing 1 m of the floor and accessed by a set of stone steps 3 m in from the doorways. This raised floor gives access to a series of lamp recesses. These measure 0.45 m wide and 0.6 m high with a granite lintel with fixed window on the inside and a hinge door into the passage. On the underside of the lintel are two small plugs to hang lamps and plugs for fixing a vent. Though some had a 1" square hole in the centre to vent through an airbrick in the wall above the lintel. Below the lamp recess was a vent in the wall from the magazines. These would have had a metal grill cover, but all were missing or broken. Along the outer stone wall of the lighting passage is a series of four courses of wood block plugs (0.22 m x 0.10 m x 0.08 m) evenly spaced up and along the wall onto which panelling would have been fixed to protect from sparks and moisture from the stone.

5.2 Description Magazines and Clearing Lobby

5.2.1 The magazines and lobby are accessed by a stairway from Room 18A and mirrored the stairway into the galleries (Fig. 6). The stairs are of the same construction of brick with stone steps, but the steps had a 1½" hole at each end of the step for a wood plug to fix wooden treads to the steps. This would have been to reduce the risk of sparks from iron shod boots entering and leaving the store. At the bottom of the stairs is a wedge-shaped anteroom with doorway into a central clearing lobby.

At each end there is a lamp recess to illuminate the clearing lobby and at the west end of the brick vaulted ceiling is a 1.64 m diameter shaft which would have been used to lift ammunition from the store to the roof. The lobby has stone built walls and suspended wood plank floor and there is a small rectangular room at the east end. A later electric light fitting was fixed in the room from the corridor. Across from the doorway from the stairs is a small wedge-shaped room with a pair of doors that opened out into the lobby. The room has a window from the light recess in the stairway to the galleries. It has a brick vaulted ceiling and wooden suspended floor. In the courses of the walling is a series of 1" wood wedges to fix panelling to the walls. Similar wooden wedges can be seen in the ante room at the base of the stairway, passages to the magazines and the magazines suggesting that all rooms had panelling or liner to reduce moisture and sparks.

5.2.2 **Magazine 1** is to the north of the lobby and is entered through a 1.32 m wide doorway with two 1.9 m x 0.58 m doors opening inwards through the 1.2 m thick wall. The doors close flush together and are clad in tin on the outside. A granite slab forms a lintel above the doors and a base for a 0.73 m high archway. This forms a lamp recess with a window into the magazine and a tin covered door for the lamps above the door. Above the door on the lintel is **No1 A.MAGAZINE**. (Plate 26). The magazine is rectangular, measuring 7.9 m x 4.9 m, with north-west and south-west brick walls with light windows from the lighting passage. The north-east and south-east walls are of stone with the entrance in the south-east and four narrow vents connected to the two in the corridor in the north-east wall. It has a brick vaulted ceiling and a suspended board floor on joists, resting on brick walls with broken brick and tile between the walls 0.4 m from the floor.

5.2.3 **Magazines 2 and 3** are to the south of the lobby and are entered through 1.32 m wide doorway through the 1.2 m thick wall opposite to the doorway to magazine 1. The doors, windows and frame have been removed and stored inside magazine 2 and were of similar construction to those in to magazine 1. There is no writing above the door and there is an open archway between magazines 2 and 3. The magazines are of the same size and construction as magazine 1, though magazine 2 is wider. The north-west walls and south-west wall of magazine 3 are of brick with light windows from the light passage. In the south-east walls of each magazine are four narrow vents connected to the two in the corridor. All the magazines, rooms and lobby are whitewashed.

6 CONCLUSIONS OF THE SURVEY OF THE KEEP

6.1.1 The survey revealed that the Keep had three major changes of use with later modification to individual rooms. The primary phase on the Keep was that of a defensive Keep to defend the garrison of the fort if its main defences were breached and to protect the main magazine store of the fort. The Keep had its own defensive dry moat around its west half and the fort's dry main moat along its east side, which were all defended by counterscarp galleries accessed from within the Keep.

- 6.1.2 The ground floor of the Keep was entered over a drawbridge and through a doorway in the south-west side of the Keep. It led to a passageway through to an inner courtyard. From this inner courtyard a series of rooms radiate out to the outer wall of the Keep and contain a gun embrasure flanked by loopholes. These embrasures would have had a sweeping field of fire across the inner upper and lower parades and across the eastern glacis in front of the fort. The rooms curve around to the west from the entrance passage to the north passage B and along the north-east and south-east face and were divided into an inner and outer room by a central passage and timber partition. The outer rooms had a 1.20 m sloped gun platform built into the floor, but had fireplaces for the comfort of the gun crews that would have been barracked with the guns. The inner rooms all had fireplaces and appear to have been used as barracks or offices with access from the central passage and inner courtyard. In a number of the rooms a bell pull system was recorded in form of bells next to fireplace (Plate 27) in the outer rooms and panels on wall (Plate 13) in the inner rooms and connected by cables under the floor boards. A number of rooms had been for other purposes such as Room 1A, which was the Keep latrine. Rooms 9A and 9B in the north corner appear to have been offices and storeroom. These rooms face onto the counterscarp wall and had no gun platform built in their floors. The Keep kitchen was in the outer room of Room 13 with two large built in ranges with second passage into Room 17B. In Room 15 in the inner room wooden stairways to a passage (Room 19) onto the roof giving a second access point to rooftop other than the central stairway. The stairway to the passage had been removed and no traces in the floor or walls were observed in view of its construction and layout with room's fireplace and window.
- 6.1.3 The roof was flat with protected earth rampart and along the north-east and south-east face a thick parapet with five gun embrasures for the forts main defence covering its eastern side. The embrasures on the north-east face have been covered by later Second World War water tank replacing two earlier water tanks, one above the latrine.
- 6.1.4 The second phase of the Keep was when the fort changed from a defensive structure to accommodation and barracks and could have been incorporated in the final phases of the Keep's construction. The gun platforms in all the rooms but number 16A were levelled up. Some of the rooms along the south-east face were opened up to form larger single rooms. The main change was the replacing of timber partitions of Rooms 17B and 18B with brick and connecting the rooms by a doorway through a dividing wall. Another change was the construction of the separate passage (Room 12A) to the magazines and the blocking of the central passage through the north-east and south-east faces. The toilet block was constructed in the northern half of the first room left of the main entrance, which was later improved with water pipes linked to new tanks on the roof. The Keep from the late 19th century is referred to as the Officers' Quarters (1896 OS map) possibly when the fort became was an army barrack and musketry training school.

- 6.1.5 The start of the third phase was after the First World War during the 1930s when the fort was used for training purposes. The Keep became the central store for the barracks, ranges and hut camp to the east of the fort. The embrasure in Room 8 at the end of passage B was converted to a doorway with a narrow footbridge placed across the Keep's moat giving a second entrance to and from the Keep. The Keep had electric lighting fitted to numerous rooms which were powered by its own supply from the engine room in Room 11. In 1938 the fort re-opened as the Territorial Army Passive Air Defence School and on the outbreak of the Second World War became the Army Gas School. In 1942 the American army occupied the fort and the Keep was used as barracks and stores. The Keep was still used as the central stores for the fort and camp in the 1950s (Bob Court) and finally closed and was boarded up in the late 1960s.
- 6.1.6 Part of the survey was a paint analysis to determine the original colour schemes within the Keep. These were carried out by Lisa Oestreicher Historic Paint Specialist and a total of ten samples were taken from walls, timber partitions and fixtures. The results from the analysis and samples showed that the interior walls of the Keep were white and of a limewash paint. This had been re-applied a number of times. The timber partitions, doors, windows and frames were a cream or white with later post 1920s brown paint possibly dating from pre Second World War when the fort became a training camp for Gas and Passive air defence. The sash windows sampled had vanish and imitation timber graining and could have been from rooms used as Officer Mess with a different paint style to the rest of the Keep. A copy of the full report is given in Appendix V.

7 THE SOUTH WEST CAPONIER

7.1 External Description

- 7.1.1 The south-west caponier is directly opposite the Keep at the western corner of the fort. It is located adjacent to the moat range and the ground level on the north-west side of the caponier has been raised for the construction of this range.
- 7.1.2 The walls are vertical and built of grey rough-pitched local stone and laid in irregular, but level courses. The doors and embrasures are lined with granite blocks with sloped reveals (Plate 47) while the loopholes are of stone and stepped in except for those in the north-west face and the south-west upper tier. On the north-west face is a sallyport with a small drawbridge across a bridge pit. The roof is a grass covered earth bank and the Chemin de ronde continues along the north-west wall.

7.2 Internal Description Upper Tier

- 7.2.1 The caponier is entered through a tunnel from the rear of the south-west Haxo battery (Fig. 9). This tunnel is of pitched-faced stone and it has a brick barrel vaulted ceiling and a stone flag stone floor. Just before the tunnel turns right into the upper tier of the caponier there is a stairway to the lower tier with an iron railing around it. At the corner into the passage of the caponier's upper tier is the open

gallery of four loopholes covering the south-east face of the caponier. The stone walling changes from a pitched face to a flush rough hewn with a small powder store on the right and entrance doorway into caponier on left and sallyport ahead.

7.2.2 The powder store is a mirror image of the lower tier and has the same construction and size as all the powder stores in the north-west and north-east caponiers. The store is a rectangular room with barrel-vaulted ceiling measuring 2.46 m x 1.86 m. There is a brick lining with a 0.15 m space between the stone wall and four narrow upright vents (0.34 m x 0.08 m) spaced in two courses along the three faces of the store. These are now blocked up. The fourth wall contains the door. The floor in the upper tier has been re-laid with modern floor slabs, but the lower tier store has a single brick course around the edge on which a wood floor is suspended and there are two wall vents below the floor. The room has a lamp recess from the passage 0.53 m x 0.38 m with a glass pane on the inside and door in the passageway. In the middle of the recess in the floor and ceiling a 1" square hole has been cut which leads to an airbrick above and below the window. This was for the lamps to burn and vent the fumes. The door is narrow with a low arched top and a small square window in the centre (two are still in-situ in the north-west lower tier store). In the top left corner a wooden door covers a 6" ceramic pipe into the passage with a perforated grill. Next to this is a second pipe from the space behind (Plates 28 and 29). A small anteroom with the same type of door as the store doors divides access from the passage to the store with air vents into the passage. In some of the ante rooms rows of wood pegs for coats survive.

7.2.3 The entrance into the caponier is through a central archway, which has a rectangular door frame 1.91 m x 0.88 m to the right of a brick wall flush with the face of the passage. Above the door is an arched window with a four-pane rectangular window, which opens out over the door and is flanked by fixed five-pane frames. The door has an iron frame stopping access into the caponier as its floor has been removed. The loops above the embrasures are in place as well as the remains of a fireplace. The embrasures have been filled and no iron shutters were fitted.

7.2.4 The sallyport at the end of the passage has been blocked up with modern breeze blocks and a new door fitted. On each side of the door in the floor is a 2.3 m long x 0.5 m wide and 1 m in depth chamber for the counter-balance weight for the drawbridge with a pulley in the top corner of the doorway. The drawbridge is 3m long and 2.5 m wide and across a bridge pit 2.5 m wide and 5.8 m long (Plate 30). The bridge is mounted on hinges set into the wall with a metal cover plate protecting the hinge (Plate 31). The weights are cast-iron plates forming a 0.75 m long and 0.3m square weight, both are badly corroded and one has broken.

7.3 **Internal Description Lower Tier**

7.3.1 The lower tier of the caponier is entered from the stairs from the tunnel and comes into the open gallery of four loopholes and mirrors the gallery above (Fig. 10). The passage lead to the entrance doorway on the left with the powder store on the right the same as the store above. The ceiling of the passage is the underside of the stone slab floor of the upper tier. Only the brick wall partly blocking half the doorway into the caponier survives. The wooden doorframe and rectangular window above the door has gone. The floor of the caponier was concrete, but this could be a later floor replacing suspended wooden floor. There is no ceiling, but the 0.30 m square beams survive and the two above the embrasures have the loop attached to the beam. The north-west walls have six loopholes facing out into the moat. The south-east wall has two embrasures, 0.6 m wide and 0.7 m high. The outer embrasure is flanked by a loophole and the inner has a loophole to its right. The embrasures are in the centre of a 1.5 m wide and 1.5 m high recess 0.20 m in depth with a central curved camber below the embrasure for a gun to pivot around. Flanking the embrasure and 0.15 m above the floor are two ringbolts. The embrasures all have a 0.7 m wide and 0.75 m high iron shutter of 1/2" plate on 1" wood plank and with a 0.15 m x 0.08 m slit in the shutter (plate 32), but all the shutters have been removed. The south-west wall has a fireplace in the left side of a central alcove with a vent above. In the alcove is a pair of cast-iron brackets 1.22 m apart for a shelf and in the upper tier alcove is a single loophole. A pile of debris, timber, shutters and fireplace fittings are in the south-east corner. The caponier is whitewashed throughout although it is now peeling in places.

7.4 **South-west Caponier Conclusion**

7.4.1 The south-west caponier was never fitted with the its flank guns, though the embrasures have the shutters and ringbolts. Smooth bore guns on garrison carriages could therefore have be fitted but no fittings were installed for the intended 32pdr SBBL. The caponier was used as a barrack room for soldiers in the early 20th century and the sallyport drawbridge was left open for access across the moat to stairs to ranges to the north-west. By 1937 the caponier was used as a store and is now vacant, though the upper tier powder store is still used for targets for the moat range.

8 **THE NORTH-WEST DOUBLE CAPONIER**

8.1.1 The north-west caponier can only be viewed by walking around the moat from the south-west and is hidden behind the backstop of the present moat range. The north-east face has an earlier pistol range against it. The walls are vertical and built of grey, rough, pitched-face local stone and laid in irregular, but level courses. The top of the wall has stepped granite coping with an earth-covered roof, now overgrown with scrub. All the embrasures and loopholes are of granite, which sloped into a small loophole or embrasure. The embrasures have a two-door grille fitted to the outside face, which opens outwards. The loopholes on the north and west face galleries are of stone and stepped in. The caponier has been cleared of vegetation and is easily viewed.

- 8.1.2 The caponier is entered by a tunnel through a range of three casement rooms set into the rear of the north-west rampart. The entrance to the tunnel is between the two west end rooms with a doorway left and right inside the entranceway (Fig. 11).
- 8.1.3 *Room 3* is a rectangular room to the left of the tunnel measuring 6 m wide and 10.65 m long with rough hewn stone block walls with mortar bond with patches of plaster. The room has a brick barrel vaulted ceiling with a small circular vent to a ceramic pipe in the rampart at the rear of the room. The floor is a suspended joist floor and there is a robbed fireplace in the rear wall with brick relieving arch. At the south-east end there are three modern sash windows looking up to the parade with an air vent of cast iron in the top of the arch above. The door in the east corner of the room is in a tall archway with a timber frame. The door itself is on the floor at rear of room. The room appears to have been a store or the canteen shown on the 1896 OS map.
- 8.1.4 *Room 2* is to the right of the tunnel and measures 6 m wide and 10.65 m long with rough hewn stone blocks walls with mortar bond with patches of plaster. The room has a brick barrel-vaulted ceiling with a small circular vent to a ceramic pipe in the rampart at the rear of the room. The floor has a suspended joist construction at the front part of the room and concrete at the back. The line of a timber partition can be observed on the line of the concrete floor. This has been moved back and cut by a new door from Room 1. In the centre of the north-east wall a passageway similar to those recorded in the Keep links Rooms 1 and 2. To the right of this is a small square cast-iron fireplace (similar to those recorded in the Keep) with stone slab in front. The south-east wall has three modern sash windows looking up to the parade with a cast-iron air vent in the top of the arch above. The room appears to have been an office at the front with a storeroom at the back and is linked to Room 1 next door by a central passage. The ceiling is painted white over earlier light blue and the walls are a light beige.
- 8.1.5 *Room 1* is a small rectangular room (10.65 m long x 4.75 m wide) with rough-hewn stone block walls with mortar bond. It has a brick barrel vaulted ceiling with a small circular vent to a ceramic pipe in the rampart at rear of room. The trace of a timber partition dividing the room in two is visible just to the north of the central passage into Room 2 in the form of a band of the original light blue paint. The room has a robbed fireplace in the back wall and one in the north-east wall. A rectangular hole 0.47 m x 0.40 m has been bricked up to the right of the north-east fireplace. The south-east wall has a modern sash window looking up to the parade next to a doorway. This room has been stripped and a new concrete floor laid and central passage blocked up although its original doorframe is still in-situ. A new door 2.16 m high and 0.9 m wide with a concrete lintel and brick facing through wall has been added to the right. The room is now used as a NBC unit.
- 8.1.6 *The tunnel* to the double caponier is of pitched stone with a brick vaulted ceiling and flagstone floor leading down from the rooms through an iron gate set in line

with back of the rooms. Only the two uprights against the walls and a line of eleven 1½” square bars set into the ceiling and cross bar at the join of the vaulting and wall survive in poor condition. This was similar to iron bar gates recorded in the galleries at Scaesdon Fort and is located at the end of the tunnel, before it turns right into the upper tier of the double caponier. There are two entrances opposite each other, to the left are the stairs down to the lower tier and the right is the entrance up to the gardens and Chemin de ronde along the top of the north-west and north ditch.

- 8.1.7 The entrance is through a small passage with recesses (2m x 0.5 m x 1.9 m) on each side for the counterbalance weights similar to the layout of the drawbridge of the sallyport of the south-west area. The weights measure 0.5 m long and 0.3 m square and although the right one is in place the left is broken. The doorway is a lower arch measuring 1.53 m wide and 2.25 high with replacement double doors (1.9 m x 0.60 m) and a metal grille over the doors filling the arch (now collapsed on floor). Above this on each side of the doorway is a 6” pulley for the chains of the drawbridge. The drawbridge measures 2.5 m x 1.7 m and is laid across a pit and covered with a piece of chipboard and garden debris, which leads to fourteen steps up into the garden (Plate 33).

8.2 **Internal Description Upper Tier**

- 8.2.1 The tunnel turns into a passage running east to west and at the west end turns north-east to south-west and enters opposite the doorway into the north-east caponier (Fig. 11). The passage is of flush rough-hewn stone, but changes back to pitched stone masonry in the end galleries. The galleries are of two bays with three loopholes, the outer of which covers the end of the caponier and the inner one is across the front of the caponier. The ceiling is brick vaulted with vaulting along the length of the galleries (as opposed to across it). The floor is formed of flagstones with steps into the caponier. At the point where the passage turns adjacent to the corner of the fort the powder store for the upper tier is on the right. This has the same construction as in the south-west and north-east caponiers with a brick lined room with vents into the passage and stairway. There is no lamp recess into the room, but its door frames are in place and the timber floor survives.
- 8.2.2 Both the north-east and north-west caponier rooms are the same with some minor alterations. These are entered up a couple of steps through a centre-arched doorway. The doorway has a frame for a 2.18 m high and 1.03 m wide door with a 1.32 m low brick wall and 0.86 m x 0.47 m rectangular window to the left of the door. A wooden panel nailed to the top of frame fills the space above the doorframe and vaulted ceiling. The rooms have two bays divided by two 1.23 m square columns supporting a brick vaulted ceiling with a circular vent hole to the roof and loop above the outward facing embrasures. The floors of the rooms are of floorboards supported by four large principal joists and common joists. The floor in the north-east caponier is partly collapsed along the west side and between columns and the north-west was rotten along the edges and below ceiling vents. The outer facing walls along the ditches consists of two embrasures with the outer embrasure flanked

by loopholes and the inner with a single loophole on outside of embrasure. The inner facing wall covering the flank of the opposite caponier has two embrasures with flanking loopholes in the outer bay and a single loophole on the inside of the inner embrasure. All these walls have air-brick vents above the embrasures and smaller air-brick vents in the top corners. The embrasures are of the same construction as in the south-west and north-east caponiers. The embrasures on the outer walls have ring bolts each side of the embrasure 0.15 m of floor and two in the floor behind the embrasure. The end wall of each is a small fireplace/range; the north-west is in poor condition and the north-east is inaccessible. All the iron shutters have been removed or fallen into the room below.

- 8.2.3 Above the outward facing embrasures, 2.1 m from the floor, are two cast-iron brackets 1.2 m apart for a shelf (Plate 34). The vent above the inner north-west embrasure has been opened to form a window and a 3-pane sliding window (1.12 m x 0.51 m) on wood rails fitted over it dating from when the caponiers were used as stores. On the wall opposite the store is a galvanised metal sign (1.08 m x 0.23 m) with **N.W.DOUBLE.CAPONIER** written in white paint (Plate 35). This is different to the signs seen in the south-west and north-east caponiers and the lower tier, which reads **UPPER TIER** and **LOWER TIER** (Plates 36 and 37). The embrasure and loopholes on the north-east face of the north-east caponier have been infilled with small 0.10 m x 0.18 m windows for protection from the later firing range against the caponier in ditch.

8.3 **Internal Description Lower Tier**

- 8.3.1 The lower tier of the double caponier is entered from the stairs of the main tunnel into the caponier. It enters into a passage running east to west and at the west end it turns north-east to south-west and is opposite the doorway into the north-east caponier (Figs 11 and 12). This is a mirror image of the upper tier, but has a flat stone slab ceiling on the underside of the upper tier floor. The galleries are the same as the one in the upper tier, but have two modern rolled steel joists set into the inner bays supporting the ceiling. The powder store is the same as the upper tier, but with both its doors fitted, a timber joist floor in the anteroom and a lamp recess in from passage (Fig. 12).
- 8.3.2 Both the north-east and north-west caponier rooms are the same with some minor alterations. These are entered through a central rectangular doorway. The doorway has a frame for a door (1.94 m high x 1.03 m wide) with a 0.67 m wide brick wall to the left of the door. Above the doorframe is a narrow, 5-pane rectangular window. To the left of the north-east caponier door and the right of the north-west caponier door is a rectangular window and bricked up archway. This is a four light window (1.22 m long x 0.60 m high) and pivoted in the middle to give more light into the lower rooms. The rooms have two bays divided by two 1.23 m square columns with a timber board ceiling supported by beams with a loop above the outward facing

embrasures. The floor of the inner bays is a suspended wood floor on 0.45 m high dwarf walls, 0.8 m above an earthen floor base. The floors in the outer bays are of concrete and fitted with two racer tracks for traversing a gun mount for the outward-facing embrasure (Plate 38). The outer facing walls along the ditches consist of two embrasures with the outer embrasure flanked by loopholes and the inner with a single loophole on the outside of the embrasure. Both the outer embrasures have a pivot lug (Plate 39) set into the wall below the centre of the embrasure (same as fitted in Fort Nelson for 32pdr SBBL) forming the centre pivot for the racer tracks. The north-west embrasure would have been fitted with a 32pdr SBBL gun on a sliding mount (traversing platform No.6 and carriage No.6). From 1885 to 1893 in this caponier a number of trials were carried out to test various weapons for defending caponiers (see Appendix II). The pivot lug shows signs of repair (plate 40 and 41) from damage in 1892 testing a new charge load. Evidence of damage from these trials is found on the north-east face of the sallyport and bridge pit at the south-west end of the ditch (Plate 42). The mounts in the north-east caponier appear never to have had a gun or carriage fitted within it.

8.3.3 The inner facing wall covering the flank of the opposite caponier has two embrasures with flanking loopholes in the outer bay and a single loophole on the inside of the inner embrasure. The loopholes on the outer face walls and the inner loophole have 0.16 m square vent holes in their upper lintel to help release fumes (Plate 43). The embrasures on the outer walls in the inner bays have ring bolts each side of the embrasure 0.15 m off the floor. The end wall of each is a small fireplace/range; the north-east is in poor condition and the north-west has been robbed. All the iron shutters have been removed and are on the floor and the embrasures have been bricked in. Some of the grills do however survive (Plate 44). The embrasures facing the north-east is covered by the construction of a butt stop for a small range against the north-east caponier. The butt stop measures 4 m in depth and 2 m high with a 45° slope with a cast concrete wall at the end of caponier to stop bullets ricocheting along the ditch. The range dates from the Second World War period, but is not shown in use on the 1968 map of the ranges.

8.3.4 Above the outward facing embrasure 2.1 m above the floor are two cast-iron brackets 1.2 m apart for shelves similar to the shelving brackets in the upper tier. The lower tier room of the caponiers doesn't have air-brick vents in the walls above the embrasures, but it does above the fireplaces. The caponiers, stores, passage and galleries have all been whitewashed with green painted woodwork. Though traces of earlier light blue can be observed under the white wash on the ceilings and walls. Remains of electric light cables and light units can be observed surviving in galleries and stores, but in a poor state or broken.

8.4 **Double Caponier Conclusion**

8.4.1 The double caponier would have been fitted with a 32pdr SBBL in its lower tier for trials of the various guns for arming the flanks of the nation's forts in the late 19th century. The lower tier of the north-east caponier also has the pivot lug and

traversing rails to mount a gun, but there were no signs of it being fitted. The other embrasures facing along the north and north-west ditches both in the lower and upper tier have the shutters and ringbolts so smooth bore guns on garrison carriages could have been fitted. By the end of the 19th century the double caponier was used as barracks along with the other fort caponiers. By 1937 the double caponier was marked as a timber store. There are traces of window glass being fitted in loopholes and two very rotten frames from embrasures in the lower north-west caponier on the floor from when the caponiers were used as quarters and stores. These were probably all broken or removed when the caponiers went out of use.

9 THE NORTH-EAST CAPONIER

9.1 Introduction

9.1.1 The caponier can only be viewed by walking around the moat from the south-west. The walls are vertical and built of grey rough pitched face local stone and laid in irregular, but level courses. The top of the wall has a stepped granite coping with an earth-covered roof, now overgrown with scrub. All the embrasures and loopholes are of granite, which slopes into a small loophole or embrasure, except the loopholes on the north-east face and east faces which are of stone and stepped or sloped in. The faces of the caponier were covered in ivy at the time of the survey. The drop ditch around the caponier in front of the loopholes can still be traced, but is partly filled in and overgrown (Fig. 14).

9.2 Internal Description Upper Tier

1.1.2 The caponier is entered through a tunnel from the north corner of the upper parade to the right of the stables (Fig. 13). The tunnel is of pitched face stone with flagstone floor and brick barrel vaulted ceiling. At the bottom of the tunnel on the left, before it turns right down the steps into the upper tier, is a small gallery of two bays with two loopholes with cast-iron railings dividing the tunnel from the gallery (Plate 66). This gallery covered the garden area behind the Chemin de ronde of the north wall. In the ante room of the upper tier the walls are of flush rough hewn stone with stairway down to the lower tier and landing to a loophole covering the north moat to the left of the entranceway. The landing had the remains of a 0.96 m high wood banister rail around the edge of stairway down to the lower tier. A number of hooks can be observed in the top of the wall of the tunnel, stairway and landing on which a lantern could have been hung.

9.2.1 To the right of the passage was the powder store on the right entered through a small stone/anteroom with a metal grill vent over the door. The powder store is brick-lined with blocked earlier vents the same as the ones in the south-west caponier, but it has been re-used later with three joists inserted across the room 1.8

m above the floor for storage. There is no light recess into the room. Beyond this the passage opens into a gallery of four loopholes covering the front of the south-east face of the caponier. At the south-east end of the gallery a 1.43 m long, 0.89 m wide and 0.73 m high slate water tank has been built on two brick piers 0.98 m with a 1" galvanised pipe into the floor to the lower tier.

- 9.2.2 The caponier is entered through an archway and a brick and timber frame door with arched window above as in the upper tier of the south-west caponier. However, this has collapsed through a rotten timber floor. The caponier is divided into two bays by a pair of 1.23 m sq columns supporting the brick vaulted ceiling with a circular vent hole to roof. The north wall has three loopholes in each bay and a brick vent above. The north-east end wall has a small alcove with a single loophole and a small fireplace/range. Graffiti dating from after the First World War and early 1930s were recorded around this fireplace (Plate 45). The south-east wall has two embrasures the same as in the south-west with the outer embrasure flanked by loopholes and the inner embrasure with one on the left. Both the iron shutters have been removed and are on floor, but the hook and clasp for the shutters are still in-situ. Both embrasures have loops above in the ceiling and ring bolts each side of embrasure 0.15 m above floor. A single ring bolt in the floor behind the inner embrasure was recorded.

