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Consulting Civil & Structural Engineers



Red House Farm
Otley Road
Framsden
IP14 6HU

Structural Preassessment Report
Conversion From Agricultural to Residential Use

DOCUMENT CONTROL

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Table of Contents

DOCUMENT CONTROL	1
1.0 BRIEF	3
2.0 SITE LOCATION & CONTEXT	4
3.0 BARN 1 OBSERVATIONS	5
4.0 BARN 2 OBSERVATIONS	9
5.0 BARN 3 OBSERVATIONS	15
6.0 PROPOSED DEVELOPMENT	22
7.0 LIMITATIONS	23
8.0 RECOMENDATIONS	23

1.0 BRIEF

- 1.1 J P Chick & Partners Limited were appointed by Mr Richard Buss to undertake a structural assessment report to inspect the integrity of 3 No. barns, and associated outbuildings in order to make comment on the viability for conversion into residential dwellings.
- 1.2 Our appointment to carry out the inspections was received on 24th September 2021. The site visit and inspections were carried out on the afternoon of 12th October 2021.
- 1.3 Mr Samuel Latimer attended site for the inspections. The weather at this time was overcast with intermittent light showers.
- 1.4 No intrusive investigations were carried out as part of this report, all inspections were carried out visually from ground level.
- 1.5 Photographs and a key plan are provided within the following report.

2.0 SITE LOCATION & CONTEXT



Figure 1 - Site location plan (google maps 2021)

- 2.1 The site is generally flat with no significant changes in level. A large pond area was located to the front of barns 2 & 3, the pond area was overgrown with dense vegetation. Concrete hardstanding was present to the front of all 3 barns and was accessed via gravel/dirt driveway. To the rear and right-hand side of the site were fields which appear to have been previously used for grazing livestock. On the left-hand side of the site is located Red House Farmhouse. The land surrounding the site is predominantly agricultural land, along the length of Otley Road are a number of residential dwelling and agricultural buildings.
- 2.2 Barn 1 is a single storey agricultural building and is of timber frame construction. It is the newest of the barns located on the site. Barn 1 is accessed via the front and rear of the building with an opening located internally between barn 1 & 2.
- 2.3 Barn 2 is also a single storey agricultural building of masonry and timber construction; it appears to have had multiple uses throughout its life showing signs of various modifications within the building. It is located adjacent to Barn 1 and is accessed via the front main doors; a large opening has been formed which also provides access into Barn 1.
- 2.4 Barn 3 is the largest of the 3 barns that are to be retained and consist of a larger double height structure and 4 No. annexes that project out perpendicular from the front elevation of the main building. Barns 2 & 3 appear to be of similar age with barn 2 and the barn 3 outbuildings being of similar construction.

3.0 BARN 1 OBSERVATIONS



Figure 2 – Barn 1 front view



Figure 3 – Barn 1 rear view

- 3.1 Barn 1 is constructed using a series of timber portal frames consisting of multiple timber beams and posts bolted together. The frames are located at approximately 4.4m c/c along the length of the structure. The overall dimensions of the barn are approximately 13.5m wide x 18.2m long.



Figure 4 – Barn 1 internal view

- 3.2 The barn is clad with a blockwork plinth to the front rear and right-hand side, the left-hand side is the external wall to barn 2. The pitched roof is finished using a corrugated cementitious fibre board supported on timber purlins.
- 3.3 The ground floor slab to Barn 1 appears to be a concrete ground bearing slab with gaps left between pour segments to allow for expansion. No trial holes or ground investigations were carried out at this time to establish the depth of the concrete slab.



Figure 5 – Ground floor slab

- 3.4 Several modifications appear to have been made to the main timber portal frames. Haunches have been crudely sawn off in order to allow for the internal livestock pens. No additional support/strengthening to the timber frames was apparent.



Figure 6 – Modifications to timber portal frame

- 3.5 Cracks to the masonry cladding were visible at the junctions where the external blockwork wall passed the timber portal frame. Localised significant damage to other areas of the masonry plinth were also observed.



Figure 7 – Vertical cracks at portal frame locations



Figure 8 – Damage to external wall to rear of barn

3.6 Significant rotting to the timbers at the base of the timber portal frames was observed along with extensive corrosion of the steel angles encasing the timber columns.



