

Hutton + Rostron Environmental Investigations Limited

Southleigh Park House: Roof timbers investigation

Site note A1 for 27 January and 5 February 2021, job no. 152.09

CONTENTS

- 1 Introduction
- 2 Staff on site and contacts
- 3 Observations and *recommendations*
- 4 H+R work on site
- 5 Proposed action by H+R
- 6 Information required by H+R
- 7 Administrative requirements

Attachments

- A Schedule
- B Photographs
- C Plans

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1 INTRODUCTION

1.1 AUTHORITY AND REFERENCES

Hutton + Rostron Environmental Investigations Limited carried out site visits to Southleigh Park on 27 January and 5 February 2021 in accordance with instructions from Steve Coull of FSL Group by email, on 10 November 2020 at 13:09. Drawings were provided by the client. For the purpose of orientation in this report, the principal façade was taken as facing south

1.2 AIM

The aim of this survey was to investigate roof structures for construction, condition, and service life so as to provide recommendations for cost effective remedial works

1.3 LIMITATIONS

Structures were not examined in detail except as described in this report, and no liability can be accepted for defects that may exist in other parts of the building. We have not inspected any parts of the structure which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the property is free from defect or in the event that such part of the property is not free from defect it will not contaminate and/or affect any other part of the property. The sample remedial details and other recommendations in this report are included to advise and inform the design team appointed by the client. The contents of this report do not imply the adoption of the role of Principal Designer by H+R for the purposes of the Construction (Design and Management) (CDM) Regulations 2015

2 STAFF ON SITE AND CONTACTS

2.1 H+R STAFF ON SITE

Tim Jordan

2.2 PERSONNEL CONTACTED

Steve Coull – FSL Group
David Mosdell – FSL Group
Site Staff

3 OBSERVATIONS AND RECOMMENDATIONS

3.1 SUMMARY OF CONSTRUCTION

The majority of roof structures were of softwood construction, although these dated from various historical phases of construction. Roofs to the north side were generally Victorian, those to the south generally Edwardian and those to the west dating from 1970s works. There has also been relatively modern refurbishment work dating from circa 2000

3.2 SUMMARY OF CONDITION

Roof timbers were generally found to be free of decay and too dry for decay to occur at time of survey. H+R roofs referenced as '1a' and '5' were significantly affected by decay; these relatively small structures can be considered for total replacement. There was a general trend for superficial damage by beetle activity, arising from a history of condensation issues. Detailed information is provided within Attachments

No chemical treatments are required to timber or masonry structures in relation to fungus or insect decay. Decayed timbers should be repaired or replaced, as directed by the Structural Engineer with detailing provided to isolate new timber from potentially damp masonry. Intact roof timbers and other solid slab roofs are deemed suitable for retention on refurbishment, subject to no further water penetration and at the discretion of the Structural Engineer

4 H+R WORK ON SITE

- 4.1** H+R inspected roof timbers by drill probing and sample exposure by removal of finishes
- 4.2** H+R took photographs for record and illustration purposes

5 PROPOSED ACTION BY H+R

- 5.1** H+R will advise on remedial detailing, so as to minimise the risk of damp and decay problems after refurbishment if further instructed by the Project Team to do so
- 5.2** H+R will advise on conservation of original fabric with regard to damp, decay and salt damage, as necessary and if further instructed by the Project Team to do so
- 5.3** H+R will review proposed remedial details as these become available if instructed by the Project Team to do so
- 5.4** H+R will return to site to inspect sample remedial details if instructed by the Project Team to do so
- 5.5** H+R will liaise with building guarantors and conservation authorities, if instructed by the Project Team to do so, so as to ensure the cost-effective conservation of original fabric and discharge of guarantee conditions

6 INFORMATION REQUIRED BY H+R

- 6.1** H+R require up-to-date copies of project programmes, as these become available
- 6.2** H+R require copies of up-to-date lists of project personnel and contact lists as these become available
- 6.3** H+R require copies of proposed remedial details for comment as these become available
- 6.4** H+R should be informed as a matter of urgency if further significant water penetration occurs onto site; so that advice can be given on cost-effective remedial measures, to minimise the risk of cost or programme overruns and so as to minimise the risk of damp or decay problems during the latent defect period

