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Fern House, Reepham, Norfolk

Structural Appraisal Report

Ref: 230833/D Hubbard
Approved By: S Prior
Date: 11 October 2023
Version: 1

1.0 BRIEF

1.1 Conisbee were asked by Tom Booen of Hudson Architects, on behalf of the client, Mr and Mrs Dacre, to visit the above property and undertake a visual inspection to assess the condition of the existing buildings in relation to proposed alterations to the structural fabric.

1.2 We understand that the design proposals broadly comprise of the construction of a new 'link' building between the Main House and Coach House building which is to be repaired and refurbished for residential use. It is also proposed to convert the existing garage for use as a gym / pool house and construct a new garage building to the East of the Main House.

1.3 This report has been prepared for inclusion within in the application for Listed Building Consent.

1.4 Our inspection was undertaken on 17 August 2023. We were accompanied by Tom Booen and Oliver Spalding of Hudson Architects. The weather was dry and bright at the time of our inspection.

1.5 Our inspection was undertaken from ground level and from all areas where safe access and suitable lighting was made available. Access was provided to the first floor of the existing Coach House via a hatch through the first floor.

1.6 Whilst our investigation work has been taken far enough to satisfy the requirements of the brief, it has, of necessity, not been exhaustive. The findings cannot therefore be warranted to apply to areas of the building not inspected or investigated.

1.7 This report is intended for the use of the client, Mr and Mrs Dacre, and no liability can be accepted for use by any third party.

1.8 The design proposals have been reviewed in line with the conservation principles of minimum intervention and maximum retention of the existing building fabric.

2.0 PROPERTY TYPE, CONSTRUCTION AND CONTEXT

2.1 Fern House (formerly known as Eynesford House) is a two-storey 19th century residential property. The property comprises of the Main House and an attached 'service wing' to the North. The structure is formed of solid masonry load bearing external walls, in Flemish bond, and masonry and timber load bearing and non-loadbearing internal walls. The upper floors appear to comprise of timber boards on timber beams and joists. The roof is assumed to be of pitched cut timber construction with clay pantiles. There are four chimneys within the main house with two located within the front (Southern) section of the property and a further two towards the rear (Northern) elevation.

2.2 A two-storey lean-to section also projects from the rear elevation of the Main House. This appears to be formed of solid load bearing masonry construction with a mono-pitched timber roof. The external wall steps in at first floor level and is assumed to be supported by a beam at first floor level.

2.3 Various outbuildings are present to the North of the main building including a Coach House with attached Coal Store, Potting Shed, Log Store and Garage. The site layout is shown in Figure 1 below. The outbuildings are formed in solid masonry load bearing walls, in Flemish bond with pitched timber roofs. The largest of these outbuildings, the Coach House, contains a timber first floor within the Southern portion of the building.

