May
2018

Chepstow Castle - Earl's Chamber

Scheduled Monument Consent Completion Report

pdp Green Consulting

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1.0 INTRODUCTION

1.1 Purpose of Document

This report has been prepared for our client, Cadw, to satisfy 'condition 16' of the Scheduled Monument Consent (SMC) dated 16th May 2016, which relates to the recently completed works undertaken at Chepstow Castle. The condition stipulates the following:

*"**Reporting:** that within 6 months of the completion of work on site, the applicant shall submit to us a draft copy of a report stating in detail the works undertaken for our written comment and approval. The report shall include colour annotated photographs of the works before during, and after completion. The report shall also include detailed measured drawings as described in condition 8 above and incorporate the archaeological watching brief report. Following approval the applicant shall submit a copy of the final report in PDF digital format and one paper copy to us, and digital copies to the regional Historic Environment Record maintained by Glamorgan-Gwent Archaeological Trust, Heathfield House, Heathfield, Swansea SA1 6EL and the National Monuments Record Wales held by the Royal Commission on the Ancient and Historical Monument of Wales, Plas Crug, Aberystwyth SY23 1NJ."*

1.2 Brief Description of the Works

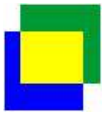
The works comprised sensitive repairs to the Earl's Chamber and Great Hall Porch Tower at Chepstow Castle, a Scheduled Ancient Monument and Grade I Listed Building. Roof level repairs were undertaken to assist in preventing/controlling water and damp penetration within the interior spaces. The works included:

- Installation of a replacement roof finish and replacement lead abutment flashings.
- Conservation repairs to roof-level walls and the base of the chimney stack on the north elevation.
- Internal repairs and alterations.
- Installation of a mechanical heating and ventilation system to assist moisture control.

1.3 Brief History of the Building

The following is extracted from the brief description presented on the rear cover of 'Chepstow Castle its History & Buildings' (Logaston Press, 2006, edited by Turner, R & Johnson, A).

"Chepstow Castle is one of the most remarkable castles in Britain. From the outside, the history of fortification can be traced from the Norman Conquest to the end of the 17th Century.



On the inside, there are suites of accommodation, intended for both ceremonial and domestic use, built and adapted for some of the greatest men of the Middle Ages and Tudor periods."

1.4 Current & Future Use

Chepstow Castle is placed in the care of Cadw and is open to the public for daily visits.

1.5 Building History & Significance

1.5.1 Scheduled Ancient Monument

Chepstow Castle was designated as a scheduled monument of national importance (MM003) and a Grade I Listed Building in 1950 (record number 2475). In 1953 the castle came into state care and has been the subject of an ongoing programme of conservation and research.

1.5.2 Listed Description

Description:	*CHEPSTOW CASTLE*
Grade:	*I*
Date Listed:	*6 DECEMBER 1950*
Cadw Building ID:	*2475*
OS Grid Coordinates:	*353330, 194113*
Latitude/Longitude:	*51.6434, -2.6745*
Location:	*BRIDGE ST, CHEPSTOW, MONMOUTHSHIRE NP16 5ES*
Locality:	*CHEPSTOW*
County:	*MONMOUTHSHIRE*
Country:	*WALES*
Postcode:	*NP16 5ES*

In a commanding position on the W bank of the River Wye. Modern access from Bridge Street, at the base of the slope.

History

The Domesday Book (compiled 1086) records that a castle had been built by William fitz Osbern who died in 1071, and the Great Tower has traditionally been held to be part of that Castle. Yet it is perhaps more plausible that the Great Tower belongs to the period following the forfeit of the castle to the Crown after 1075. A major programme of building took place under William Marshal (between 1189 and 1219) who rebuilt the upper and middle bailey defences including a rectangular tower at the SW corner of the Castle, perhaps

accommodation for William's wife. The D-shaped towers of the middle bailey are very early examples of their type. Recent dendrochronological analysis has dated the doors of the main gatehouse to no later than the 1190s indicating that William was also responsible for the lower bailey although this was subsequently rebuilt. William was succeeded by 5 consecutive sons. The upper barbican dates from this period, as does the remodelling of the Great Tower by addition of an extra storey at the W end. In the last quarter of the C13, Roger Bigod, 5th Earl of Norfolk succeeded to the ownership of the Castle, and built the major suite of apartments in the lower bailey, as well as the massive SE tower (Martens Tower). The Great Tower's upper storey was extended, and the upper barbican tower built. In the C16 timber domestic ranges (lost) were added to both sides of the middle bailey curtain wall. During the C17 the Castle was refortified to resist artillery fire especially on the S.

