HUNTLY CASTLE

Survey of stone frieze and other ornamental stone

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1.0 Introduction

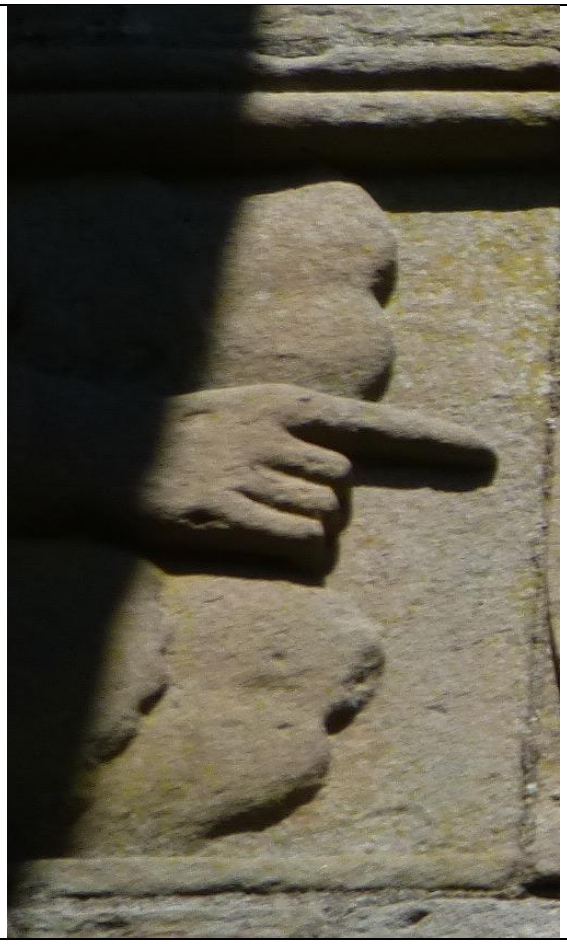
The stone frieze at Huntly Castle was consolidated in 2003 through localised injections of acrylic resin solutions to stabilise areas of delaminations, silane treatments of disaggregating sections and acrylic resin mortar pointing to open replica letter joints, bedding planes and delamination edges. A number of GRP replicate letters had been previously installed and joints around the letters were pointed with acrylic mortar.

The survey was carried out form a cherry picker and is an update of the photographic survey carried out from the ground 3 months earlier. The ornamental corbelling below the oriel window on the adjacent South tower was also inspected from close proximity.