9.3 **Internal Description Lower Tier**

- 9.3.1 The lower tier is accessed from the stairs from the upper tier which stop in front of two loopholes (Fig. 14). The passage runs back along side the stairway with access to the powder store under the stairs. This is the same brick lined with blocked vent construction as in upper tier and south-west caponier. Though the anteroom has the under side of the steps as its ceiling. There is a lamp recess into the store from the passage 0.4 m x 0.53 m with 1" square in top and bottom to air bricks above and below window. Also the two ceramic pipes are in the top of the wall to the left of recess and there are a number of rectangular vents in the wall. Beyond the store there is a timber frame and plank partition with a (1.80 m x 0.76 m) rectangular door (now stored in caponier room) of similar construction to those in the Keep to the lower gallery (Plate 46). The remains of graffiti in pencil can be observed in the frame with dates 18/5/32 and 25/5/32. The lower gallery is a mirror image of the upper tier with the underside of the stone slab floor for the ceiling with a pipe from the water tank running into the caponier room. Also at the end of the gallery is a trace of brick wall forming a small water closet and there is a socket in the end wall and frosted glass in the end loophole.
- 9.3.2 The Caponier is a mirror image of the upper tier with a concrete floor, possibly replacing an earlier wood floor. The ceiling is the underside of the upper tier floor and is painted green with boards covering the beams. On the ceiling of the outer bay, along the south-east side, is an iron bar. The doorway into the caponier is rectangular with a flat top from the floor slabs above. The doorway is partly blocked by a brick wall as in the lower tier of the south-west caponier. The frame for a door

(1.98 m high x 0.88 m wide) survives with a rectangular window above. This consists of three four-light windows with the centre a casement opening outwards. Both the embrasures have ringbolts each side 0.15 m above the floor and their iron shutters have been removed and placed on the floor. The room contains debris from the collapsed doorway above and the doors from the store and piles of rubbish in corners. Both the upper and lower tiers are whitewashed with green painted woodwork.

9.4 **North-east Caponier Conclusion**

9.4.1 The north-east caponier was never fitted with the its flank guns. Although the embrasures had the shutters and ringbolts so smooth bore guns on garrison carriages could have been fitted no fittings were installed for the intended 32pdr SBBL. The caponier was used as a barracks with the fitting of a water tank in the upper gallery and a water closet and plumbing in the lower gallery. All the loopholes have had panes of glass fitted and the embrasures had frames, but these are now bricked up. The graffiti around the upper tier fireplace dates from First World War with 1st Royal Munster Fusiliers, Ragoon, Burma, India 19--, this regiment was posted there in 1912 before returning to Europe in the First World War and a sister battalion (3rd) was station in Plymouth at end of war until the regiment was disbanded in 1922 with the independence of southern Ireland (Mills, 2006). The others were from soldiers of the 2nd Battalion Rifle Brigade dating from 1931 to 1932 when it was station there prior to posting to Malta in 1933 (Mills, 2006). There is other graffiti on the wall, but is delicate with the flaking paint and should be recorded properly before it is lost for good. The caponier is recorded as a carpenter shop in 1937 when the fort changed from a barracks to training establishment.

10 **CONCLUSION**

10.1.1 The results from the building survey have provided valuable information for the three main aims set out in the SOR for Tregantle. The aims of the survey were to provide an archive record of the Keep and caponiers in their current form in the form of photographs, written records and scaled plans and drawings. These records give an insight to the buildings and change of use since their construction.

10.2 **Use of the Keep and caponiers.**

10.2.1 The survey recorded the changes of the Keep and caponiers of Tregantle Fort. The fort's role changed from a defensive structure to a dual establishment of both part of the western defences around Plymouth and barracks for accommodation and training for units of the British army.

- 10.2.2 The Keep's transition from a defensive structure to quarters could have started during or after its completion. This may have arisen from a national problem of the mounting cost of construction and armament for the forts far outreaching the estimated budgets and improvements in weapon development and the increased cost of the new weapons. It may have also been partly caused by the changing political situation with the passing of aggression from France in the mid 19th century. The fort received only a third of all its intended guns and a smaller garrison. At the beginning of the 20th century the fort became a barrack for units of the army and part of a larger training establishment with introduction of more musketry ranges to the south and south-west of the fort.
- 10.2.3 The role of the Keep changed again during the First World War when the training establishment grew with the expansion of the wartime army. The Keep became the central store for the fort and a new hutted camp was constructed on the east side of the fort in 1917 across the road just north of the Tregantle battery. After the First World War the fort returned to quarters for army unit's station at Plymouth and did not change until 1938 and the outbreak of the Second World War.
- 10.2.4 The fort became a training school for air defence and gas at the start of the Second World War. In 1942 it was occupied by the US army along with Scraesdon for the build up for the invasion of Europe. After the war the fort reverted back to the British army and a training camp and ranges. The Keep was still the central stores for the camp until it was closed in the 1960s along with the removal of the hutted camp to the east.
- 10.2.5 The caponiers appear never to have been fitted with guns for defence, although ringbolts were fitted so small smooth-bore guns on garrison carriages could have been mounted. Only in the lower outer bays of the double caponiers were racer tracks and pivot lugs for mounting a 32pdr SBBL (the intended gun for the caponier defence) installed. These were for the 1885 to 1893 trials for the best gun to be used in the country's forts to be installed in their caponiers. These mountings are significant due to their part in the trials both of local and national interest with the arming of the fort and development of Great Britain's defence in the 19th century.
- 10.2.6 The caponiers appeared to all have been used as soldiers' quarters from the late 19th and early 20th century. Traces of this period of use survive in the north-east caponier with a WC and water tank in flanking galleries and graffiti on the walls. The caponiers then became stores and carpenters shop by 1937. The caponiers are now all shut up and abandoned, although the south-west caponier is still used for access to the moat range from the east barracks and a target store.
- 10.3 **Fittings**
- 10.3.1 The large majority of the Keep's windows, frames and doors have been removed and placed in a store in the Keep. A number survived in a poor and fair condition and an example of each was drawn to scale and photographed along with door frames and room partitions. From examining the stored frames and fittings in the

Keep only the door and window for the six rooms (Rooms 2, 3, 4, 5, 6 and 7) facing out into the inner court were not found. These have been removed completely and no fragments were identified. A few of the large arched windows above the inner court door and window do survive and were recorded. The windows and doors to the Keep are the original fittings with later modifications to individual doors and windows relating to changes in use of rooms and the building. The doors and windows are of a similar style and construction to those found at Fort Nelson.

- 10.3.2 The iron shutters for the embrasures do survive around the Keep, but have seized solid or broken off their hinges, which have corroded. The shutters mostly remain in their rooms or in the Keep store. These require careful storage or restoration to prevent further decay, along with the single iron shutters from the caponiers. The caponier shutters are in poor condition and none survive in-situ and have been removed or fallen off the corroded hinges. The shutters are unique to the caponier embrasures and should be preserved or restored. A number of the cast-iron fireplaces and small ranges in both the Keep and caponiers have been removed or damaged. A few complete 19th century fireplaces survive, but are in poor condition and should be guarded against further corrosion. The Keep fireplaces are of three main types (and a few other individual types) and have a cast-iron surround in front of a brick lined firebox built into the stone wall. The floors of a many of the rooms are in a poor state due to water leaking into the building, but are of interest as they show the changing role of the Keep with the gun platforms and some traces of later use.
- 10.3.3 In sum, the Keep remains a remarkable demonstration of short-lived episode of coastal defences, and retains features and arrangements that can vividly convey the character of the Victorian fortress.

James Mumford and Jon Gill
Oxford Archaeology
20 April 2008

APPENDIX I BIBLIOGRAPHY

Published Sources

- Dyer, N. *British Fortifications in late 19th and early 20th centuries* (Palmerston Forts Society, 2003)
- Hogg, I.V. *Coast Defences of England and Wales 1856 to 1956* (1974)
- Irving W J Tregantle Fort, Plymouth. *Journal of the Society for Army Historical Research*, 45 (1967), Pages 117-121.
- Mills, T.F. *Land Forces of Britain, The Empire and Commonwealth* (2006)
- Moore, D, *A Handbook of Military Terms* (Palmerston Forts Society)
- Moore, D. ‘The Evolution of the Caponiere: Part 1’, *Redan* 54
- Moore, D. ‘The Evolution of the Caponiere: Part 2’, *Redan* 55
- Moore, D. ‘32pdr Smooth Bore Breech Loading gun’, *Redan* 59
- Moore, D. *Arming the Forts* (Palmerston Forts Society, 1994)
- Pye, A & Woodward, F., *The Historic Defences of Plymouth* (Cornwall County Council)
- Redan* Palmerston Forts Society Journal
- Saunders, A *Fortress Britain*, 1989
- Worcestershire Regiment Website
- Wyley, f. *A Dictionary of Military Architecture. Fortifications and Fieldworks from the Iron Age to the Eighteenth Century* (1990)

Unpublished Sources

Bob Court memories of Keep as the camp store when stationed at Tregantle in 1951, during his National Service with the 1st Battalion Wiltshire Regiment from 1950 to 1952.

Aerial Photograph RAF S469 Line No 8743 BW 1/14000 Frame 17 31/8/1941 (NMR, Swindon)

Aerial Photograph RAF 58/6399 Line No 8079 BW 1/10000 Frame 64 2/7/1964 (NMR, Swindon)

SOR for Recording works at Tregantle, Antony, Cornwall

Maps

1896 Plan of Fort, 1896, PRO: WO 78/2314

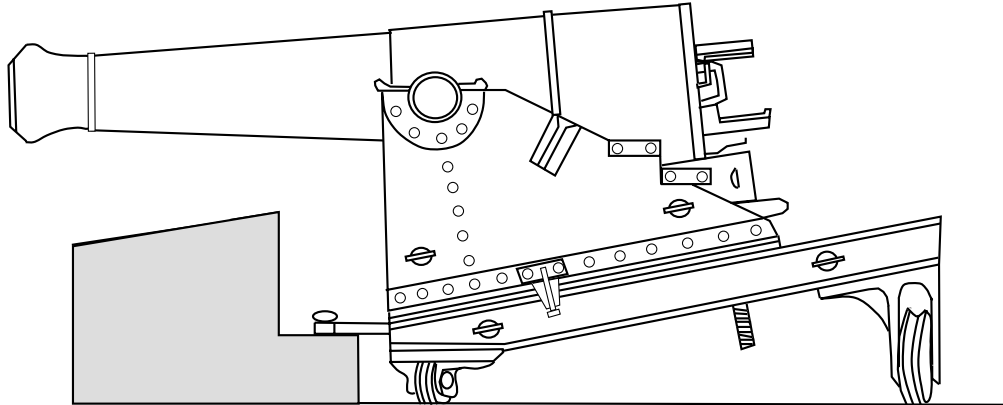
- 1917 RNAS Plan of A camp, Tregantle, 1/500 scale 1917, NMR Swindon
- 1937 Plymouth Sub District, Fort Tregantle Skeleton Record Plan, First Floor Plan 2 of 2 Revised from 1915 plan in 1937. [NMR Swindon]
- 1968 Tregantle Fort plan showing Firing Ranges, 1/2500 scale, March 1968, DWG No SWP/A74/68 [NMR Swindon]

APPENDIX II

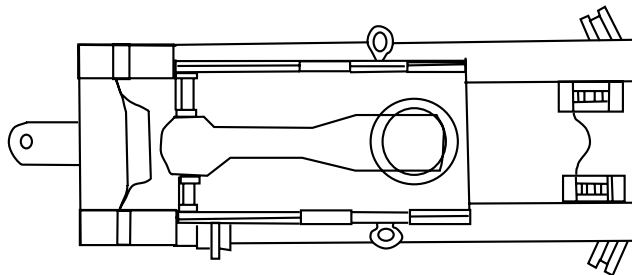
'32PR SMOOTH BORE BREECH LOADING GUN' BY DAVID MOORE

THE 32PR SMOOTH BORE BREECH LOADING GUN

David Moore



PLATFORM, TRAVERSING
MEDIUM, No. 6. IRON
Smooth Bore Breech
Loading 32 pr.
for Carriage No.6



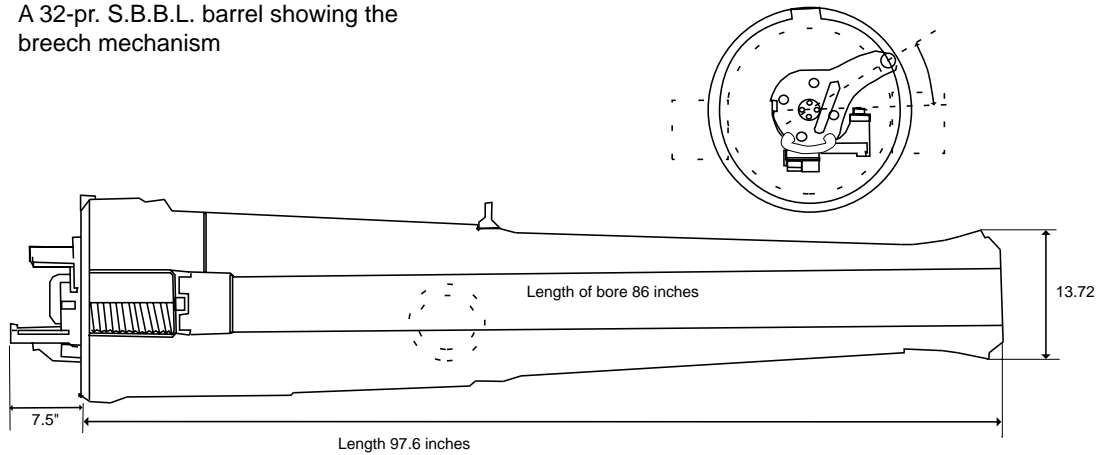
The 32 pr. S.B.B.L. is a conversion from the Smooth Bore cast-iron gun of 42cwt., to adapt it for firing case shot in the flanks and approaches of permanent works. It was later used for saluting purposes.

The cascable is completely cut off behind the base ring and the bore continued through to the breech. A slightly enlarged chamber is formed by boring out the metal in front of the obturating cup to a distance of 4.1 inches; the shoulder so made, becomes a stop for the case shot in loading. The gun is prepared for an interrupted screw, having three smooth surfaces each one sixth of the circumference in breadth, of the ordinary cylindrical type and provided with an open or projecting carrier of the R.G.F. pattern, being similar to that for the 8-inch B.L., hinged to a hinge plate, attached to the face of the breech by fixing screws.

The gun is radially vented with a copper bush. These guns were generally fired point-blank, the effect being sufficiently great up to 500 yards. They were therefore provided with a foresight only used in conjunction with a groove cut on the breech.

The barrel is 97.6 inches in total length. Platform, Traversing, Medium, No. 6. Iron for Smooth Bore Breech Loading 32 pr. for carriage No.6 This was intended for use in caponiers or for flanks. It fires over a 2-foot 3-inch parapet, with 10 degrees elevation and 15 degrees depression. The maximum recoil allowed is 1 foot 8 inches. This is controlled by a tension buffer. The slide is constructed by bolting two sides of girder iron to a front transom, and a front and rear bottom plate. Wrought-iron flanges are bolted to the bottom plates for the wrought-iron trucks, which revolve on steel axles.

A 32-pr. S.B.B.L. barrel showing the breech mechanism



The front transom is furnished with a wrought iron pivot lug, which is secured to the breast of the works by a steel pivot plug and key. The slide is fitted with two rear buffer stops, the front consisting of rectangular india-rubber pads and wooden blocks. The front buffers are fixed to the transom by spindles; the rear buffers are each fixed by a spindle to a stop, hinged on a bracket on the rear bottom plate, and so arranged that it can be folded down to clear the carriage when housed. When in use the rear stops are held in position by small catches fitted to the bottom plate.

Carriage No.6 is a Single Plate (S.P.) wrought-iron sliding carriage. The carriage consists of two brackets of $\frac{3}{4}$ -inch iron plate, joined by a transom and a bottom plate. Two angle iron guides and four clip plates are fixed to the underside of the bottom plate to maintain the position of the slide and prevent it jumping during recoil. The brackets are formed with steps for the use of handspikes in laying. There are wrought-iron trunnion bearings in which the gun is secured by capsquares and keys.

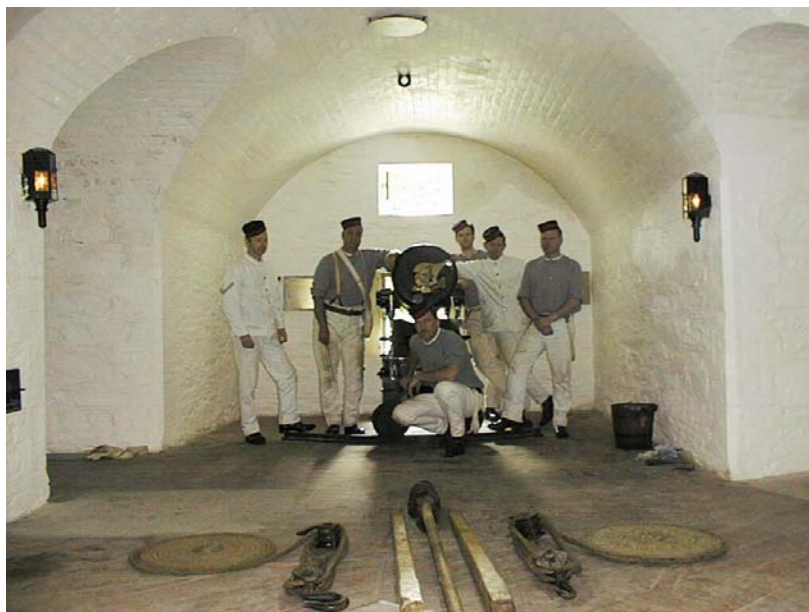
The carriage is not fitted with rollers, but the slide has a slope of 10 degrees to ensure the carriage running out after recoil. The carriage is intended to slide along the upper surface of the slide both in recoil and in running up. A lubricating groove is cut in the

bottom plate on each side, to which channels, cut through the plate and angle irons, and closed by screw plugs, lead.

The fittings consist of two eye-bolts on each bracket, a socket for the priming irons, and a metal clamp with a steel screw, which retains the carriage when run back for housing. The elevating gear consists of an iron stool bed, pivoted to a stay between the brackets; a wood quoin; and an elevating screw, fitted with a metal hand wheel, by which it is turned in a nut fixed to the bottom plate.

The hydraulic buffer consists of an iron cylinder, 4 inches in diameter, closed at each end by a wrought-iron cap, and provided with a rod, and a solid piston. It has a metal gland with ring, a leather as well as cotton packing. There are three holes in each piston, two of $\frac{3}{8}$ -inch and one of $\frac{5}{16}$ -inch diameter. The buffer is fixed to the bottom plate of the carriage by two wrought-iron securing bands, and its piston is attached to a bracket on the slide by two hexagon nuts.

The projectile consists of case shot, each filled with 730 mixed metal balls, 16 per lb the interstices being filled with powdered clay and sand. The top is a disc of elm 2- inches thick, drilled on the underside to ensure its breaking up. It was fired by a charge of 3lbs RLG2. The crew is made up of a Gun



The PAV with a replica 32-pr. S.B.L. gun in the North Caponier at Crownhill Fort Plymouth

Commander and three other numbers. (This was a reduction from an earlier detachment of six).

Length of slide

6 feet 7 inches

Radii of racers

front

1 foot 6 inches

rear

6 feet 10 inches

Weight

Carriage

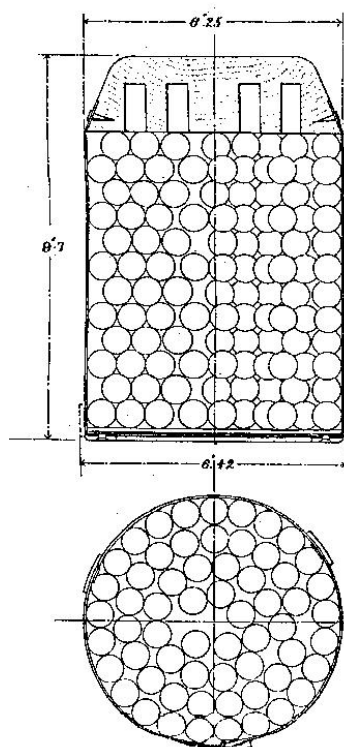
14 cwt. 1 qr.

Slide

13 cwt.

The Defence of flanks and caponiers

During the construction of the forts the exact nature of the flank armament had not yet been decided. Before the introduction of rifled guns smooth bore guns, such as the 8-inch were to be placed in the caponiers and on the flanks of the forts such as those of Gosport Advanced Line. By the time the forts of Portsdown were under construction the rifled 7-inch Armstrong gun had been adopted. It was recommended for use in caponiers as well as for flank defence and in some cases main armament. The forts of the Gosport Advanced Line, Gomer, Grange, Rowner, Brockhurst and Elson, all received the 7-inch R.B.L. as a flank defence gun together with the 64 pr. R.M.L. for the Haxo case mates. At first it was intended to mount 7-inch R.B.L. guns in the caponiers for flanking the ditches and the upper floors of the barracks at the gorges of the Portsdown Hill forts.



Shot, Case, 32pr SBBL Mark IV

In May 1872 the Inspector General of Fortifications agreed to the use of smooth bore guns for caponiers, in response to a request for carriages to mount 32pr. S.B. guns converted to 64pr. B.L.s on Krupps system mounted on non-recoil carriages. The inspector General of Fortifications disapproved of this ideas as it would require a special carriage. He preferred small

smooth bore carronades on ordinary carriages for short flanks. He suggested the 24pr. and 32pr. carronade would be suitable. In 1879 the I.G.F. was informed by the Secretary, Woolwich, that there were only 96 carronades available for about 400 emplacements. He was advised that the 32pr. Smooth Bore gun converted to breech loading could be used for the remainder at a cost of £26,848 for the 304 positions. Regarding the gorge flank defences of the Portsdown Hill forts, in 1881 the Defence Committee recommended that, as the guns had not yet been mounted, and, as for structural reasons a lighter gun was desirable, 20 pr. R.B.L. guns should be substituted for the 7-inch R.B.L. The number of guns to remain unaltered. In 1882 the platform for the 32pr. S.B.B.L. was approved and fifteen were ready for issue that year. The Surveyor General of Ordnance thought that 'the flank defence of ditches was the least important part connected with the armament of a fortress.' In January 1893 still no provision had been made to fit these guns.

Later in 1893 an Armament return (gorge and caponiers) shows the following Mounted or on charge

Nelson

4 x 40 pr. RBL on Haxo Mountings
nil 32 pr.

Widley

4 x 20 pr. RBL on Haxo mountings
8 x 32 pr. S.B.B.L.

Purbrook

4 x 40 pr. RBL on Haxo mountings
5 x 32 pr. S.B.B.L.

Wallington

2 x 40 pr. RBL on Haxo Mountings
- 6 required to complete.
nil 32 pr. 10 required to complete

Southwick

Nil 40 pr. 6 provided for in Imperial
Defence Loan
Nil 32 pr. 8 provided for in Imperial
Defence Loan

In 1899 the situation was

Mounted or on Charge To be added

Nelson

4 x 40 pr. 2 x 40 pr.

Widley

Nil 20 pr. 6 x 20 pr.
8 x 32 pr. S.B.B.L.

Purbrook

4 x 40 pr.
5 x 32 pr. S.B.B.L.

Wallington

2 x 40 pr. 6 x 40 pr.
nil 32 pr.

Southwick

Nil 40 pr. 6 x 40 pr.
Nil 32 pr.

By 1900 it was proposed to withdraw all of these guns. In 1901 Fort Widley was disarmed and the others were disarmed by 1907.

The trials of the 32pr SBBL

WO396/2 RA & RE Works Committee Report no.6

The RA and RE Works Committee Report on Experiments Connected with the Defence of Flanks and Caponiers, 1885

Fort Tregantle, one of the works of the outer line of the defences of Plymouth, was selected as the site for the experiments. The ditch in which the targets were placed is short and wide. The total length is 143 yards of which only 120 yards could be utilised for the experiments as at that distance from the caponier there is a drop in the level of the bottom of the ditch. The width is 50 feet. The escarp and counterscarp are of limestone masonry the former being about thirty feet and the latter about twelve feet high. The experiments were carried out by a detachment of Royal Artillery under Captain C. Howard R.A. under the orders of Lieut. Col. J.H.P. Anderson R.A. Mr. Nordenfelt was present during the trials. Captain Very attended on behalf Messers Hotchkiss and Company and Mr. Accles represented the firm of Sir William Armstrong Mitchell and Company.

The following guns were used during the trials:

Gun	Projectile
32pr. S.B.B.L. Gun	case shot
Rifled calibre 0.45in Gatling Gun	service and special
Hotchkiss 40mm revolving for the protection of ditches	cannoncase shot
Hotchkiss 37mm revolving cannon	common shell (and case shot)
Nordenfelt 4 barrel 1-inch	steel shot

The trials were carried out in three series on 30 April and 1 May the targets in series 'a' and 'c' were 6ft. by 6ft. and 2 inches placed in three rows of seven at a distance of 60, 90 and 120 yards from the caponier. For series 'b' scaling ladders 12ft. long were placed against the escarp and counterscarp at distances of 60, 90 and 110 yards. The obstruction in series c consisted of a pile of loose straw not in trusses 8ft. high and 6ft thick placed 12ft. from the caponier. This completely hid the targets from the lower port of the caponier. It was found necessary to make a few slight modifications in the programme.

The practice commenced with series 'c' in which three rounds instead of two were fired from the 32pr. S.B.B.L. Gun to compete with machine guns firing for one minute. In this series shell only was fired from the 37mm Hotchkiss revolving cannon. No special ammunition was fired from the Gatling machine gun as it had not then been received.

At the commencement of series 'a' two series of five rounds each were fired from the 32pr. S.B.B.L. Gun for time only without targets. The speed of firing having been thus attained three rounds were fired at targets for effect, to compare with that of each of the machine guns firing for one minute.

In series 'b' the four barrelled 1-inch Nordenfelt machine gun was fired for half a minute at one side of the ditch only as the mounting did not allow of sufficient traverse to include both. The 37mm Hotchkiss revolving cannon

was withdrawn by Captain Very and by desire of Mr. Accles special ammunition was not tried in this series. The other machine guns were fired for one minute.

In criticising the results of the trials the Committee have in view the following conditions which in their opinion be fulfilled by a gun for the defence of ditches:-

- A) The guns should discharge at short ranges a great number of man killing projectiles.
- B) The interval between successive discharges should be as small as possible.
- C) The lateral spread should be great at short ranges to obviate necessity for traversing.
- D) The gun should be simple and the mechanism and mounting not liable to get out of order during long periods of disuse.
- E) Economy as regards gun, mounting and ammunition.
- F) The detachment should be as small as possible.
- G) The projectiles should cause as little risk as possible to the defenders.
- H) In some cases there must be power to penetrate obstacles, such as might be placed in the ditch.

Table 1 shows roughly the extent to which each of these conditions was fulfilled by the various guns tried:- Comparing the several guns tried with regard to their fitness for protecting ditches it will be seen that no one of them fulfils all of the conditions.

Table 1

	Intervals between Successive discharges	Scatter	Simplicity	Cost	Detachment	Risk to defenders	Power to penetrate obstacles
32pr. S.B.B.L. Gun	Very long, half a minute	spread 6ft at 60 yards	very simple	gun £60	1NCO 4men	several balls fell inside the fort	good
0.45in Gatling Gun			Complicated				
Hotchkiss 40mm			Complicated				
Hotchkiss 37mm			Complicated				
Nordenfelt			Complicated				

Taking the guns seriatim

1. The 1-inch 4 barrelled Nordenfelt appears to be the least fitted of all for this special purpose. It is complicated and expensive and liable to deteriorate if left long without cleaning. The mounting is not adapted for use in a caponier but could doubtless be improved. The gun is designed for Naval service not for flank defence, it has to be traversed and does not fire suitable ammunition.
2. The 0.45-inch Gatling is also complicated and expensive, liable to get out of order if neglected. Requires traversing. Its bullets are easily stopped by obstacles.
3. The 32pr. SBBL is good in every point except the intermittent character of its fire and the necessity for traversing and for the employment of a comparatively large detachment. In cases where only one gun is mounted in a face of a caponier the pauses between successive discharges would be a serious disadvantage.
4. The 37mm Hotchkiss revolving cannon is complicated and expensive. It was not designed for this special service. Like all the above mentioned guns it is not automatic in its scatter and has to be traversed.
5. The 40mm Hotchkiss revolving cannon specially designed for purposes of flank defence has the

drawbacks of expense, complication and liability to deterioration. In most respects it was considerably the best gun tried.