Interior

Within the Castle Walls- Outer Bailey. Outer Gatehouse at E leads immediately on right to the hall range, comprising chamber block, kitchen and service rooms and great hall. Modern entrance and shop constructed under chamber block; upper rooms probably provided accommodation for Bigod's household officers and guests; from outside an asymmetrical range of windows, one with quatrefoil head. Kitchen is situated between chamber block and cross passage, a tall room probably formerly with central hearth; tall 2-light transomed window with quatrefoil head onto outer bailey; wall stands to battlement level with arrow slots. Service passage with wide pointed chamfered arch from bailey separates kitchen from hall range but because of rising ground unusually incorporates additional rooms: lower service rooms entered through steeply pointed arches from main passage which also leads to stairs to rib-vaulted cellar; buttery and pantry are adjacent to hall at intermediate level with large private chamber above - now a display area; renewed paired arched lights to bailey. Square embattled corner entrance tower with angle buttresses, renewed and glazed similar transomed window; paired arched lights under a double hood-mould above; pointed arched doorway in uphill face. This led externally to Great Hall which was also reached internally by stairs from the cross passage. Hall was open to roof and would have had dividing timber screen at service end and dais with high table at upper end, opposite the 3 pointed arched service doorways. Marten's tower at far side of lower bailey is entered through a pointed-arched doorway with studded wooden door of wide planks with heavy iron hinges, protected by a portcullis; flat rear face of D-shaped plan fronts bailey with projecting corner towers; stands to battlement level (and was still inhabitable in early C19); small trefoil-headed lights at upper level; inserted inward-facing C16 transom and mullion windows with cusped heads to the lights under a square hoodmould. The now floorless interior has wide embrasures to openings on 3 levels, windowless basement; chamfered pointed-arched doorway to mural tower staircase; upper chapel window with floral ornament; intact battlements and access to wallwalk.

Middle Bailey. *Entrance to the middle bailey is through what was originally an outer gateway to the earlier complex, a large projecting round tower to right with arrow slits, later Tudor insertion of doors and fireplaces, pointed-arched doorway of two orders with massive boarded studded wooden double gates with heavy hinges; remains of Tudor buildings against the adjoining wall; round corner tower to left incorporated into the curtain wall; inner side of wall also has later features. S curtain wall range, reinforced with buttresses, extending from round tower has wall-walk behind the C17 musket slots and access to the D-shaped wall-tower. At upper end is the earliest structure, the Great Tower or Hall Keep; steps up to entrance on 2-bay E side which is a square headed Norman doorway with chip-carved tympanum and two orders of round arches; N side is similar to S which is incorporated into the curtain wall, but with windows: originally hall was lit by the three small round-arched windows on this river side; the C13 modification included inserting heavily moulded pointed-arched first floor windows with quatrefoil tracery, mullions and transoms; internal Norman wall arcade with some surviving plaster and at upper gable end two round openings. Adjacent outside is the gallery, a passage through a double-arched doorway between the Keep and the riverside wall with stepped chamfered-arched openings.*

Upper Bailey. *Small and narrow and bounded at lower end by the end wall of the Keep and at the upper end by the Corner or South West Tower, built to provide domestic accommodation for persons of high status (including Countess Isabella de Clare, William Marshal's wife). Windows have wide embrasures edged with roll moulding, remains of painted plaster. Outer wall removed but that which remains stands to battlement level Adjacent is the high pointed-arched doorway, 2-orders on upper side, with wooden gate with studs and heavy hinges, leading to wooden bridge to barbican. Here the defensive walls are intact; two upper storeys to barbican tower/gatehouse, wall-walk on corbels with intact merlons, range of internal round-arched embrasures to the arrow slits; at SW the corner tower now open originally had a timber inner-facing wall. Postern gate at lower angle.*

Exterior

Magnificent Medieval Castle in spectacular defensive situation on vertical cliffs above the River Wye, aligned predominantly E/W, over rising ground. Constructed of stone, rubble and dressed. Main entrance at E through the Outer Gatehouse comprising twin round towers with battered base, cruciform and plain arrow slits at 3 levels, later square-headed windows with mullions and trefoil-headed tracery; central double arched gateway with portcullis slots, remains of barbican, murder holes, metal-reinforced wooden double doors; high detached arch above. Adjacent to left (S) is a stretch of battered curtain wall standing almost to battlement level with arrow loops. This adjoins Marten's tower, D-shaped in plan with