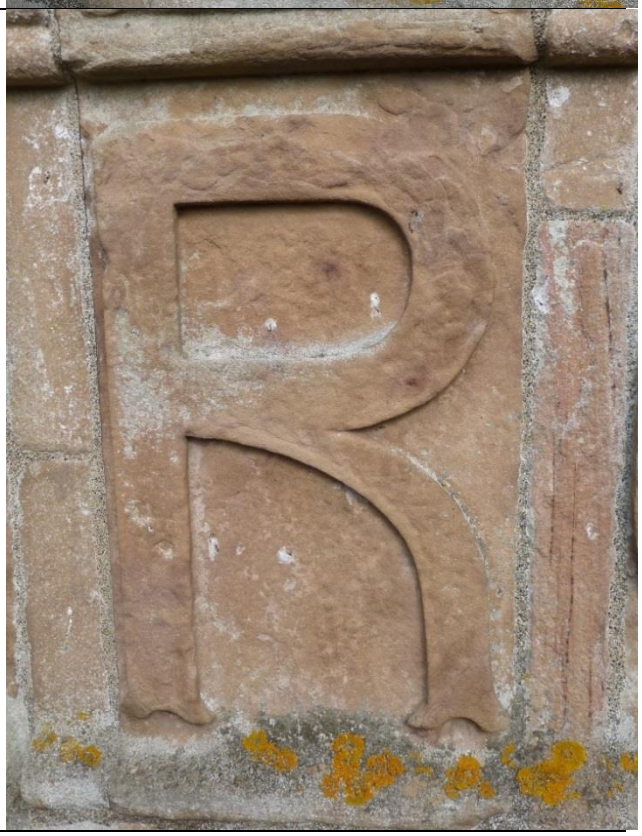
2.0 Survey

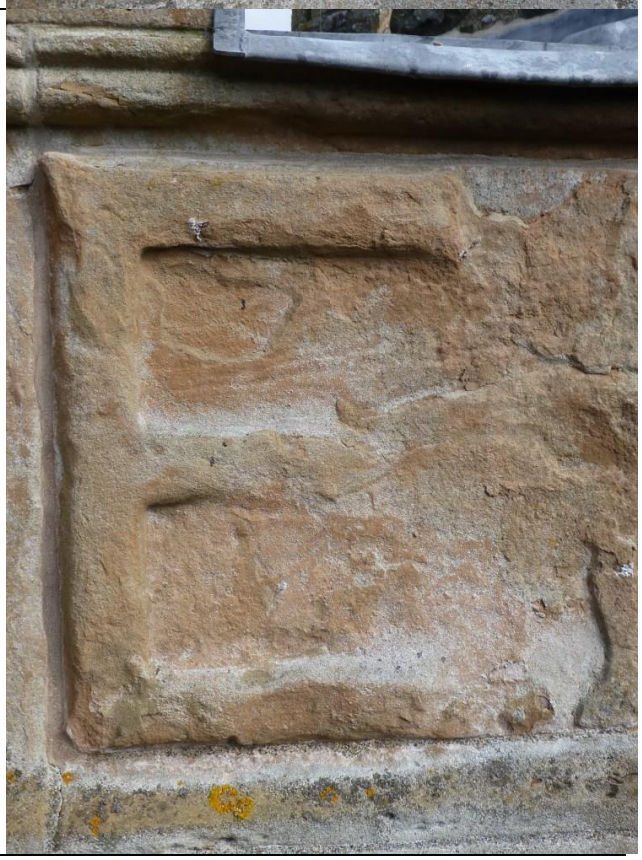
2.1 Stone frieze:

2.1.1 Upper frieze: ‘GEORGE GORDOVN, FIRST MARQUIS OF HU…’

Pointing hand: Small crack on index finger and lower side of hand.	

‘GEORGE’: G – a number of minor old resin repairs are still in situ. Small areas of delamination are visible at the top of the stone.	
E – The two upper crossbars and connecting vertical shaft are GRP replica. Nonetheless, the top left corner of the letter has been rendered with resin mortar. The remaining original stone is eroded. The resin mortar pointing around the replica parts is cracking and failing. The background surface is covered in thin, potentially protective, lichen growth.	

O – GRP replacement letter. The resin pointing around the letter is failing. The background is blistering in the centre where this has led to surface loss. Further open delamination edges are visible delaminations in the centre and corners of the stone., where old resin repairs have been lost or where new areas of decay have developed. A number of old resin repairs remain in situ.	
R – Minor fissures have been previously pointed and these fills are still in situ.	

G – Minor areas of surface scaling in the lower part of the letter.	
E – Many small areas of surface scaling and blistering, particularly towards the right side. The surface is boss in a number of areas. Fissures are visible at the top of the stone. Remaining old resin repairs are failing.	

Star between ‘GEORGE’ and ‘GORDOVN’ - mostly missing and very eroded. The right side is almost completely sheared off. The delaminating remains are cracked and boss. This appears to have been caused water running off from the adjacent channel in the flashing.	
‘GORDOVN’: G - Delaminating in many areas, minor small resin repairs remain visible but most are missing or failing.	
O – missing R – stable condition	

D - old repairs are starting to fail. Extensive pointing on right side is still in situ. Top of left side suffers surface scaling.	
O - Extensively fissured, the left side and centre are particularly eroded and appear boss. Previous resin pointing is failing.	