Figure 9 – Significant rotting of timber columns



Figure 10 – Corrosion of both timber and steel

- 3.7 Lateral resistance appears to be provided along the width of the barn by the large built-up timber columns and beams, albeit somewhat compromised by the modifications to the timber haunches. Stability is provided to the non portalised orientation by knee braces between the posts and eaves beam members.
- 3.8 The foundations to Barn 1 were not exposed as part of this visual inspection and as such we cannot comment on their suitability for re-use. Further investigations will be required to inform the existing foundation strategy.
- 3.9 Barn 1 structural members generally consist of the following sizes:
- Columns: 3 x 315 x 75 timbers bolted together using approximately. M10 bolts at 450mm c/c
 - Haunches: 2 x 145 x 120 timbers
 - Main beam: 3 x 310 x 50 timbers bolted together using approximately. M10 bolts at 450mm c/c
 - Blockwork external walls approximately. 100mm wide
 - Timber purlins: unsighted

4.0 BARN 2 OBSERVATIONS



Figure 11 – Barn 2 front view



Figure 12 – Barn 2 side view

- 4.1 Barn 2 is constructed of red brick masonry walls approximately 215mm wide increasing to a 330mm wide plinth at the base of the wall on all sides. The roof construction is a combination of timber rafters of varying non-standard sizes and new timbers of standard dimensions along with large timber beams which appear to have previously supported ceiling joist and collars at approximately every 6th rafter. The roof is finished with clay pantiles. The barn floor is of brick construction, the thickness of the ground floor was not established at this time.
- 4.2 Barn 2 internal dimensions are approximately 18.9m long x 5m wide.



Figure 16 – Barn 2 Roof

- 4.3 The timber roof and external wall towards the rear of the barn appears to have been replaced recently with sawn and sanded timber rafters and new brickwork. Lateral restraint straps and ties at eaves level have been provided as part of the replaced roof. Straps and ties are not present elsewhere in the barn. Clay pantiles to this area appear to match the rest of the roof.



Figure 17 - Replaced roof structure

- 4.4 Along the length of barn 2 it is evident that all masonry buttresses to the external walls have been removed. Broken brick and lack of wall paint is present at regular centres where buttress were likely to have been. Buttresses have not been replaced by any additional structure.
- 4.5 Bond timbers are present throughout the entire structure and are built into the inside face of the masonry walls. They are provided at irregular centres and heights throughout the building. There are voids left by the removal of some bond timbers within the inside face of the external walls.



Figure 18 – Bond timber and pier removal



Figure 19 – Bond timbers and voids in masonry

4.6 Bond timbers appear generally solid from inside face throughout, however no intrusive investigations have been carried out to confirm this is the case for the full depth of timber.



Figure 20 – Bond timbers and timber spreader beams



Figure 21 – New opening through existing wall

- 4.7 A new opening through the side elevation has been formed utilising a modern steel lintel. The lintel support appears to be adequate by inspection however the lintel size and thickness has not been established and calculations have not been produced to confirm this.



Figure 22 – Clay pantile roof

- 4.8 The roof structure externally does not appear to show signs of distress. The ridge line shows signs of slight deflection in areas however, given the age of the roof construction it is not of any immediate concern.



Figure 23 – Barn side view

- 4.9 The side elevation displays many scars and variation in brickwork type and colour. It appears that numerous modifications have been carried out to Barn 2 throughout its life. Significant weathering/damage to the external wall has been observed. This damage has been repaired in isolated areas however further repairs are likely to be required.



Figure 24 – Eaves & exposed timber beam end



Figure 25 – Eaves & exposed timber beam end



- 4.10 The large timber beams that appear to have been used to support ceiling joist are built into the solid masonry walls. The ends of the beams are exposed to the external elements with no apparent weather protection, the ends of the timber beams appear to be dark and weathered. Further investigations will be required to confirm the condition of the timber members.

5.0 BARN 3 OBSERVATIONS



Figure 26 – Barn 3 outbuildings along front elevation



Figure 27 – Barn 3 rear elevation

5.1 Barn 3 consist of four brick built annexes of red brick solid wall, and timber roof construction with a central principal double height barn of timber framed construction, with a solid red brick plinth around the perimeter standing approximately 1.25m tall. The large barn is clad in timber on all elevations, both the barn and outbuildings are roofed using clay pantiles. The ground floor construction to the barn, outbuildings and courtyard area are all of concrete oversight slab construction, the thickness of this slab has not been proved.



Figure 28 – Outbuilding front elevation



Figure 29 – Outbuilding front elevation

- 5.2 External openings to the outbuildings appear to have been previously modified to reduce their width to a single door opening. Original exposed timber lintels are still present and appear to be significantly weathered. Timber lintels are deflecting significantly resulting in cracking above the lintel bearings.