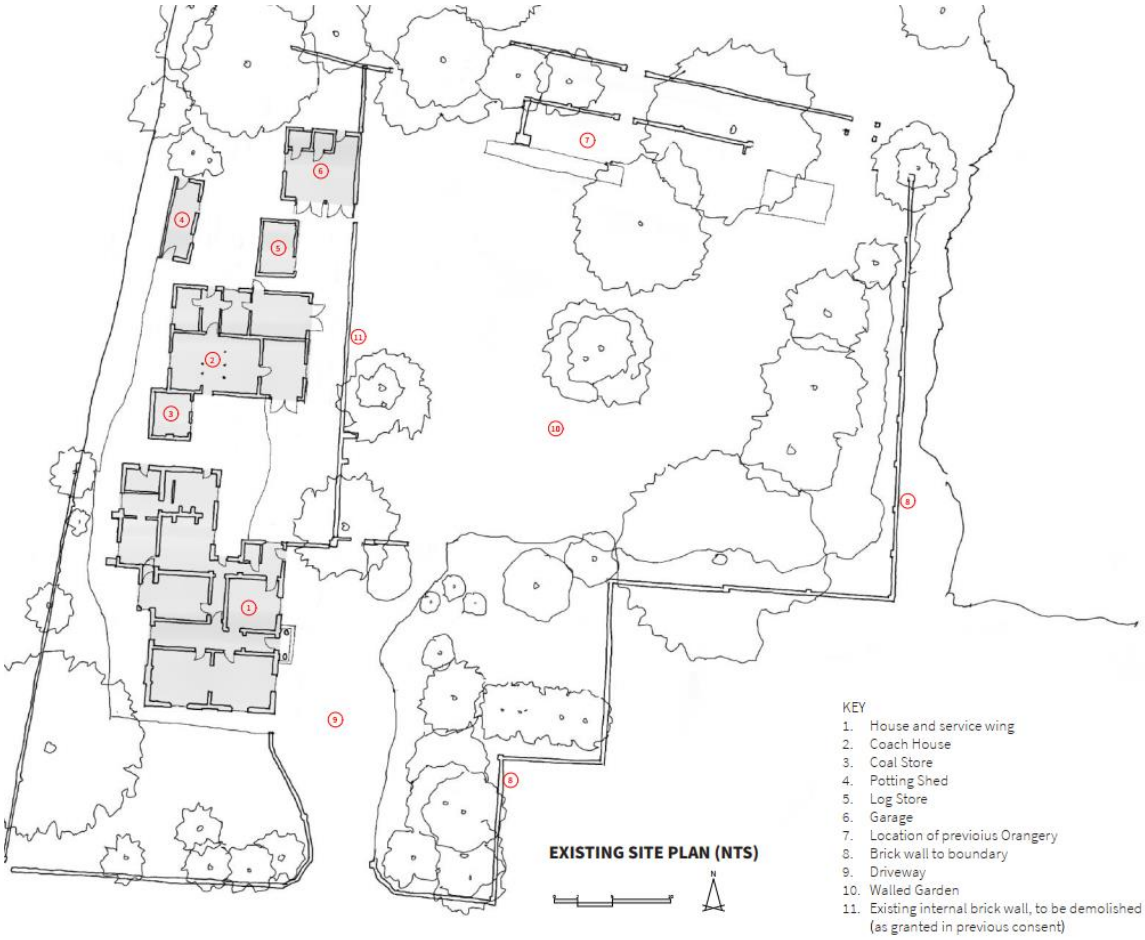


Figure 1 - Existing site plan

2.4 The property is listed Grade II and the official listing text is as follows:

TG 08 22 REEPHAM DEREHAM ROAD 7/73 Eynesford House.

Doctors house, circa 1848, of red brick and black pantiles. Double pile hipped roof of. 2 storeys, with rear gabled service wing, 2 storey lean-to waiting room, and linked Tack Room and 2 storey coach house. South elevation, 3 bays, blank centrally on ground floor. East elevation 3 bays, blank to the left, with central fluted Doric porch, with columns, pilasters and entablature. 4 panel door with glazed fanlight. West elevation with hipped bay window, to left, and central staircase window with semi-circular head and gauged brick arch. Windows, sashes with glazing bars and segmental gauged brick arches. End chimney stacks. Lean-to extension, with half glazed door with glazing bars to east and semi-circular headed sash window to north on first floor. Service wing, 2 windows, casements with glazing bars with segmental brick arches. Tack Room, single storey, and coach house with stable door, Diocletian windows, coach house door and hay loft door. Brick dentil eaves, parapet gables and central axial louvred ventilator with ogee cap. Stable fittings intact. `

Listing NGR: TG0982522905

2.5 Where crack defects are described within this report, they have been classified in general accordance with the guidance given in BRE Digest 251Assessment of Damage to Low Rise Buildings (August 1990).

Category	Definition	Crack Width
0	Negligible	Less than 0.1mm
1	Very slight	Up to 1mm
2	Slight	Up to 5mm
3	Moderate	5mm to 15mm
4	Severe	15mm to 25mm
5	Very Severe	Greater than 25mm

2.6 Photographs taken during the visual inspection are included within Appendix A.

2.7 British Geological Survey information suggests that the superficial deposits at the site are likely to comprise of Sheringham Cliffs Formation - Clay, silt, sand and gravel.

3.0 OBSERVATIONS / VISIBLE DEFECTS

3.1 The visual inspection was focused on the Main House, Coach House and Garage buildings which are proposed to be modified as part of the proposed development. We understand that the Coal Store is to be demolished and the Potting Shed and Log Store are to remain in their existing condition, an assessment of these buildings has therefore not been included in the observations section below.

Main House

3.2 When viewed externally the roof structure appears to be in generally good condition with no obvious deflection of the ridges or significant distortion evident.

3.3 The brickwork forming the chimney stacks is of a different colour to the external walls of the house suggesting that the chimneys may have been re-constructed at some stage. The chimneys appear to be in good condition with no evident cracking / leaning.

3.4 The external masonry load bearing walls appear to be in generally sound condition and no significant deterioration of the mortar joints was observed. The North and West elevations have been rendered and it was therefore not possible to observe the condition of the brickwork. Two climbing trees are present on the Eastern elevation and areas of staining / efflorescence could be observed behind the tree closest to the South-East corner.