V - Numerous but minor fissures in all areas; small delamination are opening up in centre of the stone.	
N – Flaking on right side with numerous small resin repairs visible in other areas which are starting to fail.	

Star between ‘GORDOVN’ and ‘FIRST’ - Eroded at top right side with minor delaminations visible here. This appears to be caused by water run off due to missing stringcourse stone above.	
‘FIRST’: F - missing I – missing R – The lower leg is mostly eroded. Large old repairs in the top left corner are starting to open up. Minor delamination are visible below the crossbar.	

S – Minor fissures in top left corner. Missing cement pointing appears to have been replaced with acrylic mortar pointing.	
T - Surface blistering on left side with old resin repairs still in place.	

Fleur-de-lis above ‘S’ – The resin mortar pointing along fissures is starting to fail. Open masonry joints appear to have been pointed with acrylic resin mortar.	
Star between ‘FIRST’ and ‘MARQVIS’ – Minor surface scaling on left side.	
MARQVIS: M - blistering and surface scaling on lower left side and top right hand side. Old repairs here are failing.	

A – The lower right corner is lost and resin repairs on the lower left corner are starting to open up. Surface losses have occurred here and at the top right corner.	
R – stable, largely covered in thin lichen growth.	

Q – Minor surface scaling and open delamination edge on lower right side of letter. Largely covered in thin lichen growth.	
V – Delaminated top left corner. Thin lichen colonises all but the freshly revealed surface. I - missing	

S – Eroded lower edge and minor surface scaling but otherwise stable.	
Star after ‘MARQVIS’ – delamination and surface loss at top. Acrylic resin mortar has been used to point vertical masonry stone joints to either side, indicating at least partially missing or failing mineral mortar pointing here.	

OF: O - Fissures on lower left hand side with open repairs visible here. The lower right corner is also fissured and the surface appears boss. Minor delaminations have occurred on the top right corner.	
F - Minor surface scaling and losses along the top bar and fissured along lower cross bar. Appears boss. Failing old resin repairs on right side of background.	

Star after ‘OF’: Top and bottom right hand arms are missing. The presence of cracks indicates that further areas are at risk of delamination.	
HVNTLY: H - Old resin mortar repairs along delamination edges are starting to fail. Cracked along cross bar, also delamination edges starting to open up and fissures at top left corner.	

V: The lower part of the letter is lost due to delamination and the surface above appears boss and fragile. Old resin mortar repairs are visible in the top left corner and lower right side. These appear to be intact. The remaining letters of the word 'HVNTLY' are missing.	
Q at far Eastern end: Loss of lower edge moulding and top left corner; cracks visible along the lower and left edge:	

Summary upper stone frieze condition survey:

Stone	Replica	Surface decay	Old repairs
Hand		x	
G		x	x
E	x		x
O	x	x	x
R			x
G		x	
E		x	x

Stone	Replica	Surface decay	Old repairs
Star		x	
G		x	x
O – missing			
R			
D		x	x
O		x	x
V		x	
N		x	
Star		x	
F – missing			
I - missing			
R		x	x
S		x	x
T		x	x
Star		x	
Fleur-de-lis			x
M		x	x
A		x	x
R			
Q		x	
V		x	
I - missing			
S		x	
Star		x	x
O		x	
F		x	x
Star		x	
H		x	x
V		x	x
Q		x	