7 ADMINISTRATION REQUIREMENTS

- 7.1** H+R will require formal instructions for further investigations and consultancy on this project
- 7.2** H+R require confirmation of distribution of digital and printed copies of reports and site notes

Attachment A

SCHEDULE OF OBSERVATIONS AND RECOMMENDATIONS

REFERENCE	ITEM	OBSERVATIONS	RECOMMENDATIONS	CLIENT COMMENTS
SNa1.1 ROOF 1				
SNa1.1.1	Construction	Steel and softwood structure dating from 1970s works Mansard arrangement with crown flat roof Cranked primary steels, 'I' section 265 x 150mm overall, flange 70 x 15mm, web 10mm thick Secondary steels, 'C' section 150 x 80mm overall Gutter/eaves steel at south elevation, 'I' section 210 x 210mm overall, flange 100 x 10mm, web 10mm thick Mansard rafters 75 x 50mm at 400mm centres Wall plate (eaves) 75 x 50mm Ceiling joists 50 x 50mm at 330mm centres Flat roof joists 150 x 50mm at 400mm centres 22mm thick ply sheathing (at flat roof and south mansard pitch) Bitumen felt only (no ply) laid at north mansard	-	
SNa1.1.2	Condition	Access was available to the majority of the structure for inspection. A small part of the north mansard remained enclosed although there was no evidence that this disguised decay There was no decay detected to roof timbers abutting the perimeter masonry of the north, east and west (despite water ingress to masonry slightly below the roof line, arising from defective eaves guttering shown on plans) Along the south parapet gutter, there were general problems of long term and recurrent condensation, leading to beetle and wet rot damage in gutter sole timbers. Condensation was visible at time of survey, apparently due to a 'cold-bridge' defect arising from an insulated rafter void adjacent to an un-insulated steel beam below the gutter. Surface moisture contents in timbers were generally ~16 per cent which was sufficient to support minor ongoing beetle activity. A slight leak at the east end of the gutter had allowed a small area of more significant decay, deep moisture contents here were 30 per cent	<i>No chemical treatments required</i> <i>The roof was generally suitable for retention, subject to no further water penetration and at the discretion of the Structural Engineer</i> <i>As part of replacing roof finishes, allow to remove gutter sole formwork from the south parapet and to replace in new. These timbers should be isolated from the masonry by air gaps and/or strips of DPC. The Architect should review detailing for insulation and ventilation</i>	

REFERENCE	ITEM	OBSERVATIONS	RECOMMENDATIONS	CLIENT COMMENTS
SNa1.2 ROOF 1a				
SNa1.2.1	Construction	Flat roof with west-facing small mansard pitch, dating from 1970s works Flat roof joists measured 100 x 50mm at 400mm centres Joist spanned east-west with a peculiar timber 'ladder-beam' support detail at the east Ceiling joists bore onto an eaves plate at the west wall, over which short posts supported a plate for flat roof joists	-	
SNa1.2.2	Condition	The ladder beam carrying the east side of the roof was structurally decayed at its south bearing and partially decayed at the north bearing The eaves wall plate carrying the west side of the roof was structurally decayed for 1000mm at its south end, along with 2no. ceiling joist bearings and 2no. mansard rafter feet Cold bridge condensation and resultant beetle damage affected the west side of the roof generally	<i>No chemical treatments required</i> <i>H+R suggest that it may be most efficient and sustainable to entirely replace this structure to an improved/simplified design</i> <i>It may be possible to repair the existing structure by propping the flat roof joists and entirely replacing the bearing details along the east and west sides of the roof (perhaps by new steels spanning north-south). These timbers should be isolated from the masonry by air gaps and/or strips of DPC. The Architect should review detailing for insulation and ventilation</i>	
SNa1.3 ROOF 2				
SNa1.3.1	Construction	Pyramid lantern roof over double volume space/void, dating from 2000 works There was no access to the shallow roof void (although a ceiling hatch was present)	<i>H+R can inspect further when access is available to the hatch entry, if instructed</i>	
SNa1.3.2	Condition	H+R saw no evidence to suggest that the structure was affected or vulnerable to damp/decay The roof benefited from good eaves overhangs which minimised risk of water ingress and resultant decay	<i>No chemical treatments required</i> <i>The roof was deemed suitable for retention, subject to no further water penetration and at the discretion of the Structural Engineer</i> <i>The Architect should review detailing for insulation and ventilation</i>	
SNa1.4 ROOF 2a				
SNa1.4.1	Construction	Lean-to pitched roof at north of roof 2 Rafters 100 x 50mm at 380mm centres Eaves plate 75 x 110mm Top plate 75 x 150mm	-	
SNa1.4.2	Condition	As part of works dating from ~2000, the eaves plate had been replaced at both the east and west ends. End-rafters had been locally replaced at this time also There was no decay detected and deep moisture contents were 'dry' An eaves ventilation strip was visible as the rafter void had not been fitted with insulation (works left incomplete, as found in Roofs 1 and 1a)	<i>No chemical treatments required</i> <i>The roof was deemed suitable for retention, subject to no further water penetration and at the discretion of the Structural Engineer</i> <i>The Architect should review detailing for insulation and ventilation</i>	

