Hutton + Rostron
Environmental Investigations Limited

The Pest House: Timber roof and floor structures condition investigation

Site note 3 for 27 November 2018, job no. 148.73

CONTENTS

Attachments

Distribution:

Ray Pearson – Dandara Ltd

File: 148.73

1 INTRODUCTION

1.1 AUTHORITY AND REFERENCES

Hutton + Rostron Environmental Investigations Limited carried out a site visit to The Pest House on 27 November 2018 in accordance with instructions from Ray Pearson of Dandara by email, on 25 June 2018 (08:04). Drawings provided by Dandara, ref 150.01 – 150.06 were used for the identification of structures. For the purpose of orientation in this report, the side entrance to the building was taken as facing west

1.2 AIM

The aim of this survey was to investigate timber floor and roof structures for construction and condition. Cost effective and remedial works using environmental means are recommended, as necessary

1.3 LIMITATIONS

This survey was confined to the accessible structures. The condition of concealed timbers may be deduced from the general condition and moisture content of the adjacent structure. Only demolition or exposure work can enable the condition of timber to be determined with certainty, and this destroys what it is intended to preserve. Specialist investigative techniques are therefore employed as aids to the surveyor. No such technique can be 100 per cent reliable, but their use allows deductions to be made about the most probable condition of materials at the time of examination. 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 woodwork or other 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. Any design work carried out in conjunction with this report has taken account of available pre-construction or construction phase information to assist in the management of health and safety risks. 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. No formal investigation of moisture distribution was made

2 STAFF ON SITE AND CONTACTS

2.1 H+R STAFF ON SITE

Andy Wade
Joe Lovelock
Andrew Ellis
Isobel Mar

2.2 PERSONNEL CONTACTED

Ray Pearson – Dandara Ltd

3 OBSERVATIONS AND RECOMMENDATIONS

3.1 SUMMARY OF CONSTRUCTION

3.1.1 Materials

1 Roof: The roof structure of the main building to the east was entirely of hardwood construction (Oak – *Quercus robur/petraea*) with the exception of a narrow section softwood secondary ridge board (sat above the historic oak ridge beam). The later extension to the west consisted of a softwood structure (*Pinus sylvestris*) with some salvaged oak elements. Roof space floor boards were of softwood timber in both the historic and later areas, although visual access was limited due to dust and debris, and the abandoned belongings of previous occupants

2 Floor structures and timber frame elements: The main historic section of the building was constructed using a timber frame with joists, studs, and plates of oak. The floor structure of the later extension to the west was of softwood material. Floor boards in the main historic section of the building were softwood as were the floorboards in the extension. The ground floor softwood floor boards were laid onto softwood timbers, which were in turn laid onto clinker-ash concrete slabs. Timber frames in the historic section of the building were covered wall-to-wall with a ~50mm thick cement-based render

3.1.2 Build-up

1 Roof: Pitched and hipped to the west. The roof appeared to be tiled onto battens over roofing felt. The main historic section of the building was constructed using rafters cut and fixed to a ridge beam, supported by a wall plate at the eaves with the ridge beam supported mid-span with a central post. There was then a secondary softwood ridge board forming the apex of the roof. Simple trusses formed the gable ends. The west hip was in a traditional manner with jack rafters rising to hip rafters, meeting at a ridge on the west façade of the historic part of the building

2 First-floor structure: The first-floor joists spanned east-west between tie-beams and were supported by mortise and tenon jointing. Decorative foam insulation had been installed between the joists at ceiling height leaving the painted timber structure exposed below. The first-floor west bedroom floor covering was a form of cement-based screed which had replaced the original floor boarding however historic floor boarding was still evident in the remaining first floor areas