Key to table:

x = minor decay

x = active decay

X = severe decay

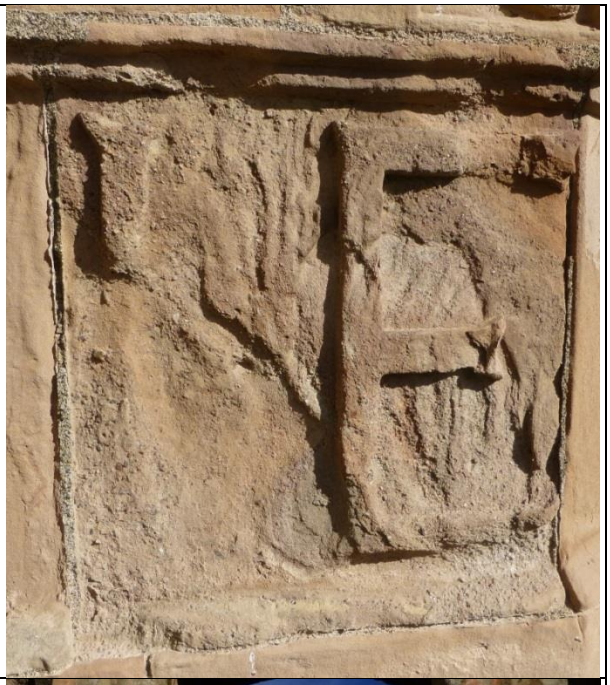
X = at imminent risk of loss

2.1.2 Lower frieze: ‘HENRIETTE STEVART, MARQVISSE OF HVNTLY’

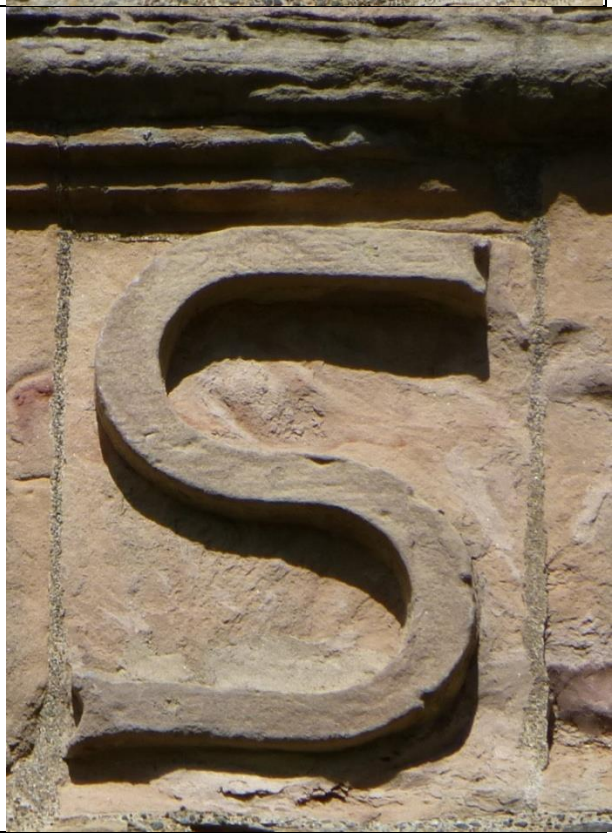
Pointing hand left of ‘Henriette’. Small delamination at bottom and previously repaired delamination edges above hand.	
HENRIETTE: H - failing old repairs of cracks in the centre of the stone. The surface is delaminating and boss in the centre.	

E - replica letter at the top and the joint is open here, delamination edges are visible on the original lower half of the letter. The resin mortar pointing round letter is cracked and failing.	
N - Very soft and disaggregating, severely eroded at the bottom.	
R - severely decayed and very fragile with much of letter at imminent risk of loss, marked increase in decay since 2009. The letter had to be removed as it was at imminent risk of stone fall and possible injury to persons below. It was extremely fragile and came away in many pieces.	

Letter before removal	
Stone after removal of the letter ‘R’	

I - almost completely missing letter and stone is very eroded. E - very worn, same stone as above, marked increase in decay since 2009. The stone is very coarse grained and very fragile on its right side.	
T - Minor surface scaling and disaggregation. Area of decay at the top centre edge of the stone	

T - Minor fissures and surface scaling.	
E - Old repairs of delamination edges are starting to fail. Minor new fissures have developed along central part.	
Carved boar heads and lettering above ‘Henriette’ - open bedding planes and minor fissures.	