rectangular corner turrets, one with high E facing arched window, deep spur buttresses, deep arrow loops at 3 levels and trefoil-headed lancets, deep coped battlements with arrow slits, crowned by eroded stone figures (C14); also a later 2-light Tudor window. Curtain wall continues at a right angle, slightly curved and following the crest; signs in the masonry of alteration and rebuilding, including a blocked arch; two wide buttresses and range of rectangular cannon slots along the top; this forms the S wall of the lower bailey. At the junction between this and the S wall of the middle bailey is a round tower with battered base, 3 storeys, battlements, arrow slits. Further to W a second D-plan tower, with battered base, battlements, arrow slits. Curtain wall continues to adjoin the rectangular Great Tower; outer wall of 5 bays separated by pilasters of large square stone blocks; originally no windows, one C13 insertion. Curtain wall continues from upper end enclosing the upper bailey extending to the outer face of the Corner Tower with ashlar quoins standing to battlement height with cruciform arrow slits, 2 round-arched windows at wall-top level and blocked arch to plinth, low large blocked arrow loop; this is the top of the upper bailey. At the W end comes the Barbican complex, comprising a tall circular corner tower on a rocky outcrop, with cruciform arrow slits at 3 levels and all angles. The wall between tower and barbican is curved rising from bare rock, intact to battlements and incorporating arrow slits. The tall Barbican Tower itself, also rising from high bare rock, stands in front of the W gateway; sides of tower are battered for 3/4 of their height; three large arrow slits below a corbel table beneath the battlements; tall outer arch (remodelled C20); pointed inner arch with portcullis slots within the pointed tunnel vault; heavy double doors. The N side of the castle complex standing directly on the river cliffs can only be seen from a distance but follows the same sequence except at the E lower end where the outer wall of the great hall, kitchen and service block and chamber block adjoin the E side of the outer gatehouse.

Reason for Listing

Graded I as a medieval building of national importance.

Chepstow Castle is a Scheduled Ancient Monument 13/0703/MM003 (MON) R

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References

Turner, R, Chepstow Castle, Cadw Guidebook, 2002.

Newman J, Gwent/Monmouthshire, Buildings of Wales series, 2000, pp168-182.

1.5.3 Development of Chepstow Castle

The following background information about the castle is extracted from the Scheduled Monument Statement of Significance.

"Chepstow Castle comprises the remains of a medieval castle begun in 1067 by William fitz Osbern, Earl of Hereford. It is situated on a limestone promontory on top of tall cliffs overlooking the River Wye. The castle dominated the medieval town that developed around its foot; the bridge which provided access for travellers into south Wales; and the river which was a main highway of the period.

The oldest building in the castle is the Great Tower. Rectangular, and measuring 36m long by 14m wide, it dominates the centre of the castle. The tower contains some reused building materials, probably brought from the ruins of the Roman town Venta Silurum – modern day Caerwent. It was probably used as an audience chamber – a place where the lord of Chepstow, at times the king, conducted ceremonial or judicial functions.

Connecting the Upper and Middle Baileys is the gallery, a single-storey building which formed a roofed passage. The Upper Bailey is likely to have been the centre of William fitz Osbern's original Norman castle. The end of the Upper Bailey is closed by Marshal's Tower – a two storey rectangular tower built by William Marshal (d. 1219) in the very early thirteenth century. The first floor contains the remains of an elegant chamber lit by five finely dressed windows.

Beyond the Upper Bailey gateway is a small defended platform which crosses a deep, rock-cut ditch to the Upper Barbican. This ditch marks the western limit of the castle under the Normans and William Marshal. The heavily defended Upper Barbican was created in the second quarter of the thirteenth century when the defensive line was extended further along the promontory to the west. The curtain wall runs from Marshal's Tower in the Upper Bailey across the ditch to the south-west tower. From the south-west tower the curtain wall curves around to the Upper Gatehouse. From this gatehouse there was access to the castle's gardens and the home farm. The curtain wall continues to cut off the end of the promontory and returns for a short length to deter any attackers from clambering around the cliff into the castle.

The walls and towers of the Middle Bailey were added to the castle by William Marshal in the late twelfth century as part of his complete remodelling of the castle's defences. However, the break in slope near the centre of this bailey may mark the position of the western defences of the Norman castle. The entrance to the Middle Bailey is through a simple gateway in the curtain wall which is protected by a three- storey D-shaped tower projecting forward from the curtain wall. A low curtain wall links this tower to another of very similar design at the outer angle of the middle bailey, but this was significantly modified with the insertion of fireplaces and doorways during the early sixteenth century. The curtain wall returns from the corner tower to a D-shaped tower – modified during the Civil War. The Middle Bailey does not seem to have contained any buildings in the Middle Ages, perhaps because they would have reduced the grandeur of the approach to the main entrance of the Great Tower.

The Lower Bailey is the most complicated part of the castle with buildings of many different periods represented. The bailey was added to the castle by William Marshal in the late twelfth century and substantially remodelled a hundred years later by Roger Bigod, earl Marshal of England, with the construction of a large domestic range, the 'Gloriette' and Marten's Tower.

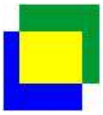
The Main Gatehouse is of a revolutionary design for the late twelfth century. It consists of two round towers of slightly different diameter built close together and well equipped with arrowloops to provide a wide field of fire. Outside there was a small barbican which further protected the entrance. The round tower to the left was the castle's prison and that to the right was a guardroom. This is thought to be the oldest twin-towered gatehouse in Britain and demonstrates that William Marshal and his master craftsmen were at the forefront of castle design, building on their experiences in France and the Holy Land. The gatehouse has been dated by the tree- ring dating of the original doors in use until the 1950s but now displayed in the Lower Bailey domestic range's porch. At over 800 years old, they are believed to be the oldest castle doors surviving in Europe.

