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64 Lincolns Inn Fields, London

Structural Assessment Report

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1.0 INTRODUCTION

1.1 Conisbee was appointed by our client, James Taylor Homes Lincolns Inn Ltd, in May 2020 to provide structural engineering services as part of a revised planning application to construct an extra storey at 64 Lincoln's Inn Fields, an early 19th century Grade II listed four storey town house located on the west side of the square.

1.2 The additional storey will accommodate a two bedroom residential apartment replacing the current roof construction. The new storey will be enclosed by a mansard roof with dormer windows at the front and rear elevations and will incorporate the reconfigured existing roof structure relocated from below, plus a small central flat roof to accommodate plant. A new internal staircase will also be provided and the existing lift shaft will be extended above third floor level. Both the new and existing structure will be supported on the existing internal and external loadbearing brickwork walls supplemented with loadbearing blockwork walls built off the existing stairwell and lift shaft.

1.3 We have undertaken a detailed inspection and assessment of the existing roof and wall construction to provide a greater understanding of the building's historic development, condition and integrity in order to accurately and appropriately inform our conclusions and recommendations taking full account of its historical significance. Throughout this process we have liaised closely with Nash Baker Architects and The Heritage Practice.

1.4 Whilst our investigation and assessment has been taken far enough to satisfy the requirements of our brief it has, of necessity, not been exhaustive. Our input is limited to the roof extension and excludes any other parts of the property where alterations are proposed. We were not able or required to inspect all parts of the roof or walls nor did we inspect parts beyond our remit, consequently we are unable to report that any such parts are free from defects.

1.5 This report is intended for the use of James Taylor Homes Lincolns Inn Ltd and no liability can be accepted for its use by any third party.

2.0 EXISTING PROPERTY: LOCATION, CONSTRUCTION & CONTEXT

2.1 64 Lincoln's Inn Fields is a Grade II listed town house consisting of four storeys plus basement. It is located on the west side of the square within the Bloomsbury Conservation Area in the London Borough of Camden. Plan, section and elevation drawings of the existing property prepared by Nash Baker Architects are provided in Appendix A.

Photograph 1: Front elevation of No. 64 in context with adjacent buildings

Photograph 2: Front elevation of No.64

2.2 The Historic England listing describes the property as dating from the early 19th century, however there is evidence of at least one earlier structure on the site which has been incorporated wholly or partially into the current building. Detailed descriptions of the property and its historic development can be found in the recent reports prepared by Nash Baker Architects and The Heritage Practice and will not be repeated here. This report focusses on relevant information regarding the genesis of the structure within the upper parts of the property, including the walls and roof.

2.3 From a general structural perspective the property is of traditional construction typical of its era, comprising timber joist floors bearing on loadbearing brickwork perimeter walls and both brickwork and timber stud internal walls, some of the latter possibly containing brickwork infill.

2.4 The roof has six distinct parts: a full width duo-pitched roof at the front of the property, two independent central half hipped roofs abutting the north and south party walls respectively, a central flat roofed area housing the lift overrun, a small hipped roof at the rear and a small flat roof also at the rear. Other than the lift overrun roof which is formed of woodwool slabs finished with asphalt, and the small flat roof at the rear which is finished with a modern membrane, all of the pitched roofs are of traditional cut timber construction finished with slates. Each of them has undergone substantial historical development comprising their deconstruction, modification and reassembly, the evidence of which will be presented and discussed in the following sections of this report.

3.0 DEVELOPMENT PROPOSALS

3.1 It is proposed to construct an extra storey at 64 Lincoln's Inn Fields to accommodate a two bedroom residential apartment, thereby forming a new fourth floor level. The architectural proposals prepared by Nash Baker Architects are provided for information and reference in Appendix B.

3.2 Creation of the extra storey will involve reuse of the current roof construction with a mansard roof with dormer windows at the front and rear elevations and will incorporate the reconfigured existing roof structure relocated from below, plus a small central flat roof to accommodate plant. A new internal staircase will also be provided and the existing lift shaft will be extended above third floor level. Both the new and existing structure will be supported on the existing internal and external loadbearing brickwork walls supplemented with loadbearing blockwork walls built off the existing stairwell and lift shaft.