Opinion.

The Committee are of opinion that none of the guns tried fulfilled the necessary conditions and that these experiments only afford data on which to base further trials. The Committee recognise two requirements for the defence of ditches.

- A) a quick firing breech loading gun capable of firing a powerful projectile to destroy obstacles as well as case shot to kill men.
- B) A rifle calibre machine gun for employment in minor ditches and as auxiliary to A.

Both these guns beside fulfilling as far as possible the conditions given in para 6 of this report should be so mounted as to give the maximum cover to the detachments.

Recommendation.

The Committee recommend that guns and mountings to fulfil these requirements be procured for further trial.
(22 September 1885 H. Schaw Col. R.E. President R.A and R.E. Works Committee)

Appendix 1

The experiments to be carried out in the ditch of the left face of Fort Tregantle which is 143 yards in length. The guns to be fired from the right embrasure of the lower floor of the caponier. The effect of fire to be noted on screens and scaling ladders.

32pr. SBBL gun, case shot mounting and detachment as before, five rounds against time commencing with the first round loaded no targets in ditch.

	Interval	Total	Mean duration of interval
Round 1			
Round 2	20 seconds		
Round 3	53 seconds		
Round 4	1 min 17 sec		
Round 5	1 min 40 sec	1 min 40 seconds	25 seconds

**RA & RE Works Committee Report
No.13**

**Defence of Flanks and Caponiers
Trial of a Modified 32 pr SBBL gun at
Fort Tregantle 30 July 1886**

On 22 September 1885 the Committee submitted report no.6 'The trial of certain guns with reference to their capabilities in flank defence'. Among them was the 32pr. SBBL guns respecting which the Committee reported as follows :

The 32pr. SBBL is good in every point except the intermittent character of its fire, necessity for traversing and for the employment of a comparatively large detachment.

On 22 April 1886 the Director of Artillery informed the Committee that a 32pr. SBBL gun, modified so as to improve the spread of case shot, so as to obviate the necessity for traversing had been sent to Devonport for trial. On 21 July 1886 The D of A and IGF notified their approval of the programme of practice, which was drawn up with a view to obtaining a direct comparison between the gun previously reported on and that now sent for trial.

The practice was carried out on 30 July 1886 in the ditch at Fort Tregantle, some modification of the programme was found necessary on account of the unsatisfactory working of the breech mechanism.

As regards the intermittent character of the fire of the 32pr SBBL gun alluded to in report no.6 the modified gun gave most unsatisfactory results, due however to the imperfect fit of the obturator cup, which entailed the use of a drag rope to open the breech after each round. A detachment of three men was found sufficient for the service of the gun. The spread of pellets from the modified gun left nothing to be desired. Without any alteration of the line of fire by traversing or elevating three rounds

covered well the whole front 42 feet. Of targets at 42 yards range the 32pr. SBBL gun previously tried gave a spread of only 6 ft. at sixty yards. On the three rows of targets there were 1277 hits as against 653 in the former trial, whilst on the front row there were 837 hits evenly distributed as against 328 in three groups. The muzzle preponderance of the gun due to the weight of the screwed portion rendered necessary the lashing down of the breech as a temporary arrangement which should be superseded by a more permanent one.

Opinion

The modification of the gun and ammunition has fulfilled all requirements so far as the spread of the shot is concerned. The Committee are therefore of opinion that elevating and traversing gear may in future be omitted from mountings of guns of this description. Some radical alteration of the breech mechanism appears to be necessary to ensure uniform rapidity of fire.

Description of gun and mounting

Ordnance SBBL 32pr. Mark I fitted with muzzle shot spreader. The gun is the same as that described in list of changes §4066 except that the muzzle has been modified to increase the lateral spread of the balls of the case shot, the alteration consisting in removing the swell of the muzzle and screwing on a cast iron block in which the central opening at the inner end has a diameter corresponding to the calibre of the gun viz 6.35 inches, which is increased laterally to 8.75 inches at the face of the muzzle, projections to act as cut-shots being formed above and below so as to direct the balls right and left when driven out of the gun on firing.

Mounting

Wrought iron special for flanks and caponiers with hydraulic buffer, modified by the removal of the front and rear truck and elevating gear and the substitution of wood blocks.

WO396/4 RA and RE Works Committee 1886**Trial of a Nordenfolt 6pr. QF gun for flank defence at Fort Tregantle**

The sub-committee are of opinion that the Nordenfolt 6pr. QF gun has not proved itself superior to the 32pr. SBBL gun for flank defence of ditches. They have been guided by the following considerations in arriving at this conclusion:

The effect recorded on the targets in the practice with the 6pr. though greater in actual number of hits than that obtained with the 32pr. SBBL is probably not superior in man-killing power since one or two bullets will put a man *hors de combat* as effectively as fifty.

With both guns the front was well and evenly covered.

As regards simplicity the amount of skill necessary for effective working the balance is largely in favour of the SBBL. With this gun there is no need for laying elevating or traversing. The gun as far as its manipulation is concerned remains a fixture. The detachment merely have to load and fire as fast as they can. With the 6pr. the case is widely different. As already pointed out no small measure of skill is required so to vary the laying of the gun as to ensure a good distribution of effect and at the same time work the firing handle successfully.

The cost of the 32pr. SBBL gun and mounting is practically the same as to the 6pr. QF gun and its mounting. The Committee understand that the breech of the 32pr is being modified and rendered suitable for fixed ammunition. This will materially increase the rate of fire. Under these circumstances they are of opinion that the gun will probably answer all the purposes for which it is intended and do not think that at present any advantage will be gained by further experiments such as those now reported.

WO33/46 Papers 1887**32pr. SBBL gun 16.2.86**

A special case shot RL no. 5,013 was tried in this gun which was provided with a special muzzle to facilitate breaking up of shot. Results very satisfactory. Gun sent to Fort Tregantle for further trial by Royal Artillery and Royal Engineer Works Committee.

WO33/ 51 papers 1891**Extracts from the Annual Report of the President of the Ordnance Committee for the year 1890****32pr. SBBL gun**

Practice was carried out at Shoeburyness to test the rapidity of fire and the breech mechanism of the above gun using fixed ammunition. Nine rounds were fired in two minutes six seconds. The extraction of the empty cases was not satisfactory and the gun had a muzzle preponderance. These points were rectified by the Director General of Ordnance factories and further practice was carried out when the extraction was fairly good, the muzzle being just kept down by a counterweight. It is recommended that a light strap should be added over the breech. Further practice is to be carried out using Bayliss's primers.

WO33/52 Papers 1892**Annual Report of the President Ordnance Committee for the year ended 1891****32pr. SBBL**

Further practice was carried out with the gun in February 1891. The Bayliss removable primers which were used were satisfactory. The extraction and working of the breech screw were not all that could be desired. After firing the gun ran up violently against the front stops and caused the rear of the slide to lift. This interfered with the rapid service of the gun. It was recommended by the Superintendent of experiments that the rear of the slide should be held down to the platform. After modification the the extraction three round were fired in June 1891



South West
caponier at Fort
Tregantle,
Plymouth

and further alterations to the breech mechanism were recommended. Ten rounds were fired in September 1891.

Time of firing :-

5 rounds 363/4 seconds.

As the loading was not in all cases as satisfactory as it should have been the question was referred to the Director General of Ordnance Factories who was making further alterations and on completion of these the firing will be continued.

WO33/53 Papers 1893

**Annual Report of the President
Ordnance Committee for the year
ended 1892**

32pr. SBBL

The alterations necessary to make the gun loading for fixed ammunition with removable primer having been carried out the Committee proceeded to fire ten rounds at Shoeburyness. The working of the breech mechanism was satisfactory and the extraction good. The Director General of Ordnance Factories informed the Committee that the alteration of the gun to take fixed ammunition could not be done locally without a heavy expenditure. The Committee then recommended that ten rounds should be fired from the

gun with cup objection at Fort Tregantle with a 3lb charge and a projectile to design RL no. 6724. This design containing mixed metal balls 16 to the lb in the place of 367 balls at 16 to the lb as in the design RL no. 6399. The objectioning cup was to be well lubricated before commencing the trial and any case of it sticking was to be noted. Programme no 806 was accordingly drawn up and approved. Five rounds were fired at Fort Tregantle in 2 minutes 3 seconds the last round taking 1 minute 6 seconds and the breech being opened with very great difficulty. Practice was stopped after the fifth round owing to the pivot bolt in the masonry giving way and the angle iron guides having become injured owing to the excessive recoil. The Director General of Ordnance Factories considered that the buffer must be at fault and the committee recommended that the Inspector of Ordnance Machinery should be directed to take the buffer to pieces and report on it. As it was found to be dangerous, on account of bullets ricocheting out of the works, to carry out the remainder of the programme at Fort Tregantle the Committee arranged to renew the firing at Shoeburyness. Five rounds were accordingly fired, one as a preliminary

and four for rapidity, the four being fired in forty-one seconds. The Superintendent of Experiments in calling attention to the tremendous effect to the targets pointed out that the effect depended on the guns being fired with the proper elevation so that the centre of the cone of dispersion of the bullets should properly sweep the ground to be defended. He recommended that the fixed wood block on which the breech of the gun rested should be permanently adjusted to the correct height suitable to the situation by either being cut away to give elevation or by having a piece nailed on to it to give more depression. The Superintendent was requested to repeat the trial for rapidity with a two pound charge of powder. This trial has not been made before going to press.

WO33/54 Annual Report of the President Ordnance Committee for the year ended 1893

32pr. SBBL

The trial for rapidity with the 2lb charge was repeated Shoeburyness 14th. January 1893 when it was found that the smaller charge was liable, on account of its shape, to jam between the objurating cup and the chamber. Four rounds, excluding time lost by the jamming were fired in 32 seconds. The results compared most unfavourably with those obtained with the 3lb charge, as there were comparatively few 'throughs' and one round did not break up. The Committee were of the opinion that as a large number of guns without muzzle spreaders had been already issued, and as the alteration of the breech to make them suitable for use with fixed ammunition could not be effected locally without a heavy expenditure, whilst the addition of the muzzle spreader could not be made locally at all, they, after full consideration did not recommend the introduction of fixed ammunition or muzzle spreader, but that the case shot design RL no. 6724 should be used with the 3lb charge. If however more guns of this nature were required the

Committee recommended that they should be made suitable for use with fixed ammunition to RL design no 7423, and as this contained mixed metal instead of iron balls the muzzle spreader need not be introduced. Full particulars of the trial of this gun will be found in report no. 933 the recommendations in which, with the concurrence of the Deputy Adjutant General were approved 15th. March 1893 by the Director of Artillery. Some severe recoils having been experienced during the trials the question was referred to the Director General of Ordnance Factories who attributed them to the size of the holes in the piston and recommended that trials should be carried out. This was approved by the Director of Artillery and trials were now proceeding at Shoeburyness. Three holes in the buffer were plugged up and the carriage still recoiled to the rear stops but not so hard as previously. The Committee were furnished 18th. December 1893 with the dimensions of the interior of the buffer which they referred to the Director General of Ordnance Factories who had been asked to say how he proposes to control the recoil.

The Committee recommended that guns no.1 and 61 should be retained for experimental purposes. The following were the particulars. No.1 gun first ordered from muzzle loader to breech loader had less metal removed from the breech than later converted guns. No. 66 gun had a copper objurating ring of special form, remainder of gun of modern pattern. Both guns experimental and neither had a muzzle spreader.

The final years.

Many of the forts did not receive the 32pr SBBL guns that were approved for the defence of their caponiers. This was mainly due to lack of supply but by the 1890s doubts had begun to be expressed as to whether caponiers were able to provide a suitable form of local defence.

The introduction of more efficient

machine guns sounded the death knell for the 32pr SBBL. Some caponiers were allocated a machine gun but many remained empty.

By 1906 most of the land front forts were disarmed. the existing 32pr SBBL guns were returned to woolwich. Some did survive as saluting guns as show by a *Return of Ordnance and Mountings in Practice and Saluting Batteries 1 April 1913*

Dover saluting Battery

7 x 32pr. SBBL on Sliding

Amherst Fort

7 x 32pr SBBL on Sliding

Coalhouse Fort

7 x 32pr SBBL on Standing

It cannot be a mere co-incidence that seven was the number of 32pr SBBL guns that eventually found their way to the Royal Armouries collection at Fort Nelson.



The PAV with a 32pr SBBL gun at Fort Nelson, Portsmouth



APPENDIX III SUMMARY OF SITE DETAILS

Site name: The Keep, Tregantle Fort, Antony, Cornwall

Site code: ANTREG 07

Grid reference: NGR SX 3862 5332 **Type of evaluation:** Historic building recording and investigation

Date and duration of project: Site work undertaken in March and April 2007 for a total of thirteen days.

Location of archive: The archive is currently held at Oxford Archaeology, Janus House, Osney Mead, Oxford, OX2 0ES. It will be deposited at an appropriate museum or other agreed body.

APPENDIX IV GLOSSARY

Bridge pit: A stone lined pit located before a gatehouse which was covered by the drawbridge when in the open position, and when the drawbridge was closed the pit was exposed and formed a impediment to attackers.

Caponier: A casemate which projects into the ditch of a fort, providing flanking fire along it. Also a passage for communicating with outworks.

Carriage: The cradle in which a gun is mounted.

Casemate: a gun emplacement occupying a vaulted chamber in a fort.

Chemin de Ronde: A sentry path, usually at the foot of the rampart, but above the escarp with a parapet for cover. Usually employed where the upper part of the scarp wall is built independent of the rampart.

Counterscarp: Exterior slope of ditch.

Counterscarp galleries: A series of chambers built into the counterscarp of a fort for flank defence.

Ditch: A moat, wet or dry. An excavation outside the parapet with material from the excavation forms the parapet.

Drawbridge: A moveable bridge over moat or ditch in front of entrance.

Drop ditch: Placed in front of loopholes flanking a caponier and reducing the ground level in front by 7 foot or more to prevent enemy firing into the defender.

Embrasure: Opening in parapet or casement front through which cannon could be fired.

Fort: A closed work which has a parapet flank defence for its ditches, and therefore re-entering (flanking) angles: Derived from 'fortis' - strong.

Garrison carriage: A carriage for guns not intended for the front faces of a fort. Based on the naval carriage and mounted on a platform.

Glacis: A mass of earth in front on ditch. The glacis protects the scarp of the wall from distant breaching fire and affords no cover to the enemy from the fire of the parapet.

Gun platform: Or garrison platform made of stone and laid at angle of 1 in 15 in order to check recoil of cannon. Employed for garrison guns in permanent fortifications.

Keep: The English term for a donjon; the inner tower of a castle, usually the strongest, used by the besieged as the last refuge tower.

Lamp recess: An alcove or small tunnel in a wall for placing a lamp. In the magazine a pane glass was fixed to stop sparks entering the chamber. With lamps placed in from the outside passage.

Lighting passage: A passage specially built adjacent to a magazine to allow lamps to be inserted into recesses for illuminating the magazine.

Loophole: An aperture for firing a rifle through a wall. They were placed to cover a specific area and not weaken the wall or endanger the firer to enemy fire.

Loop: A ring found in the centre line of a casemate and used to suspend the gun during the process of mounting it. The positions would differ to the size of gun intended to be mounted and mode of mounting.

Magazine: A place of safe storage of gunpowder. It could be main or expense. The expense was for made up ammunition and later known as cartridges stores. The main magazine was where both gunpowder and shells were stored and was the reserve store for the fortification.

Parapet: A bank of earth or wall protecting troops from enemy fire. Or a wall or bank on a rampart, gun guns could fire over or through.

Pivot lug: This is the point in front of the gun so it could be traversed to give a 70° field of fire.

Racer track: Curved tracks set into the floor of a gun emplacement, which enabled guns to be traversed more quickly.

Rampart: The raised earthwork, which forms the curtain on which guns and troops are positioned to defend a fortress. The high bank which the parapet stands on.

Ringbolts: Iron rings set into wall and floor of casemate. Their use was for attaching the tackles used to traverse a gun. After the introduction of traversing gear to make fast the tackle when mounting the guns.

32 pdr SBBL: This was the 32 pdr Smooth Bore Breech Loader gun that was to be fitted in the forts for flank defence in caponiers. Most forts did not receive their guns due to changing thought on defence and the development of machine gun.

Traversing platform: a wood or metal platform, which supports the carriage of the gun and can be traversed on racer tracks.

APPENDIX V PAINT ANALYSIS BY LISA OESTREICHER)

TREGANTLE FORT KEEP
ANTONY, CORNWALL
Paint Analysis Report

June 2007

TABLE OF CONTENTS

1. INTRODUCTION

- 1.1 Background and brief
- 1.2 Sources of data

2. ARCHITECTURAL PAINT RESEARCH

- 2.1 Removal of paint samples
- 2.2 Examination of paint samples
- 2.3 Description of paint samples

3. CONCLUSIONS

4. APPENDICES

- 4.1 Sample list
- 4.2 Sample location photographs

1. INTRODUCTION

1.1 Background and brief

Tregantle Fort is a Grade II listed complex of buildings located in Antony, Cornwall.

Tregantle Fort was constructed in 1865 as part of the western defences of Plymouth. Designed by the Royal Engineers under the direction of Colonel W. F. Drummond Jarvis, it is hexagonal in layout with a semi-circular keep and flanking barracks on the south and east sides. Tregantle Fort was disarmed towards the end of the last century and has since been used as barrack accommodation for the surrounding firing ranges.

The fort complex is currently listed on the Buildings at Risk Register. In order to rectify this situation the Ministry of Defence conducted an initial audit to confirm the status of those buildings at risk. Following on from this audit a more detailed assessment of the identified structures is currently being undertaken. As part of this assessment ten samples were taken from the in situ and stored joinery in the Keep of Tregantle Fort. It is hoped that their analysis will establish a better understanding of their past decorative treatment and inform the process of reinstating replica joinery and the decoration of internal wall surfaces. If possible, the paint investigations are to assist in determining which features are original to the building and which were later twentieth century insertions.

1.2 Sources of data

- *SOR for Recording works at Tregantle, Antony, Cornwall, MOD Buildings at Risk Phase II Survey SOR Vs 3.1*
- Pye, Andrew & Woodward, Freddy, *The Historic Defences of Plymouth*, pp. 80 – 84
- Secretary of State List Description, *Tregantle Fort*, 26 January 1987
- Ten paint samples removed the Keep at Tregantle Fort, Antony, Cornwall

2. ARCHITECTURAL PAINT RESEARCH

2.1 Removal of paint samples

A total of ten samples were taken from in situ and stored joinery elements as well as painted brick and stone work in the Keep at Tregantle Fort.

Samples were removed with a scalpel blade, dentil drill and conservation chisel.

Sample locations can be found on the sample list outlined in Appendix 4.1 and sample location photographs in Appendix 4.2.

2.2 Examination of paint samples

The samples were mounted in polyester resin and cross-sections prepared. These were examined under an incident and ultra violet light microscope.

Once the sequence of paint layers had been established micro-chemical tests were undertaken to identify pigments and media on a number of key strata. The findings reached are noted in the Description of key paint samples and Conclusion sections of this report.

2.3 Description of paint samples

2.3.1 Joinery

Windows

Sample 1 was removed from a window sash and sample 3 from a casement window. Both windows were stored in the Keep.

The sash window displayed a total of thirteen separate schemes of decoration over a softwood substrate prepared with a red lead primer.

The sash window was predominately painted in shades of cream. However, one white scheme was also noted along with two manipulated decorations in imitation of timber graining. Varnish layers were visible completing the two grained decorations as well as one of the cream decorations, giving the window a glossy finish.

A variety of iron oxide earth, carbon black, and red lead particles were identified in these paint mixtures along with the occasional instance of vermilion. As all these pigments were in common use in house decoration prior to the construction of Tregantle Fort they are not useful for dating individual painted decorations. The initial twelve schemes stained positive for significant lead content. The final decoration appears from examination under incident and ultraviolet light to have been applied using a modern titanium based coating.

Lead white was the most commonly used body colour for decorative oil paints from the classical period up to the 1950s. It was superseded at this time by modern titanium based paints which first came on to the market in the 1920s.

Fewer painted decorations have survived on the softwood casement window. No evidence remains of the initial red lead priming coat as well as a number of the intermediary schemes and paint strata. Nonetheless, the retained decoration would suggest that the casement window was painted in a similar manner to the sash window throughout its decorative history with one or possibly two exceptions. It is unclear whether the casement window was intended to be grained as part of Scheme 3. Also, one additional white scheme not evident on the sash window can be seen here forming the existing decoration. Examination of this final decoration under ultra-violet light would suggest that it was executed using zinc based paint.

Zinc based paints were first manufactured commercially for use in house decoration in 1850.

**Architectural Paint Research
Window, Tregantle Fort Keep**

Photomicrograph showing sample 1, taken from the stored sash window, photographed in cross-section under incident light at 100X magnification. Printed magnification not calculated.

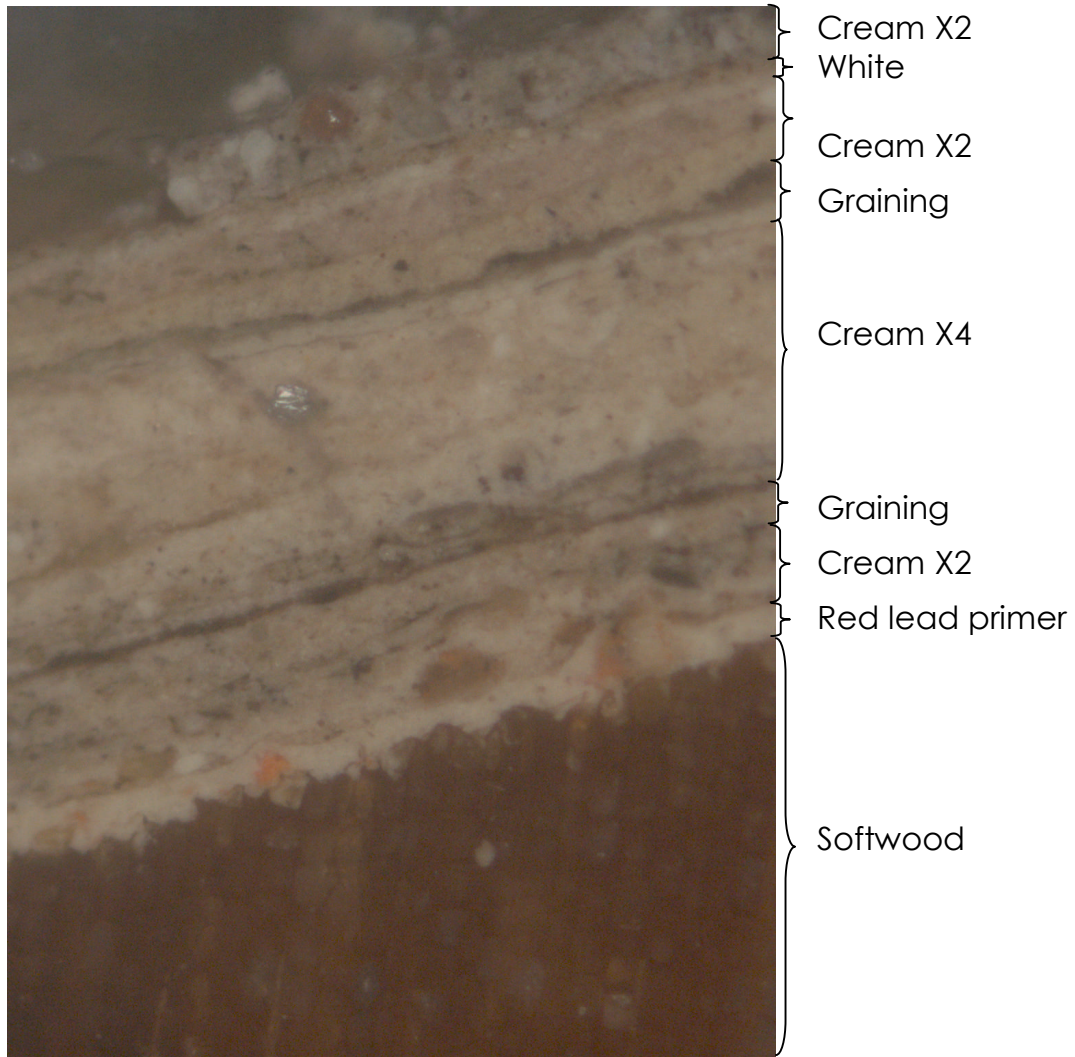


Table 1: Windows

	Sample 1 Sash window (Stored)	Sample 3 Casement window (Stored)
14		Zinc white
13 Post 1920¹	Cream	Clear coating Cream
12	Oil Yellow-cream	
11	White	Oil White
10	Deep warm cream	Oil Deep warm cream
9	Yellow-cream	
8 GRAINING	Varnish Brown Broken white	Varnish White Off-white
7	Cream	
6	Cream	
5	Varnish Warm cream	Varnish Warm white
4	Deep cream	Deep cream
3 GRAINING	Varnish Brown (thin) Cream Deep cream	Deep cream
2	Cream (thin)	
1	Deep cream Light cream Warm cream	Light cream Warm cream
Primer	Red lead	
Substrate	Softwood	Softwood

¹ Titanium based paints identified indicating a post 1920 date of execution.

Panelling

Sample 4 was removed from the corridor face of the panel barge board in Room 1 and sample 5 from the inside face of the panel frame in Room 3.

Both the corridor and interior face of the panelling were predominately painted in shades of cream with the occasional appearance of a white or brown decoration. However, the two faces of the panelling within the two rooms sampled were not always painted in a similar fashion.

No instances of grained decoration were identified on the panelling. However, varnish was used on the corridor face of the barge boarding in two instances to create a glossy finish.

These paint mixtures were relied predominately on particles of iron oxide earth and carbon black for their pigmentation. The initial ten schemes were applied in traditional lead based paints. Whilst modern titanium based coatings were identified in the eleventh and final phase of decoration, the penultimate scheme appears to have employed zinc based paints.

Architectural Paint Research Panelling, Tregantle Fort Keep

Photomicrograph showing sample 5, taken from the inside face of the panel frame in Room 3, photographed in cross-section under incident light at 200X magnification. Printed magnification not calculated.

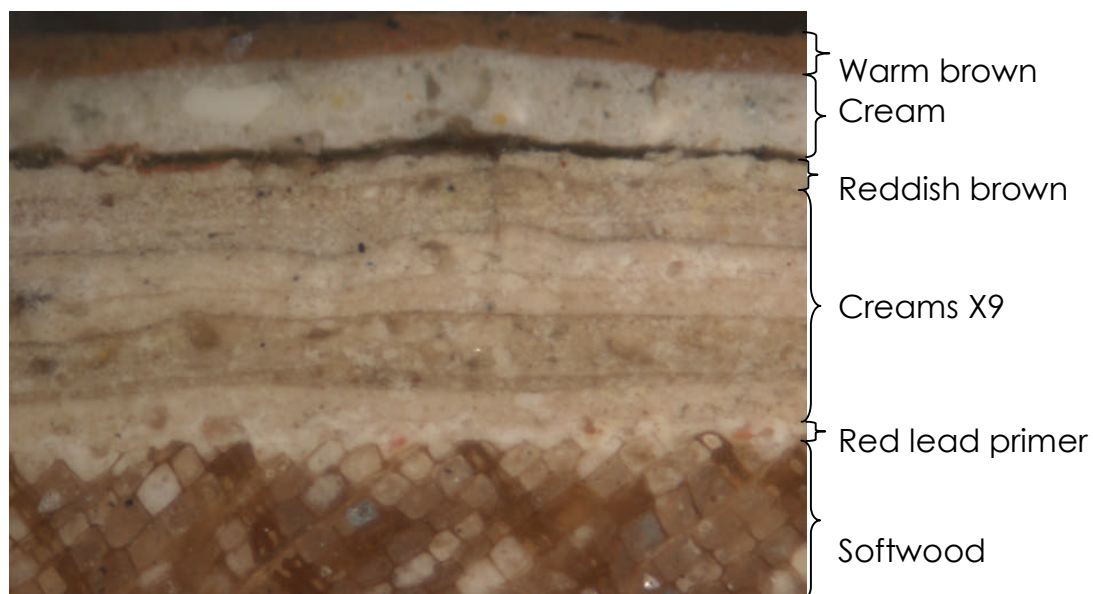


Table 2: Panelling

	Sample 4 Panel bargeboard Corridor face Room 1	Sample 5 Panel frame Inside face Room 3
19		
18		
17		
16		
15		
14		
13²	Yellow cream (thin)	Warm brown
12³	White	Cream
11 Post 1920⁴	Yellow-cream	
10⁵	Oil Deep cream	Reddish brown (fragment) Cream
9	Varnish Deep cream	Deep cream
8	Varnish Light cream	Light cream
7	Oil Light cream	Dark cream
6	Cream	Light cream
5	Light cream	Light cream
4	Deep cream	Light cream
3	Cream	Deep cream
2	Deep cream	Deep cream
1	White	Light cream
Primer		Red lead
Substrate	Softwood	Softwood

² Titanium based paints identified suggesting a post 1920 date of execution.