Figure 30 – Cracking above weathered timber lintel



Figure 31 – Outbuildings in courtyard area

- 5.3 All four annexes are of similar construction consisting of a small brick-built enclosure and a pitched roof shelter behind. The pitched roof structure is supported on timber beams to the front which transfer the roof loads to timber posts, with the roof supported on a solid brick wall to the rear.



Figure 32 – Outbuildings in courtyard area

- 5.4 The roof structure to the courtyard outbuildings consists of timber rafters with ridge collars and eaves ties. The rafters are typically 100x38 timbers at approximately 400mm c/c. Collars and ties are provided at approximately 2400mm c/c. The timber beams and posts are approximately 150mm sq.
- 5.5 Outbuilding timber roofs are generally in good condition. Isolated locations where the roof appears to have leaked has manifested in the rotting of timber members. The roof construction does not appear to be original and the rafters appear to be uniform in size.

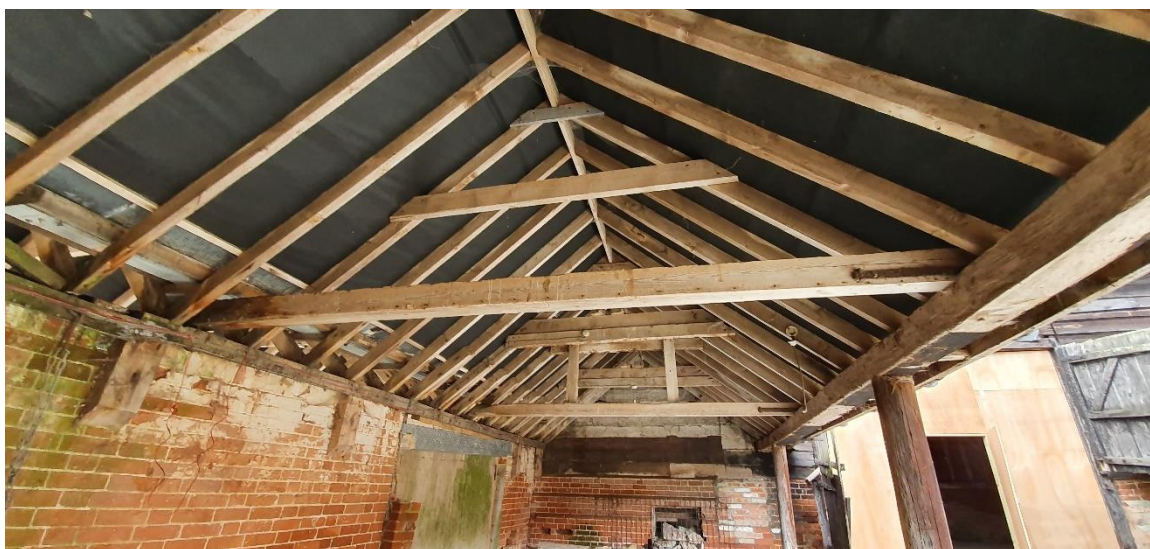


Figure 33 – Outbuildings in courtyard area. Note damp timbers to tie members



Figure 34 – Outbuilding with lean-to roof

- 5.6 The lean-to roof to the outbuilding on the left-hand side appears to have a whitewash applied to a section of the roof where the sarking boards have been retained, timber rafters and sarking boards are damp to touch in areas and appear to be weathered. Timber specialist to confirm suitability for re-use. No flashing was observed where the corrugated roof connects in below the clay pantiles.



Figure 34 – Outbuilding with lean-to roof. Note lack of flashing between both roofs

- 5.7 Significant damage to brick walls has been identified at several locations across all of the outbuildings. Wall thickness have been significantly reduced in areas, and masonry below lintel bearings have been removed. Re-building of masonry walls will be required to return the structure to its original strength.



Figure 35 – Significant damage to masonry wall



Figure 36 – Removal of masonry directly below lintel bearing. Note drop in lintel at support.

- 5.8 A lintel bearing has been compromised where masonry has been removed from below. The roof structure appears to be spanning over the opening without relying on the lintel for support.