3.3 Full details of the proposals can be found within the Design & Access Statement prepared by Nash Baker Architects.

4.0 PREVIOUS INVESTIGATIONS & ASSESSMENTS BY OTHERS

4.1 In November 2013 a Heritage Impact Assessment was prepared by Purcell to inform proposals to develop the building into a series of nine flats, and in 2014 planning permission was subsequently granted and the proposed works undertaken. Purcell's report makes only passing reference to the roof, which is not understood to have been altered as part of these works, noting that it is a mixture of different ages of modern timber as indicated by various tool markings. It appears that inspections were limited to the easily accessible northernmost half hipped roof and the flat roof above the lift overrun.

4.2 In 2015 a Design & Access Statement was assembled by James Taylor Homes (Lincolns Inn) Ltd to support an application for planning and Listed Building Consent for a proposed roof extension, involving the demolition of the existing roof and construction of an additional storey at roof level to create a two bed apartment.

4.3 The report indicates that the northernmost half hipped roof, the flat roofed area above the lift overrun and the full width duo-pitched roof at the front of the property were inspected internally, and further detail is provided about the roof than in Purcell's 2013 Heritage Impact Assessment.

4.4 Reference is made to roof alterations undertaken during the 1970s and to surveys completed by Montagu Evans confirming that the roof has been subject to a number of other alterations which have diminished its significance and contribution to special architectural and historic interest. It is stated that the roof timbers vary in age from reused historic (C19th) timbers to modern (late C20th) timbers, that the greater proportion of the existing roof fabric is not original, and that many remaining historic timbers have been moved from their original position. Consequently it was felt that the whole arrangement does not present a completed or original composition.

4.5 The report also notes angled scarring on the southern party wall indicative of an earlier lower roof profile. This reveals that the current roof pitch had previously been raised in height, an alteration which was conjecturally supposed to have occurred during the 1970s at the same time the lift overrun was added.

4.6 The report considers that only the form of the front section has historic value, and consequently replacement of the roof was considered to be acceptable.

5.0 CURRENT INVESTIGATION & ASSESSMENT

5.1 Initial assessment

5.1.1 Following an unsuccessful attempt to obtain planning and Listed Building Consent for the proposed roof extension in 2015, Conisbee was asked by James Taylor Homes Lincolns Inn Ltd in October 2019 to review their Heritage Impact Assessment together with the Planning Inspectorate's appeal decision letter and provide comment as appropriate.

5.1.2 In our response provided in November 2019 we made three main observations:

- The primary objection of The Planning Inspectorate related to the visual impact of the proposed additional storey; its impact on the loss of historic fabric was apparently considered to be of less concern.
- No reference was made in any of the documents assembled by James Taylor Homes Lincolns Inn Ltd and Purcell to the potential re-use of historic structure within the new storey. We feel that such a proposal might otherwise be adopted to assuage some of the concerns expressed by The Planning Inspectorate regarding the potential loss of historic fabric.
- No reference was made in The Planning Inspectorate's response to the detailed assessment of the roof contained in the Design & Access Statement prepared by James Taylor Homes Lincolns Inn Ltd. This was apparently an oversight which, if resolved, might address some or all of the objections raised.

5.2 Structural inspection

5.2.1 Conisbee was subsequently appointed by James Taylor Homes Lincolns Inn Ltd in May 2020 to provide structural engineering services for a revised planning application to construct the extra storey, involving detailed visual and intrusive inspections aimed at supplementing, ordering and contextualising the information previously acquired by others.

5.2.2 Kevin Clark of Conisbee visited the property on 27th May 2020 and again on 24th June 2020 to inspect relevant internal and external areas of the property where safely and feasibly accessible. The weather was dry, warm and bright at the time of each inspection.