³ Zinc based paint identified.

⁴ Titanium based paints identified indicating a post 1920 date of execution.

⁵ Zinc based paints identified.

Doors

Sample 2 was removed from the locking rail of a stored door, sample 6 from a panel and sample 7 from a panel moulding on the corridor face of the door fronting Room 3.

As many as twelve separate schemes were recorded on the doors. Both the stored and the in situ doors retained similar decorative histories over softwood substrates prepared with red lead primer. The doors were painted principally in shades of cream and white and were not decorated brown until the existing scheme. In three instances varnish was applied to the decoration to give the doors a glossy appearance. From the limited spectrum of samples there is no indication that individual elements were highlighted in contrasting colours but instead the doors were painted in a uniform manner throughout.

In addition to the established range of iron oxide earth, carbon black and red lead pigments, particles of what appears to be blue verditer were identified in the cream decorations forming the third and fourth decorative schemes.

Blue verditer is considered to be an unusual choice of pigmentation. Although it has been found in nineteenth century house decoration it was most popular in the seventeenth and early eighteenth centuries.

The initial ten schemes stained positive for significant lead content. Modern titanium and zinc based paints followed.

Skirting

Sample 8 was taken from the skirting sited in Room 4.

The skirting was painted a total of thirteen times over a softwood substrate prepared with a red lead primer. However, the existing warm brown decoration was absent on the sample examined. Over its decorated history it was painted in shades of cream and brown.

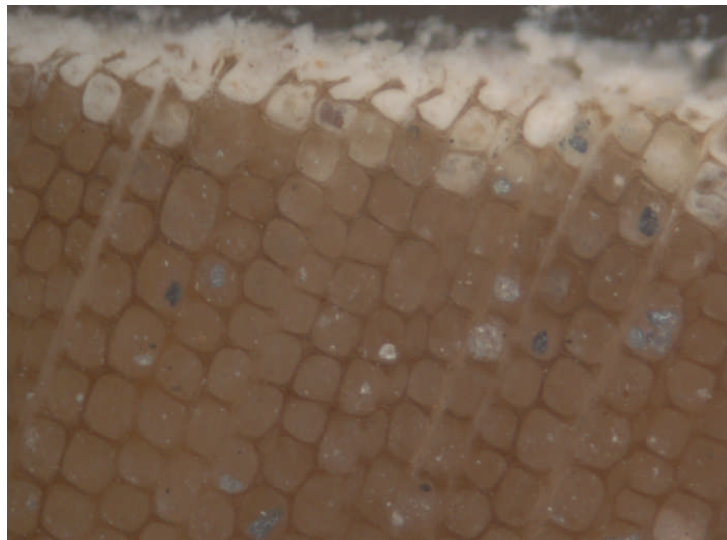
Particles of iron oxide earth, carbon black and red lead were visible in these paint mixtures. Traditional lead based paints were employed in the initial ten schemes, followed by titanium and zinc based decorations.

Architectural Paint Research Panelling, Tregantle Fort Keep

Photomicrograph showing sample 6, taken from the door panel in Room 3, photographed in cross-section under incident light at 200X magnification. Printed magnification not calculated.



Warm brown
White
Yellow-cream
Creams X3
Varnished white
Creams X4



Red lead primer on
softwood

Table 3: Doors and skirting

	Sample 2 Door Locking rail (stored)	Sample 7 Door panel moulding Corridor face Room 3	Sample 6 Door panel Corridor face Room 3	Sample 8 Skirting Room 4
13⁶	Warm brown White	Warm brown White	Warm brown	(Warm brown missing)
12⁷	White	White	White	Warm cream
11 Post 1920⁸	Yellow- cream	Yellow- cream	Yellow- cream	Light warm brown Cream
10	Oil Deep warm cream	Oil Deep warm cream	Oil Deep warm cream	Cream
9	Varnish Deep warm cream	Deep warm cream	Deep warm cream	Light cream
8	Varnish Deep warm cream		Warm cream	Deep cream
7	Cream			Warm brown
6				Cream
5	Varnish Warm white	Varnish Warm white	Varnish Warm white	Cream
4	Dark cream	Deep cream (blue verditer)	Deep cream	Cream
3	Cream	Cream (blue verditer)	Varnish Cream	Deep cream
2	Deep cream	Deep cream	Deep cream	Light cream
1		Cream	Cream	Deep warm cream
Primer	Red lead	Red lead	Red lead	Red lead
Substrate	Softwood	Softwood	Softwood	Softwood

⁶ Titanium based paints identified suggesting a post 1920 date of execution.

⁷ Zinc based paints identified.

⁸ Titanium based paints identified suggesting a post 1920 date of execution.

2.3.2 Painted wall surfaces

Sample 9 was taken from the painted stone wall of Passage A and sample 10 from the brick arch soffit leading to Room 6.

Seven white and one light cream coloured limewash decorations were identified on the stone walls of Passage A. Particles of French ultramarine were added to all of the white limewash mixes to prevent yellowing and to create a more brilliant appearance. Although the final white strata had the appearance visually of a limewash coating micro-chemical tests indicated that it contained a significant amount of lead.

French ultramarine is a synthetic pigment first invented in 1828 but not in general use in house decoration until the middle of the nineteenth century. A few particles of iron oxide earth were noted in the light cream limewash mixture.

Only one white coating broken with a few particles of iron oxide earth was visible over the brick arch soffit. Micro-chemical tests suggest that this layer contained a significant amount of both calcium carbonate and lead.

Architectural Paint Research
Painted wall surface, Tregantle Fort Keep

Photomicrograph showing sample 9, taken from the stone wall of Passage A, showing the final decoration stained yellow for significant lead content. Photographed in cross-section under incident light at 100X magnification. Printed magnification not calculated.



3. CONCLUSIONS

The joinery examined as part of these investigations was constructed of softwood. Many of these windows, doors, panelling and skirting were prepared with a priming coat pigmented with red lead.

As many as fourteen separate phases of decoration were recorded on the joinery, at least ten of which were executed using traditional lead based paints.

Interior features such as doors and panelling are regarded to have historically been redecorated on approximately a twenty year cycle with exterior features being recoated at more frequent intervals. This would suggest that in normal circumstances a sufficient number of decoration schemes survived on the joinery features examined to account for their one hundred and forty-two year history. However, it should also be considered that on a military installation painting application and stripping campaigns may have been undertaken more frequently in order to keep personnel occupied.

The colour palette on the joinery consisted predominately of shades of cream, white and in the later stages brown. Graining in imitation of timber does not appear to have been a common finish and was noted only on the windows. However, there were sporadic instances on all the joinery features of the use of varnish to give a glossy appearance.

The current investigations were not able to identify any joinery elements that were obviously inserted into the Keep at a later date.

The stonework forming Passage A recorded nine instances of decoration. The overwhelming majority of these appear to have been brilliant white limewash coatings.

Limewash was renewed more frequently than traditional lead based paints, as often as every three to five years. This would suggest that the original decorative finish has not survived in this location. However, the evidence that has been retained might indicate the type and colour of earlier decorations.

Only the existing paint history has survived on the brick arch soffit of Room 6 indicating that it has been stripped and renewed in the recent past.

Appendix 4.1 Sample list

TRE.K.1	1:	Window sash	Stored in Room 1	
	2:	Locking rail, door	Stored in Room 1	
	3:	Casement window	Stored in Room 5	(3)
TRE.K.2	4:	Panel, barge board, corridor face	Room 1	
	5:	Panel, frame, room face	Room 3	
	6:	Door, panel, corridor face	Room 3	(2)
	7:	Door, panel moulding, corridor face	Room 3	
TRE.K.3	8:	Skirting	Room 4	
	9:	Wall	Passage A	(2)
TRE.K.4	10	Arch soffit	Room 6	(2)

Appendix 4.2

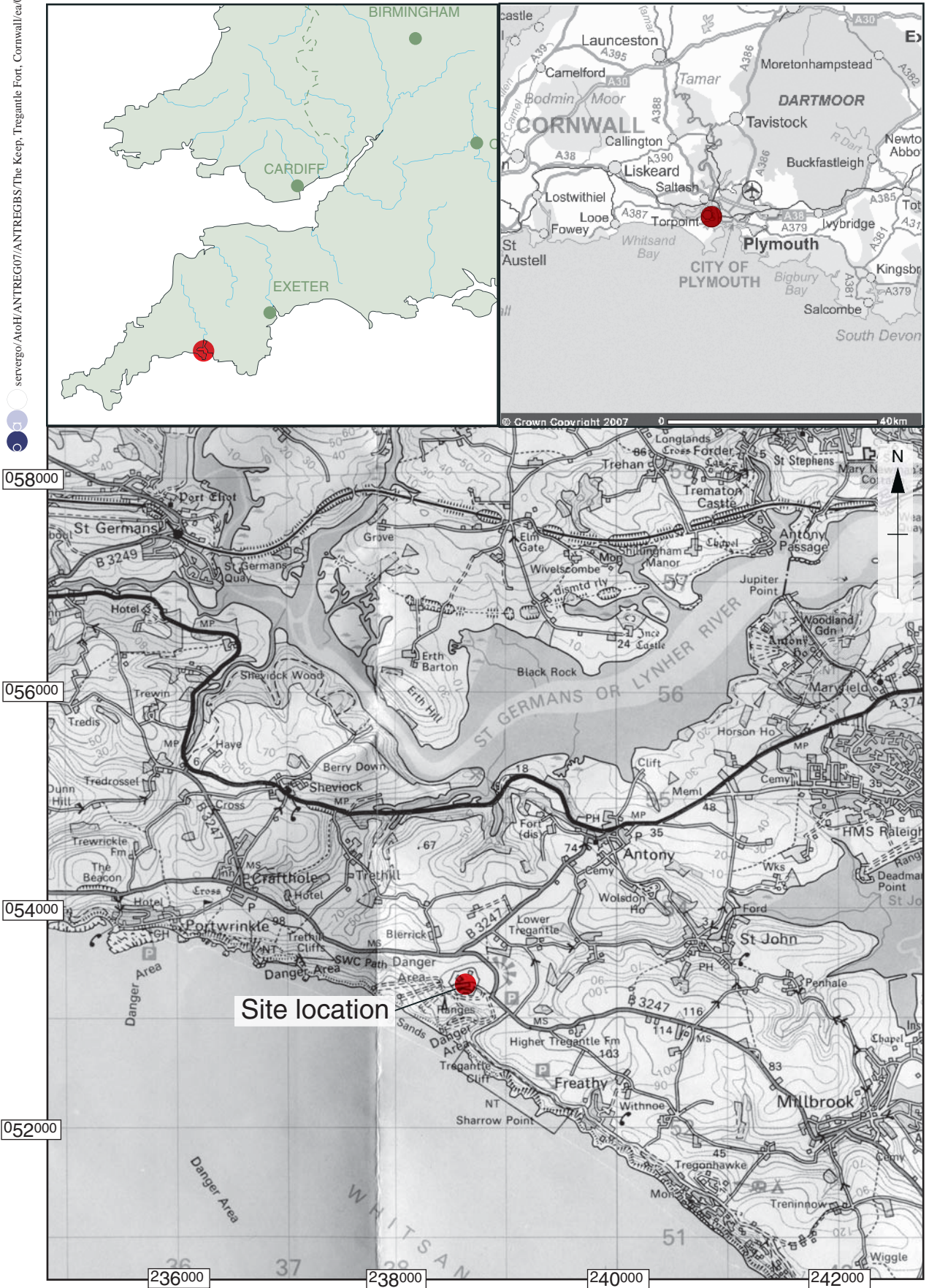
Sample location photographs











Reproduced from the Landranger1:50,000 scale by permission of the Ordnance Survey on behalf of The Controller of Her Majesty's Stationery Office © Crown Copyright 1974. All rights reserved. Licence No. AL 10005569

Figure 1: Site location

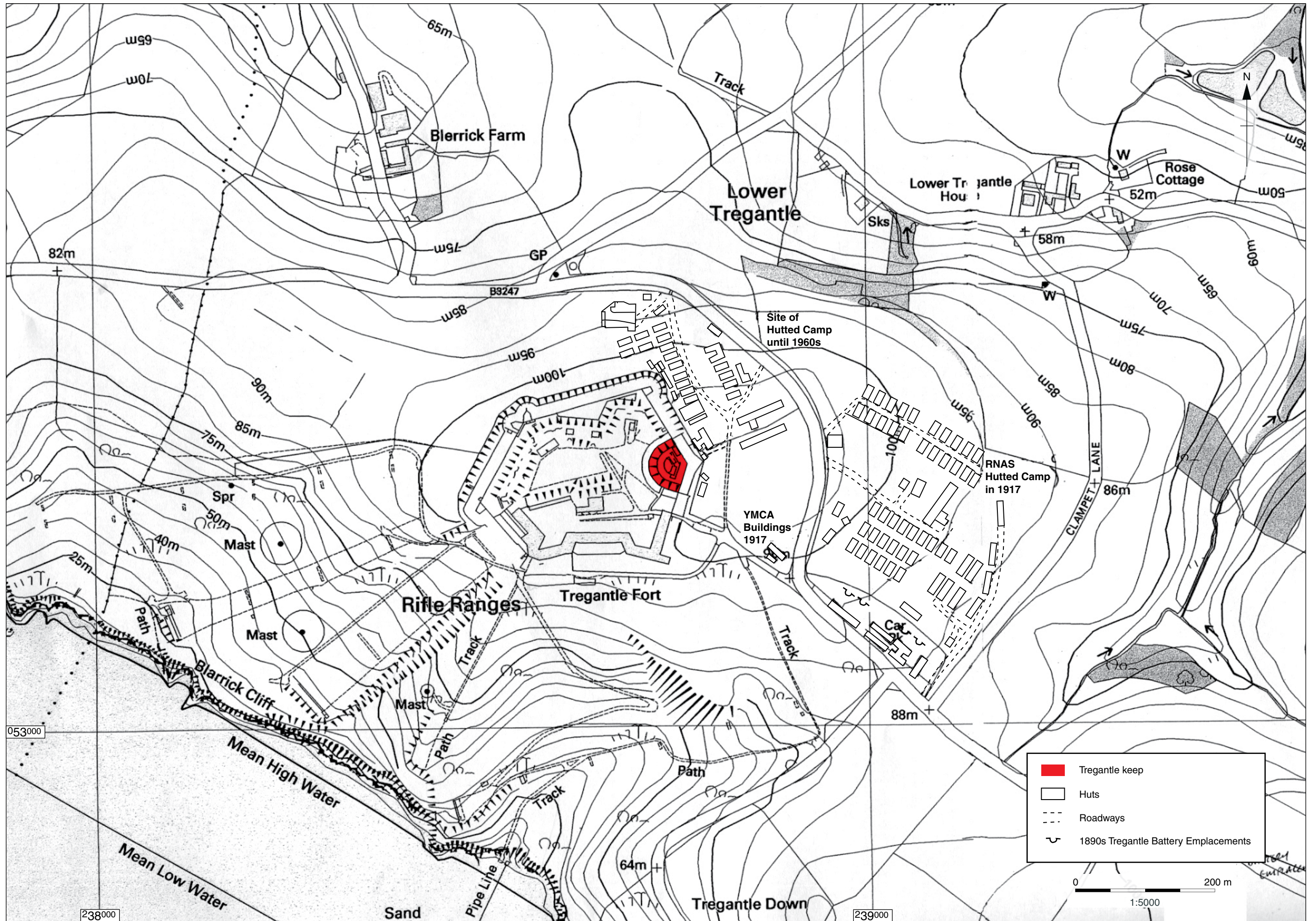


Figure 2: Site plan of fort, ranges and location of camps to the east of the fort

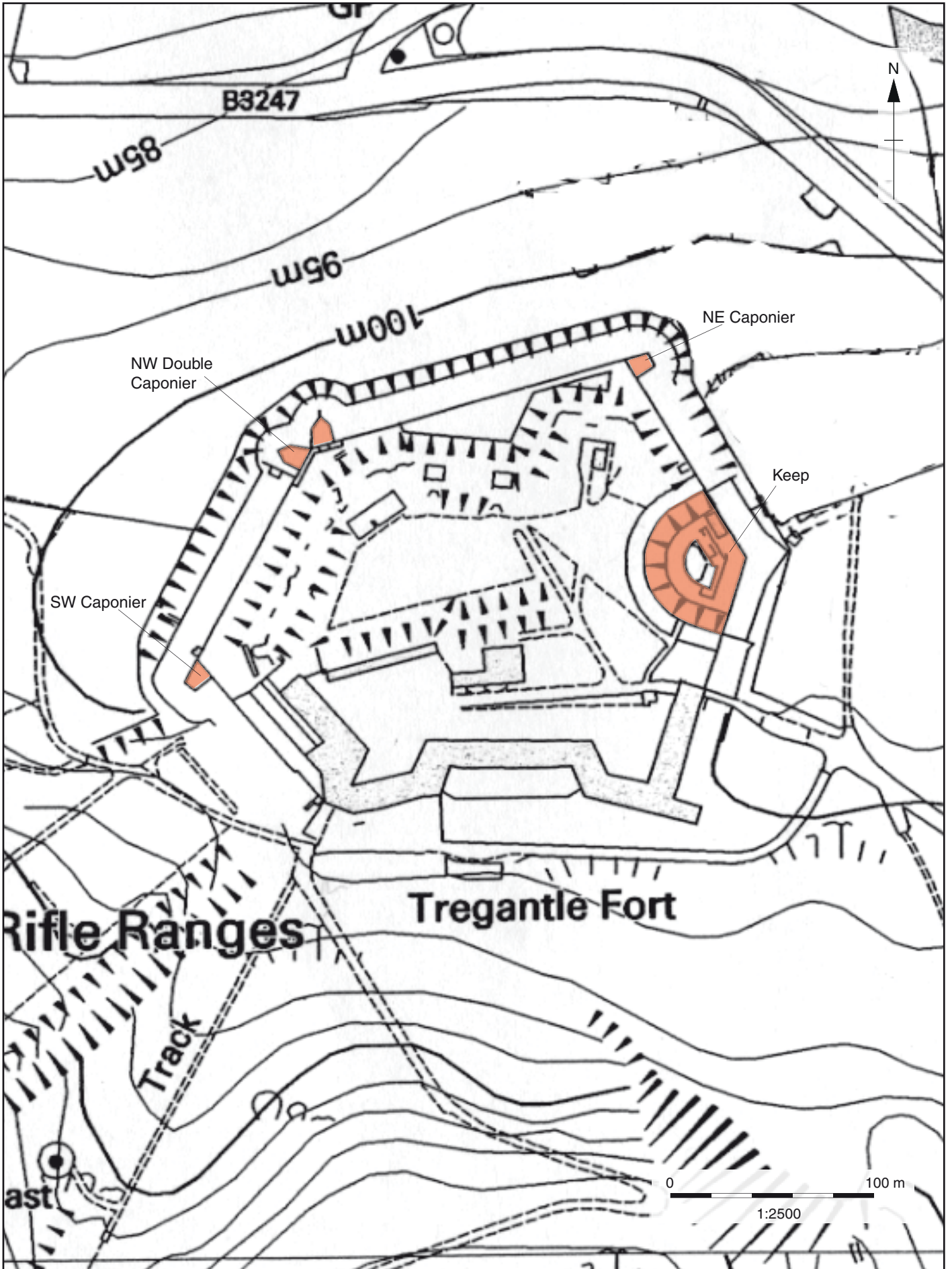


Figure 3: Plan of fort showing areas of the survey

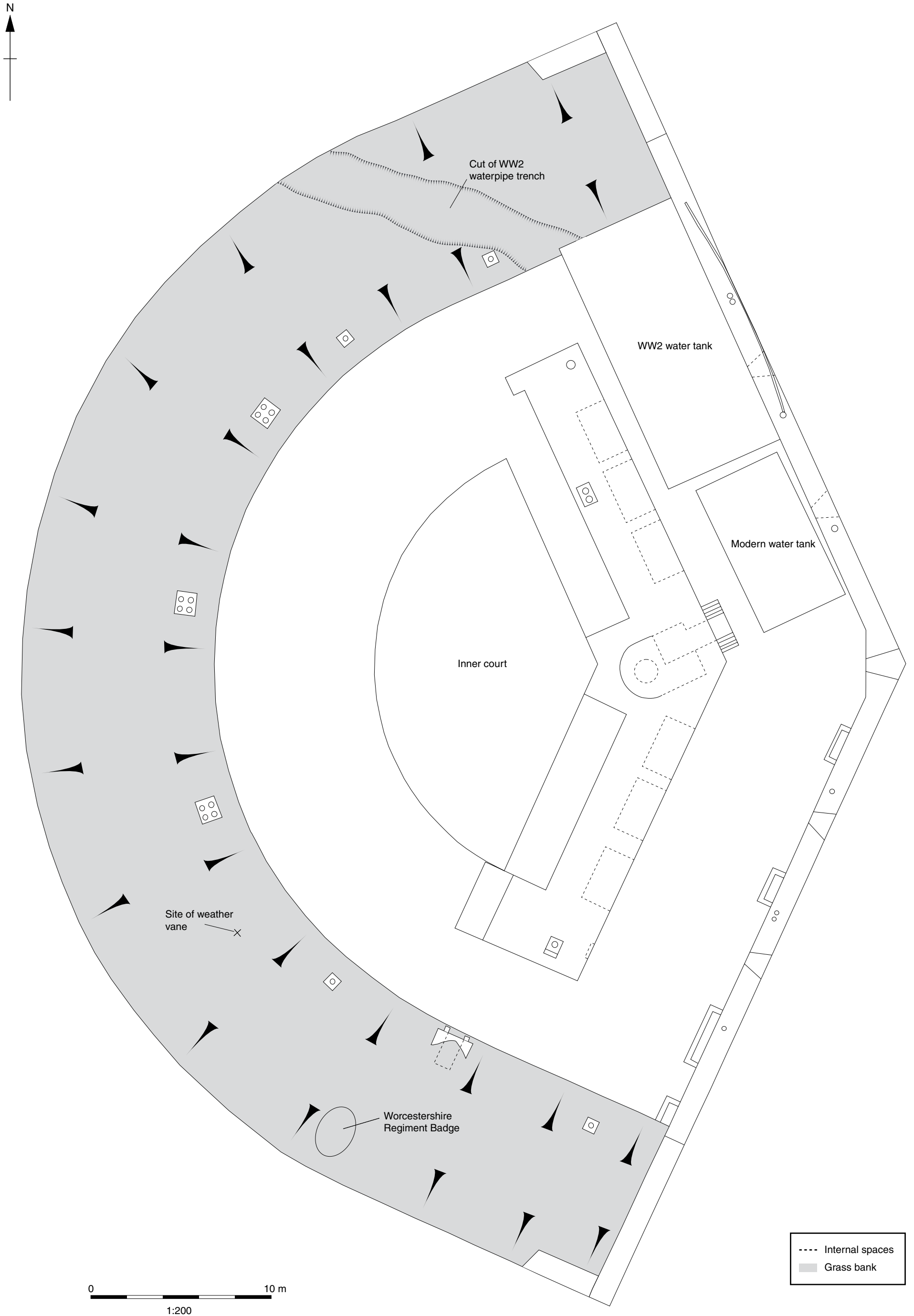
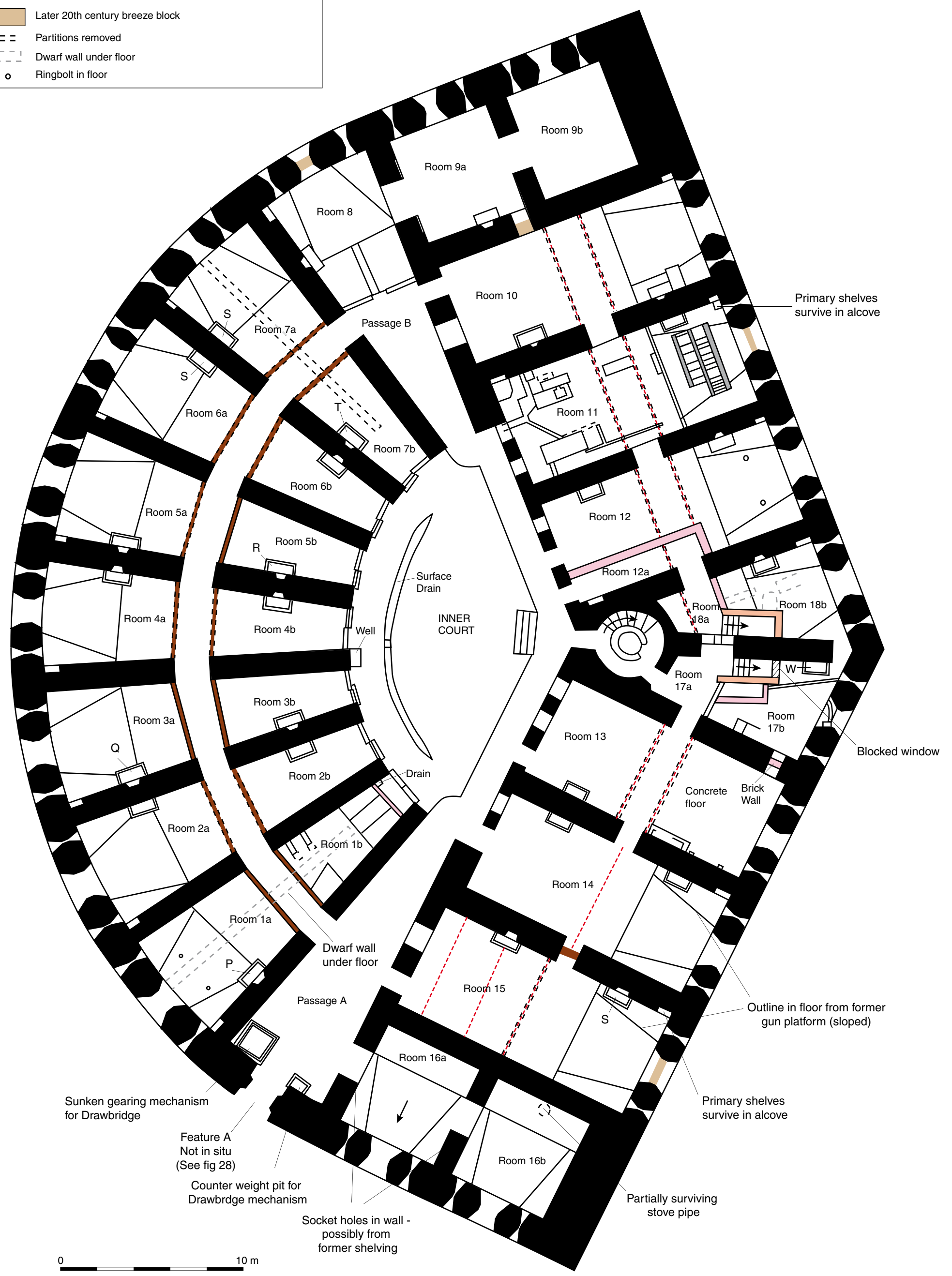


Figure 4: Plan of keep roof

Key

- Main primary structural stone walls (1858-64)
- Primary brick walls
- Primary panelling in-situ
- Primary panelling (not in situ)
- Imprint from former partition (probably secondary additions)
- Secondary Brick walls
- Later 20th century breeze block
- Partitions removed
- Dwarf wall under floor
- Ringbolt in floor