3.5 Two buttresses are present on the West elevation, these appear to be in reasonable condition with minor staining of the brickwork at low level.

3.6 Previous repairs / areas of repointing as well as localised spalling of a handful of bricks were noted on the East elevation of the service wing. An area of staining / algal growth was also noted above the ground floor windows.

3.7 Efflorescence of the high-level brickwork is present on the Eastern elevation of the lean-to, and it appears that previous repairs have been undertaken to the low-level brickwork. Re-pointing of the brickwork below the eaves level was also noted on the North elevation.

3.8 Internally no obvious significant cracking / structural movement was observed during the visual inspection. Areas of the first floor were noted to feel slightly ‘bouncy’ when walked upon.

3.9 Assess to the roof spaces was not provided during the inspection.

3.10 The existing boundary wall to the West of the house was observed to be leaning. Widespread vegetation growth was also noted as well as mortar loss in some areas.

Coach House

3.11 When viewed externally the roof structure appears to be in generally good condition with no obvious deflection of the ridges or significant distortion evident. Internally there is no apparent deterioration of the timber roof structure however deflection of the purlins is clearly visible. The sizes of the roof members were recorded during the inspection and are included on the sketch in Figure 2 below.

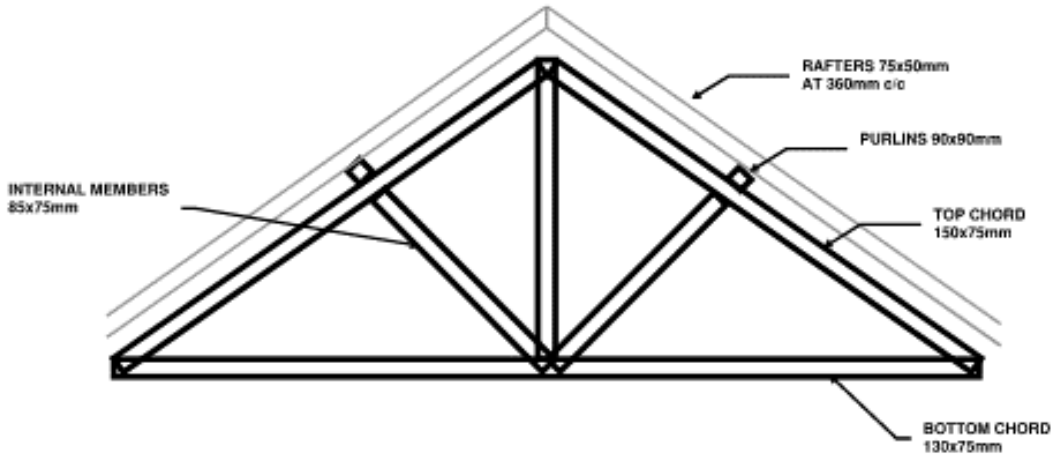


Figure 2 - Coach House existing roof structure

3.12 Several areas of mortar loss and / or localised spalling of the brickwork are present on the external elevations. Efflorescence is also present at high level on both gable elevations where the brickwork appears to be in relatively poor condition.

3.13 A vertical crack on the South elevation appears to have been previously repaired but has re-opened at some stage. There is also evidence that cracks above the double doors have been filled previously.

3.14 There is a vertical joint on the East elevation between the one and two storey sections of the building, most of the mortar filling the joint has fallen out leaving an open vertical joint.

3.15 Internally substantial deterioration of the brickwork has occurred in some localised areas with significant spalling of the bricks.

3.16 Slight diagonal cracking of the wall between the car parking area and the stables is visible from on both sides of the wall.

3.17 The window to the garage area does not appear to have a lintel over and slight diagonal cracking is present emanating from both corners of the window opening.

Garage Building

3.18 When viewed externally the roof structure appears to be in generally reasonable condition with no obvious deflection of the ridges or significant distortion evident.

3.19 Previous repairs to the gable elevation including a crack to the arch lintel over the window opening were noted during the inspection.

3.20 There is a slight diagonal crack extending either side of the window opening on the rear elevation, some bricks adjacent to the window have also been replaced previously. The adjacent freestanding external wall has issues with staining of the brickwork, mortar loss and localised areas of spalling.

4.0 ADDITIONAL COMMENTS / OBSERVATIONS

4.1 Due to the properties listed status Listed Building Consent (LBC) will be required to undertake the proposed alterations and possibly some of the remedial repair works identified.

4.2 If not already undertaken, it is recommended that the client considers the need for an asbestos survey. Whilst unlikely to be present in an historic structure of this type subsequent alterations and additions means that presence of asbestos containing materials is possible and should be given full consideration particularly prior to undertaking any type of opening up works.