REFERENCE	ITEM	OBSERVATIONS	RECOMMENDATIONS	CLIENT COMMENTS
SNa1.5 ROOF 2b				
SNa1.5.1	Construction	Flat roof bounding south and west of roof 2, dating from 2000 works but possibly making use of some older steelwork Flat roof joists 125 x 50mm at 400mm centres	-	
SNa1.5.2	Condition	There was no decay detected and deep moisture contents were 'dry' There was good detailing for isolating timbers from the external masonry using air gaps The bearing of the primary steelwork (supporting the lantern aperture for roof 2) at the south elevation showed some deficiency in the supporting masonry	<i>No chemical treatments required</i> <i>The roof was deemed suitable for retention, subject to no further water penetration and at the discretion of the Structural Engineer</i> <i>The Architect should review detailing for insulation and ventilation</i> <i>Structural Engineer to review adequacy of steelwork bearings</i>	
SNa1.6 ROOF 3				
SNa1.6.1	Construction	Pitched and hipped roof with offset in ridge line, dating from early/mid Victorian period Rafters 95 x 55mm at 380mm centres Collars (modern addition/strengthening) 100 x 50mm Purlins 100 x 100mm Ceiling beams 225 x 75mm at 700mm centres Ceiling joists 100 x 50mm at 300mm centres Eaves plate 75 x 150mm Tie beams (only at west half of roof, 4no.) 190 x 80mm	-	
SNa1.6.2	Condition	There was no structurally significant decay detected and deep moisture contents were 'dry' Historic partial decay had affected the north eaves plate in a sample area, this was not deemed structurally significant Throughout the roof, there had been a history of superficial damage by common furniture beetle, arising from elevated surface moisture contents (condensation) Beetle activity had been limited to the outer 'sapwood' of individual elements but had left the 'heartwood' intact There had been a history of minor structural defects in the east half of the roof; originally there were no tie beams to restrain spread and the purlins were not braced/carried at their spans. There was some evidence of fissures in the north pitch purlin. Previous remedial collars had been installed which appeared effective in strengthening the roof. Rafters had been replaced in the south pitch The second tie beam from the west showed a lack of connection to the eaves plate at the north end	<i>No chemical treatments required</i> <i>The roof was deemed suitable for retention, subject to no further water penetration and at the discretion of the Structural Engineer</i> <i>The Architect should review detailing for insulation and ventilation</i> <i>Structural Engineer can consider reinstating the missing tie beam to eaves plate connection using steel strapping/brackets</i>	