Star after ‘Henriette - Boss and surface has become rounded through distortion. The lower edge and lower right corner are decayed with cracks and delaminations edges visible. Further decay is visible all over the stone. The lower part of the star is disaggregating.	
STEVART: S - replacement letter, failing repair to lower edges. The background is disaggregating and has been heavily repaired with resin mortar in the lower part where it is failing.	

T - replacement letter; area to right of letter is very eroded. Delamination of stone background has led to considerable surface loss in the past. Edge pointing, where still present, is discoloured and failing. New areas of decay have opened up, particularly in the centre of the stone. The left side has been previously repaired with cement which is still in place. Fading resin repairs are visible in the lower left corner.	
E - replacement letter; delamination of stone background has led to considerable surface loss in the past. Edge pointing, where still present, is discoloured and failing.	

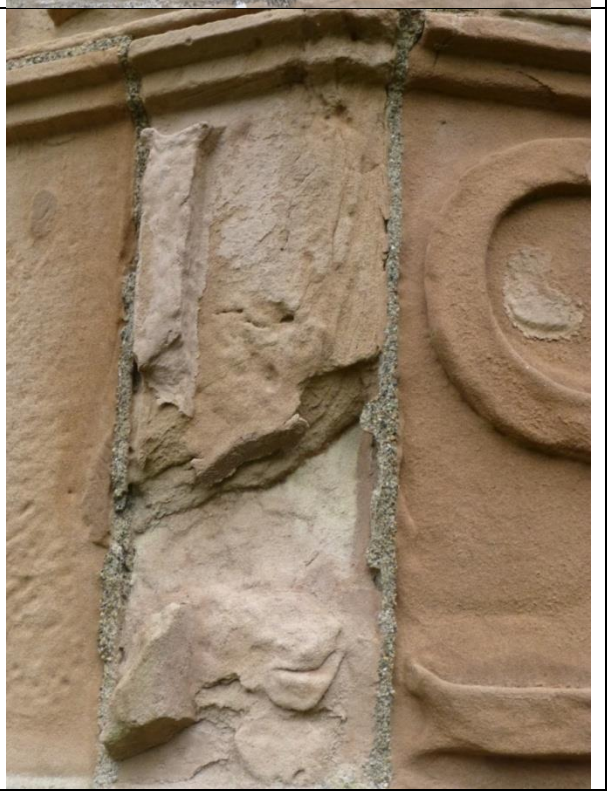
V - Vertical delamination on right side. A band of mineral inclusions has been preferentially eroded from bottom left to top central section, resulting in surface pitting. Previous resin mortar fills are now failing and discoloured. Cracks in top right corner of letter and central left side.	
A - Crack on right side, disaggregating lower left area of central section. Fleur-de-lis above – open bedding planes.	

R - Surface blistering and disaggregation of central lower part. Lettering above – Open bedding planes and a large dry would benefit from being pointed.	
T - Disaggregating and cracked throughout and many surface areas are boss. Previous resin mortar pointing is partially missing. Fleur-de-lis above – open bedding planes.	

Thistle above ‘Stevart’ - An area of decay is visible in the centre of the top moulding of the (missing) panel above the thistle. Missing pointing here. The panel of the thistle itself has been extensively resin mortar pointed in the past with many of the repairs now failing while others are still in position but faded and unsightly. Boss surfaces were detected in many areas. The left side of the thistle has been extensively repaired in the past whereas the right side is in good condition. The eroded ends of the moulding above the thistle have previously been heavily resin mortar repaired while the central section is missing. The stringcourse below the thistle is eroded but appears stable.	
Star after ‘Stevart’ – some surface erosion and minor surface flaking, particularly on right side.	

MARQUISSE: M - Heavy resin mortar repairs are starting to fail now with cracks opening up at the edges.	
A – Suffers minor disaggregation below the cross bar.	