4.3 Several manholes are present within the footprint of the proposed link structure. A CCTV survey will be required to confirm the layout and condition of the existing below ground drainage network which may need to be modified to facilitate the proposed development.

5.0 DESIGN PROPOSALS

5.1 This section contains a summary of the architectural and structural proposals for each area of the proposed works. The proposed site plan is shown in Figure 3 below.

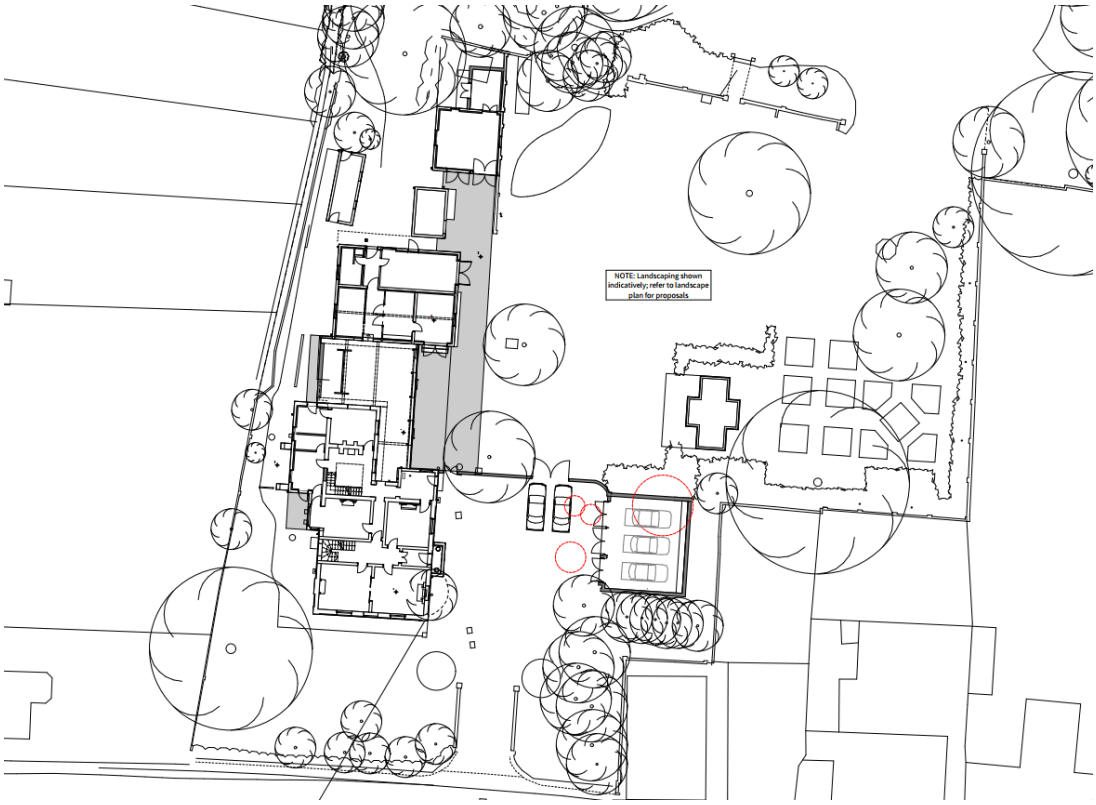


Figure 3 - Proposed site plan

Existing Main House

5.2 The primary modification proposed within the main house consists of introducing a new opening at first floor level to form a new central Stair Hall. Details of the existing floor have not been established at this stage however the floor is expected to consist of timber joists spanning between the masonry walls. The new opening will require the introduction of new trimmer beams around the edge of the opening, wherever possible this will be detailed to retain as much of the existing fabric as possible.

5.3 The existing staircase adjacent to the utility room is to be removed and the openings at first and second floors level will be infilled with new timber joists supported on the existing load bearing walls.

5.4 It is also proposed to modify areas of the existing roof to provide a vaulted ceiling. Details of the existing roof structure will need to be determined to enable an assessment of the structural works required to facilitate the vaulted ceiling.

5.5 The existing roofs are to be insulated. Details of the existing structure will need to be determined during the next design stage to confirm the structure has sufficient capacity for the minor increase in loading.

5.6 Other works include the addition of new openings for doors / windows and modifications to existing openings. New lintels will need to be installed above the proposed openings to support the masonry above.

5.7 It is not envisaged that any significant intervention is required to the existing external walls which are generally in good condition. Minor repairs and localised areas of repointing are likely to be required to the lean-to section which abuts the North elevation. Repairs to the existing fabric are to be carried out using traditional methods and materials.