Close to the entrance of the castle, Marten's Tower or the 'New Tower', as it was referred to in Roger Bigod's accounts, was started around 1288 and brought into use by 1293. It was begun after the earl's domestic apartments had been completed and almost certainly replaced an earlier tower dating from the Marshal period. Marten's Tower has been described as a 'mural tower to end all mural towers', but it is far more than a simple defensive work and acted as a guest suite for the earl's most important visitors. The two principal rooms had glazed windows, access top private latrines and retain substantial traces of their original decorative scheme painted according to the documents in 1292/3. In addition, there is a basement, a room in the roof space and a private chapel carried out over the curtain wall to the east. This tower was used to imprison the regicide, Henry Marten between 1668 and 1680. The castle well is just alongside the door.

The castle was damaged (and consequently considerably repaired) during the Civil War, when its strategic location as a port at the crossing of the Severn and location on the front line between Royalist Monmouthshire and Parliamentarian Gloucestershire was crucial. It was garrisoned for the king at the outbreak of the war, taken by the parliamentarians, seized back by the royalists and retaken by the parliamentarians, when it was granted to Oliver Cromwell.

In the 18th century industrial works were established in the lower bailey. The castle passed into ruin and became a popular visitor attraction as a picturesque ruin on the Wye Tour in the late 18th century. As a dramatic and romantic setting the castle became a popular venue for events in the Victorian Period, when owned by the Duke of Beaufort, who carried out conservation works to the fabric of the castle.

The death of the 8th Duke of Beaufort in 1899 brought a variety of commercial and private properties associated with the castle up for sale. Despite the interest of local authorities, and suggestions that the property should be acquired by the Crown, the castle passed into private ownership in 1905, when it was purchased by the Lysaght family.



Notable events subsequently held at the castle include the Chepstow Horticultural Show, pageants, sports, promenade concerts and a fireworks display to celebrate Queen Victoria's Jubilee. In addition, the Chepstow Local Board leased the castle ditch as a public park. Excavations were undertaken in 1909 by Dr Orville Ward Owen, who searched for manuscripts written by Francis Bacon, and for two weeks in 1913 the castle was the location for the filming of Ivanhoe, with supporting roles and extras hired from the local community."

1.5.4 The Gloriette

The Earl's Chamber has been constructed within a domestic range of the Castle known as the Gloriette. The following description of the Gloriette is taken from the Statement of Significance.

"Roger Bigod III, Fifth Earl of Norfolk and the grandson of William Marshall's daughter Maud, undertook the last great phase of building work at Chepstow Castle from 1270 to 1306: strengthening the Barbican gate; building 'Marten's Tower; and building the domestic range known as the 'Gloriette'.

The Gloriette, designed by Bigod's master mason, Ralph Gogun of London, is comprised of an extensive range running from the outer face of the Middle Bailey curtain wall to the rear of the Main Gatehouse, including two adjoining blocks linked by a central service passage, built to take advantage of the changes in height across the site. The hall and ceremonial and private chambers of the earl occupied the higher ground to the west, and the service rooms, kitchen and additional accommodation were constructed below. The Earl's Chamber was situated above the service rooms. This room would have been a combination of bedchamber, a private sitting room and an audience chamber.

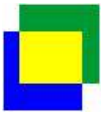
The suite of apartments and lodgings was appropriate for one of the richest magnates of King Edward I's reign. To earn the name Gloriette, a name given to only four buildings in England and Wales, this range must have been very special or exotic."

1.5.5 The Earl's Chamber

The Earl's Chamber is located at first floor level, over what were originally the service rooms of the Great Hall to the west. The following is a description of the surviving physical remains and the way in which the building was used, extracted from the Statement of Significance.

"At Chepstow Castle the Earl's Chamber still occupied the whole of the first floor over the service rooms of the hall, in contrast to the later 13th century trend for locating the lord's private rooms behind the dais.

The plan of the chamber is irregular, with maximum dimensions of 12.1m by 6.5m.



A fireplace is located centrally in the east wall. The massive stone lintel may be an alteration from an earlier hooded fireplace, which would have been more common in the later 13th century.

A broad, two-light window in the north wall overlooks the gorge of the Lower Wye Valley.

A smaller window overlooks the courtyard.

Servants entered the chamber from a narrow spiral staircase leading up from the pantry on the floor below.

A well-appointed closet and latrine, built over the river, is located beyond the north-east corner of the chamber.

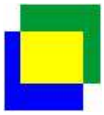
A doorway (now blocked) in the south-east corner of the chamber led onto the Great Pentice.