5.2.3 External inspection was carried out from both ground level and roof level, and internal access was available to all floors including the third floor apartment, Flat 9, which covers the entire building footprint. Physical access was initially available to only one of the roof spaces, shaded green in drawing SSK010 provided in Appendix C.

5.2.4 Consequently we advised that several small areas of the ceiling in Flat 9 should be opened up, as shown in drawings SSK010 and SSK011 in Appendix C, to permit a visual inspection of almost all of the roof voids and a better understanding of the roof structure. Although internal inspection by this means was relatively limited it nevertheless allowed useful information to be obtained regarding the roof construction and its historic development.

5.2.5 Fibrous insulation was located between the joists across the entire rear face of most of the ceilings which obscured some parts of the structure, however temporary local removal of insulation was undertaken in selected representative areas to allow targeted inspection and assessment to be made.

5.2.6 The roof comprises six main parts as shown in drawing SSK011 in Appendix C:

- a full width duo-pitched roof at the front of the property (Roof 1)
- a flat roofed area housing the lift overrun (Roof 2)
- a half hipped roof abutting the north party wall (Roof 3)
- a half hipped roof abutting the south party wall (Roof 4)
- a small hipped roof at the rear adjacent to the north party wall (Roof 5)
- a small flat roof at the rear adjacent to the south party wall (Roof 6)

5.2.7 The existing roof structure arrangement is illustrated in our plan and section drawings SSK100, SSK101, SSK200, SSK201 and SSK202 provided in Appendix C.

5.2.8 Each of the pitched roofs (Roofs 1, 3, 4 & 5) are traditionally finished with natural slates and lead flashings supported on timber battens on timber sarking boards. There are some cracked, slipped and otherwise defective slates and leadwork but these are relatively minor, so the existing slates, battens and sarking boards can and should be reused where possible. The flat roof above the lift overrun (Roof 2) is finished with asphalt laid on woodwool slabs spanning between the supporting blockwork walls of the lift shaft, while the flat roof by the south party wall (Roof 6) is finished with a continuous waterproof membrane (see photographs 3 to 6).

5.2.9 All of the pitched roofs are of cut timber construction, comprising common rafters tied to the ceiling structure at their feet in a traditional arrangement typical of that found in relatively small span pitched roofs constructed throughout the 19th century.

Photograph 3: Roof 1 view north

Photograph 4: Roofs 2 & 3 view north

Photograph 5: Roof 4 view south west

Photograph 6: Roof 5 view north west

5.2.10 The rafters of Roof 1 meet at a ridge beam, and the large primary beams at ceiling level are supplemented by hangers and straining beams forming rudimentary queen post trusses (photographs 7 & 8). Approximately two thirds of the roof structure dates from the C19th, the remainder at the south end of the front pitch comprising C20th rafters presumably installed during the 1970s when other alterations were undertaken (see 5.2.10 below). The ceiling structure is formed entirely from C20th joists supported on the primary beams which are mostly C19th in origin, and the ceiling itself has been subjected to previous alterations resulting in the replacement of all original lath and lime/sand plasterwork with a modern C20th suspended ceiling on a proprietary framing system.

5.2.11 The southern half of the parapet to the front elevation has been partially rebuilt in modern brickwork, corresponding to the modern rafters at the front roof pitch (photograph 9). These interventions may relate to the position of a chimney stack and breast in this area which were removed during the 1970s roof alterations.

5.2.12 A large C19th chimney stack is located halfway along the south party wall which intervenes into Roof 1 (photograph 10). The roof structure is built around the stack where it passes through the roof void suggesting that the roof structure in this area post-dates the stack.

5.2.13 Roof 2 was built in the 1970s to accommodate the lift overrun (photographs 11 & 12) and would have originally comprised common rafters in a corresponding arrangement to that remaining at the rear pitch of Roof 3. There is some evidence to suggest that prior to these alterations collar ties or straining beams were present in a similar arrangement to that seen in Roof 1.