5.8 Remedial works are likely to be required to repair and stabilise the existing boundary wall. This is likely to comprise of the careful removal of vegetation and localised areas of re-pointing. Additional buttresses may be introduced to prevent further leaning of the boundary wall.

New Build Link

5.9 A new build single storey link structure is to be constructed between the Main House and the Coach House. The link will be fully glazed on the Southern Elevation and will also contain fully glazed ‘slots’ within the roof at the interface between the link and the adjacent existing buildings.

5.10 The structure for the link building will consist of a steel frame supporting timber flat roof rafters. The new roof structure will be supported by circular steel columns on the South elevation, the existing masonry walls to the Main House and Coach House and the new wall forming the Norther elevation to the link structure. Steel is proposed for the primary structure to minimise the depth of the roof build-up and to limit deflections of the structure supporting large areas of glazing. The proposed roof structure is shown in Figure 4 below.

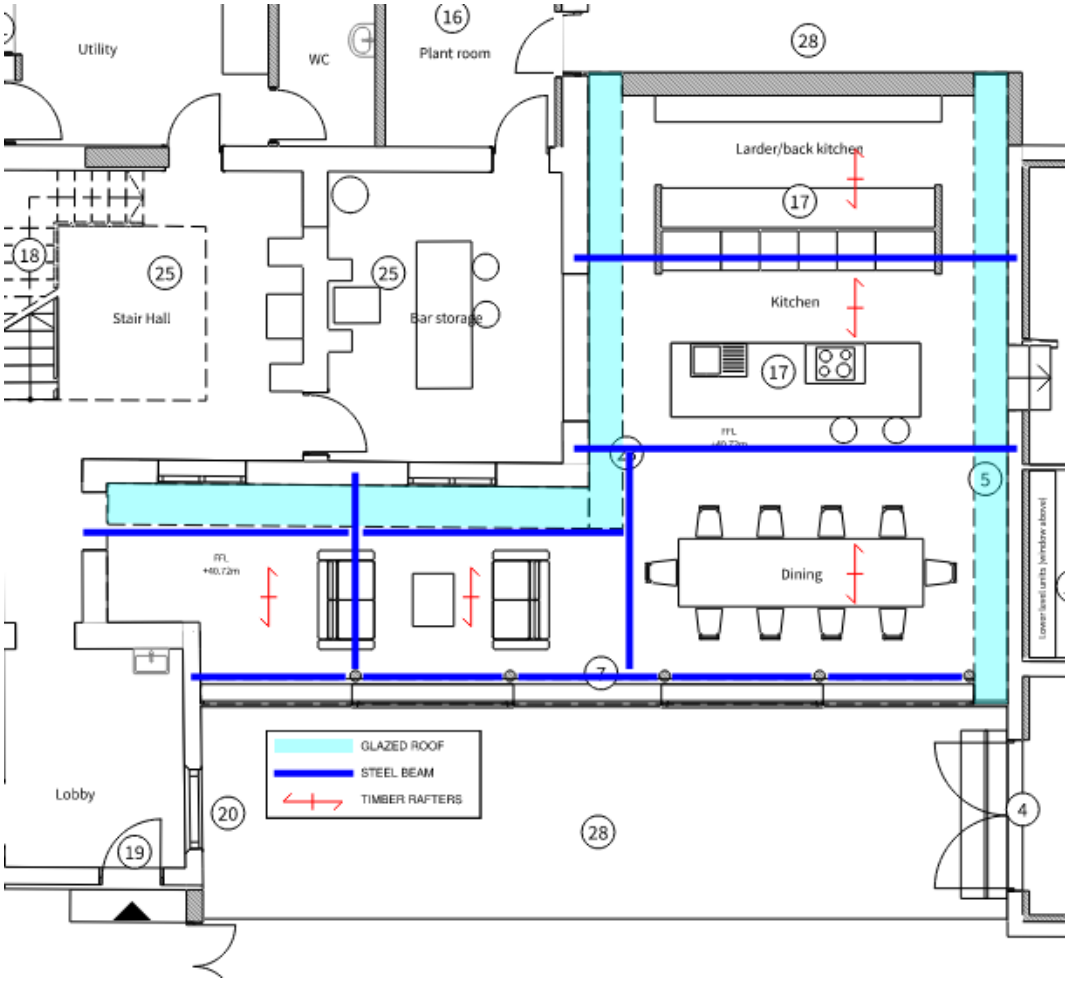


Figure 4 - Link roof structure

5.11 A limited number of padstones will need to be formed within the existing fabric. These will be designed to limit stresses on the brickwork to acceptable levels (0.63N/mm²) to avoid overloading the existing brickwork.