R - Appears fragile in spite of being heavily repaired in the past, particularly the middle section where surface losses have previously occurred and old resin mortar repairs are now failing.	
Q – Extensive old resin mortar repairs are evident which are mostly still in position but have started to lift away from the surface near the bottom edge.	

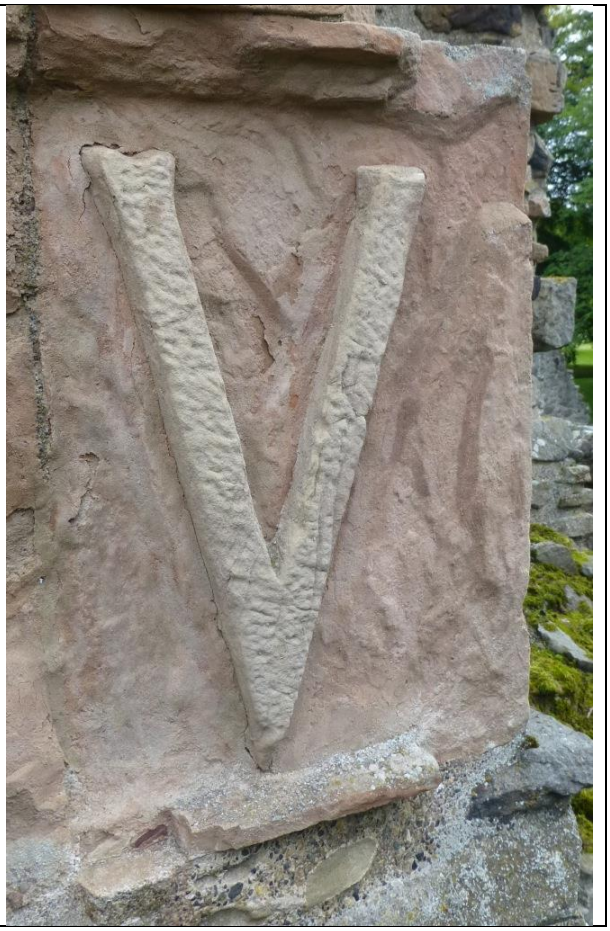
V – Disaggregating on right side. A dry appears stable.	
I - mostly missing letter and very decayed stone, suffering deep delamination of lower part which is very soft and displays open delamination and failing resin mortar repair edges.	

S - Delamination at top of letter. Minor opening up of small old resin repairs; disaggregating surface. Lower section of adjacent small stone is deeply eroded.	
S - old repairs still visible but starting to fail. Fissures and areas of disaggregation are evident.	

E - fissured and scaling (exfoliation) in places, particularly on lower part of vertical bar.	
Carved flowers and lettering above ‘Marqvisse’ – open bedding planes	
Star after MARQUISSE - Much of the original background surface is missing, the stone has been extensively repaired in the past. Heavy resin mortar edge pointing is now failing. The upper part retains original background surface but has lifted away from the substrate. The star is fissured at the top and its right side is disaggregating.	

OF: O – The central area of the stone suffers extensive surface blistering and exfoliation, possibly of a surface consolidated section of the stone, is occurring.	
F – Surface exfoliation and disaggregation of lower part.	

Star after ‘of’ – Minor disaggregation of lower part.	
HVNTLY: H - The background of the stone is delaminating and blistering while also being covered in extensive resin mortar repairs that are now failing. A large area in below the cross bar has lifted from the surface and is very fragile. Only the left vertical bar of the letter is original, the rest has been replicated in the past. The pointing mortar is failing around the replicated areas.	

V – Replica letter with previously consolidated background where (extensive) repairs are still in place but now failing, particularly on the left side. The remaining letters and frieze is missing.	