5.2.14 Most of the structure in Roof 3 dates from the C19th with the remainder comprising late C20th additions including the ceiling joists supported on C19th primary beams (photographs 13 to 16). However the larger primary beams located longitudinally beneath the valleys and which support the feet of common rafters in Roofs 3, 4 and 5 are of Oak and are of an earlier date, possibly late C18th. Some of these beams are provided with wrought iron straps at their interconnections to tie the beams together to prevent disengagement of their joints due to natural shrinkage and the lateral thrust applied at the rafter feet, thereby improving overall restraint and robustness. Such straps may have been installed in these locations by a diligent builder to strengthen and integrate reused older timbers or as a remedial measure to consolidate dislocated mortice and tenon joints.

5.2.15 Owing to the direct physical access to the structure which is possible in Roof 3 close up inspection of the surface of individual timbers and their connections was undertaken with a low angled light, revealing evidence of the sawing and cutting processes used to convert them from the parent tree (photographs 17 & 18).

Photograph 7: Roof 1 view south

Photograph 8: Roof 1 view south

Photograph 9: Roof 1 view east

Photograph 10: Roof 1 view south west

Photograph 11: Roof 2 view north

Photograph 12: Roof 2 view north

Photograph 13: Roof 3 view north

Photograph 14: Roof 3 view north west

Photograph 15: Roof 3 view west

Photograph 16: Roof 3 view south east

5.2.16 This inspection revealed that the common rafters are a mixture of machine sawn early- to mid-C19th timbers (displaying distinctive regularly spaced straight or curved lines characteristic of bandsawn or circular sawn timber) and hand worked timbers from the late C18th or possibly earlier (displaying randomly distributed axe or adze marks).

5.2.17 The timbers in Roof 3 and in the remaining roofs inspected are predominantly (approximately 90%) machine sawn C19th material. The as found position of the late C18th rafters reveals little about the previous form of the roof but their inclusion together with many more rafters of a much later date suggests they derive from re-used cut down elements from a previous roof or floor configuration within No. 64, or possibly from another building altogether.

5.2.18 The larger timbers also possess carpenters' assembly marks in Roman numeral format (photograph 20) which were most commonly used before the mid-C19th. The primary beams also contain several unused mortices in a configuration suggestive of reuse (photograph 19), either from one of the previous roof configurations or possibly from elsewhere off site.

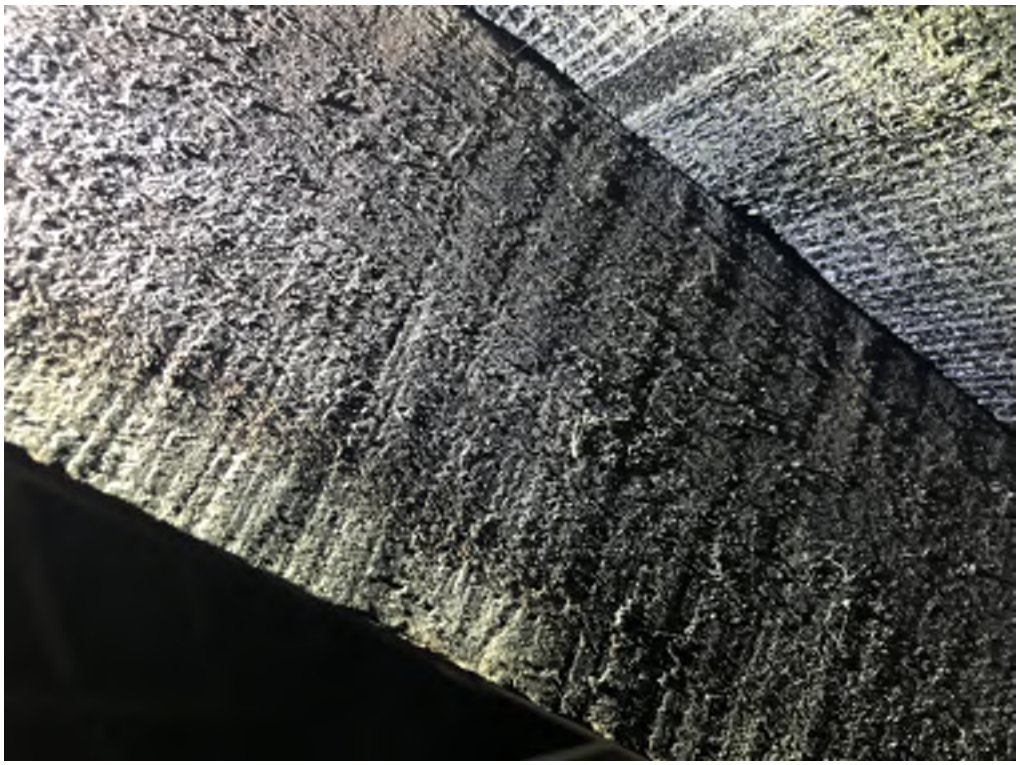
5.2.19 Close inspection also revealed that some of the larger timbers are inscribed with shipping marks (photographs 21 & 22), and reference to recent research indicates that these marks confirm that the timbers were sourced from eastern Europe and exported to London via the port of Danzig (now Gdańsk) as part of the Baltic pine trade that began in the 1820s and boomed in the 1850s The marks are corroborated by confirmation of the species as pine.