Figure 37 - Internal view of existing barn

- 5.9 The large barn to the rear of the outbuildings is generally in good condition. The barn is constructed using timber stud walls built off a 215mm wide brick plinth which extends approximately 1.25m above slab level. The structure appears to be formed from principal timber frames with haunches/knee braces and cross members which provide lateral resistance. The 140x170 timber posts of the main frames are located at approximately 2.2m centres. 100x150 studs at 450mm c/c form the infill walls between timber frames. The timber roof appears to be supported on purlins connected back to the principal timber frames.
- 5.10 A timber bridge spans between alternate frames spanning approximately 4.4m, this appears to be of newer construction than the rest of the barn. No access to the bridge was available and as such the bridge is unsighted. Further investigation into the suitability of re-use is required.



Figure 38 – Typical timber defects to barn 3



Figure 39 – Further typical defects to barn 3

- 5.11 Typical defects comprise of very minor levels of softening/rotting of the timbers and infestation which can be observed from figure 38 & 39. This type of defect is present throughout the barn and can be observed at several locations. Damage appears superficial and does not seem to be causing structural distress.



Figure 40 – rear elevation of Barn 3

- 5.12 Externally the roof and wall structure appear to be in good order with no significantly visible deformations or deflections observed. Ridge line appears relatively level with slight deflections present, however given the variability in member sizes it is likely the structure has always displayed such deflected form.

6.0 PROPOSED DEVELOPMENT

- 6.1 It is understood that the 3 barns considered within this report and accompanying outbuildings are to be converted from agricultural use to domestic dwellings.

- 6.2 At the time of production of this report no architectural drawings indicating the extent and form of the proposed residential dwellings have been provided.
- 6.3 Further information regarding the proposed change of use is required in order to comment on the nuances of the proposed conversions.

7.0 LIMITATIONS

- 7.1 This report shall be for the private and confidential use of the client for whom it was undertaken, and it should not be reproduced in whole or in part or relied upon by third parties for any use without the express written authority of J P Chick and Partners Limited.
- 7.2 Unless stated otherwise in the report, we have not disturbed any fixtures and therefore no fitted carpets, floorboards or linings have been removed. Coupled with this, we have not exposed the foundations or tested the drains to the property. We are therefore unable to report that such part of the property is free from defect.
- 7.3 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.
- 7.4 The condition of the finishes, waterproofing, damp penetration and structural timbers, unless specifically referred to, are not the subject of this report. We would recommend the services of a specialist to cover these areas.
- 7.5 The extent of this survey is such that we cannot detect problems that are latent or concealed.
- 7.6 All observations were undertaken from ground level and therefore comments are based on what could reasonable be seen from that location.

8.0 RECOMENDATIONS

- 8.1 Foundations to existing structure will require exposing and assessment in due course to confirm suitability and capability of resisting additional loads. This will be undertaken as part of the building regulations application.

- 8.2 An intrusive ground investigation should be carried out to determine the underlying geology. A review of the superficial ground conditions from the British Geological Survey indicate that Lowestoft Formation (Diamicton) may be present. Diamicton is typically found to have medium volume change potential, however this will need to be verified via laboratory testing.
- 8.3 The existing ground floor slabs will also require intrusive investigation to confirm thickness, sub-base etc to confirm if these may be retained. Generally, these appear in a fair to good condition where visible.
- 8.4 The timber stanchions identified have deteriorated beyond a serviceable state to barn 1 will need to be replaced with structural timber of a similar size. Further replacements may be necessary following inspection of the existing frame by a timber specialist.
- 8.5 Where present, it is recommended that bond timbers are removed from the wall construction and replaced with brickwork in a suitable mortar. Bond timbers have the potential to rot over time particularly where located within external walls.
- 8.6 Where timber members have suffered from prolonged water ingress these will need to be assessed on an individual basis and may be repaired, augmented or replaced. The general condition of the timbers is considered as good and repairs such as this will be limited.
- 8.7 Damaged masonry panels are to be replaced or repaired using materials to match the existing. Cement mortar is not to be used as replacement for lime mortar.
- 8.8 Loadings will be slightly increased in order to upgrade the insulation and finishes etc. The existing roof structures are performing adequately at present, and calculations will be necessary to demonstrate that the current members are adequate for re-use.
- 8.9 Overall stability of the structures will also need to be assessed. The addition of internal cross walls as part of the conversion will allow these to be designed as masonry or timber framed buttressing walls or wind posts may be introduced if necessary.
- 8.10 In conclusion the existing single storey agricultural buildings and double height barn are suitable for conversion subject to the remedial works outlined in the report. Supporting calculations will be required as part of the building regulations package to support the existing arrangement and any slight increases in load from the proposed conversion works.