3 Ground floor structure: The butt-jointed floor boards in the historic part of the building were laid onto wide section thin timbers which were in turn laid onto poorly bound clinker ash concrete slabs. Tongue-and-groove softwood boarding covered the floor joists in the west extension. These were laid onto a relatively recent concrete slab. Visual access to the bearing ends was not possible at the time of survey however it appeared from photography beneath the floor void that they may be embedded into the masonry walls at both the east and west ends. A small section of cast in-situ concrete floor was also noted projecting into the east bedroom from beneath the stairwell

4 Historic timber frames: The north, east, and south ground floor walls of the timber frame had been fully covered with a ~50mm thick cement-based render and false timber studding added to create the impression of a Tudor aesthetic. Removal of a portion of the particle board skirting revealed a section of wall which showed that the in-fill panels may have retained the original finish, although the material could not be identified on the day of the investigation. Further opening-up in a number of areas at skirting level revealed the oak timber sole-plate. The entire west wall, including round the fireplace, had been covered with a decorative false stonework finish which appeared to be a plaster-based product such as *Artex*, over a cement-based render.

The embedding of the timber frame behind later remedial works appeared to have been an attempt to improve the thermal efficiency of the building. The first floor and roof space in-fill panels consisted of a cement-based render, although the west internal historic gable end in the roof space still retained a wattle and daub panelled finish

5 South lean-to extension: It was understood at the time of survey that this section of the building is due for demolition and was therefore not part of the investigation

3.1.3 History

The property was understood to date from the 16th century with significant alterations having taken place in the 19th and 20th century. The core of the structure was formed from an oak timber frame construction with the joints being of traditional mortice and tenon and pegged with ~3/4inch oak pegs. It is likely that the structure began initially as just the two bays to the east, with fully gabled ends. There is no evidence to suggest that there was a smoke bay or open fire due to the lack of evidence of smoke blackened timbers in the roof structures, whilst the floor structures appeared to be of original construction. It is therefore likely that the chimney stack to the west is original to the construction, which fits with the understanding that brick chimneys became more commonplace in the UK during the Tudor period of 1485-1603. The chimney also showed significant evidence of weathering (as well as the now wattle and daubed internal west gable wall) suggesting it had been exposed to the elements for a considerable length of time. This supported the theory that the west hipped-end of the property was a much later extension and would have changed the profile of the structure significantly. Supporting this further was that the hip roof structure was predominantly comprised of softwood timber elements with what appeared to be reclaimed or salvaged oak elements also incorporated. The extension was likely to have been added in the late 19th to early 20th century

The property is recorded as Grade II listed and marked as a 'pesthouse' on a 19th century O.S map. Pesthouses (or plague houses/ fever sheds) were buildings specifically constructed for those afflicted with communicable diseases such as tuberculosis, cholera, smallpox, or typhus. Often used for forcible quarantine, many towns and cities had one or more pesthouses accompanied by a cemetery or a waste pond nearby for disposal of the dead. There are numerous examples still in existence of pesthouses within the UK, however, few are in their original condition. They were commonly constructed from funds donated by the church, benefactors or parishes are commonly of low status construction, being purely functional structures. It is therefore noteworthy that this structure has managed to retain features such as the decorative moulded stop-chamfers evident on the central carriage beam at first floor level, which would have been time consuming to craft. Additionally, one would typically expect the raw materials of a 'charitable' construction, built out of necessity for the infectiously sick, to be of low grade or poor quality, whereas this structure has survived reasonably well due to the fact there is a limited quantity of bark or sap wood on the key structural elements. The oak used throughout the building is of straight, sound condition and stable cross-sectional dimensions which has also helped to increase its durability; essentially it was a small, well-formed, and conscientiously built structure

The timber framing, now heavily concealed externally by a 20th century façade in stretcher bond red brick at ground floor level and tile-hung cladding at first floor, was of simple construction, with large dimension close stud walling, diagonal upwards bracing, and main/corner posts without jowls, but still incorporating teasel tenons into the bay division tie beams. At roof level the three trusses were formed from king posts with single alternating curved braces from tie-beam level. The king posts supported a ridge beam which in turn supported the underside of the common rafters. The single pair of purlins were formed from a plank, nailed to the underside of the common rafters to prevent lateral wracking of the roof elements and to provide support to the underside of the roof floor joists (also the first-floor ceiling joists); a simple but effective method. There appeared to

be no further provision for structural bracing to the roof elements in the form of curved or diagonal wind braces