A small, square room over the porch was accessed from the spiral staircase from the pantry. Contain a fireplace and well-lit, this room may have served as a private closet or treasury.

The wall plates for the roof ran along the continuous, quarter-round corbel table along each wall, with the position of the roof trusses marked by corbels at a lower level.

The roof was low-pitched, covered in lead (which required regular repair).

No medieval plaster and paintwork had survived the alterations within the chamber."



2.0 HERITAGE WORKS

2.1 History & Character

Information is included within Section 1.4 above. A Site Location Plan is provided in Appendix 2.

2.2 Existing Record Documents

2.2.1 A set of drawings were provided with the Brief showing the details of the project to alter the re-roofing of the Chamber originally carried out in the 1980s. These were prepared in 2005. These drawings were used to record the survey work. The Statement of Significance refers to a number of historic documents and photographs held mainly at the National Archive, the National Monuments Record for Wales, and Cadw.

2.3 Recent Alterations & Repairs

Recent works are summarised as follows, again extracted from the Statement of Significance.

"1980's: The remains of the custodian's house were stripped out and the Earl's Chamber was re-roofed and floors inserted to provide an internal space to house a Civil War exhibition.

Ongoing problem with intermittent water ingress has seen various efforts to resolve the problem.

2008-2010: Project undertaken to redecorate the Earl's Chamber. Works included the insertion of a new lath and plaster suspended ceiling, fixed to the underside of existing beams, walls were rendered with lime plaster and finished (except for the SW wall, due to ongoing damp) with a hand-painted decorative paint scheme. The decorative scheme on the walls was based directly on the surviving evidence from the chambers in the New Tower, with the ceiling design based on a variety of contemporary sources.

Ongoing damp problem has resulted in a number of remedial works, including renewal of lead flashings and patch repairs.

2012-2014 – lath and plaster ceiling has failed in places and damp problem is ongoing."

2.4 Condition of the Building Pre-Commencement of the Works

As referred to above, work was carried out to re-roof the Chamber in the 1980s and bring the space back into use. There had been ongoing problems with water penetration, which has also affected a subsequent project to redecorate the Earl's Chamber.

2.5 Development of Repair Proposals

2.5.1 The roof structure and first floor structure were installed in the 1980s, and this was followed in 2008-10 by the project to decorate the interior of the upper space to recreate Roger Bigod's late thirteenth century private apartment, known as 'La Gloriette'. Consequently, it was clear that all the interior finishes (paint, wall plaster, floor covering and ceiling) are very recent and of no historic value. Notwithstanding this, the masonry walls beneath the finishes are of major historic importance.

2.5.2 In brief, the initial scope of the work (Phase 1) was a visual inspection of the roof of the Chamber and the adjacent Porch Tower, the high-level masonry, and rainwater goods, to determine the sources of water penetration and the failure of the lath and plaster ceiling, and to prepare proposals for remedial work.

2.5.3 Further to the completion of the Phase 1 survey and remedial works recommendation report for the Earl's Chamber commissioned by the Welsh Government under the Cadw Conservation Specialist Service Framework (C129/ 2012/13), pdp Green Consulting were commissioned to carry forward with Phase 2. pdp Green Consulting, leading a consultancy design team as required, were appointed to fully develop the scheme and documentation to enable procurement of contracted services via Welsh Government competitive tender, project manage and administer the contract through to completion, undertake environmental monitoring during and post works and provide a post remedial works condition report to include recommendations for future reinstatement of a decorative scheme within the Earl's Chamber.

2.5.4 Phase 2 survey work was undertaken on 5th August 2015, to expand upon the findings of the Phase 1 investigative works. Further inspections of the roof and walls of the Earl's Chamber were required to assess the likely mechanisms for water penetration, and to provide recommendations for repairs. In turn, the repair proposals were described in the Phase 2 Report submitted as part of the approved SMC on which the contract works were generally undertaken.

2.5.5 Full details of the condition survey and investigative works that were undertaken as a means to inform the repair proposals are provided within the Phase 2 Report that was submitted as part of the SMC application that was approved on 16th May 2016. To avoid unnecessary duplication of information, this should be referred to in order to provide the necessary background for the following sections.

2.6 Repair Works Undertaken

2.6.1 Introduction

2.6.1.1 The SMC dated 16th May 2015 was approved following submittal of the Phase 2 Report, accompanying survey and proposal drawings, specification, schedule of work, which together demonstrated the extent of the works and comprised the documentation included for tendering purposes.

2.6.1.2 The works were tendered under Cadw's approved system and following a period of review, Taliesin Conservation were appointed to undertake the work in the role of Principal Contractor. Works commenced at site on Tuesday 4th October 2016. pdp Green Consulting continued in their role as Lead Consultant, as well performing the role of Contract Administrator.