0 10 m
1:200

Figure 5: Plan of ground floor of keep

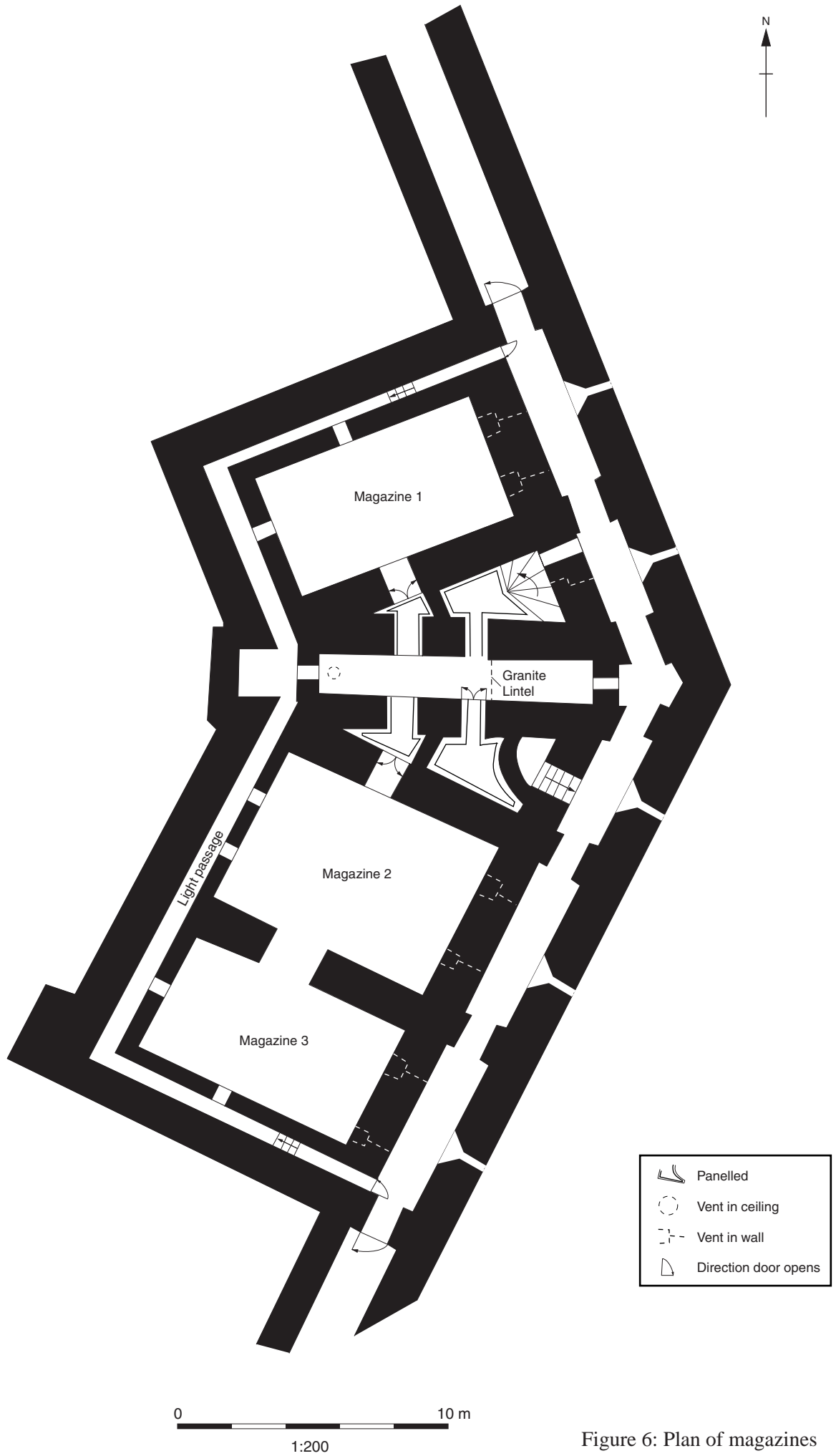


Figure 6: Plan of magazines

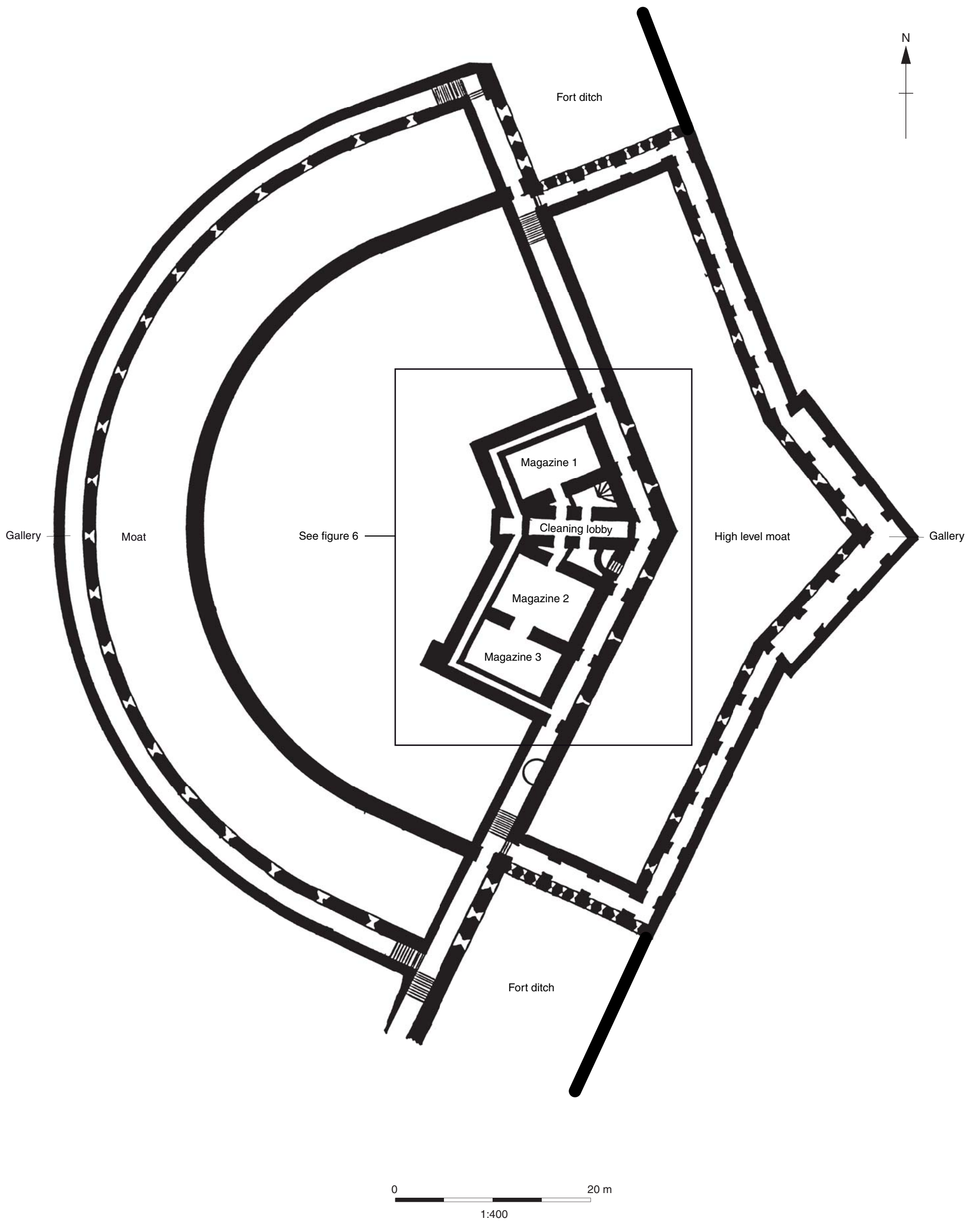


Figure 7: Keep, magazines and galleries

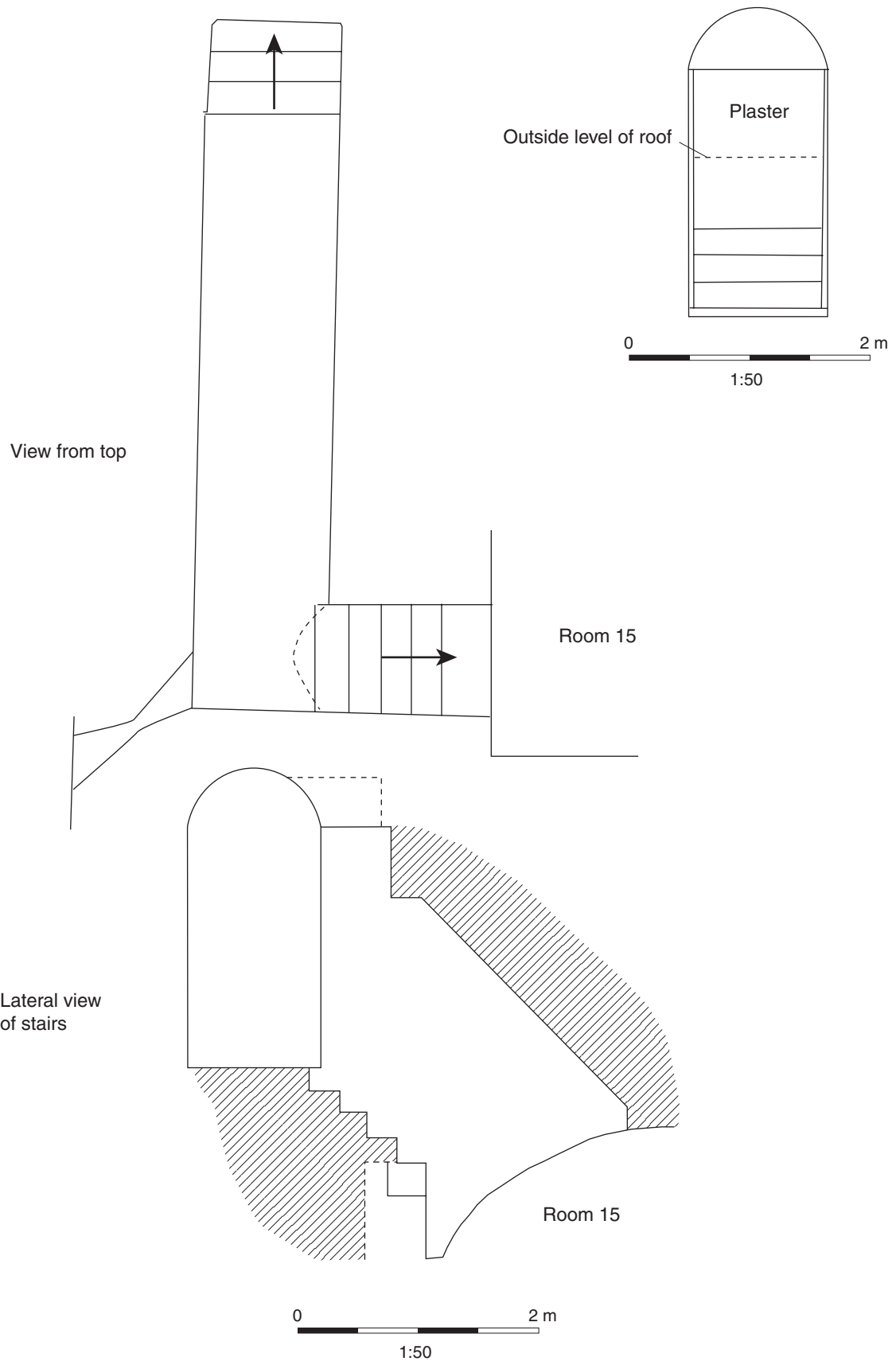
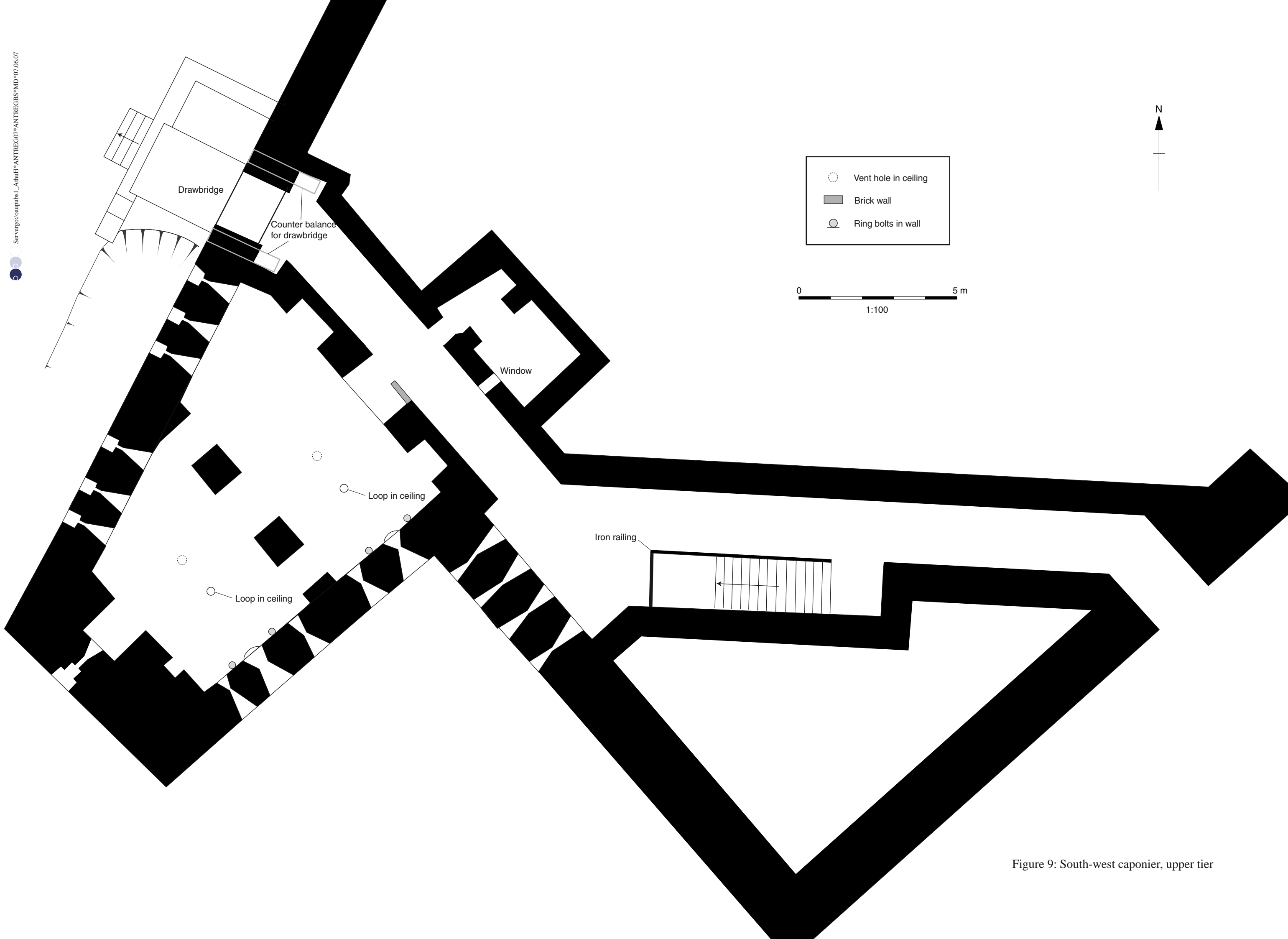