5.12 The ground floor to the link building is proposed to be formed of ground bearing limecrete slab which will require an excavation of approximately 400mm. New pad / strip foundations will also be provided to support the new columns and load bearing walls. Investigations will be required to establish the ground conditions and details / levels of the existing foundations to both the Main House and the Coach House. A degree of underpinning may be required to prevent undermining of the existing foundations during the construction of the new foundations and ground floor slab however the depths / build-ups will be minimised to avoid this wherever possible.

Existing Coach House

5.13 The existing Coach House is to be refurbished for residential use. As noted in section 3 there are several areas of masonry deterioration externally and internally as well as some cracking of the masonry. It is anticipated that the defects observed can be remedied with sympathetic repairs to the existing fabric which are likely to include the following:

- e-pointing
- Localised replacement of significantly spalled bricks
- Installation of helical bed joint reinforcement across cracks
- Re-bedding of the upper courses of brickwork on both gable elevations
- Installation of a lintel above the existing window opening on the South Elevation

5.14 The existing first floor structure consists of 60x120mm floor joists spanning between downstand beams which measure approximately 160x250mm. Calculations have been carried out to assess the existing floor structure which has been found to be inadequate for the proposed use. It is therefore proposed to replace the existing first floor structure with a new timber floor which meets modern design standards. It is proposed to retain the existing downstand beams as non-load bearing elements to retain the existing fabric and to maintain the existing aesthetics.

5.15 Visible deflection of the duo pitched roof above the main area of the Coach House was noted during the visual inspection. Calculations have been carried out to assess the capacity of the existing roof members which have been found to be inadequate for the proposed insulated roof build-up. It is therefore proposed to replace the existing roof structure to facilitate the introduction of insulation.

5.16 Within the single storey ‘lean to’ section some internal walls are to be removed and consequently the existing roof purlin will be unsupported. New timber roof rafters will be provided to span between the external wall on the North elevation and the internal wall as shown in Figure 5 below.