5.2.20 The ceiling below Roof 3 has been subjected to previous alterations resulting in the replacement of all of the original lath and lime/sand plasterwork with a modern C20th suspended ceiling on a proprietary framing system.

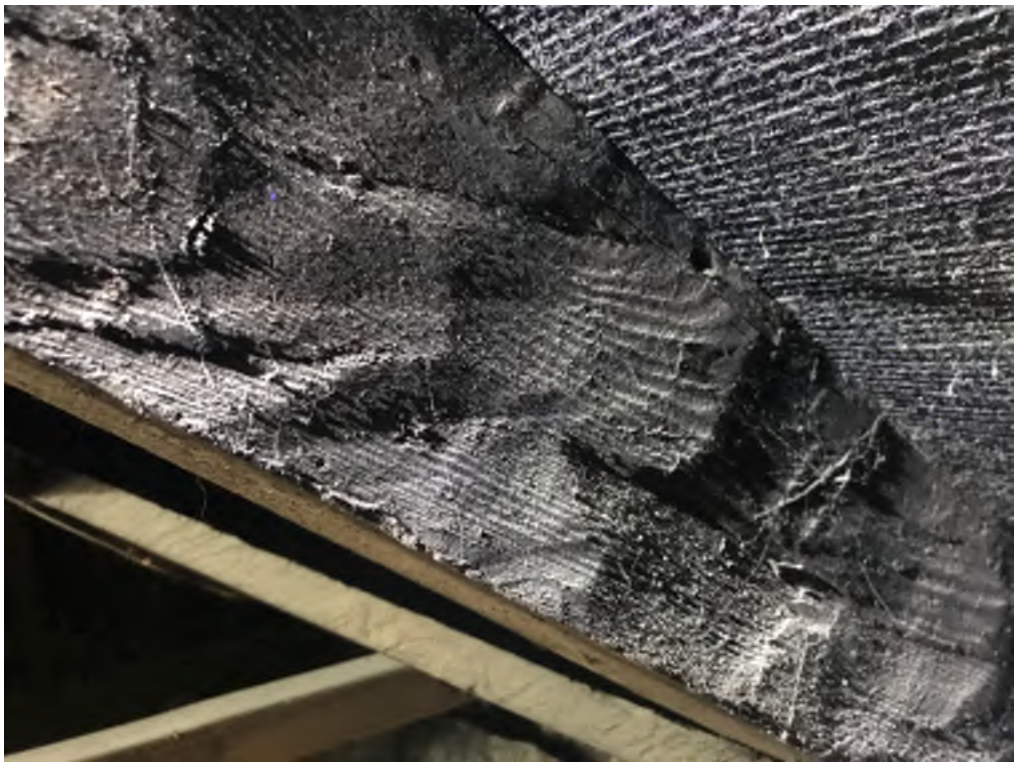
5.2.21 Direct access to Roof 4 was not possible but inspection via Roof 3 indicates that it likely represents the structural arrangement of Roof 3 prior to its alteration in the 1970s.