Figure 8: Plan of passage 19 from room 15 to roof top



- Vent hole in ceiling
- Brick wall
- Ring bolts in wall

0 5 m
1:100



Figure 9: South-west caponier, upper tier

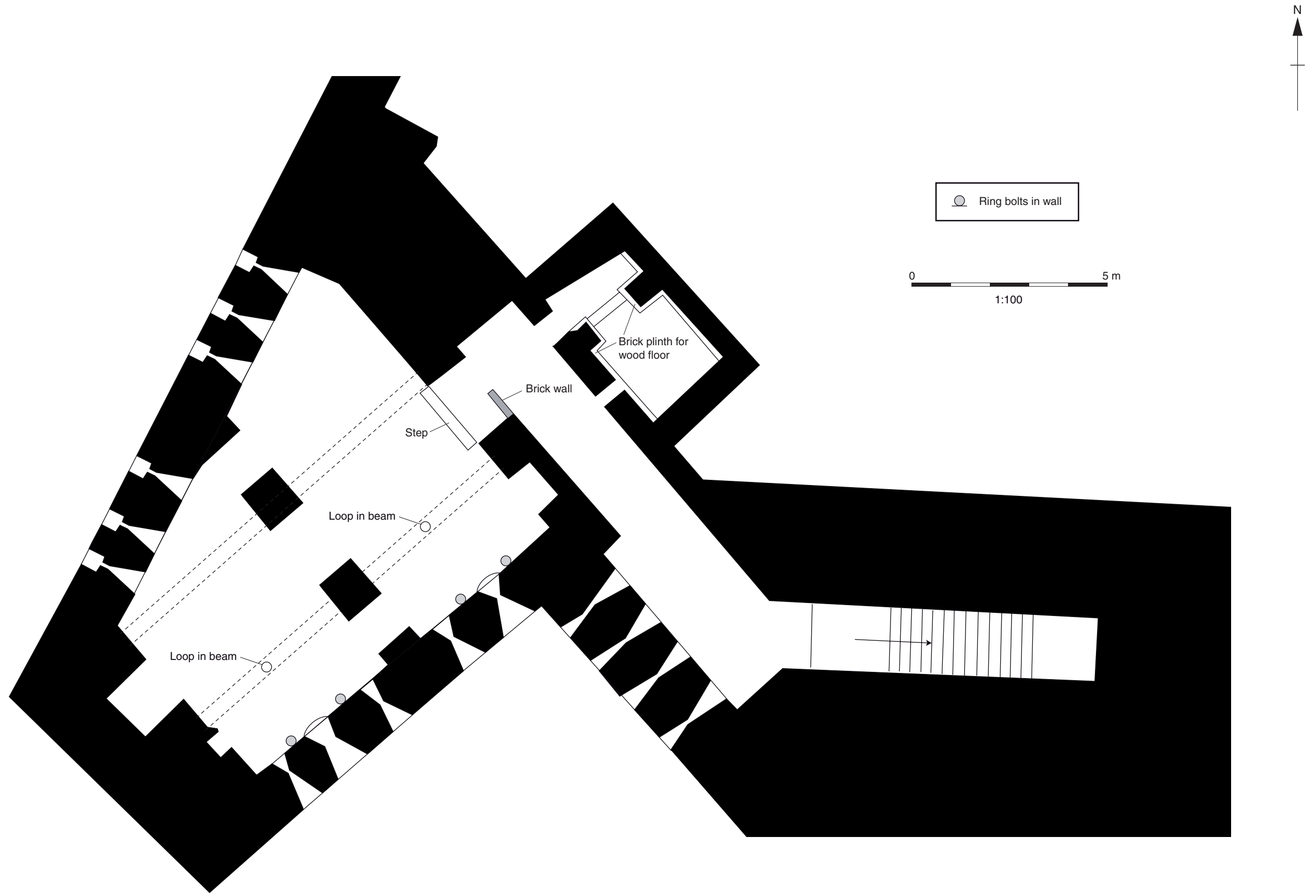


Figure 10: South-west caponier, lower tier

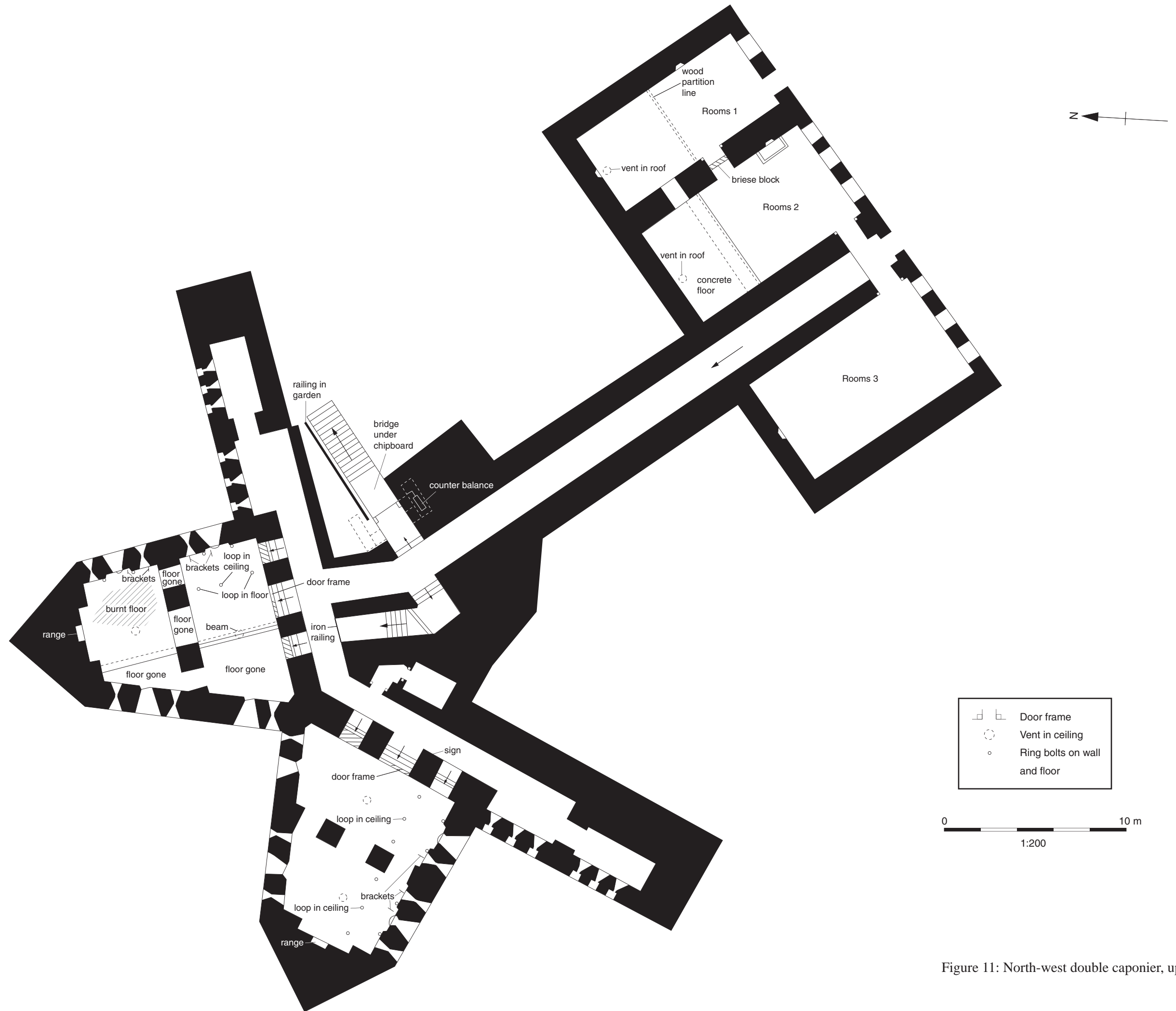


Figure 11: North-west double caponier, upper tier

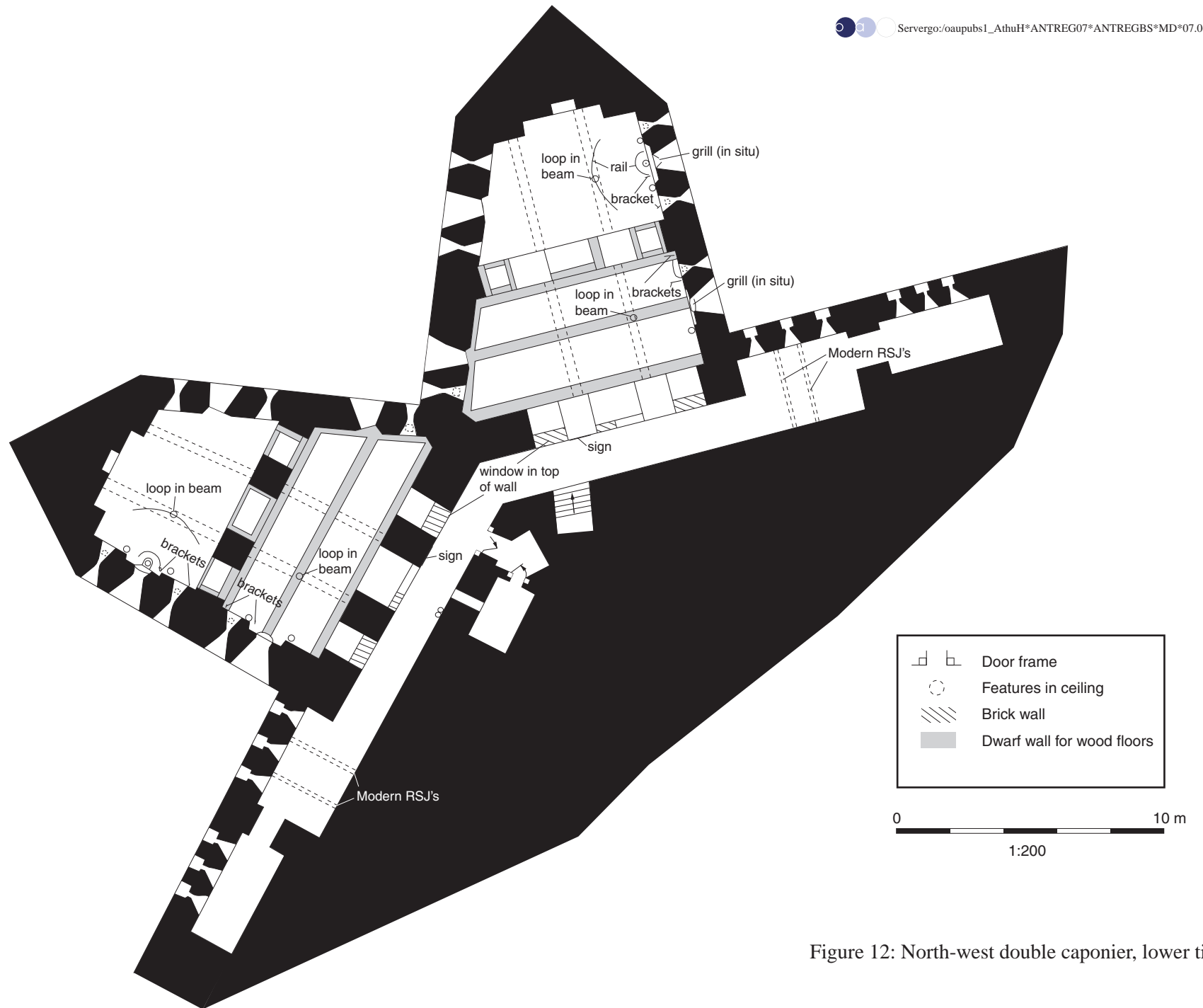


Figure 12: North-west double caponier, lower tier

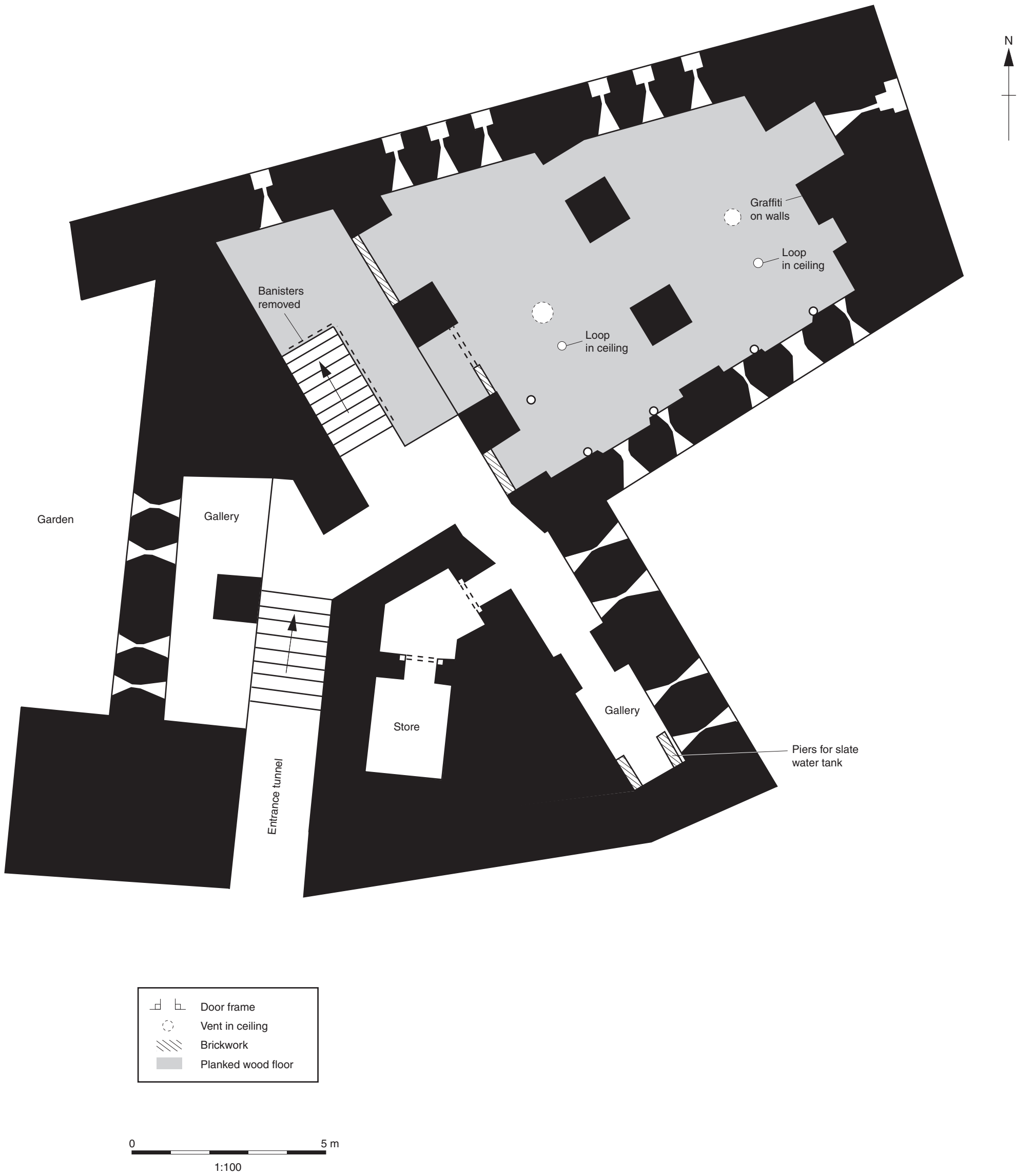


Figure 13: North-east caponier, upper tier



Figure 14: North-east caponier, lower tier

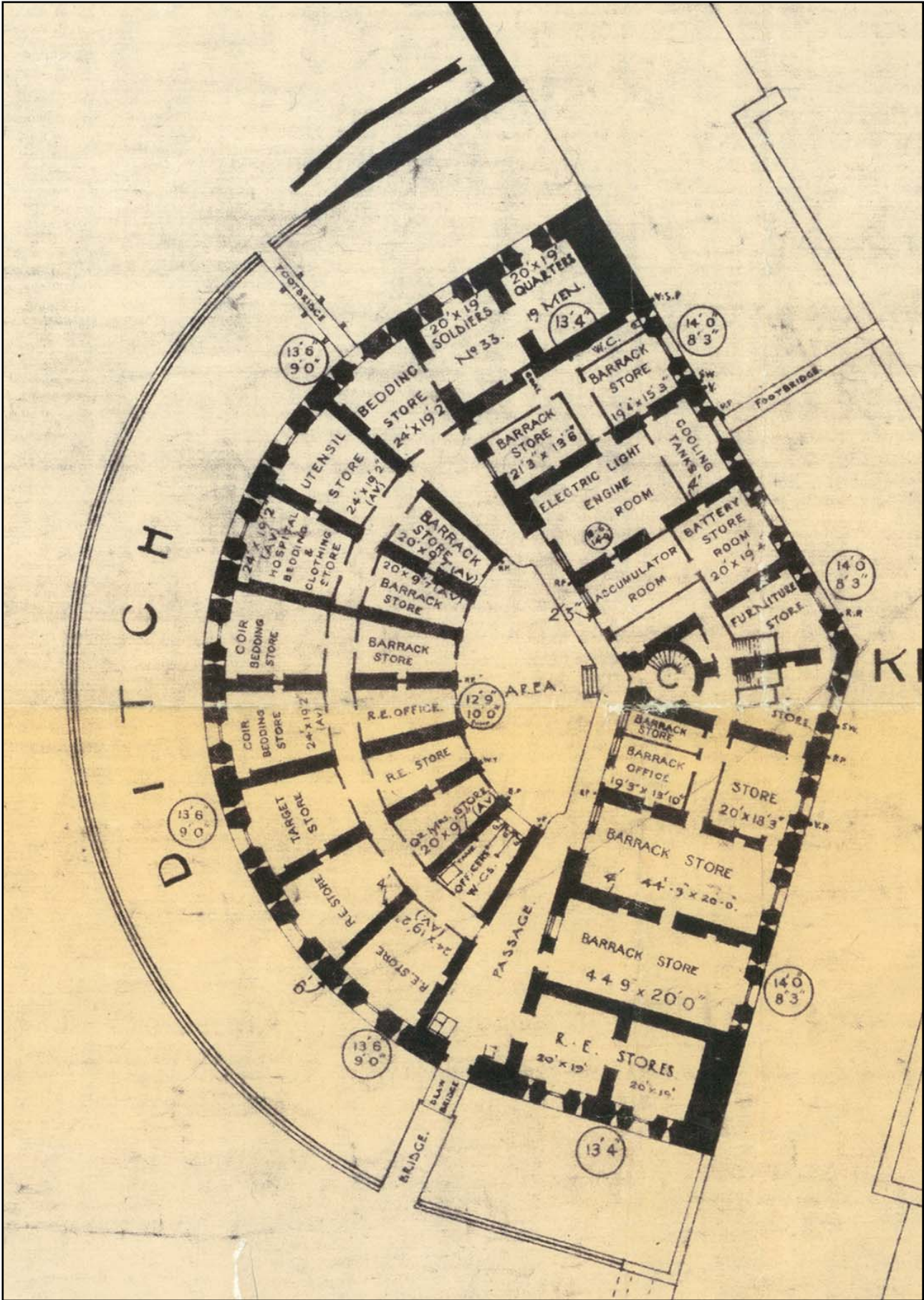
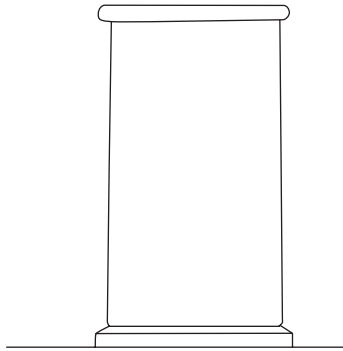
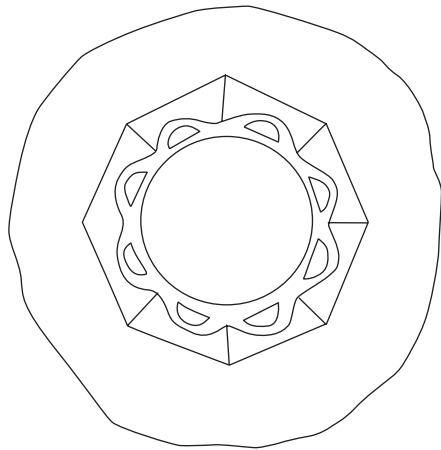
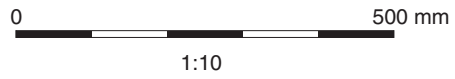


Figure 15: The ground floor plan of keep in 1937



Cast iron chimney pot



Ceramic chimney pot

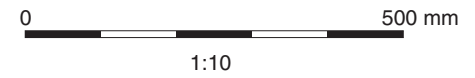
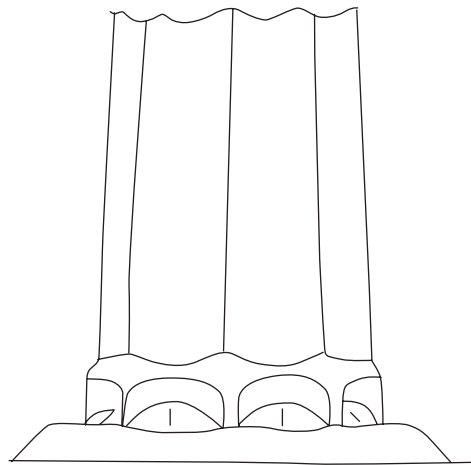


Figure 16: Two forms of chimney pots on keep roof

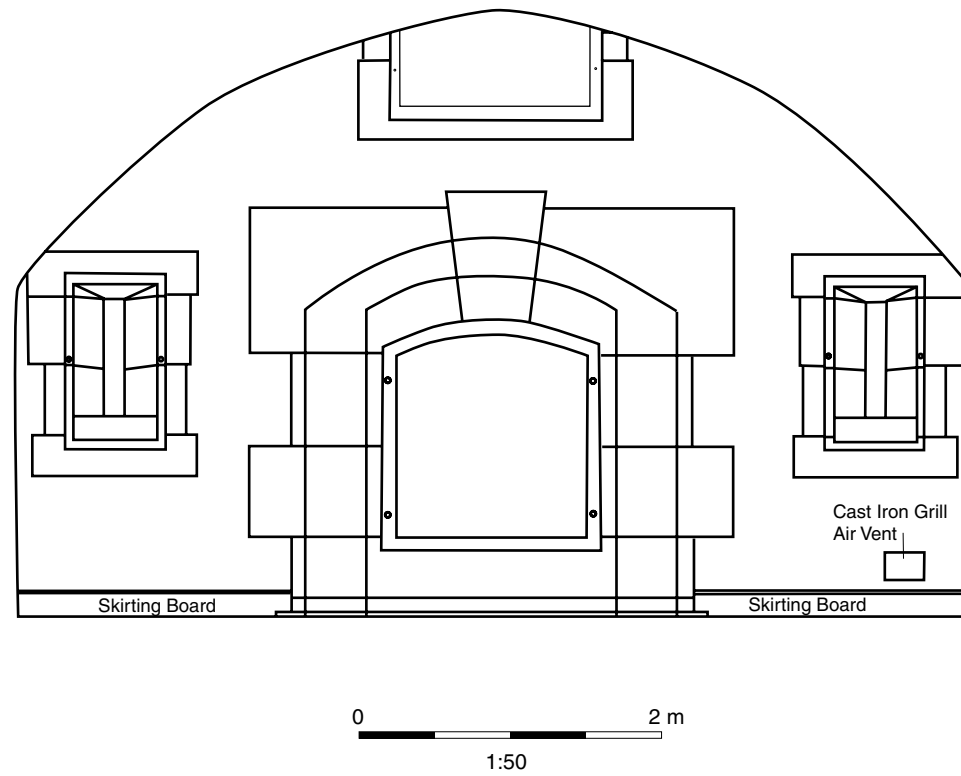


Figure 17: Layout of embrasures and windows in keep

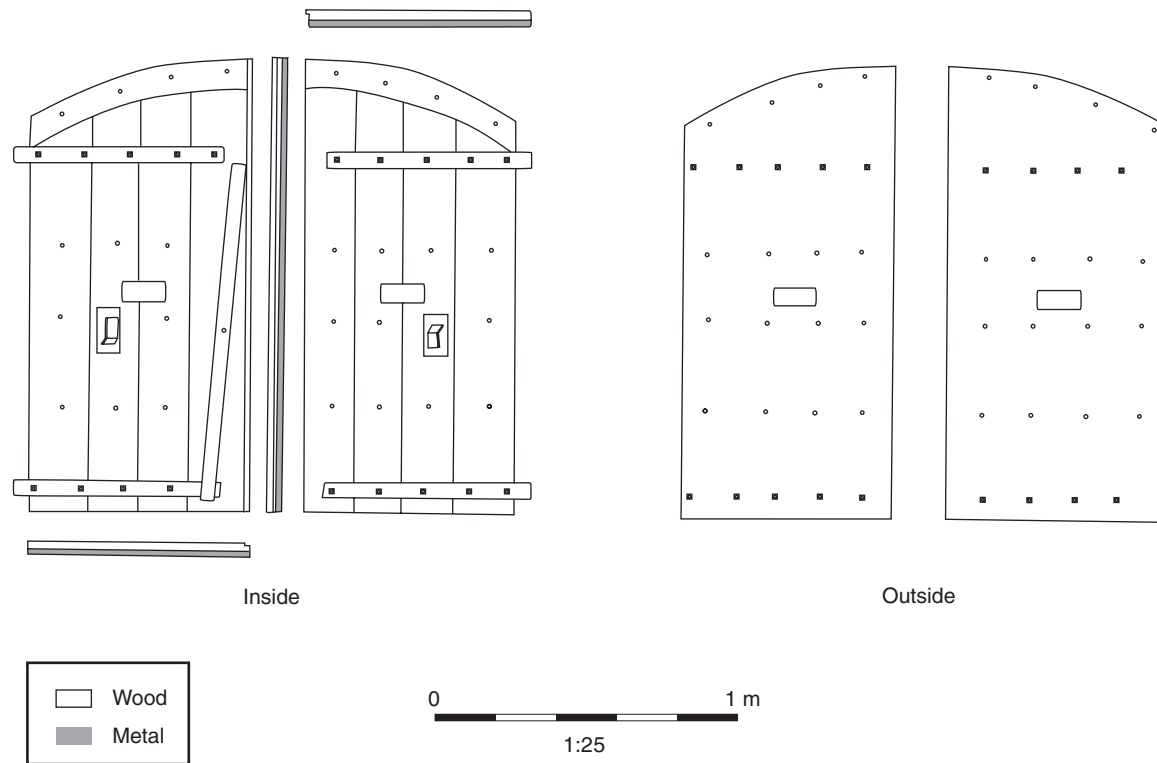


Figure 18: Iron shutters of embrasures

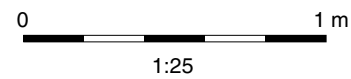
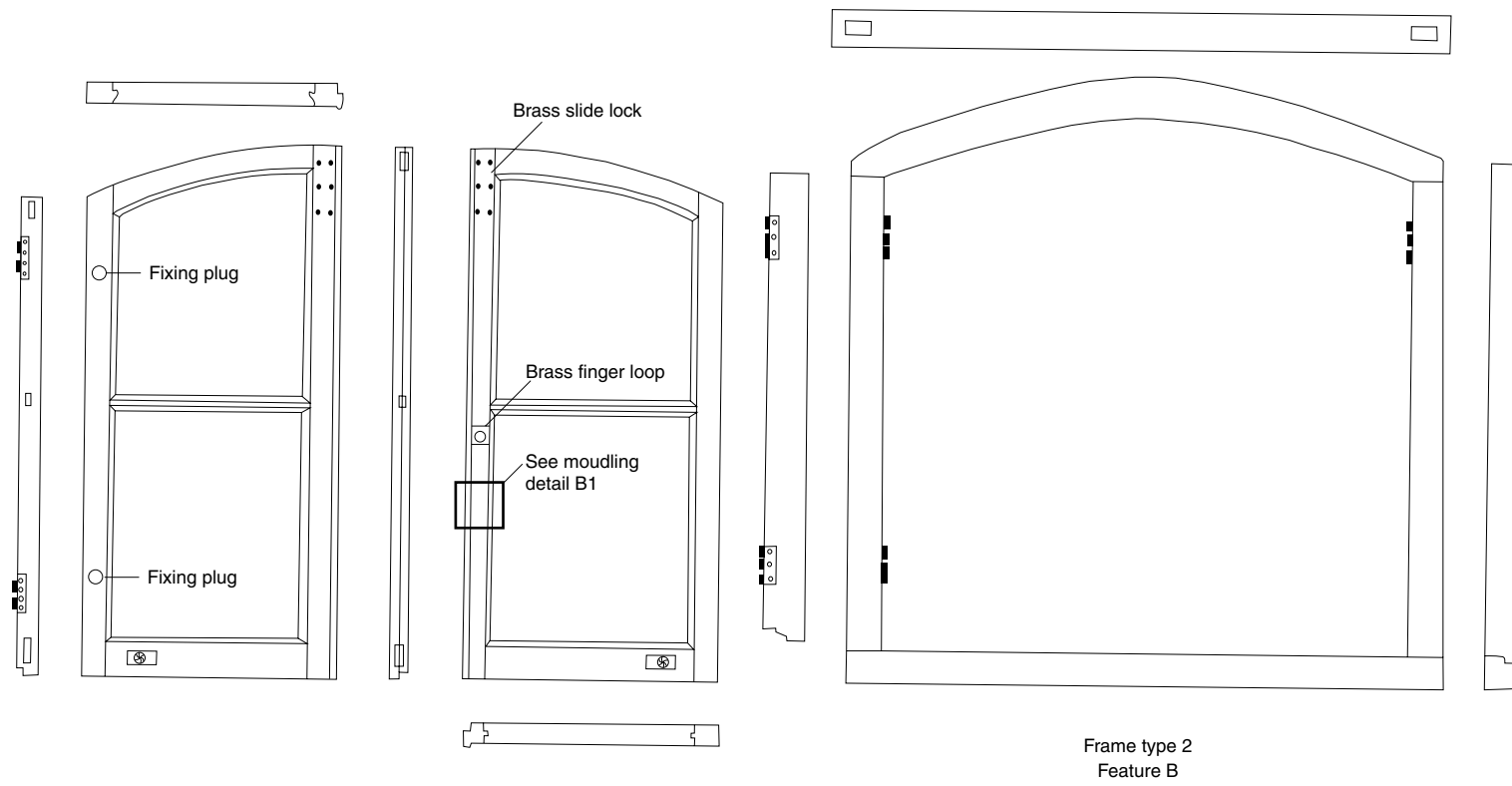
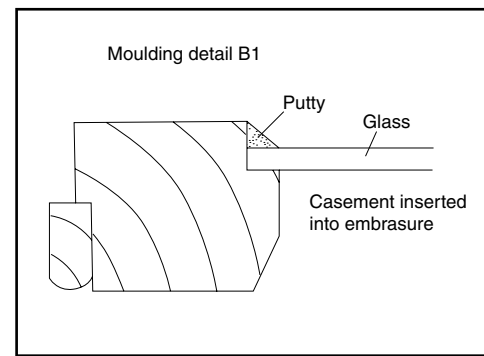
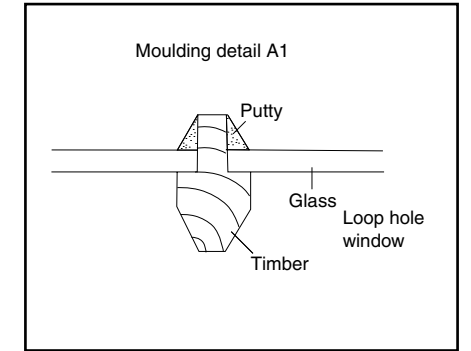
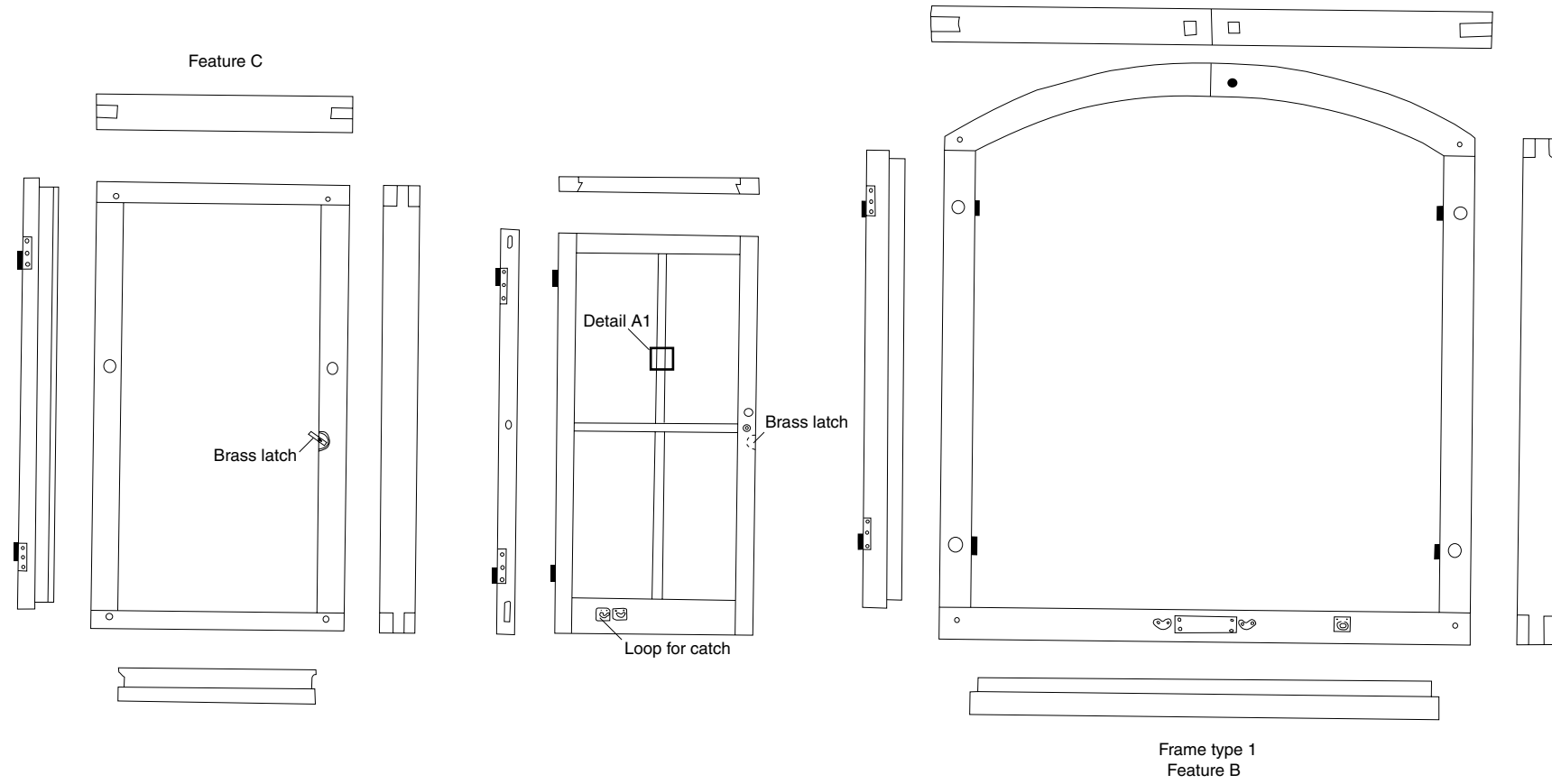
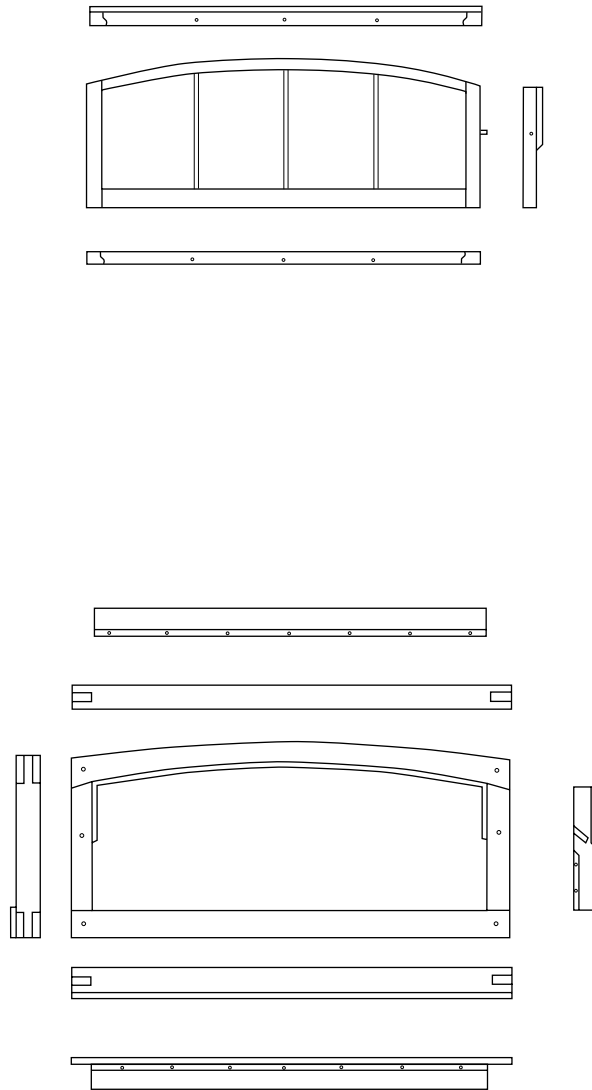
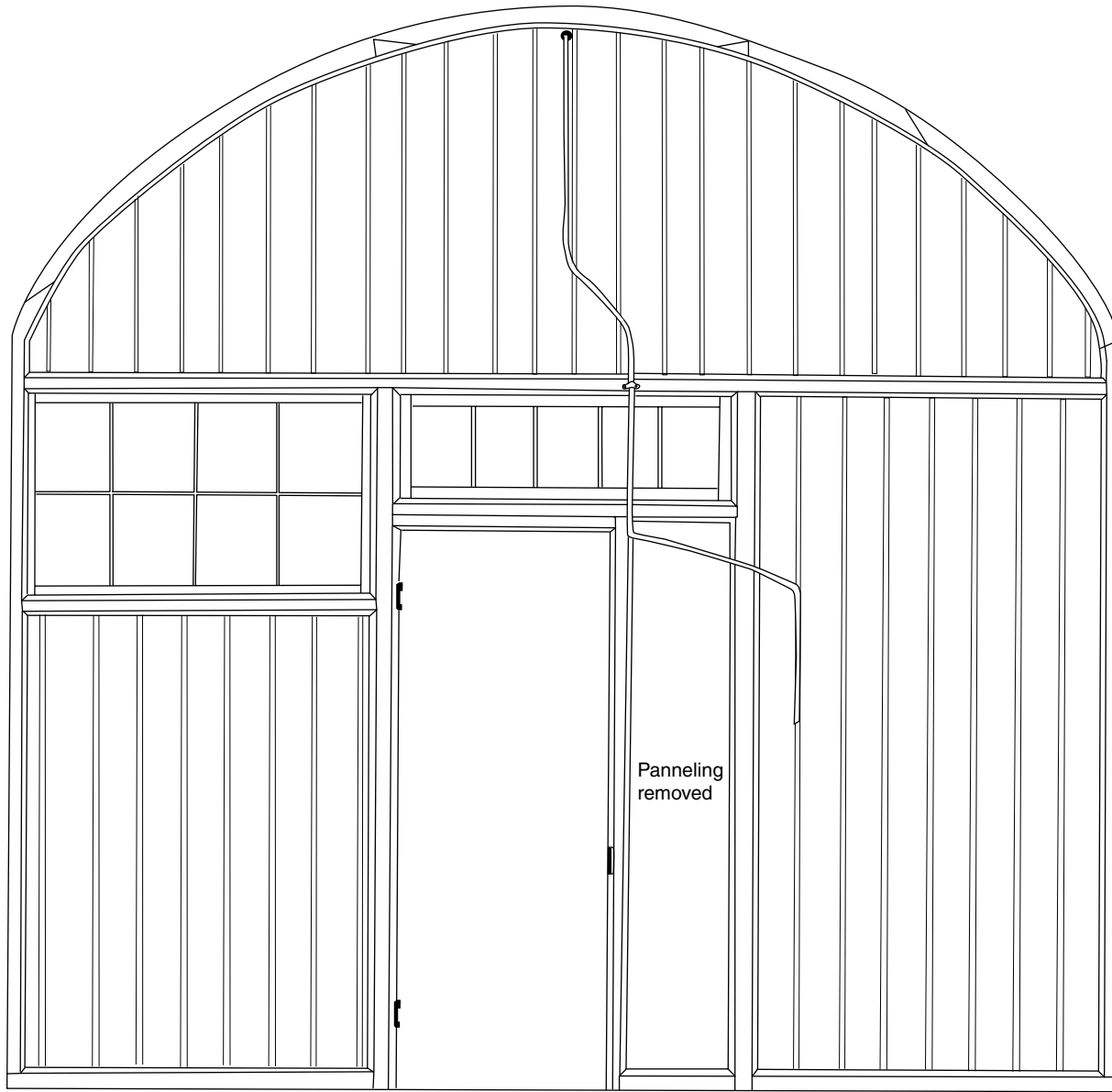


Figure 19: Window and frames of embrasures, (Feature B), and loopholes, (Feature C)