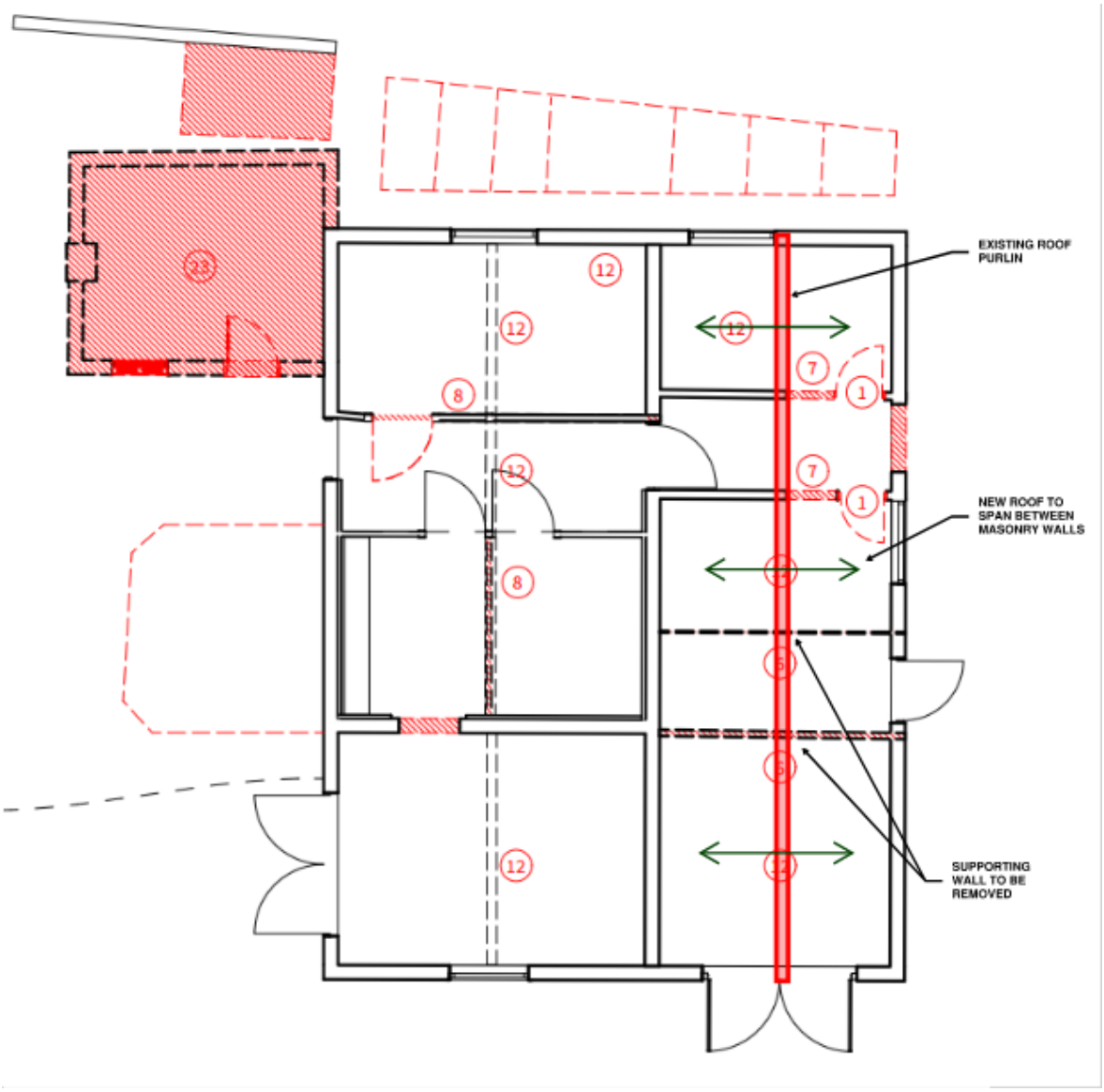


Figure 5 - Proposed stable block lean-to roof structure

5.17 A new ground floor limecrete slab is to be formed which will require an excavation of approximately 400mm. Investigations will be required to establish the ground conditions and details / levels of the existing foundations which will inform whether any underpinning is required to prevent undermining of the existing walls during the construction of the new floor slab.

Existing Garage

5.18 The existing garage is to be refurbished for use as a pool / gym roof. This includes a single storey extension to the rear comprising of load bearing masonry walls supporting a hipped timber roof. The proposed layout is shown in Figure 5 below.

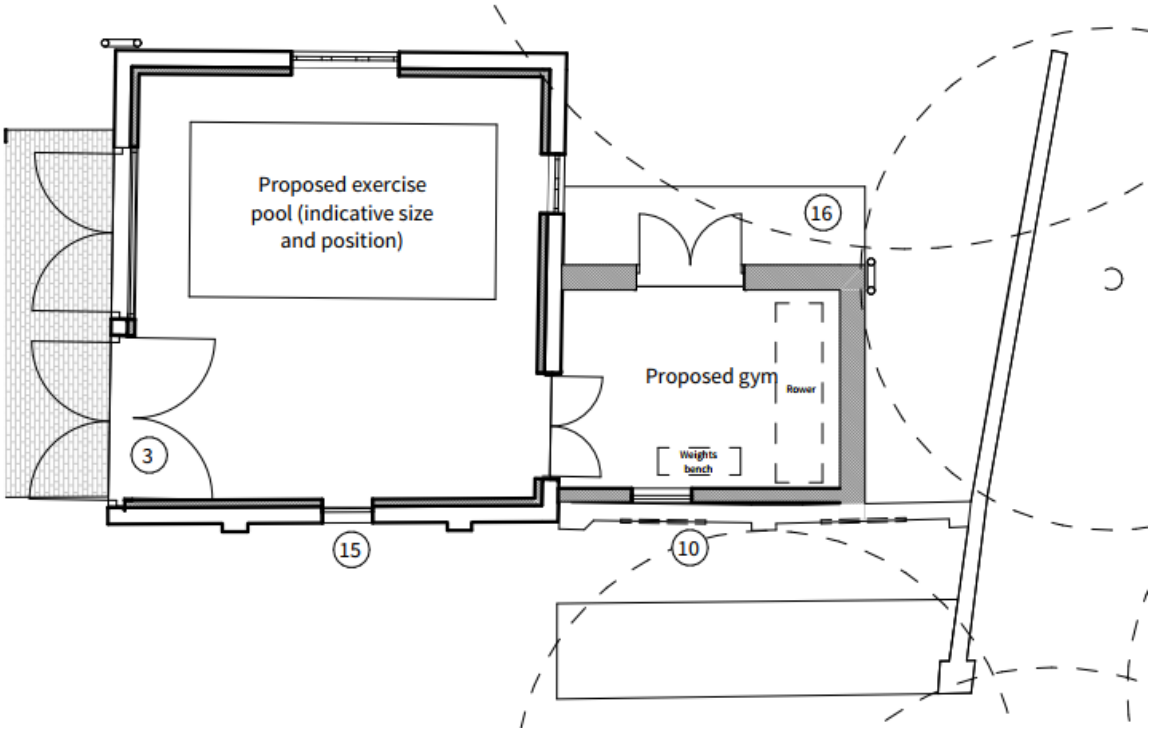


Figure 6 - Proposed Pool House Layout

5.19 The proposed extension is adjacent to the existing garden wall which abuts the existing garage. Due to the condition of the existing wall, it is proposed to construct a new load bearing wall to support the roof of the extension and retain the garden wall in its current form. The investigations will be required during the next stage to establish details of the foundation to the garden wall and inform the detailing of the interface between the new / existing walls.