The single west facing gable window at roof level, as well as the historic nature of the wide ship-lapped oak floor boards appeared to be original to the construction and suggested the attic space may have been originally intended as additional convalescence space. Supporting this theory was the unique construction method in dividing the first-floor level with the attic floor structure; conventionally the truss tie beams would form the ceiling height of the room below (and the roof space floor level), however, this is not the case with The Pest House where the tie beam was too low to allow for even minimal head room necessitating the introduction of an additional central spine/carriage beam above, which ran longitudinally down the centre of the structure, jointed into the king posts, and carried the attic floor joists at a raised height, allowing sufficient head room at first floor level as well as the added benefit of a usable attic space above. This made for complicated viewing at first floor level where one could see the bottom section of the trusses and the pitch of the roof cut off by the central spine beam and attic floor joists. The ground floor construction could not be fully determined due to the extent of cement-based render to the external and internal walls

At ground and first floor level all historic oak timbers had been subjected to an impermeable black paint, which can often have a detrimental effect upon the historic integrity of a structure. However, despite this, the original tooling marks could still be witnessed in the timber surfaces and provide a clue as to how these timbers were originally converted and fashioned. Rough tooling such as adze, side axe, and pit-sawn tooth marks could be identified, as well as two excellent examples of carpenter's marks on the west side of the central tie beam at first floor level. These are commonly referred to as 'datum' marks, and were scratched onto the timber surface as an aide during the prefabrication process prior to assembly on site. Datum marks often change, being unique to the carpenter who inscribes them, and these examples were formed of a single scratched line on the timber at a 90-degree angle to the underside of the tie beam, with two adjacent semi-circular parallel marks denoting the inside edge of the datum; see Fig. 22 in Attachment B. Such markings are key to helping us understand the way in which these structures were created, and as such, due effort and attention should be given to retaining as many of them as possible during refurbishment works. Special care should be taken during any sand blasting treatment of historic timbers as significant historic content may be lost or damaged irreversibly

H+R can provide additional advice on best practice of historic timber surface conservation and consolidation if required

3.2 SUMMARY OF TIMBER CONDITION

3.2.1 Timber decay

1 Roof: Decay to roof elements was historic and predominantly limited to the existing sapwood bands of the historic oak elements with the remaining heartwood sections remaining structurally sound. Rafters with decayed sapwood bands in excess of ~20 per cent of the cross section are represented on the plans at Attachment C. In one location the decay had proved to be substantial enough to cause partial failure of the common rafter bearing end onto the historic ridge beam. All vulnerable bearing ends and partially decayed timbers were micro-drilled and probed for deep moisture content and no further significant decay was detected

2 First floor: Opening-up of the wall coverings to the south-east corner revealed some decay to the joint between the mid rail and the south-east timber post. Some historic insect damage to timbers was noted but this was to the non-structural sapwood band of the timber. No further significant decay was detected during the investigation

3 Ground floor: The ground floor timbers have been much more vulnerable to damp and decay due to inadequate ventilation of the sub-floor. In general, decay had been by wet rot fungus. On the understanding that the property will be refurbished to the standard of current Building Regulations, it is anticipated that it will be impractical to retain the existing historic ground floor structure (potentially both the solid clinker-ash slabs and the floor board support timbers), this is on the basis of the lack of damp-proofing below plates, the extremely shallow sub-floor depth, and inadequate provision for ventilation

4 West extension: Decay detection drilling and detailed visual inspection to the accessible timber elements in the west extension did not reveal any decay on the day of the survey