5.2.22 The construction of Roof 5 is similar to Roof 4, comprising C19th rafters and C20th ceiling joists supported on C19th primary beams (photographs 23 & 24). The ceiling below Roof 5 has been subjected to previous alterations resulting in the replacement of all of the original lath and lime/sand plasterwork with a modern C20th suspended ceiling on a proprietary framing system.

5.2.23 Roof 6 was inaccessible so the arrangement of its structure, age and condition is somewhat conjectural, however it may be reasonably assumed to be formed from modern C20th timber joists bearing directly onto the external brickwork walls.



Photograph 17: Roof 3 rafter detail showing machine formed cutting marks



Photograph 18: Roof 3 rafter detail showing hand formed cutting marks

Photograph 19: Roof 3 rafter detail showing reused common rafter

Photograph 20: Roof 3 primary beam detail showing carpenters' assembly mark

Photograph 21: Roof 3 primary beam detail showing shipping marks

Photograph 22: Roof 3 primary beam detail showing shipping marks

Photograph 23: Roof 5 view north

Photograph 24: Roof 5 view west

Photograph 25: North party wall showing sequential construction

Photograph 26: Roof 1 south party wall showing previous duo-pitched roof profile

Photograph 27: Roof 1 north party wall with no evidence of previous roof profile

Photograph 28: Roof 3 north party wall showing previous duo-pitched roof profile

5.2.24 The brickwork party walls display evidence of previous alterations and additions (photograph 25). Both of the chimney stacks at the north party wall appear to have been extended vertically at some stage in their life, most likely in the late C19th to accommodate major alterations to the previous roof structure. The wall between these two stacks has also been remodelled and is an infill of much later date.

5.2.25 The remainder of the north party wall east and west of the chimney stacks merely abuts the stacks rather than being fully bonded into them, possibly suggesting that the entirety of these walls were constructed at some later date to facilitate construction of the current, or a previous, roof arrangement.

5.2.26 Within the voids of Roofs 1 and 3 there is direct and indirect evidence of at least two previous roof configurations, one still visible lying slightly lower than the existing roof profile, and another now hidden lying below the level of the current third floor ceiling.

5.2.27 There is a clear visible profile of a previous duo-pitched roof on the south and north party walls in Roofs 1 and 3 respectively (photographs 26 and 28). Curiously there is no corresponding roof profile on the opposing north party wall in Roof 1 (photograph 27) which suggests that this wall has been subsequently reconstructed, thereby removing any evidence of the previous roof profile in this area.

5.2.28 Measurements indicate that the previous front and rear roof ridge heights and pitches were very similar, if not the same, each being located approximately 1.4m above the current third floor ceiling level. Roofs of this period were commonly pitched very shallow and in this case may have been clad in sheet lead rather than slates, however no direct evidence of the historic cladding was found.

5.2.29 Significantly the brickwork surfaces both above and below the historic roof profile are heavily stained and darkened by sooty polluted air, indicating that the area was once was exposed to the atmosphere for a considerable period of time. This is strong evidence that the current third storey and its roof is not original, being constructed as an addition at some stage during the C19th, perhaps in place an earlier lower mansard springing from somewhere near the level of the current third floor level.

5.2.30 This evidence implies that at least one other earlier roof was once present below the level of the current third floor ceiling, any remaining evidence of which has now either been lost or instead may still remain hidden behind the current wall finishes.

6.0 DISCUSSION & RECOMMENDATIONS

6.1 Detailed inspections suggest that the upper storey of the existing building, including each roof, has undergone much structural alteration in the course of its history, involving deconstruction, relocation, modification and reassembly in two or more historic phases. Some of the alterations to the roof structure are relatively recent.