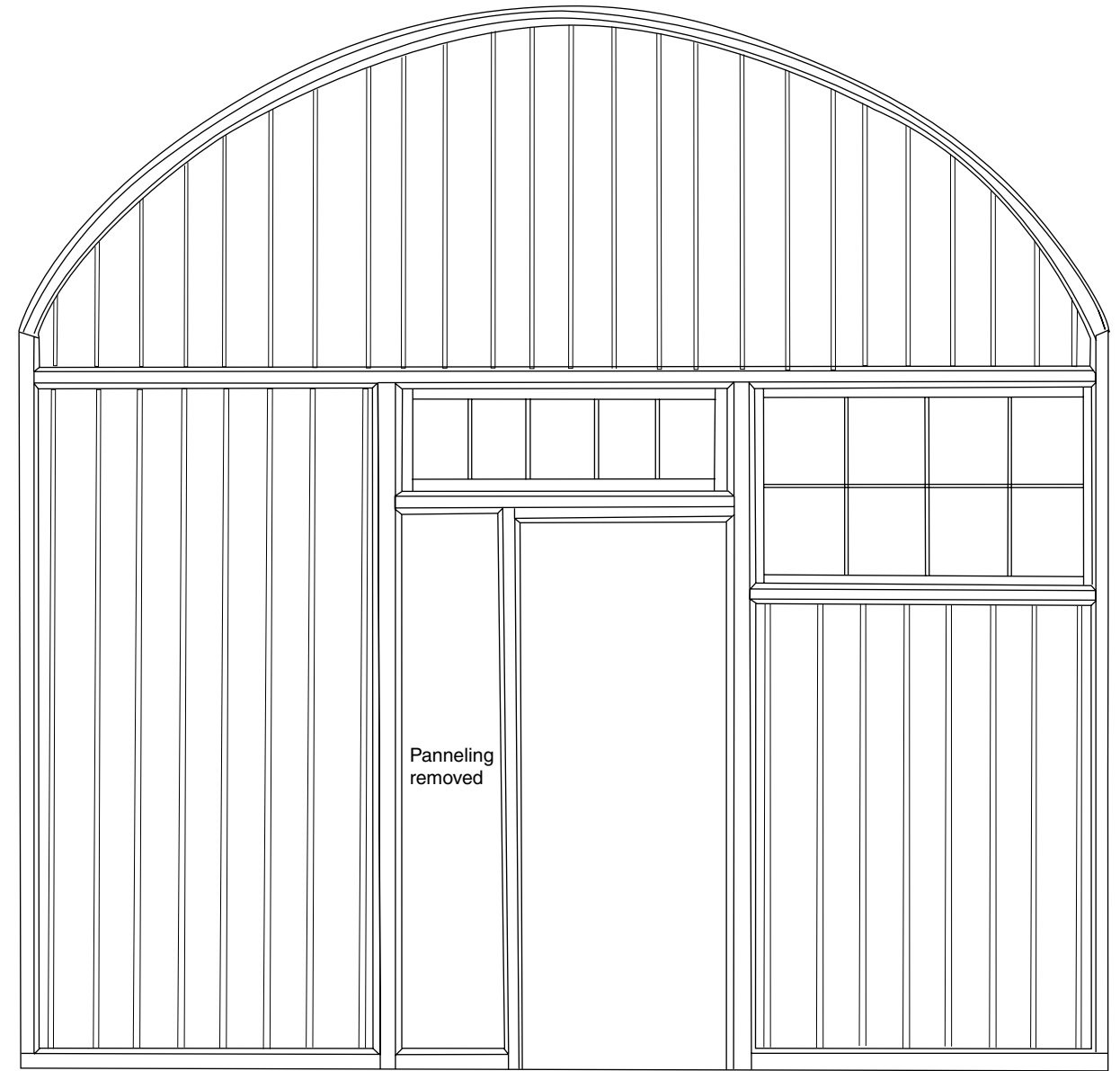


0 1 m
1:25

Figure 20: Window and frame above embrasure, (Feature D)



Inside from Room



Outside from Passageway

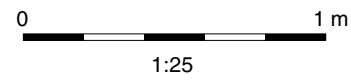
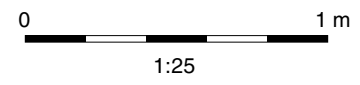


Figure 21: Room 1 Timber Partition into toilets, (Feature O)

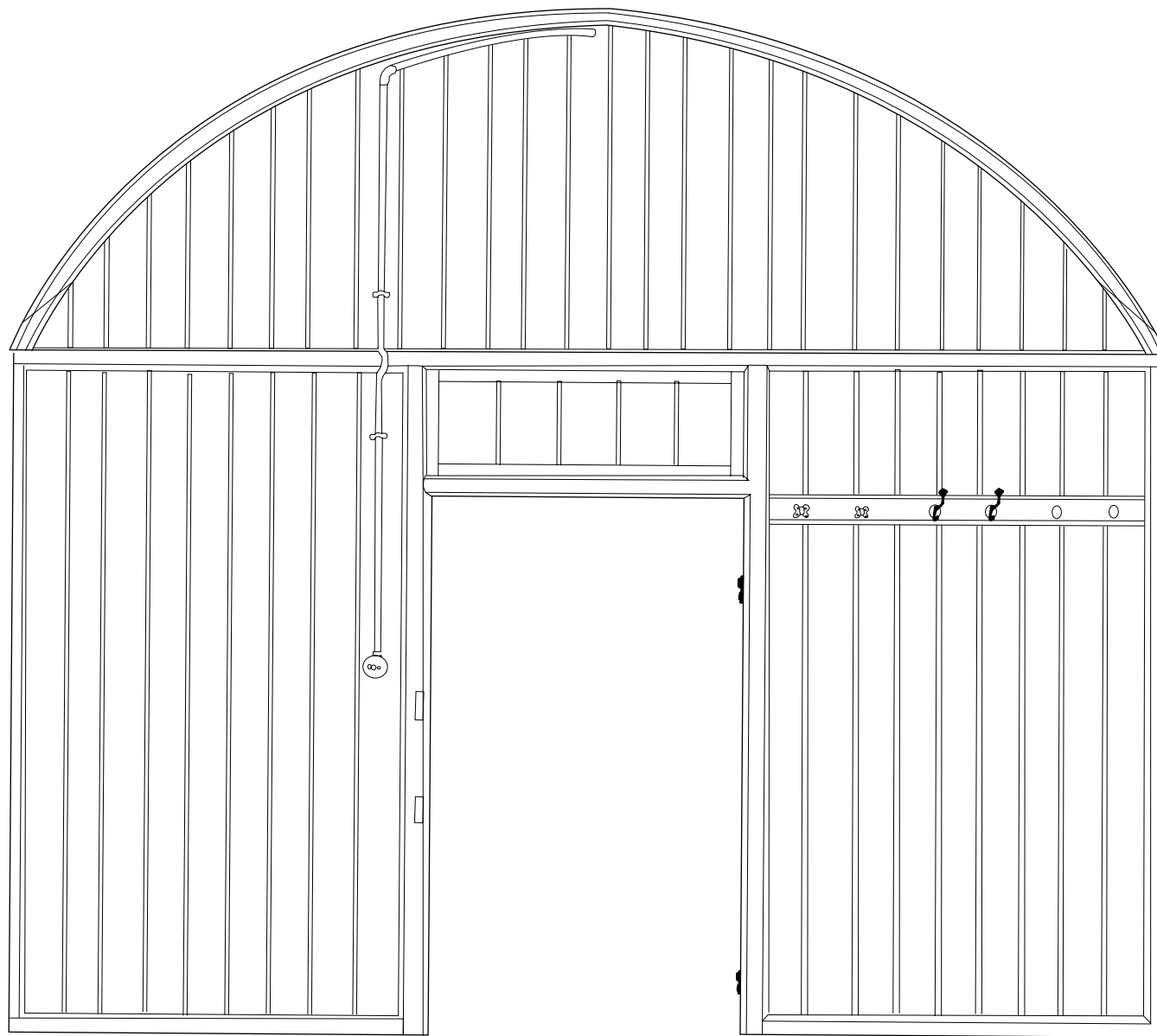


Outside from Passageway



Inside Elevation from Room

Figure 22: Room 3, Smaller Timber Partition, (Feature N)



Inside from Room



Outside from Passageway

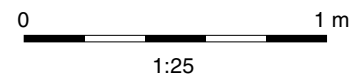
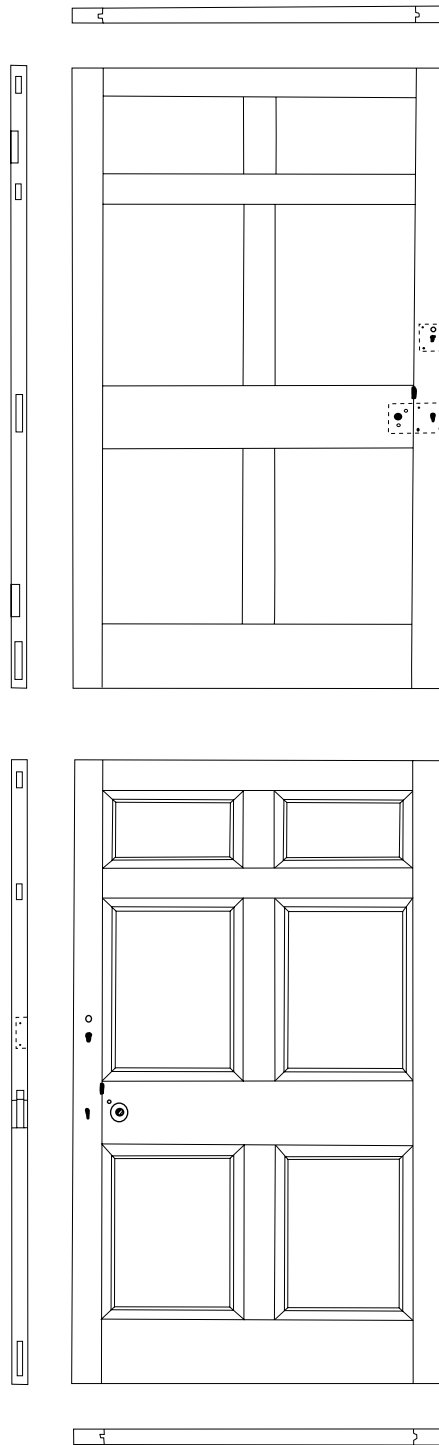
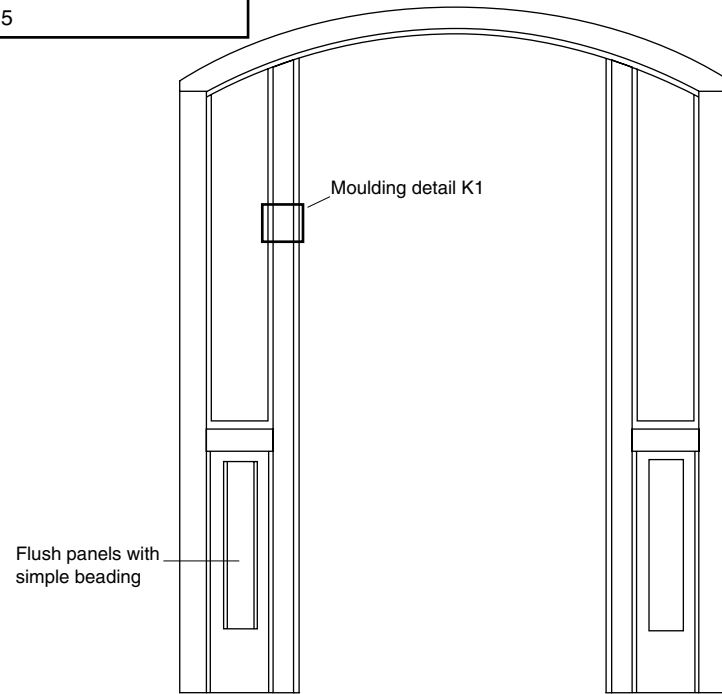
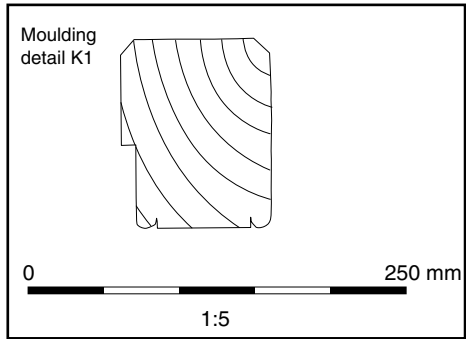


Figure 23: Larger timber partition, (Feature M)

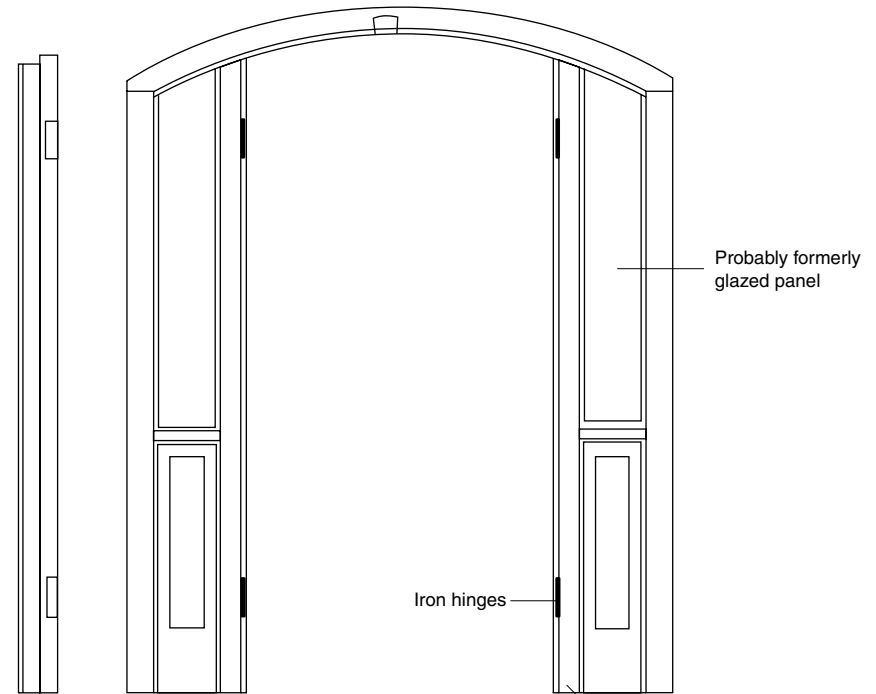


0 1 m
1:25

Figure 24: Door of timber partitions, (Feature L)



Outside Elevation from Passage B



Inside Elevation from Passageway

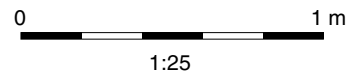


Figure 25: Doorway Frame into Passageway from Passage B, (Feature K)

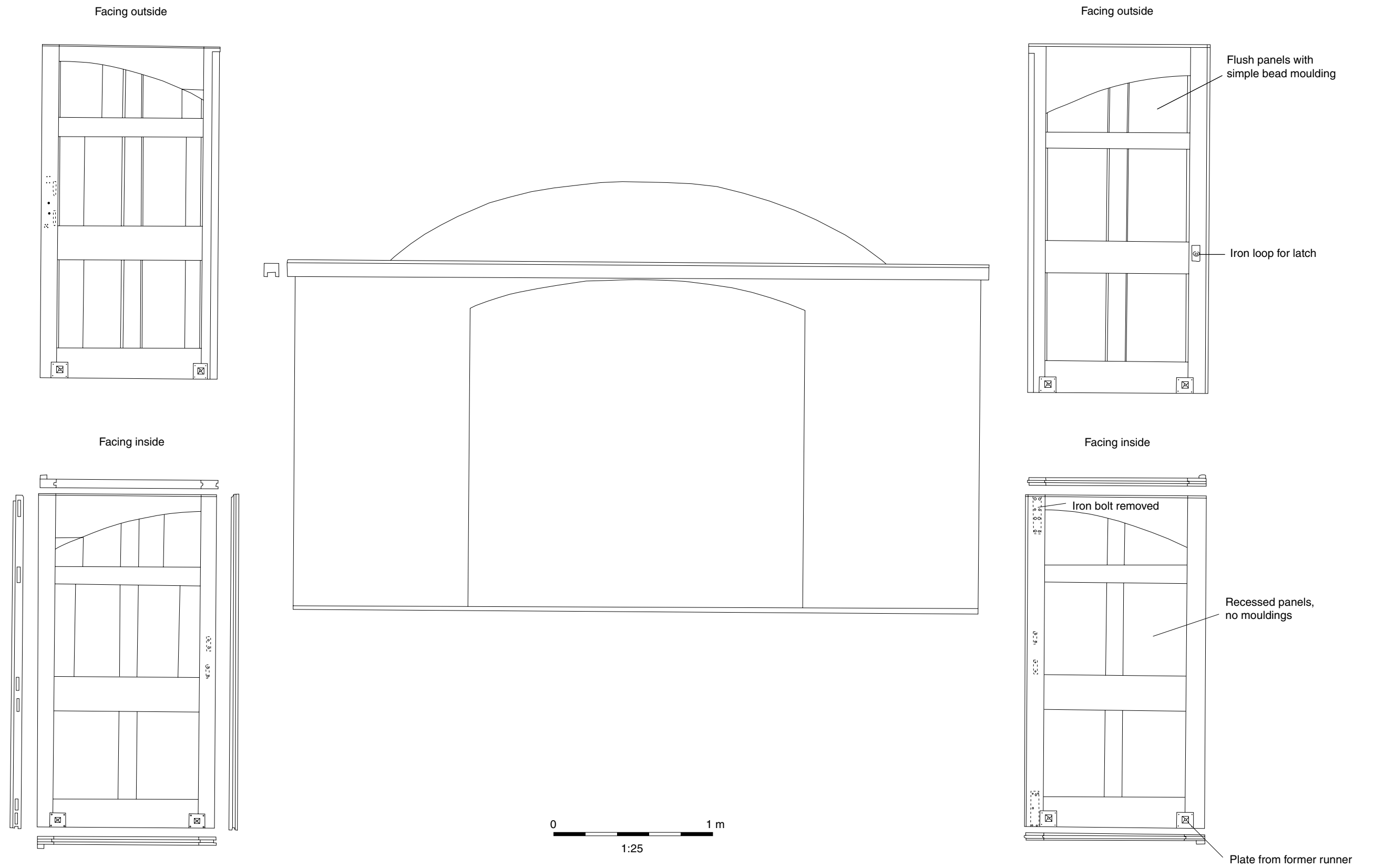


Figure 26: Sliding doors from room 8 into room 9A, (Feature I)

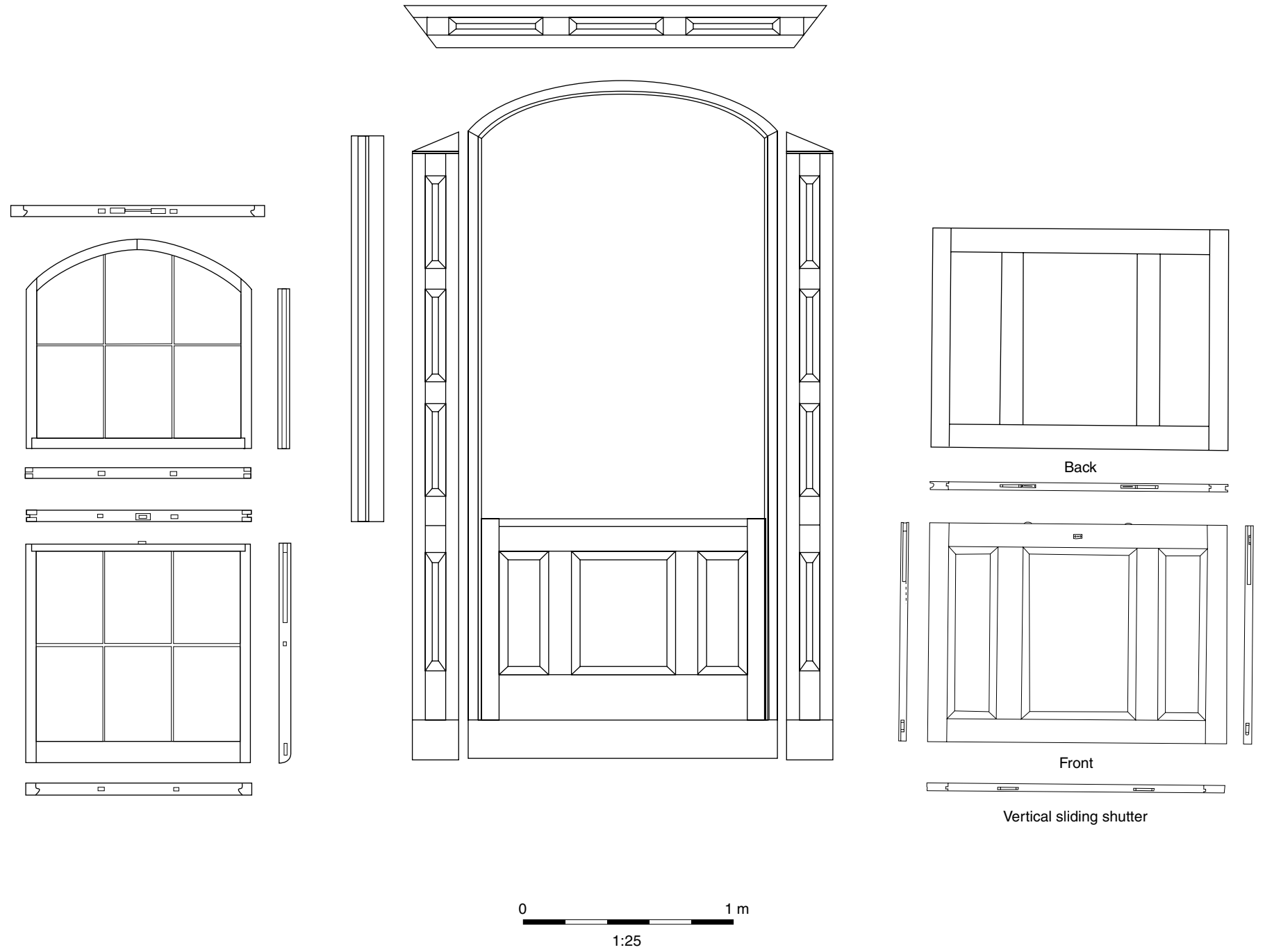


Figure 27: Panellled sash window in room 14, (Feature J)

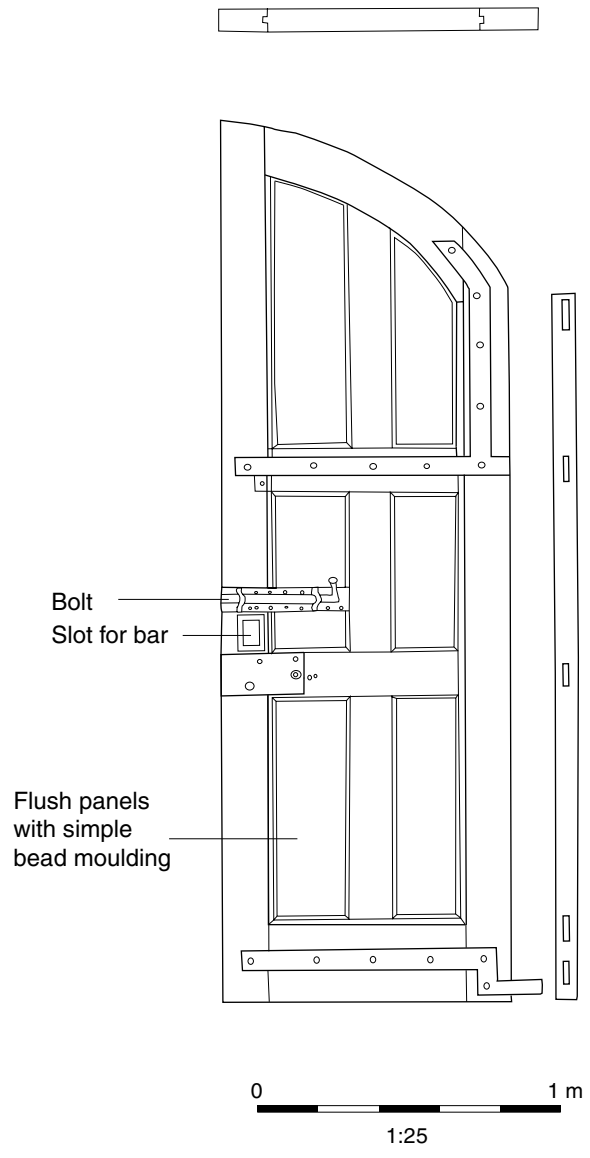


Figure 28: Right keep door inside elevation, (Feature A)

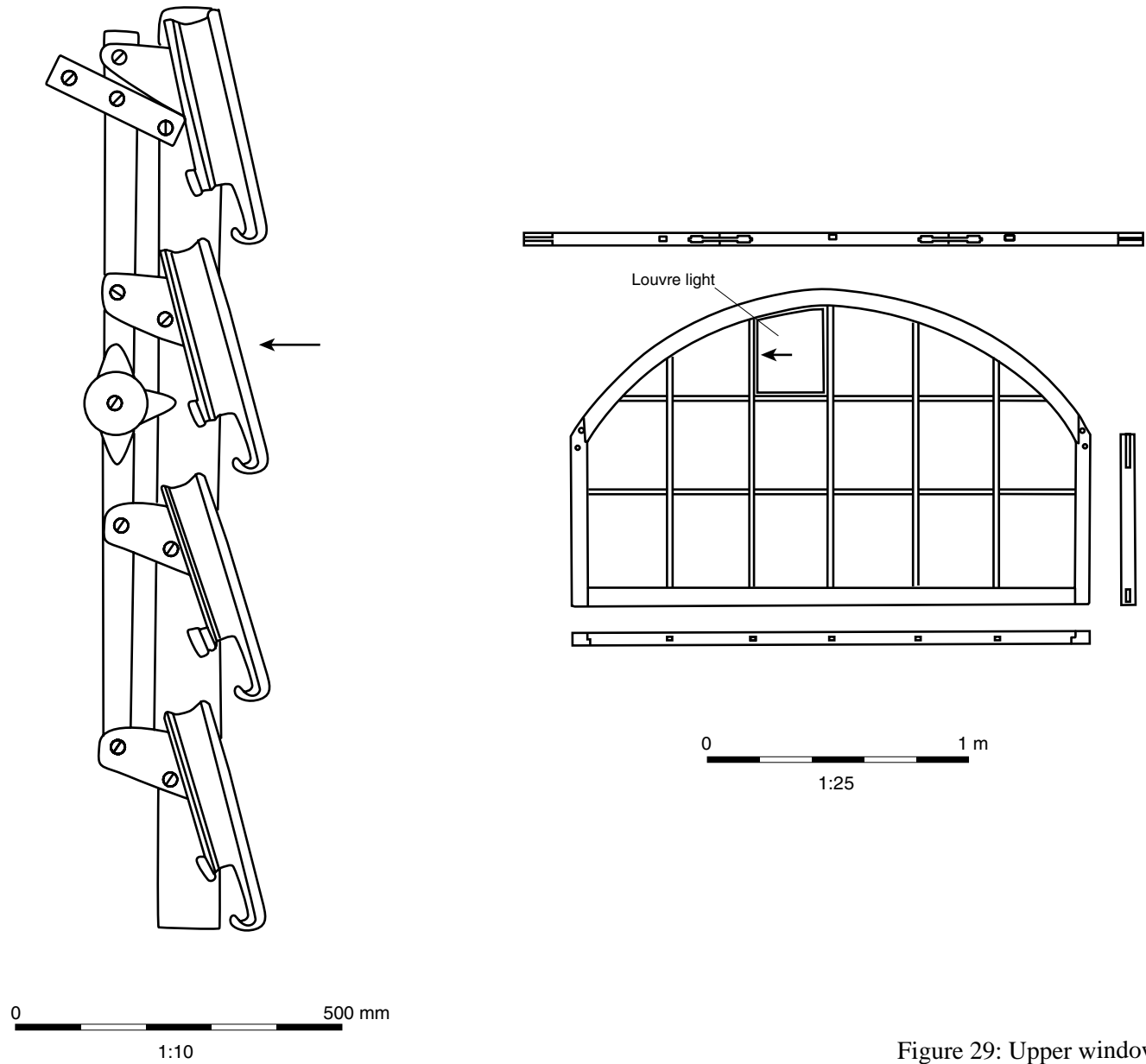


Figure 29: Upper window facing onto inner courtyard, (Feature H)