Summary lower stone frieze condition survey:

Stone	Replica	Surface decay	Old repairs
Hand		x	x
H		x	x
E	x	x	x
N		**X**	x
R		**X**	x
I		**X**	x
E		**X**	x
T		x	
T		x	
E		x	x
Boar & monogram		x	
Star		**X**	
S	x	x	x
T	x	x	x
E	x	x	x
V		x	x
A		x	x
R		x	x
T		x	X

Stone	Replica	Surface decay	Old repairs
Fleur-de-lis and monogram		x	
Thistle		x	x
Star		x	
M			x
A		x	
R		**X**	
Q			x
V		x	
I		**X**	x
S		x	
S		x	x
E			x
Flowers and monogram		x	
Star		**X**	x
O		x	
F		x	
Star		x	
H	x	x	x
V	x	x	x

Decay appears to be very dependent on the type of individual stone used in the construction and quite some variance can be observed here. As a result, varying extremes in condition can be observed in close proximity i.e. severely decaying stones adjacent to virtually intact stones.

However, in general the lower frieze is significantly more decayed than the upper frieze and the cause for this merits some further investigation: For instance, it may be possible that rainwater is accumulating on the 2nd floor below the lower frieze windows and extend the wetting period of the stones which could have resulted in higher salt contamination. The latter appears indicated by the salt efflorescence on the bay window corbelling. It would be useful to observe the frieze and flooring during and after severe rainfall.

2.2 Window and stringcourse moulding:

Many areas of the string courses, window surrounds and mullions are delaminating, scaling, cracked and display open bedding planes:

Bay window furthest east: The mouldings have been extensively repaired with acrylic mortar in the past and these are now beginning to fail with some opened up to water ingress and potential entrapment already. Many areas are very fragile, particularly the top moulding which requires urgent repair. The mullions are very decayed and have been heavily repaired with resin mortar in the past which is now failing. The sill is cracked.

East bay window

Central bay window: Extensive cracking along bedding planes is particularly evident in the upper parts. The central sill is split and old resin mortar repairs are failing. The bedding of the left window sill and string course below the left side of the central bay window are open with masonry joint pointing also missing here.

Bay window furthest west: It is in comparatively better condition to the other bay windows. A number of old repairs are visible and intact. Some open bedding planes are visible on the left moulding near the top of the window. The central sill is split. The corbelling below this window in particular is covered in salt efflorescence and its cement pointing is proud of the preferentially weathered stone. The sill moulding is cracked throughout.

Generally, an increase in decay was noted furthest east (and away from shelter offered by tower) and near the bottom of windows (where moisture can settle on sills).

2.3 Gablet above ‘GORDON’:

The gablet could not be reached during the 2003 works. It suffers severe decay to its left gable as the pediment architrave here is eroded and not protecting the stone below. While the surface has been lead covered to prevent direct moisture ingress, this is not extended out far enough to shed water away from the carved detail below. As a result not only the pediment detail here but also the lower mouldings and sill have suffered increased surface decay in the form of open bedding planes, fissures, surface scaling and erosion.

The top sculpture is much eroded and cracks are visible on right side, in spite of lead flashing above it. Most of the top of the pediment has lost a substantial thickness of its surface through delamination. The left panel is very eroded and delaminating but nonetheless, old resin repairs remain visible. It appears fragile. The centre left side of the armorial panel is much eroded due to the missing stringcourse above. The right hand side is in much better condition. The moulding and sill below the left side is eroded along the bedding planes due to water run-off. Failing old resin repairs remain visible along open bedding planes. Extensive surface scaling on the moulding at the base of the gablet has been previously pointed.

2.4 Decorative corbel below South tower oriel window:

All gargoyles along the top edge of the corbelling are missing their heads.

East face: The chevron moulding at the top is disaggregating on its right side whereas an area of delamination is visible on the left. Old repairs remain in situ on the moulding below. Further repairs are required, though, and surface losses have occurred since these repairs were carried out. A thick cement band of grit pointing has been applied below. The two rope mouldings below suffer open bedding planes, particularly the lower one. Similarly a stepped concave moulding below displays open bedding planes. A triple stepped moulding below is boss on its right side. A small area of delamination is visible on the base.