5.20 Details of the proposed exercise pool are to be confirmed. If excavations are required to set the pool below existing floor level the implications on the existing foundations will need to be considered and underpinning of the existing foundations may be required.

5.21 Insultation is to be added at roof level and investigations will be required to determine details of the existing roof structure so that the increase in roof loading can be assessed.

New Build Garage

5.22 The new garage will be constructed of a timber frame supported on ground bearing pad / strip foundations.

5.23 Some existing trees will be removed to facilitate the construction of the new garage.

6.0 NEXT STEPS

6.1 Arrange access / localised opening up works as required to establish details of the existing structure.

6.2 Undertake ground investigations to establish details of existing foundations and determine design parameters for foundations and ground floor slabs. This will include establishing the presence of cohesive (clay) soils which may be subject to volume change (heave) following the proposed removal of existing trees.

6.3 Undertake CCTV survey to establish details / condition of existing below ground drainage network.

6.4 Carry out calculations to determine the capacity of the existing structural elements subject to modifications or increases in loading.

7.0 APPRENDIX A – SITE PHOTOGRAPHS

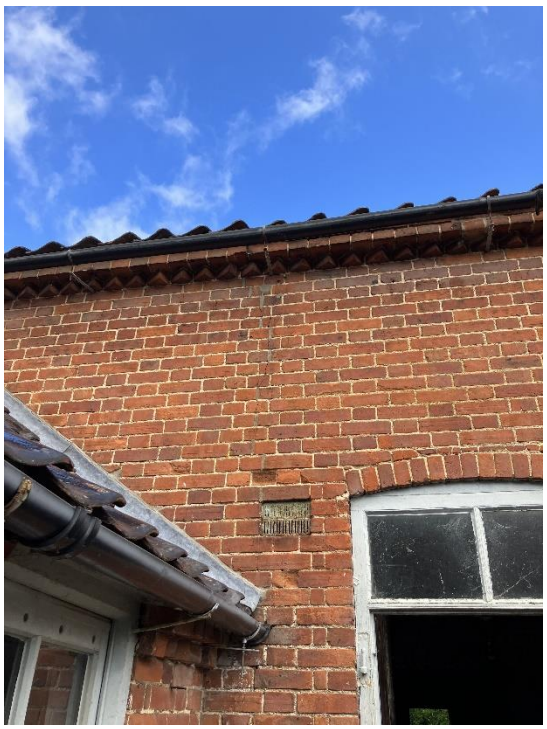
Photograph 1 – View of chimney adjacent to Southeast corner of Main House. Efflorescence / staining of brickwork visible on brickwork behind tree.

Photograph 2 – View of buttresses to Main House West elevation. Minor staining of brickwork at base of buttresses.

Photograph 3 - East Elevation of Main House Service Wing. Staining of brickwork between ground / first floor windows and previous repairs to brickwork. Localised spanned bricks.

Photograph 4 – Main House Lean-to East Elevation. Efflorescence of brickwork at high level and brickwork repairs under ground floor window. Historic window opening infilled at first floor.

Photograph 5 – Coach House East Elevation. Efflorescence of brickwork at high level and localised spalling of brickwork.



Photograph 6 – Vertical crack on Coach House South Elevation.

Photograph 7 – Previous repairs to Coach House South Elevation. Minor distortion of brickwork bed joints over double door opening.

Photograph 8 – Vertical joint in Coach House East Elevation.

Photograph 9 – Coach House storage area brickwork deterioration.

Photograph 10 – Cracking in corner of stable area. Crack extends through the wall and is visible in the adjacent garage.

Photograph 11 – Diagonal cracking over brickwork over Coach House garage window opening. It appears that no lintel has been provided above the window.

Photograph 12 – Timber roof structure to Coach House.

Photograph 13 – Previous repairs to Garage Gable Elevation

Photograph 14 – Cracking and previous brickwork repairs to Garage rear elevation.

Photograph 15 – Garden wall along Western site boundary