6.2 The current roof structure is a combination of pine from several periods: easily discernible C20th timbers, majority C19th timbers and several pre-C19th timbers, and there is direct and indirect evidence of at least two previous roof configurations, one slightly lower than the existing roof profile and another below the level of the current third floor ceiling.

6.3 This evidence strongly suggests that the current third storey is a later addition, perhaps in place of an earlier mansard capped with a duo-pitched roof profile similar to that contained in the present development proposals.

6.3.1 Owing to the periodic alteration of the upper part of the building coupled with the incorporation of earlier structural elements it is difficult to offer a definitive construction date, but in simple terms it could be stated that the vast majority of the fabric to be removed, reconfigured and reconstructed was built in the early- to mid-19th century.

6.3.2 The majority of the timbers in each roof, where visible, are generally of good quality with few splits or shakes. Localised water staining is visible in some areas however there is no evidence of significant water-related decay, infestation or other damage, nor is there evidence of excessive deflection or distortion.

6.3.3 Given the significant of previous alterations we feel that it would be appropriate to carefully dismantle and rebuild the roof structure in a form closely following the existing.

6.4 Preliminary structural proposals

6.4.1 Our preliminary structural proposals are illustrated in drawings SSK111, SSK112 and SSK210 provided in Appendix C. We have carefully developed our structural proposals to retain in situ the vast majority of the historic structure at third floor ceiling level (i.e. proposed fourth floor level) and roof level including all of the 19th century timbers and the handful of late-18th century timbers still present. The majority of the existing slates, battens and sarking boards should be reused where possible.

6.4.2 To address concerns previously expressed we recommend the re-use of sound historic fabric within the new storey where practically possible. Salvageable elements in good condition (brick, timber and wrought iron straps) may potentially be incorporated into other parts of the new structure in a practical, economic and sustainable way. Virtually all of the existing fabric is capable of reuse, however we advise that a suitable allowance should be made for a percentage of the existing materials, say 5%, being so defective as to be beyond practical repair and therefore unsuitable for reuse.

6.4.3 The best possible conservation practice should be applied to ensure maximum retention of historic fabric, entailing the recording of the remaining original elements in situ before their careful removal, storage and reconstruction in the proposed configuration.

6.4.4 Pending due consideration from all parties, and the provision of all necessary permissions, a suitably qualified asbestos consultant should be appointed to undertake a Refurbishment and Demolition asbestos survey to identify and control the presence and nature of any asbestos containing materials within the building.

6.4.5 The proposed de-construction sequence is set out below in outline:

Step 1 Clearly and uniquely identify, tag and record location of all timbers in a manner suitable to allow their identification and reconstruction.

Step 2 Install all additional temporary works necessary to protect and stabilise the existing structure during its deconstruction.

Step 3 Sequentially deconstruct the roofs and carefully set aside in a protected enclosure.

Step 4 Sequentially deconstruct selected internal walls and posts and carefully set aside in a protected enclosure.

Step 5 Inspect all timber members, dispense with those which cannot be re-used and clean, treat & repair those that can.

6.4.6 Any defective or compromised structural elements or joints would be addressed and repaired during this process in an appropriate manner using traditional compatible techniques to maximise the retention of historic fabric.

6.4.7 The new roof structure will mostly comprise re-used existing elements but will incorporate new rafters to form the lower parts of the mansard. New steel beams spanning between the brickwork party walls and new internal will assist in supporting the relocated roof structure plus a small central area of reinforced concrete composite slab to accommodate plant.

6.4.8 The proposed re-construction sequence is described below:

Step 1 Strengthen in situ the existing floor structure where necessary.

Step 2 Construct new timber stud internal walls and steel beams, securing them to the party walls as construction proceeds.

Step 3 Erect new mansard rafters and reinforced concrete composite slab.

Step 4 Erect re-used and repaired roof structure using tagging system to ensure all elements are correctly located.

Step 5 Install new roof and wall finishes.

Step 6 Remove all temporary works.

6.4.9 This report has been prepared on behalf of Conisbee by:

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Associate & Head of Heritage Engineering

Date: 10.07.2020