3.2.2 Timber moisture contents

In general, timber deep moisture contents were below 12 per cent which was too dry for decay by fungus or insect to occur. However, elevated moisture contents were found locally, in areas of ongoing water penetration, and where the sub-floor and walls were poorly vented. This was allowing localised areas on ongoing decay at the time of survey, especially to the floor boards and embedded timber frame sole plate of the ground floor

3.3 SUMMARY OF RECOMMENDATIONS

1 No chemical remedial treatment is either required or recommended in relation to fungal decay organisms or wood-boring insect infestation

2 Decayed timber should be cut back to sound material and repaired or replaced as determined by the Structural Engineer, and should follow the guidelines laid out by Historic England, especially when concerned with the historic fabric of the building. New timbers should be isolated from damp or potentially damp masonry via the use of a damp-proof material or a through-ventilated airgap of at least 10mm

3 It is recommended that the repairs to the historic timbers are conducted by a carpentry/joinery firm who are familiar with large section timber heritage repairs with the priority being the maximum retention of existing historic fabric

4 Further opening-up of the timber frames is recommended which will involve the removal of the cement-based rendered in-fill panels. This will allow further assessment of the condition of the remaining timber frame, and will highlight any possible hidden damp and decay issues

5 Localised isolation and repair of timber elements is required as described in Attachment A

6 Replacement oak should be new or salvaged air-dried or kiln dried oak (Quercus robur/petraea) to match existing

7 Serious consideration should be given to lowering the floor level of the historic ground floor area to increase ventilation. This requires removal of all floor coverings and the clinker ash concrete slabs below. Timber in contact with the saturated slabs are highly vulnerable to damp and decay and the slabs are allowing free passage of water from the ground. H+R can advise further if required

4 H+R WORK ON SITE

4.1 H+R inspected all accessible structural timbers by deep drilling and probing, as necessary, so as to determine their decay state and deep moisture content

4.2 H+R opened up some relevant areas in order to inspect embedded timbers and so as to determine their damp and decay state

5 PROPOSED ACTION BY H+R

5.1 H+R will advise on repair and conservation of timber elements, so as to minimise the risk of decay after refurbishment if instructed

5.2 H+R will advise on remedial detailing, so as to minimise the risk of damp and decay problems after refurbishment if instructed

5.3 H+R will advise on conservation of original fabric with regard to damp, decay and salt damage, as necessary and if instructed

5.4 H+R will review proposed remedial details as these become available if instructed

5.5 H+R will return to site to inspect sample remedial details if instructed

5.6 H+R will liaise with conservation and historic building authorities, if instructed, so as to ensure the cost-effective conservation of original fabric

5.7 H+R will liaise with building guarantors, as necessary, so as to ensure the issuing of collateral warranties and building guarantees at practical completion, if required

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 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