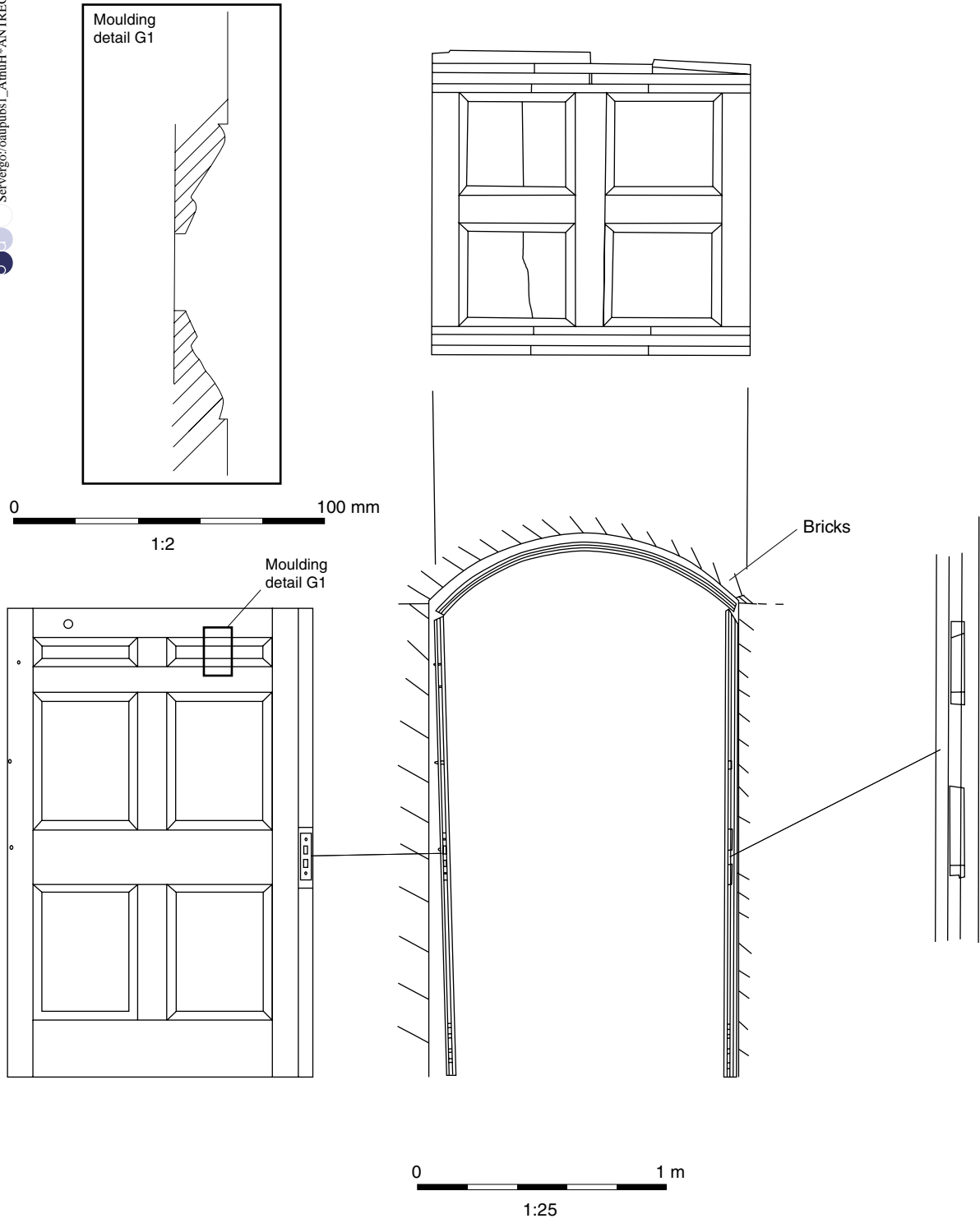


Figure 30: Panelling of passageway from room 13 to room 17A, (Feature G)

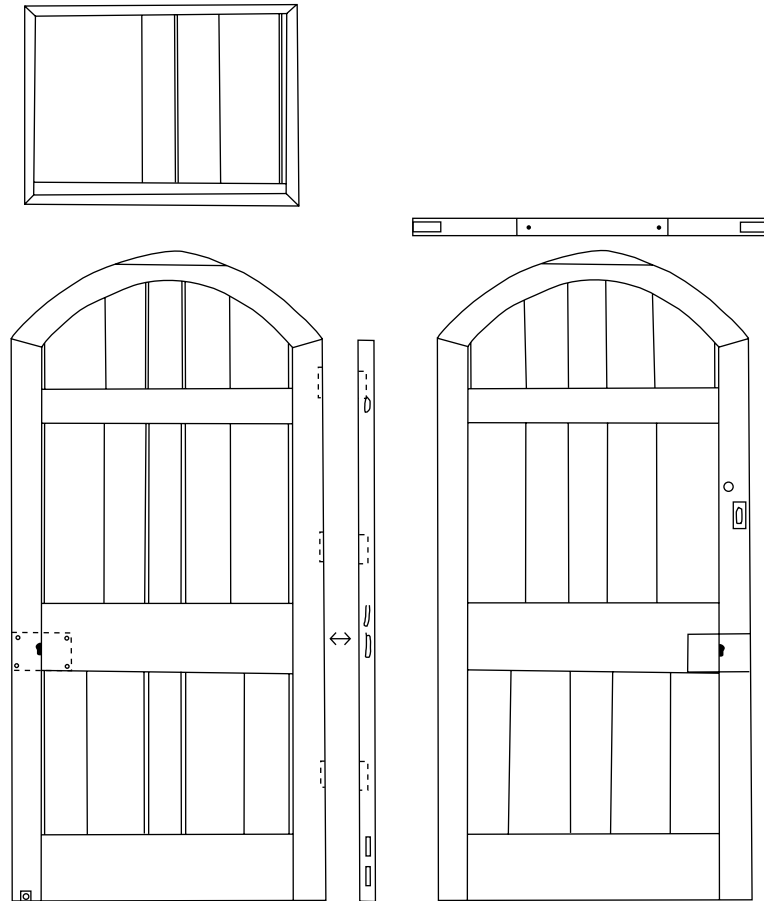


Figure 31: Door from doorways from inner courtyard into rooms 11, 12, 13 and 14 and a later fitted hatchway, (Feature F)

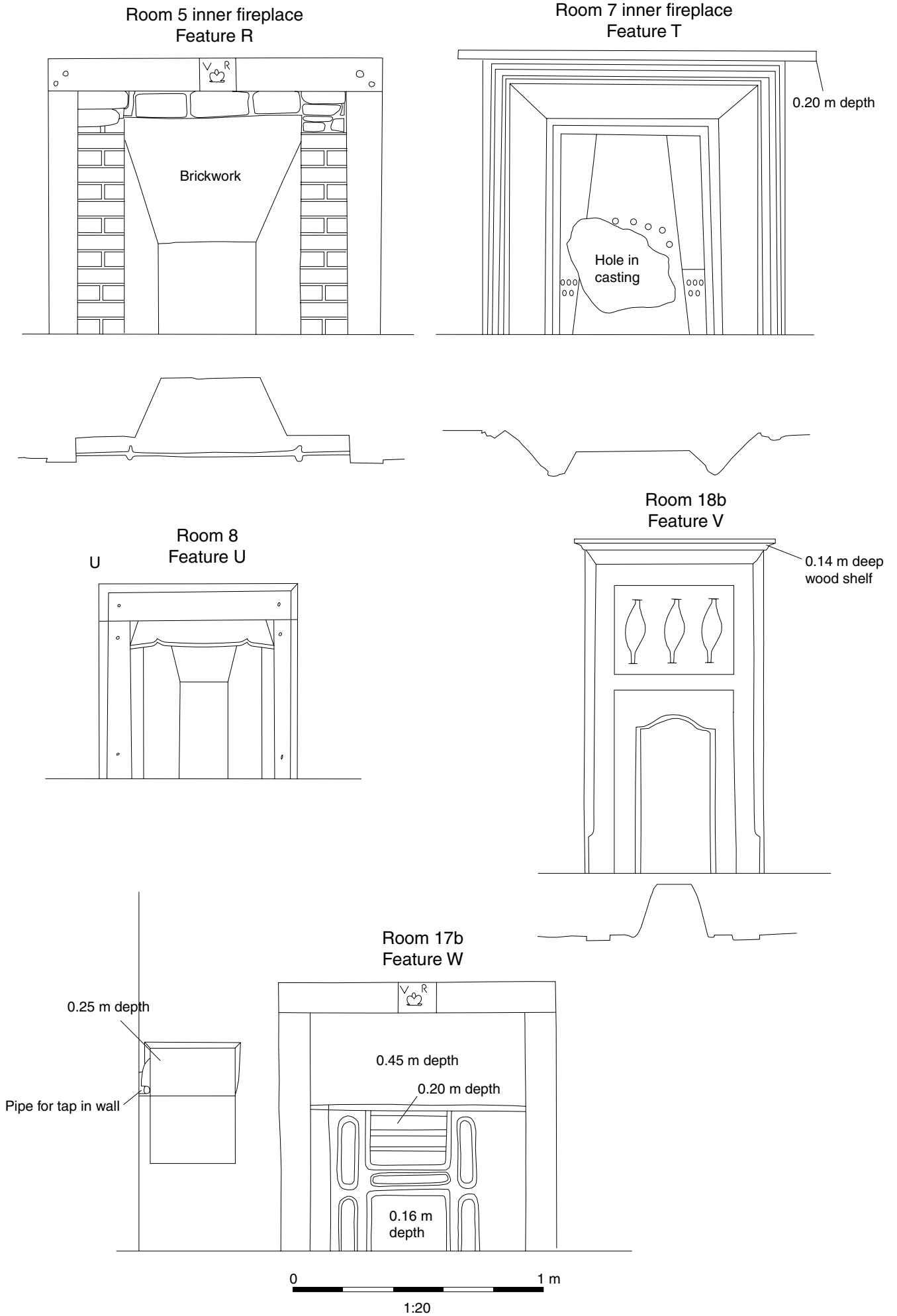
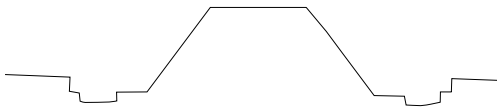
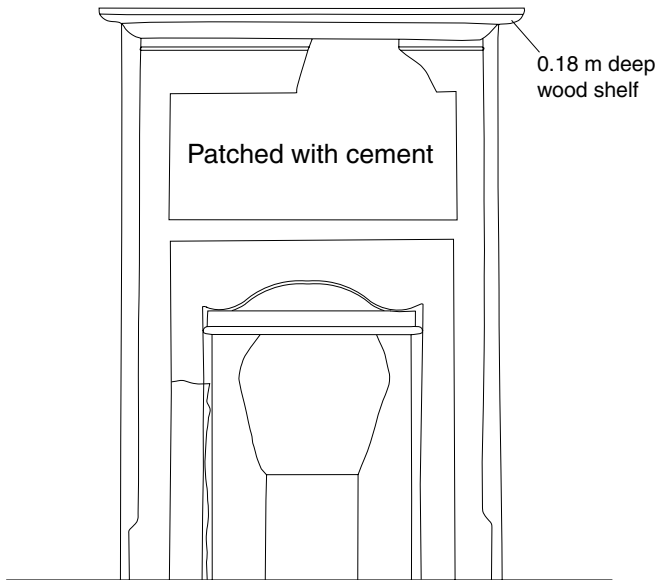
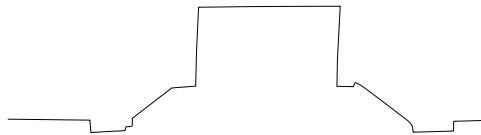
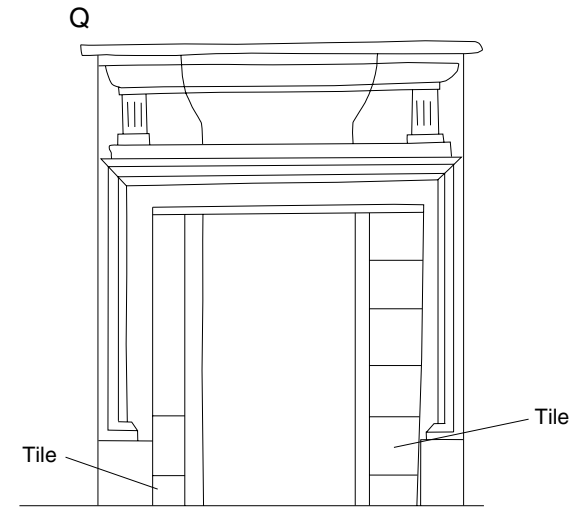


Figure 32: Fireplaces

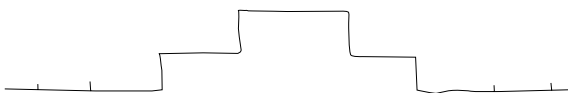
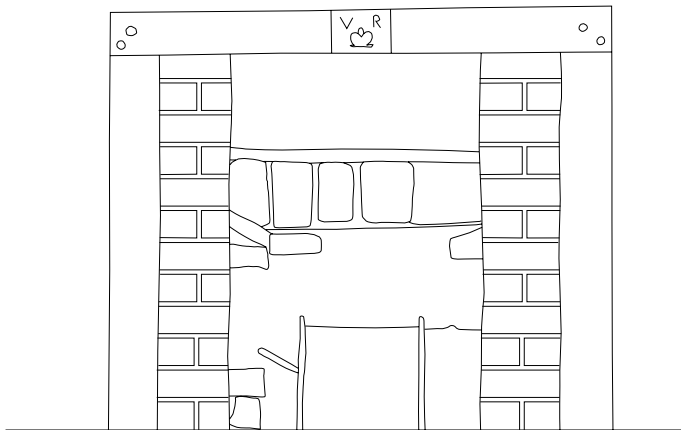
Room 1
Feature P



Room 3 outer fireplace
Feature Q



Room 2 inner fireplace
Feature R



Room 2 outer fireplace
Feature S

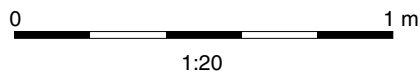
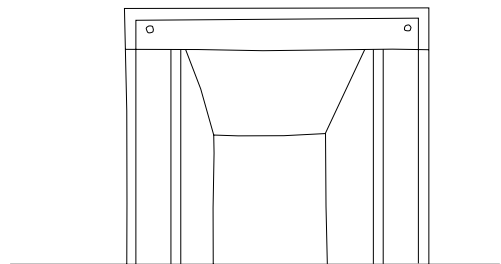


Figure 33: Fireplaces



Plate 1: View from bridge into keep showing counter-scarp loopholes and trace of drop ditch



Plate 2: Chimney in earth rampart of keep roof



Plate 3: Gun store in earth rampart of keep roof

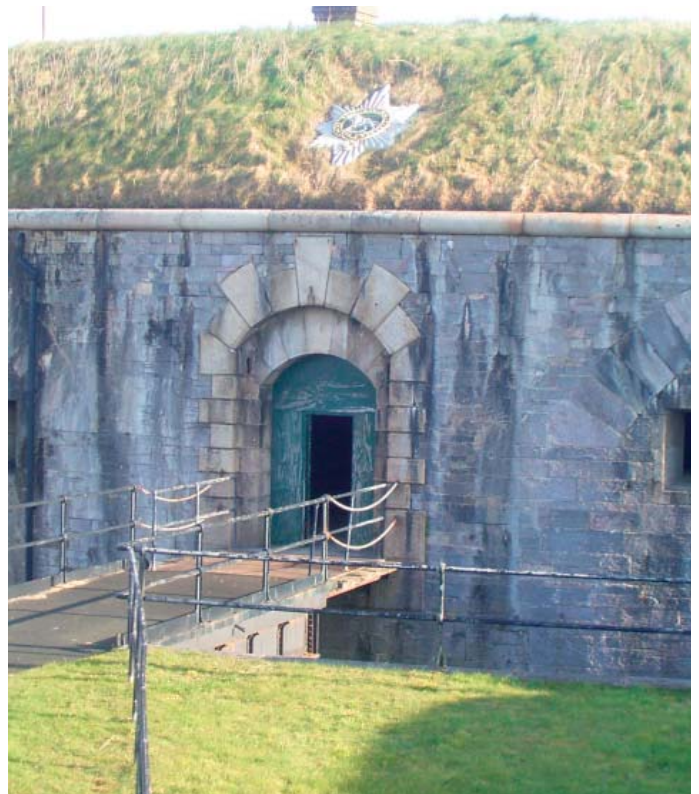


Plate 4: The Worcestershire Regiment badge over the main entrance to keep



Plate 5: Weather vane on the keep roof



Plate 6: Brick arch ready stores behind embrasures on keep roof



Plate 7: Iron railing around the top of the inner courtyard



Plate 8: Drawbridge gearing mechanism



Plate 9: Officer Mess painted over doorway

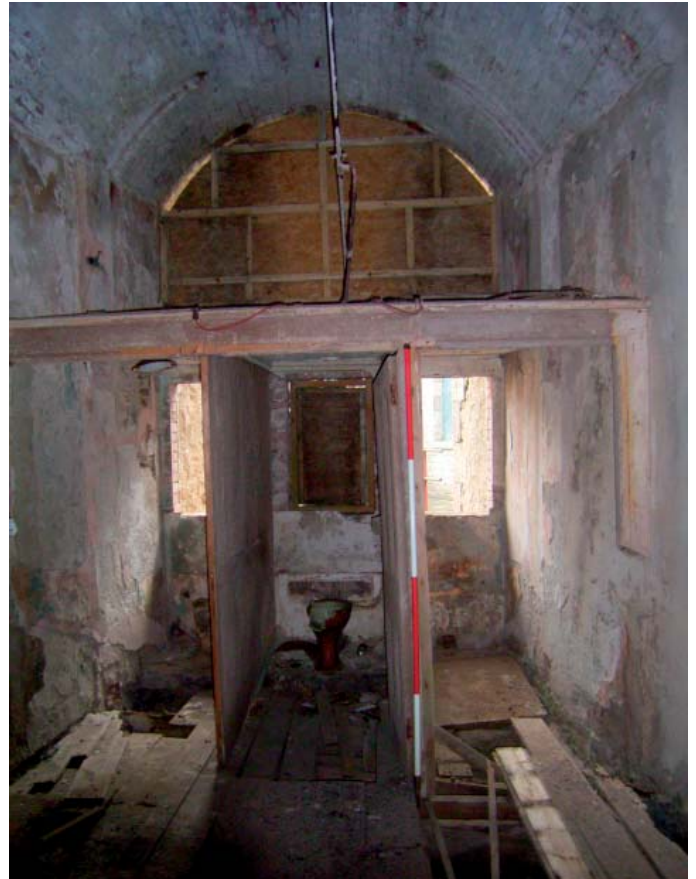


Plate 10: Toilet cubicles of room 1B



Plate 11: Fireplace with the VR over crown on the cast iron surround



Plate 12: Wood blocks on floor for rifles in rack



Plate 13: Board on wall for bell pull system



Plate 14: Doorway into room 8 from footbridge across ditch with the sockets in wall below



Plate 15: Sliding doors between room 8 and room 9A



Plate 16: Doorway between rooms 9A and 9B



Plate 17: Door and window facing into passage B from room 10



Plate 18: Window in room 12 opened into doorway into inner courtyard



Plate 19: Panel work surviving in arch of central passageway



Plate 20: Small cast fireplace and range with cast iron sink to left in room



Plate 21: Fireplace in room 18B



Plate 22: View along passageway (room 19) to blocked doorway onto keep roof



Plate 23: View along galleries flanking keep ditch



Plate 24: View of galleries facing along ditch with flanking loopholes



Plate 25: Entranceway into lighting passage of magazine



Plate 26: Entranceway into the No1 magazine showing tin covered doorframe and light recess above



Plate 27: Fitting for bell pull system along side fireplace



Plate 28: Wood cover over vent from store into passage



Plate 29: A ceramic vent in end of pipe from store into passage



Plate 30: The drawbridge and sally port from the south west caponier

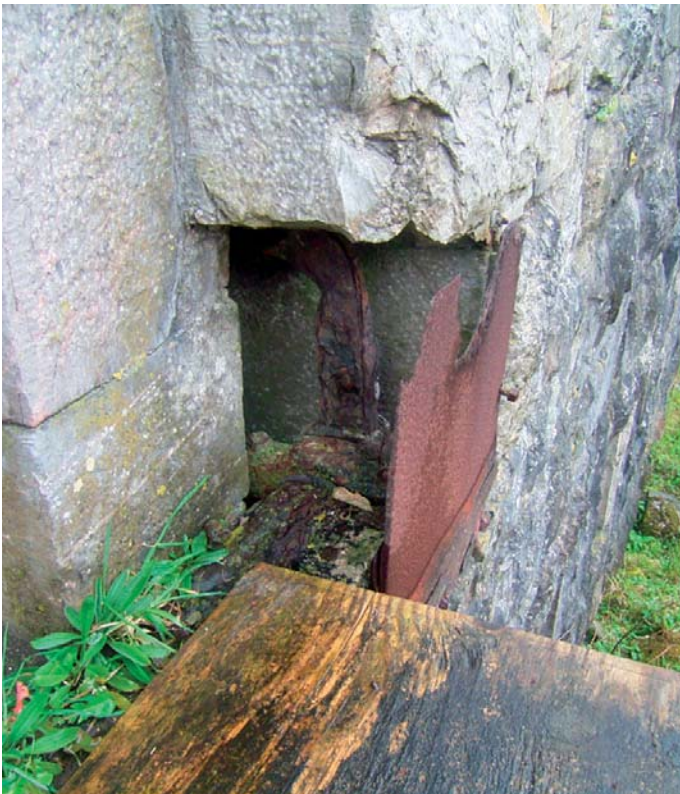


Plate 31: Hinge of drawbridge protected by metal plate



Plate 32: Iron shutter of caponier embrasure, showing wood back, slit and brackets



Plate 33: View across drawbridge from passage to NW Double caponier up steps to Chemin de Rondes



Plate 34: Cast iron bracket of shelf in caponiers



Plate 35: Galvanized sign in upper tier of double caponier



Plate 36: Galvanized sign in Upper tier



Plate 37: Galvanized sign in Lower tier



Plate 38: Racer tracks and pivot for mounting the 32pdr SBBL in north-west caponier.



Plate 39: Pivot lug and smaller racer track in north-east caponier



Plate 40: Pivot lug and repair to mounting in north-west caponier from the trails



Plate 41: External view of repair to mounting in north-west caponier from the trails



Plate 42: Damage to the south-west drawbridge from the trails of the 32pdr



Plate 43: Air vent in the top of loophole in lower tier of double caponier



Plate 44: Metal grill of caponier embrasure in place behind later blocking



Plate 45: Graffiti on wall next to fireplace in upper tier of north east caponier

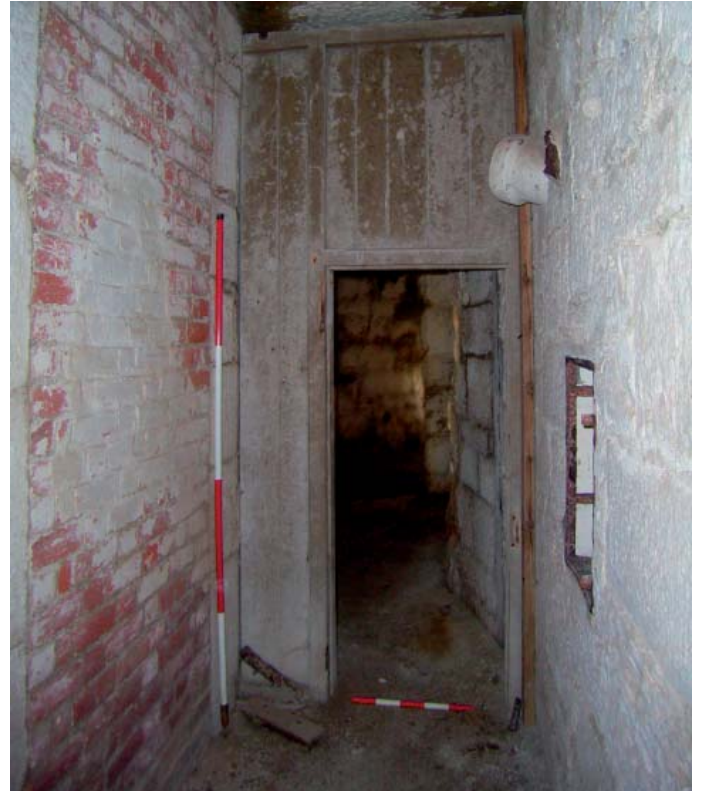


Plate 46: Wood partition in lower tier of north-east caponier dividing gallery and WC from caponier



Plate 47: View of the south west caponier showing the granite embrasures and flanking loopholes



Plate 48: The removed gun platforms from the keep roof stacked in the field outside the keep



Plate 49: Aerial view of Tregantle Fort showing the entrance and the keep



Plate 50: Aerial view of Tregantle Fort showing the Moat range and remains of the camp to the east of the fort



Plate 51: View of the keep's entrance over bridge



Plate 52: View of the keep from the upper parade



Plate 53: Detail of external view of the keep embrasure and flanking loophole



Plate 54: The south-east face of the keep from the bridge into the fort



Plate 55: View of the keep from the site of the hut camp east of the fort



Plate 56: Inner court of the keep looking towards the entrance passage



Plate 57: Rooms flanking the entrance of tunnel to the North-west Double caponier



Plate 58: Tunnel into the North-west Double caponier with remains of iron gate



Plate 59: Passage of upper tier with entrance to caponier on the left and entrance from tunnel on right. Railing on right are over stairs into the lower tier



Plate 60: Collapsed floor of upper tier showing layout and construction of caponier



Plate 61: View along ditch towards north-east caponier of double caponier showing later range butt and protective ricochet wall



Plate 62: Detail of butt against east face of caponier showing blocked embrasures and loopholes



Plate 63: The flanking faces of the North-west Double caponier with modern backstop of the moat range behind



Plate 64: View of the flank of the North-east caponier with keep in back ground along ditch



Plate 65: View of the North-east caponier showing the embrasures with drop ditch in front

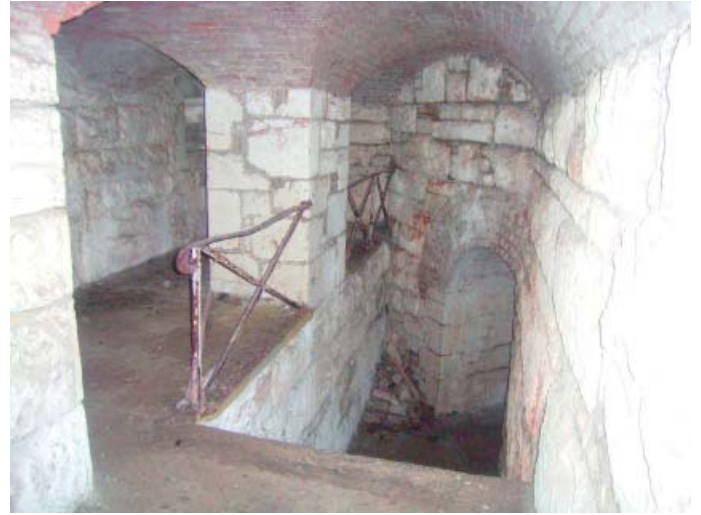


Plate 66: Gallery off the tunnel to the North-east caponier before entering the caponier



Head Office/Registered Office

Janus House
Osney Mead
Oxford OX2 0ES

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

OA North

Mill 3
Moor Lane
Lancaster LA1 1GF

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

OA East

15 Trafalgar Way
Bar Hill
Cambridgeshire
CB23 8SQ

t: +44 (0) 1223 850500
f: +44 (0) 1223 850599
e: [oaeast@thehumanjourney.net](mailto: oaeast@thehumanjourney.net)
w: <http://thehumanjourney.net/oaeast>

OA Méditerranée

115 Rue Merlot
ZAC La Louvade
34 130 Mauguio
France

t: +33 (0) 4.67.57.86.92
f: +33 (0) 4.67.42.65.93
e: [oamed@oamed.fr](mailto: oamed@oamed.fr)
w: <http://oamed.fr/>



Director: David Jennings, BA MIFA FSA

*Oxford Archaeological Unit is a
Private Limited Company, N^o: 1618597
and a Registered Charity, N^o: 285627*