Oriel Window of South tower – east face

Oriel Window of South tower – south face

South face (front): The top moulding has lost all detail apart from the chevron on right side which is detached from its substrate while the central part of this moulding is very fragmented. The moulding below is disaggregating and only retains detail on its right side. The two rope mouldings below are disaggregating on the left side and scaling on the right side. The stepped moulding below has been extensively repaired, almost rendered, in the past on the right side and this is now failing. The left side is disaggregating. The stepped moulding below has lost much of its surface and salt crystals are visible on the right while the left side is disaggregating and has lost all detail. The left side of the base moulding is missing and minor scaling is visible on the right side. Three stone courses above the corbelling (front face) are deeply eroded. The left and central gargoyle are cracked.

Oriel Window of South tower – west face

West face: The far left chevron moulding and lower part of the moulding and gargoyle above are cracked and at risk of loss. Nonetheless the stone retains most of its moulded detail. Cracks are visible on the right side of the chevron moulding and small areas of disaggregation on its left underside. The concave moulding below appears stable apart from its boss right side. The rope mouldings below appear stable whereas the stepped moulding below that is eroded on its right side. The lower step moulding is almost completely missing, only retaining traces of its far left side. Thick salt crystals are visible near the front corner and one loose surface area here had to be removed for safety reasons. The moulding below is eroded and a crack is visible on the corner detail.

3.0 Recommendations

Salt sampling and analysis in combination with a moisture and/or thermographic survey should be undertaken so as to investigate the likely cause for the decay being more severe on the lower frieze. Stone analysis is required for stone matching but would also be useful in terms of establishing a decay profile as well as determine salt and mineral distribution. The presence of near surface salts or clays would prohibit the use of surface consolidants.

Missing or failing cement (joint) pointing of the masonry should be replaced with an NHL 3.5 hydraulic lime mortar. This will require the removal of resin mortar repairs in

some areas. Similarly, proud cement pointing should be cut out and replaced with hydraulic lime mortar or cut back if the former is not possible without harming the surrounding masonry. Larger cracks e.g. on the window sills, would be better pointed with hydraulic lime mortar, if possible.

Failing resin repairs should be removed and large resinous surface repairs minimised to improve the permeability of the stone surfaces. In particular, the pointing around replica letters needs to be removed and re-applied with a reversible acrylic resin mortar consisting of 10% Paraloid B72 in acetone mixed with colour-matched sands.

Areas of surface delaminations, cracks and fissures which have led to surface detachment need to be re-adhered through the localised injection of 2.5. – 10% Paraloid B72 in acetone. Conservation treatment may also require the re-adhesion of loose fragments with thixotropic polyester or reversible acrylic resin where possible. This is likely to particularly apply to the corbelling below the Oriel window which appears very fragile in many areas.

Delamination edges, open bedding planes (mostly found on mullions, stringcourses and mouldings), cracks and fissures would benefit from being pointed with colour-matched acrylic mortar to prevent moisture and soil ingress to reduce the rate of decay.

Severely disaggregating areas may require surface consolidation with a non-hydrophobic silane with a silica deposition rate of 10% (subject to stone analysis results).

The indentation or replacement of the stone, from which the letter ‘R’ for ‘HENRIETTE’ was removed, is recommended as the name is now difficult to read. The shape and size of the letter can be obtained by taking a mould from or laser scan of the same letter elsewhere on the frieze. A suitable replacement stone can be identified through petrographic analysis and stone matching services. The remaining stone is not sufficiently sound to form a suitable surface to which a replacement letter could be attached.

The flashing on the left side of the gablet should be extended to prevent water run-off down the face of the pediment. Similarly, improvements may be possible to the flashing along the wall head where channelling of rainwater has led to local acceleration in surface erosion.

All treatment must be carried out on dry stone and in dry frost-free conditions. For this reason a covered scaffold with platforms at suitable work access heights and with a hoist to lift materials is required.

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