THE PEST HOUSE: SITE NOTE 3 FOR 27 NOVEMBER 2018, JOB NO. 148.73 **ATTACHMENT A**

SCHEDULE OF OBSERVATIONS AND RECOMMENDATIONS

REFERENCE	ITEM	OBSERVATIONS	RECOMMENDATIONS	CLIENT COMMENTS
SN3.1 ROOF				
SN3.1.1	Structure	Historic roof: 32 no. Oak Rafters – ~80 x 110mm @ 480mm centres (variable) 1 no. Oak Ridge beam – ~130 x 130mm 3 no. Oak King post – ~180 x 120mm 3 no. Oak Post brace – ~50 x 190mm 13 no. Oak Studs – ~35 x 80mm @ 430mm centres 6 no. Oak Purlin - ~20 x 150mm West hip: ~7 no. Softwood Rafters – ~75 x 50mm @ 450mm centres ~75 no. Oak Rafters – ~75 x 100mm @ 450mm centres ~20 no. Softwood Jack rafters – ~75 x 50mm @ 450mm centres 3 no. Softwood Purlins – ~60 x 80mm 3 no. Softwood Raking struts – ~75 x 50mm 2 no. Softwood Hip rafters – ~90 x 50mm 3 no. Oak + Softwood Rafter plates – ~100 x 120mm	*The structure may be retained, at the discretion of the Structural Engineer who may wish to comment upon adequacy of the existing structure to bear the loadings envisaged upon refurbishment* *All repairs below to be designed and directed by the Structural Engineer, with provision for isolation between timber and masonry*	
SN3.1.2	Timber deflection	Current partnering remedial timbers are inappropriate and ineffective, providing little support to the deflected rafters	*Appropriate partner repairs should be conducted on the historic rafters, and should run full-length from eaves to ridge to provide adequate support*	
SN3.1.3	Timber decay	Rafter had minimal bearing support due to a loss of cross-section size from decay at the rafter head	*Chemical remedial treatment is neither recommended or required in relation to fungal decay organisms or wood-boring insect infestation*	

REFERENCE	ITEM	OBSERVATIONS	RECOMMENDATIONS	CLIENT COMMENTS
			Decayed timber should be cut back to sound material and partner repaired or replaced in conjunction with advice from the Structural Engineer, who may wish to comment on the existing adequacy of the structure	
SN3.1.4	Failed partnering	2nd generation/salvaged oak rafter had failed and remedial repairs were ineffective	*Appropriate partner repairs should be conducted on the historic rafter*	
SN3.1.5	Failed timber elements	Structural failure to the 2nd generation/salvaged oak plates and jack rafter	*The plates and jack rafter should be sympathetically repaired or replaced as determined by the Structural Engineer, using appropriate materials*	
SN3.2 FIRST FLOOR				
SN3.2.1	Structure	~25 no. Oak Joists – ~100 x 110mm @ 500mm centres 3 no. Oak Tie beam – ~200 x 200mm 3 no. Oak Central posts – ~170 x 170mm ~8 no. Oak Braces – ~50 x 210mm 2 no. Oak Spine beams – ~190 x 200mm 4 no. Oak Rafter plates – ~180 x 160mm 6 no. Oak Main posts – ~200 x 200mm 6 no. Oak Purlins - ~20 x 150mm	*Structure can be retained at the discretion of the Structural Engineer notwithstanding the repairs to the structure outlined below. The Structural Engineer may also wish to comment on the load-bearing adequacy of the existing structure* *All repairs below to be designed and directed by the Structural Engineer, with provision for isolation between timber and masonry*	
SN3.2.2	Minimal bearing	Central carriage beam had minimal bearing at the east and west ends. The mortise and tenon joint appeared to have spread apart, and there was no evidence of a peg to retain the joint	*At the discretion of the Structural Engineer, provisionally allow for additional structural support to be afforded to the carriage/spine beam in these areas with the introduction of steel straps or supplementary traditional oak supports*	
SN3.2.3	Timber decay	Opening-up of the timber frame floor-supporting mid rail revealed some decay to the joint between the plate and the south-east corner post	*Chemical remedial treatment is neither recommended or required in relation to fungal decay organisms or wood-boring*	

REFERENCE	ITEM	OBSERVATIONS	RECOMMENDATIONS	CLIENT COMMENTS
			insect infestation *Decayed timber should be cut back to sound material and repaired sympathetically using appropriate materials as instructed by the Structural Engineer/Architect*	
SN3.3 GROUND FLOOR				
SN3.3.1	Structure	Historic area (Lounge and bedroom 2): ~8 no. Oak Sole plates - ~200 x 200mm ? no. Mid rails - ~200 x 200mm Floorboards - ~150 x 28mm (butt-jointed) Sub-floor board supports - ~150 x 25mm West extension: Joists - ~200 x 47mm @ 400mm centres Floorboards - ~135 x 18mm (tongued and grooved)	*Historic area:* *All remaining timber elements of the floor not decayed already remain highly vulnerable and should be removed. The clinker-ash concrete slabs below are saturated and allowing free passage of moisture to the timbers which, combined with little to no ventilation, is providing ideal conditions for damp and decay organisms to thrive* *Serious consideration should be given to lowering the floor level in this area and increasing ventilation. H+R can advise further if required* *West extension:* *Structure can be retained as part of the refurbishment at the discretion of the Structural Engineer, who may wish to comment on the adequacy of the structure for its intended future purpose. Further investigation is recommended however to determine the nature of the support at the bearing ends of the joists* *All repairs below to be designed and directed by the Structural Engineer, with provision for*	