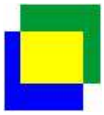
2.6.1.3 Cadw's representatives throughout the construction phase included the Regional Inspector of Ancient Monuments and Archaeology (South East Wales), Louise Mees. Throughout the contract works, items affecting the historic structure and fabric that were carried out as a variation to those shown on the SMC approval were first approved in writing by Louise.

2.6.1.4 Photograph taken pre-commencement, during and post completion of the Works are included in Appendix 1.

2.6.2 Roofing Repairs

2.6.2.1 Despite its location within Chepstow Castle, the roof structures to Earl's Chamber and the Great Hall Porch Tower are fairly recent and have no historic value. Further to the Phase 2 survey inspections and numerous defects/issues observed, including inadequately profiled roof decking for the support of lead sheeting, and the affects that reprofiling would have at wall abutments, the SMC was granted for the removal of the existing lead roof covering and replacement using a 'single ply membrane' with a lead grey colour finish. 'Sarnafil' (manufactured by Sika) had a precedent for being used in replacement for lead at Grade I Listed Buildings, which demonstrated its aesthetic value. The life expectancy is in excess of 40 years, and provides a cost effective and durable solution. Vantage points for views onto the roof area from within the grounds are extremely limited due to the castle's configuration, whilst views into the site at this location are restricted to a glimpse from the other side of the River Wye. The completed roof installation utilising a replacement material with a similar appearance to leadwork was carefully considered by Cadw and the Design Team throughout the project development and construction phases. Sarnafil is a BBA Certified product and a 15-year installation guarantee has been provided.

2.6.2.2 With exception of the roof to the existing stairwell running between the Earl's Chamber and Great Hall Porch Tower, the existing roofs did not require reprofiling (which a lead roof installed to Lead Sheet Association guidance would have demanded) thereby minimising the amount of work required and cost concerned. The existing diagonally laid substrate timber



boarding and roofing insulation laid between the existing flat roofing joists (hung between the principal Glulam beam rather than supported over the top of them) were removed, and replaced with 18mm exterior grade plywood and mineral wool insulation respectively as part of the process.

2.6.2.3 Of particular note was the severe 'chalking' to the underside of the lead roofing sheets lifted during deconstruction, and significant 'cupping' of the existing timber substrate boards. It was apparent that the existing roof had underwent high levels of moisture 'build-up' and had 'sweated' as a consequence. This was unsurprising, as the deconstructive works also confirmed that the existing insulation fully filled the joist depths without a ventilation path.

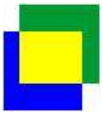
2.6.2.4 Upon discovery of this issue, immediate and 'reactive' measures were required to allow a ventilation path beneath the roof decking to be installed, which minimised intervening with the existing roof structure and roof configuration, and on the basis that the timber roofing members found to be in good condition generally, but with repair work carried out to the main roof gutter, and the east and west ends of the roof in contact with the solid masonry walls. To assist 'drying out' of existing vulnerable timberwork in direct contact with masonry, and reducing the risk of condensation within the roof, an 'up and over' vent detail was installed directly above the line of each of the Glulam beams, comprising 50mm timber battens/tilting fillets, and a 50mm clear ventilation path provided through the roof void over the new partial-fill insulation laid between the joists. For further info refer to the Roof Plan on drawing J14-091/4013L and Detail D-03 on J14-091/4024C, included within Appendix 3.

2.6.2.5 New lead cover flashings were installed at wall abutments, and where practicable to install, it is ventilated abutments that provide the air flow to the timberwork beneath the supporting roof deck, together with 3no. proprietary 'mushroom' ventilators installed at key locations (as indicated on the Roof Plan drawing J14-091/4013L).

2.6.2.6 Where localised repairs of the roof members were carried out and existing retained timberwork found to be in direct contact with masonry, a polymeric DPC was installed to isolate the timberwork from direct contact with the historic walls.

2.6.2.7 In addition, a roof-mounted heat recovery unit and ancillary ductwork was installed as part of the M&E works to provide heating and ventilation within the Earl's Chamber. This plant is mounted on a proprietary 'big foot' support system, and all of the coatings to the heat recovery unit and insulated ductwork are finished in grey. The locations and low profile of the plant installation were carefully considered to remain discreet. A record drawing of the roof-mounted plant is provided at the end of Appendix 3, with a photograph of the installation nearing completion included in Figures 24 & 27 of Appendix 1.

2.6.2.8 A roof access hatch and fall restraint system have also been installed to facilitate access onto the roof via the inside of the Earl's Chamber, considered essential for maintaining the roof-mounted plant that has been introduced. The hatch has a low profile and a marine-grade



stainless steel self-finish, and it's positioning predominantly behind the gabled south elevation provides the safest and most discreet location for the installation.