REFERENCE	ITEM	OBSERVATIONS	RECOMMENDATIONS	CLIENT COMMENTS
SNa1.7 ROOF 3a				
SNa1.7.1	Construction	Lean-to pitched roof, construction as for roof 2a There was no access to this structure due to in-situ soffit plaster	<i>H+R can inspect further when exposure is available, if instructed</i>	
SNa1.7.2	Condition	There was no evidence of damp/decay	<i>No chemical treatments required</i> <i>The roof was deemed suitable for retention, subject to no further water penetration and at the discretion of the Structural Engineer</i>	
SNa1.8 ROOF 3b				
SNa1.8.1	Construction	Flat roof along south side of roof 3 There was no access to this structure due to in-situ soffit plaster and lead roof finishes Parts of the structure which interfaced with the void space of roof 3 indicated that this had been replaced during with 2000 works Steel beams and softwood joists was the suspected composition	<i>H+R can inspect further when exposure is available, if instructed</i>	
SNa1.8.2	Condition	At this stage, there was no evidence by way of damaged roof finishes or soffit plaster to suggest any significant damp/decay issues affecting the structure	<i>No chemical treatments required</i> <i>The roof was deemed suitable for retention, subject to no further water penetration and at the discretion of the Structural Engineer</i>	
SNa1.9 ROOF 4				
SNa1.9.1	Construction	Central flat roof with penetration for main stair lantern light Solid slab structure with battens and sheathing laid over to support a felt finish The slab was considered most likely to date from the Edwardian works with the felt and support timbers renewed during the 1970s and 2000 works 2000 era repairs: pre-treated softwood battens 120 x 50mm at 360mm centres 1970s era: softwood battens 150 x 50 at 370mm centres	-	
SNa1.9.2	Condition	Parts of the structure which interfaced with the void space of roof 6 indicated that a previous generation of felt substrate boarding had been lost to decay in the past Battens/joists supporting the sheathing had been replaced in the vicinity of the external access hatch to roof 6 There was no evidence to suggest any significant damage/decay affecting the existing substrate battens and boarding for the felt finish	<i>No chemical treatments required</i> <i>The solid slab roof and timbers laid over were deemed suitable for retention, subject to no further water penetration and at the discretion of the Structural Engineer</i> <i>It is assumed that the roof finish will be replaced, this may call for renewal and/or re-design of substrate sheathing</i>	

REFERENCE	ITEM	OBSERVATIONS	RECOMMENDATIONS	CLIENT COMMENTS
SNa1.10 ROOF 5				
SNa1.10.1	Construction	External bell frame with lead flat roof Structure fully exposed to weathering, finished in gloss paint Corner posts 100 x 100mm Rails 75 x 100mm Cross-bracing 60 x 50mm Headstock 120 x 120mm	-	
SNa1.10.2	Condition	Three out of four of the post feet had been decayed by wet rot for upto 400mm above the line of roof 3b. There was some evidence that splice repairs had been carried out in the past but had succumbed to further decay Cross-bracing had been decayed at the north, south and west sides Generally, decay had been at the most exposed south-westerly aspects. Cracks in film forming gloss paint have exacerbated wet rot decay by allowing water penetration but restricting net drying	<i>H+R recommend that the bronze bell is carefully removed and placed into secure storage as soon as possible</i> <i>Although repair of the existing structure may be possible, H+R recommend replacement of the structure in more durable materials. This could be achieved using a replacement structure in oak with the same geometry and dimensions but without a paint finish</i>	
SNa1.11 ROOF 6				
SNa1.11.1	Construction	Pitched and hipped roof, 'L' shaped in plan, dating from Edwardian works Roof boards 25 x 180mm Ridge plate 220 x 40mm Rafters 100 x 50mm at 350mm centres Collars 100 x 50mm Purlins 130 x 100mm Eaves plate Ceiling joists 125 x 50mm at 360mm centres Gutter sole joists	-	
SNa1.11.2	Condition	In at least 5no. locations, there had been previous patch repairs to gutter sole boarding carried out during the last scheme of works (2000?) when roof finishes were also refurbished In one of these areas, abutting the west chimney (H+R ref 9), a rafter span has also been replaced due to previous decay below a stepped flashing	<i>No chemical treatments required</i> <i>The roof was deemed suitable for retention, subject to no further water penetration and at the discretion of the Structural Engineer</i>	