REFERENCE	ITEM	OBSERVATIONS	RECOMMENDATIONS	CLIENT COMMENTS
			isolation between timber and masonry	
SN3.3.2	Timber decay	Sole plate of embedded timber frame showing decayed sections along its length	*Chemical remedial treatment is neither recommended or required in relation to fungal decay organisms or wood-boring insect infestation* *Decayed timber should be cut back to sound material and repaired sympathetically using appropriate materials as instructed by the Structural Engineer/Architect*	
SN3.3.3	Timber decay	Floorboards significantly decayed along with the thin timber supports below and resting on the clinker-ash slabs	*Chemical remedial treatment is neither recommended or required in relation to fungal decay organisms or wood-boring insect infestation* *A complete re-design of the floor structure is recommended. See recommendations in SN3.3.1 above*	
SN3.3.4	Timber decay	Sole plate of embedded timber frame decayed where in contact with the concrete slab	*Chemical remedial treatment is neither recommended or required in relation to fungal decay organisms or wood-boring insect infestation* *Decayed timber in contact with the concrete slab should be cut back to sound material and repaired using appropriate materials as instructed by the Structural Engineer/Architect. Consideration should be given to isolating the timber from the concrete slab via the use of a through-ventilated air gap of at least 10mm, or a damp-proof material*	

REFERENCE	ITEM	OBSERVATIONS	RECOMMENDATIONS	CLIENT COMMENTS
SN3.3.5	Historic insect attack	Timber sole plate showed signs consistent with insect infestation from Death Watch Beetle (*Xestobium rufovillosum*), but this was considered to be inactive. Timber in this location was also saturated in localised spots with moisture content above 25 per cent	*Chemical remedial treatment is neither recommended or required in relation to fungal decay organisms or wood-boring insect infestation* *Decayed timber should be cut back to sound material and repaired using appropriate materials as instructed by the Structural Engineer/Architect*	

Attachment B

Fig 1:

Pest house; showing external view of hipped west end. The east end was of fully gabled construction

Fig 2:

Roof, west hipped end; showing the roof structure in this area is predominantly of softwood roof elements. Note the failed rafter plate in the south-west area

The Pest House
Photographs
27 November 2018
Not to scale

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Fig 3:

Roof, west hipped end; showing roof structure in this area is predominantly of softwood and of markedly different construction to the oak roof to the west of the chimney stack. Note the raking

Fig 4:

Roof, west hipped end; showing likely salvaged oak elements being reused in a predominantly softwood roof. Now substantially decayed and often coupled with newer addition softwood timbers

— F1

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Fig 5:

Roof, west hipped end; showing likely salvaged oak elements being reused in a predominantly softwood roof. Now substantially decayed and often coupled with newer addition insubstantial softwood timbers

Fig 6:

Roof, west hipped end; showing 3no. Historic ceiling build-ups creating two separate floor voids. Each of approximately ~600mm. Access to these areas was limited at the time of investigation

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Not to scale

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Fig 7:

Roof, west hipped end; showing what appeared to be an asbestos type material used for the middle ceiling build-up

Fig 8:

Roof, west hipped end; showing brick structure chimney stack. Likely original to the buildings construction. Note the heavily weathered appearance of the brickwork suggesting this masonry structure was once exposed to the elements and that the hipped roof was a much later addition