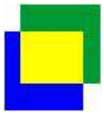
2.6.3 **Repair of High Level Stonework**

2.6.3.1 Careful and selective repair work was undertaken to the historic stonework walls, this being a Scheduled Ancient Monument and Grade I Listed Building. It is noteworthy that some previously completed repairs (circa 2005) include the installation of low-profile coping stones on the west side of the roof, located at either side of the chimney stack. These copings are bedded on a lead DPC that runs through the solid wall constructions. Generally, the stonework remained unaffected by the works, with the exception being a couple of specific locations (chimney base and east corner of Great Hall Porch Tower parapet, described below), whilst removal of vegetation and repointing in key high-level and vulnerable locations was undertaken.

2.6.3.2 With the exception of 'clay rich' repointing work undertaken in the mid 2000's, the existing pointing is generally of a cementitious mix, and details of the sampling under taken at Phase 2 are included in that report submitted as part of the SMC. It was established at that time that all of the clay rich repointing would be removed, as it was reducing porosity of the mortar, resulting in shrinkage cracking and causing increased moisture contents in the walls. This was undertaken as planned.

2.6.3.3 From within the Earl's Chamber and under the approval of Cadw, samples of hearting mortar were taken by the Principal Contractor in the early stages of the works, on the basis that this mortar would be of similar constituent mix proportions to the walls at higher level. Fuerther details are provided within Appendix 5. From this process, a suitable repair mix was agreed for use in the high-level mortar repairs i.e. 2:5 ratio NHL3.5 hydraulic lime: CLS 22 'Ocean Rough' sand (sand supplied by the Cornish Lime Company). The NBS specification is provided in Appendix 6.

2.6.3.4 In addition to the general condition pre-commencement of the Works, the arrangement of the remaining wall constructions also made passage of moisture fairly straightforward. Some walls directly over or adjoining into the Earl's Chamber from adjacent areas have flat ledges or are gable-ended, with exposed rubble cores. To summarise, the exposed rubble cores mean that individual stones and pointing mortar would provide level platforms where rainwater could stand or pond, rather than allowing water to be discharged/thrown from the wall-tops. Inevitably, water/moisture was able to track straight through any voids between the stones and pointing mortar. With the exception of the areas repaired in 2005, these walls appear to be pointed with cementitious mortar. As means to remediate these issues, a combination of lime flaunchings and lead weatherings were originally granted approval to the Lesser Hall shelf and rubblecore wall-tops under the SMC. However, concerns were raised by Cadw during the works regarding the fixing of leadwork, which would have required clips fixed back to the historic masonry. After much thought and consultation between the Design Team and Cadw a proposal was agreed,



considered practicable and intervening with the existing structure/fabric in a less intrusive and visually unobtrusive manner. However, the repair methodology has not been adopted by Cadw before, and there is an element of this remediation method being a 'trial' for all parties, which Cadw accepted. The identified areas of stonework requiring remedial treatment were cleaned down and raked out/repointed using the approved NHL3.5 lime mortar. After repointing, a lime-wash was applied to the masonry and allowed to dry out (acting a 'slip-plane' and offering 'reversibility') before application of a 2-coat render system using 'Prompt' natural cement mixed with CLS 22 'Ocean Rough' sand (also used in the NHL lime:sand pointing mortar), built-up in minimum 10mm coats. The base coat includes polypropylene fibres to help shrinkage/flexibility, whereas the top coat does not. The render coats were floated to follow profile of stonework, introducing the flaunching to prevent 'shelving' on flatter stones. The resultant appearance and performance of the Prompt wall cappings appears to be successful overall, with a challenge for the Contractor during application being the rapid set time of the natural cement mix. The stability and robustness of this repair technique will need to be carefully monitored over the longer term. Included in Appendix 7 in relation to the Prompt capping is the NBS Specification prepared by pdp Green Consulting, application guidance prepared by Cornish Lime Company, as well as general information for the natural cement product.

2.6.3.5 With scaffold access in place to the high-level walls bearing over the Lower Bailey, a visual structural appraisal by the Architect and Structural Engineer in late-2016/early-2017 confirmed significant cracking through the quoin mortar joints and associated displacement in the external side of the parapet located at the east corner of the Great Hall Porch Tower. The concern was that the structure could be at risk of collapse and constituted a severe health and safety risk, prescribing that advantage should be taken to appropriately remediate the structure whilst access was available. Repair proposals were prepared by the Structural Engineer and described in a letter report and accompanying sketches in early January 2017 (included in the 'As Constructed' info presented within Appendix 3), which were subsequently approved by Cadw. This included localised dismantling and rebuilding of the parapet wall affected, with the introduction of helical stainless-steel reinforcing bar to the mortar bed joints.

2.6.3.6 Similarly, a visual structural appraisal was undertaken by the Engineer in relation to the chimney base over the Lesser Hall in early Spring 2017. Concern had been raised by the Architect over the weathering of the corbels to the chimney stack located on the northeast elevation of the chamber. Externally, the chimney stack sits proud of the wall masonry and rests at its base on two wide corbel stones. These stones have suffered significant erosion through weathering and their diminished section threatens the support of the upper masonry. The visual inspection of the chimney stack identified the condition of the masonry and pointing to be variable with some areas in poor condition. Again, instability and potential collapse was raised as a concern, so repair proposals were put forward and approved by Cadw. A 'pinning' technique using stainless steel bars was undertaken through the stonework to ensure an effective repair and carried out in conjunction with localised repointing. A sketch drawing of the work undertaken is included in Appendix 3.