REFERENCE	ITEM	OBSERVATIONS	RECOMMENDATIONS	CLIENT COMMENTS
SNa1.12 ROOF 7				
SNa1.12.1	Construction	Small pitched roof at east side of roof 4 Largely a Victorian structure but with post-fire replacement of the south pitch carried out during the Edwardian period Rafters 110 x 50mm at 360mm centres Ridge plate Wall plate (valley) Ceiling joists	-	
SNa1.12.2	Condition	Throughout the roof, there had been a history of superficial damage by common furniture beetle, arising from elevated surface moisture contents (condensation) There was no decay decayed below the valley gutters along the north and south sides of the roof Damaged internal finishes presented at the lower corner of the skylight penetration although this extent of water ingress did not appear to have led to decay in the structure	<i>No chemical treatments required</i> <i>The roof was deemed suitable for retention, subject to no further water penetration and at the discretion of the Structural Engineer</i> <i>The Architect should review detailing for insulation and ventilation</i>	
SNa1.13 ROOF 8				
SNa1.13.1	Construction	Small pitched and hipped roof to north of roof 7 This appeared to be a Victorian structure, originally with large apertures in both north and south pitches for a skylight/lantern penetration. However, these had been infilled with rafters and covered-over Rafters 90 x 60mm at 280mm centres Gutter sole boards and 6no. rafter spans had been replaced in recent history	-	
SNa1.13.2	Condition	Throughout the roof, there had been a history of superficial damage by common furniture beetle, arising from elevated surface moisture contents (condensation) There was no decay decayed below the valley gutters along the north and south sides of the roof, nor at the west abutment to a flat roof At the east wall abutment, partial decay was detected in a trimmer plate and rafter foot serving a chimney back-gutter detail (H+R chimney ref 17)	<i>No chemical treatments required</i> <i>The roof was deemed suitable for retention, subject to no further water penetration and at the discretion of the Structural Engineer</i> <i>Partially decayed timbers abutting the chimney should be replaced, strips of DPC should be used to isolate new timbers from the damp masonry</i> <i>The Architect should review detailing for insulation and ventilation</i>	

REFERENCE	ITEM	OBSERVATIONS	RECOMMENDATIONS	CLIENT COMMENTS
SNa1.14 ROOF 8a				
SNa1.14.1	Construction	Flat roof with octagonal lantern penetration, situated to west of roof 8 There was no access to the structure due to in situ soffit plaster and lead roof finishes	<i>H+R can inspect further when exposure is available, if instructed</i>	
SNa1.14.2	Condition	At this stage, there was no evidence by way of damaged roof finishes or soffit plaster to suggest any significant damp/decay issues affecting the structure	<i>No chemical treatments required</i> <i>The roof was deemed suitable for retention, subject to no further water penetration and at the discretion of the Structural Engineer</i>	
SNa1.15 ROOF 9				
SNa1.15.1	Construction	Pitched and hipped roof structure at north-east corner of property, dating from the Victorian period ridge plate 150 x 30mm rafters 85 x 55mm at 350mm centres (some salvaged historic timber elements incorporated) eaves plate (at north) 75 x 140mm tie beams 150 x 70mm (3no.) ceiling joists 85 x 50mm at 320mm centres Ceiling joists had been replaced at the east end of the roof	-	
SNa1.15.2	Condition	Throughout the roof, there had been a history of superficial damage by common furniture beetle, arising from elevated surface moisture contents (condensation) There was no decay decayed below the valley gutter along the south side of the roof. The west end of the roof was at very low risk of decay where it was protected from water ingress by an eaves overhang The east end of the north wall plate had been partially decayed for ~500mm due to defects in the external envelope. This plate supported the trimmer plate running across the east wall to carry ceiling joist ends which were therefore at risk of potentially crushing down. However no such movement had yet occurred at time of survey	<i>No chemical treatments required</i> <i>The roof was deemed suitable for retention, subject to no further water penetration and at the discretion of the Structural Engineer</i> <i>Partially decayed eaves plate should be repaired;</i> <i>-Cut-out 1x1m opening in ceiling finish</i> <i>-prop ceiling joist trimmer</i> <i>-cut-back decayed eaves plate to sound timber</i> <i>-install new section of eaves plate, seated onto strip of DPC and fixed with steel straps to retained eaves plate adjacent</i> <i>-provide packing and connection straps to re-support ceiling joist trimmer</i> <i>The Architect should review detailing for insulation and ventilation</i>	
SNa1.16 ROOF 10				
SNa1.16.1	Construction	Flat roof for canted bay window at ground level There was no access to the structure due to in situ soffit plaster (highly decorative) and lead roof finishes	<i>H+R can inspect further when exposure is available, if instructed</i>	
SNa1.16.2	Condition	At this stage, there was no evidence by way of damaged roof finishes or soffit plaster to suggest any significant damp/decay issues affecting the structure	<i>No chemical treatments required</i> <i>The roof was deemed suitable for retention, subject to no further water penetration and at the discretion of the Structural Engineer</i>	