— F1

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Fig 9:

Roof, west hipped end; showing significant failure to chimney flashing detail. Moisture is being allowed to penetrate at this juncture creating the conditions for damp and decay to the timber elements below

Fig 10:

Roof, west hipped end; showing north-west joint between the historic oak rafter plate and the later addition softwood hipped roof rafter plate. This joint was judged to be structurally innadequate

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Fig 11:

Roof, west historic oak pitched roof; showing substantial decay to the sapwood band of the common rafter to the north of the central king post. However remaining heartwood was sound and deep moisture contents were below 8 per cent which is too low for decay to occur

Fig 12:

Roof, west historic oak pitched roof; showing substantial decay to the sapwood band of a north pitch common rafter. Note also the historic peg is now visible and has failed. However remaining heartwood was sound and deep moisture contents were below 8 per cent which is too low for decay to occur

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Fig 13:

Roof, west historic oak pitched roof; showing east gable end structure with single window and single brace. No significant decay detected during investigatory works. Deep moisture contents were below 8 per cent which is too low for decay to occur

Fig 14:

Roof, west historic oak pitched roof; showing typical common rafter with minimal sapwood band and of good quality grade timber

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Fig 15:

Roof, west historic oak pitched roof; showing common rafter with sapwood band now decayed as a result of historic insect infestation and moisture penetration. However remaining heartwood was sound and deep moisture contents were below 8 per cent which is too low for decay to occur

Fig 16:

Roof, west historic oak pitched roof; showing common rafter with knotted and distorted grain. Note that all sapwood had been subject to historic decay from insect infestation and moisture penetration. However remaining heartwood was sound and deep moisture contents were below 8 per cent which is too low for decay to occur

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Fig 17:

Roof, west historic oak pitched roof; showing south-west area featuring 5 no. heavily deflected historic rafters now coupled with remedial softwood timbers for additional support. These softwood remedial timbers may not be suitable for retention during refurbishment works

Fig 18:

First floor, central room looking west; showing exposed roof truss, including tie-beam, king post, bracing and studs as seen from floor below. Note unconventionally the central floor spine beam is fixed into the king posts rather than the tie beam, thus creating head room for the first floor level. However this joint appeared to have minimal structural bearing. No decay detected upon deep drilling and moisture probing

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Fig 19:

First floor, east room looking east; showing exposed roof truss elements, including tie-beam and bracing as seen from floor below. Note the visible purlin was found to be of plank construction at ~20x150mm which was nailed to the underside of every common rafter and supported the floor/ceiling joists above

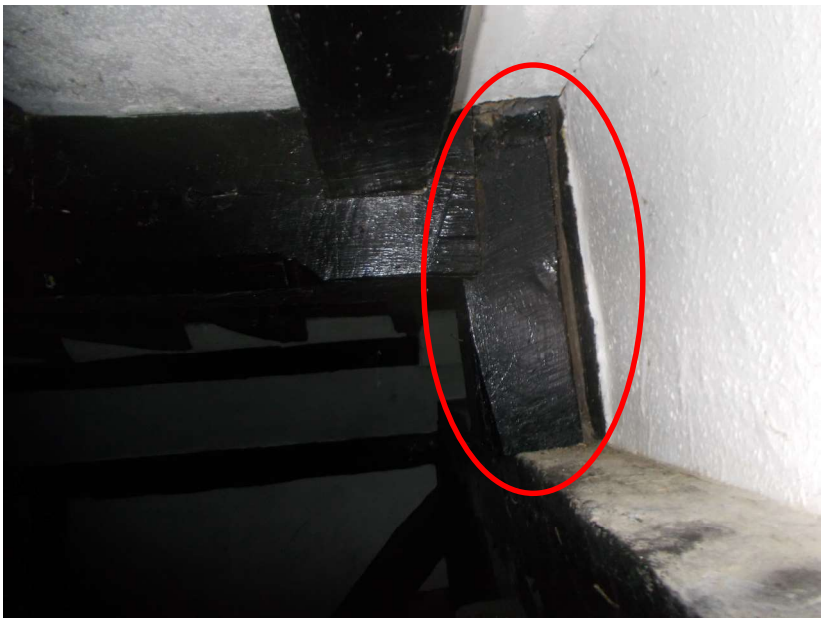

Fig 20:

First floor, central room, west end of central carriage beam; showing beam with minimal bearing onto a relatively small section upright. This joint may not be suitable for during refurbishment works or future occupancy. Structural Engineer to comment

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Fig 21:

First floor, central room, east end of central carriage beam; showing beam with minimal bearing into base of truss king post with no evidence for a pegged tenon. This joint may not be suitable for during refurbishment works or future occupancy. Also note the missing floor/ceiling joist, sawn off at its tenon location. Structural Engineer to comment

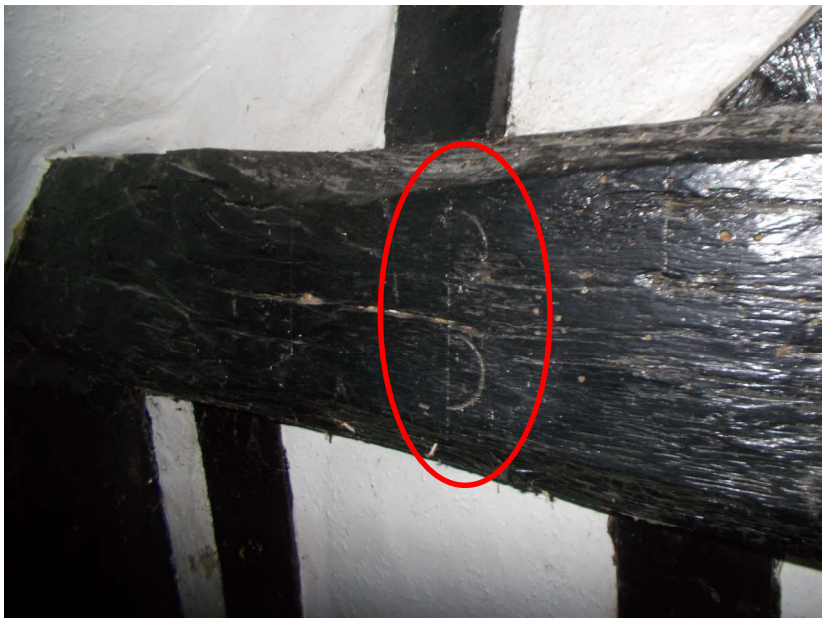

Fig 22:

First floor, central tie beam, showing historic carpenters marks on to primary face of the timber. These scratched markings were an aid to the methods of construction and suitable effort should be made for historically significant markings such as these to be retained during refurbishment

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Fig 23:

Bedroom 2; showing the south-west corner of the room and the severely decayed section of floor boarding. The floor boards were supported by timber supports, equal in size to the floor boards, resting on the slabs below. There was no evidence of any damp-proof material being incorporated into the arrangement

Fig 24:

Bedroom 2; showing the clinker ash concrete slabs below the floor in the south-west corner. Penetrating dampness from the ground below had caused the clinker ash concrete slabs to weaken and were disintegrating in localised areas

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Fig 25:

Bedroom 2; showing the cement-based repairs to the timber frame sole plate. Historic decay has reduced the cross-section size of the sole plate by at least 50 per cent, and timber moisture contents were high enough for further decay to occur on the day of the survey

Fig 26:

Bedroom 2; showing the localised disintegration of the clinker ash slabs due to excessive penetrating damp from the ground below

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Fig 27:

Bedroom 2; showing the south-west corner and the structurally significant decay to the timber frame sole plate

Fig 28:

Bedroom 2; showing the decay and cement-based repairs to the timber sole plate

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