2.6.4 Internal Repairs

2.6.4.1 The extent of the external repairs, i.e. providing a replacement roof finish with a minimal approach to the repair to the stonework walls, allowed the preparation of a simple design methodology for internal works, and bearing in mind that Cadw's intention is for the Earl's Chamber to be brought back into use by visitors, such as for holding events or for educational purposes.

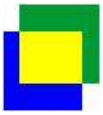
2.6.4.2 The finishes removed from this space were all modern, and therefore did not have historic value. The delaminating lath and plaster ceiling was one of the first items removed during deconstructive works. Following removal, a condition inspection of the roof timbers was made by the Conservation Architect, and the timberwork was confirmed to be in a satisfactory condition generally. The existing ceiling battens remained in place generally, and receives a replacement plasterboard and skim ceiling finish. A 'Compriband' tape seal ensures that the plasterboard and skim remains isolated from direct contact with the solid wall constructions, and a painted softwood trim was installed to conceal this junction.

2.6.4.3 The modern cementitious plasterwork to the walls in the Earl's Chamber was removed, which the Contractor advised was with ease due to lack of key into the rubblestone substrate. With the substrate wall exposed, assessment alongside Cadw was made of the existing condition of the stonework and pointing. It was agreed that repointing would not be undertaken, as the robustness and integrity would likely cause more harm than benefit. Instead, a gentle abrasive cleaning process ('EcoStone') was undertaken to the stonework, to remove remnants of the plaster left in-situ.

2.6.4.4 8no. 'mock' wall brackets (replicating bases of trusses to give the impression of this type of roof construction) were carefully removed from the north and south walls within the Earl's Chamber. The stainless-steel bolt fixings to these trusses were cut flush with wall face. Elsewhere in the Chamber a few ferrous bolt fixings were carefully drilled out and repaired using the NHL3.5 lime:sand mortar mix adopted for the external repointing works.

2.6.4.5 The ends of the oak floorboards were carefully cut back by approximately 25-50mm to prevent direct contact with the masonry.

2.6.4.6 Natural ventilation is provided within the Great Hall Porch Tower to assist in drying out the masonry walls and existing timberwork forming the roof construction. Within this space, oak packers were removed from the existing holes present through the depth of the walls. Within the internal end of the hole, a stainless-steel insect mesh has been installed, with the mesh held in place with a modest oak frame wedged into the opening without directly fixing to the surrounding stonework, and the gaps sealed between the oak frame and irregular masonry profile using 'Compriband' tape. To the external end of these existing holes, a stainless-steel wire was installed to prevent bird nesting and entry. No fixings in relation have been made into the masonry whatsoever.



2.6.4.7 A powered mechanical heating/ventilation system has been installed to assist in controlling the moisture levels within Earl's Chamber, with the plant installed at roof-level. Insulated ductwork is installed within the ceiling void, and 'flush' supply diffusers and extract grilles are installed within the replacement plasterboard ceiling finish, alongside the 'flush' LED downlighters fitted to illuminate the space. A careful process of evaluation was undertaken in relation to the heating/ventilation system and lighting proposals, which considers the likely use of the space for educational purposes, and the historic, aesthetic and communal values that are of relevance to the space.

2.6.4.8 Excavation work was carried out at the site for the installation of a new power supply into the Buttery/Pantry located beneath the Earl's Chamber. The new cable supply runs from a nearby cabinet located in the Tower located at the southwest end of the Great Hall. An Archaeological Watching Brief was undertaken by Dr Amelia Pannett, Field Monument Warden for Cadw, and the report is included within Appendix 4. No finds or features of archaeological significance were identified during the excavation of the electricity cable trench, and no features of archaeological interest were revealed or damaged during the groundworks.

2.6.4.9 In turn, the electrical cabling to the Earl's Chamber is concealed in oak boxing. No fixings in relation are provided directly into the stonework, with fixings made into the mortar joints between individual stones.

2.6.4.10 At the time of writing, the interior of the building is undergoing a process of 'drying out' and re-acclimatisation, and the environment is being carefully monitored. An Interim Report is provided within Appendix 8, demonstrating that the repair works are generally successful, and the building is responding accordingly, with significant drops in the relative humidity and stability of internal temperature now provided (thermostat currently set at 15°C). However, the report does highlight the necessity of correct operation and maintenance of the mechanical plant after an error was made during use of the system controls within March 2018. Fortunately, this was identified, and the control settings correctly reset. The environmental monitoring continues.

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