REFERENCE	ITEM	OBSERVATIONS	RECOMMENDATIONS	CLIENT COMMENTS
SNa1.17 ROOF 11				
SNa1.17.1	Construction	Low level flat roof at west side of roof 6 Solid slab structure of concrete beam and block construction, suspected to date from 1970s works Underdrawn by softwood battens to support plasterboard soffit finish	-	
SNa1.17.2	Condition	Failure in the roof finish was allowing active liquid water penetration; this was freely draining out of the ceiling into the room below	<i>Urgent measures required to provide temporary protection to the roof finish (i.e. clean surface and apply waterproofing product, pending final refurbishment)</i> <i>The solid slab roof was deemed suitable for retention at the discretion of the Structural Engineer</i>	
SNa1.18 ROOF 12				
SNa1.18.1	Construction	Low level flat roof, sunken between roofs 3 and 9 Softwood flat roof joists, Victorian era, span north-south The suspended MF ceiling of the ground floor room below provides a continuous void, enclosing the underside of first floor joists, a bressummer beam carrying the first floor wall and the roof structure Mineral wool insulation was packed between joists, secured by netting There was no access for physical inspection due to in situ soffit plaster and lead roof finishes The south side of the roof was glazed, shedding water to a metal box gutter with drainage running concealed in horizontal pipework	<i>H+R can inspect further when exposure is available, if instructed</i>	
SNa1.18.2	Condition	At this stage, there was no evidence by way of damaged roof finishes or soffit plaster to suggest any significant damp/decay issues affecting the structure	<i>No chemical treatments required</i> <i>The roof was deemed suitable for retention, subject to no further water penetration and at the discretion of the Structural Engineer</i>	
SNa1.19 ROOF 13				
SNa1.19.1	Construction	Orangery flat roof with large rectangular aperture for lantern light. No access to north end of roof void Softwood timbers used for infill around lantern, primary beam supports in 'I' section steel (300mm high). Timbers dating from 2000 works, steelwork appeared Edwardian Overall void depth 300mm		
SNa1.19.2	Condition	At this stage, there was no evidence by way of damaged roof finishes or soffit plaster to suggest any significant damp/decay issues affecting the structure	<i>No chemical treatments required</i> <i>The roof was deemed suitable for retention, subject to no further water penetration and at the discretion of the Structural Engineer</i>	

Attachment B



Fig 1:

H+R roof 1; showing general view



Fig 2:

H+R roof 1; showing north eaves detail



Southleigh Park House
Photographs
January 2021
Not to scale



Fig 3:

H+R roof 1; showing general view



Fig 4:

H+R roof 1; showing beetle activity below south gutter



Fig 5:

H+R roof 1; showing wet rot and beetle activity below south gutter



Fig 6:

H+R roof 1a; showing general view



Southleigh Park House
Photographs
January 2021
Not to scale



Fig 7:

H+R roof 1a; showing decay at south-east corner

Note ladder beam support arrangement



Fig 8:

H+R roof 1a; showing decay at north-east corner

Note ladder beam support arrangement



Southleigh Park House
Photographs
January 2021
Not to scale



Fig 9:

H+R roof 1a; showing decay at south-west corner

Note ladder beam support arrangement



Fig 10:

H+R roof 2; showing general view

Access hatch noted but inaccessible



Southleigh Park House

Photographs

January 2021

Not to scale

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Fig 11:

H+R roof 2a; showing general view



Fig 12:

H+R roof 2b; showing general view



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January 2021
Not to scale



Fig 13:

H+R roof 2b; showing steel bearing detail at south wall



Fig 14:

H+R roof 3; showing east void

Note modern collars and (south pitch) rafters



Southleigh Park House
Photographs
January 2021
Not to scale



Fig 15:

H+R roof 3; showing east void

Note fissures in purlin



Fig 16:

H+R roof 3; showing typical beetle damage on timber surfaces, tending to favour sapwood which has often been lost in the past (arrow)



Southleigh Park House
Photographs
January 2021
Not to scale



Fig 17:

H+R roof 3; showing east void

Note sample area of inspection to north eaves plate found to be partially decayed



Fig 18:

H+R roof 3; showing west void



Southleigh Park House
 Photographs
 January 2021
 Not to scale



Fig 19:

H+R roof 3; showing west void

Note modern structures protruding from roof 3b



Fig 20:

H+R roof 3; showing west void

Note poor tie beam connection at north side



Southleigh Park House
Photographs
January 2021
Not to scale