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Visual structural inspection report of agricultural building for conversion to residential use

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Barn 1, Bower Farm
Thurleston Lane
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1 BRIEF

- 1.1 Orwell Structural Engineers Limited were appointed by Mike Frost through Wilkinson Planning Ltd via email received on 6th July 2022, to undertake a preliminary visual structural inspection of an existing agricultural structure, known as Barn 1, at the site of Bower Farm, Thurleston Lane, Akenham.
- 1.2 The purpose of the inspection was to establish the suitability of the existing structure for the proposed conversion from agricultural to residential use in accordance with Class Q in Part 3 of Schedule 2 of the Town and Country Planning (General Permitted Development) Order 2015.
- 1.3 We attended site to undertake the inspection of The Barn 1 structure on Friday 12th August. The weather was dry, warm and sunny.

2 BRIEF DESCRIPTION

- 2.1 The site is approached via an unmade track off Thurleston Lane leading from Henley Road.
- 2.2 The site is generally level.
- 2.3 The building is a steel framed agricultural barn with blockwork wall infill and clad with fibre cement corrugated sheets to the roof and gables. At the time of inspection the barn was largely empty with some areas used for storage. There is a single storey lean-to structure to the South elevation. The single storey lean-to structure was not surveyed as it is understood this is to be demolished as part of any future conversion works.
- 2.4 The age of the property is unknown, however reviewing historic mapping, there does not appear to have been any previous structures on this site and it is likely the barns date from approximately the 1980s/1990s.

3 GEOLOGY

With reference to mapping published by the British Geological Survey, the site is shown to be located in an area where the superficial soils comprise Lowestoft Formation Diamicton Boulder Clay underlain with Thames Group Clay, Silt and Sand.

4 OBSERVATIONS

- 4.1 The barn is a four bay steel framed structure with a footprint of approximately 18m x 14.8m. The internal layout of the barn is open plan with the main access via a pair of sliding doors to the East elevation with two access doors into the lean-to in the South elevation.
- 4.2 The barn roof is duo pitched clad in fibre cement corrugated sheets, which may contain asbestos with the occasional clear corrugated rooflight. The sheets appear to

be in a reasonable condition and watertight. It is assumed the existing roof covering will be suitably disposed of during the conversion works and replaced with a more thermally efficient roof covering.

- 4.3 The structure of the barn is provided by steelwork frames at 4.6m centres. The framing comprises columns and rafters of 203mm x 102mm RSJ section with tapered flanges. The column flanges are exposed externally. The frames support twelve rows of purlins and two eaves beams comprising 60mm wide x 175mm deep timbers. Timber purlins are at approximately 0.75m centres, with 1.3m centres to the timber eaves beam.
- 4.4 The steelwork columns appeared to have been painted with red oxide primer and the coating was flaking with evidence of rust beneath both internally and externally however there appeared to be no loss of section. The existing steel rafters appeared to have no paint coating and had two spliced connections.
- 4.5 The two steel rafters were welded at the apex and overall slab to ridge height was measured as approximately 5.45m.
- 4.6 Steel column baseplate connections were not visible and assumed to be encased within the concrete slab
- 4.7 There are four steel box section braces spanning diagonally from the gable elevation timber wall plate to a steel tie spanning between two of the timber roof purlins. At the interface between the diagonal brace and wall plate there is a vertical steel box section connecting the gable wall plate to the underside of the timber lintel over the door openings.
- 4.8 The timber purlins are jointed over some steel frame rafters with a bolted steel splice and fixed with a diagonal brace to the bottom flange of the rafter.
- 4.9 To the East elevation a 100mm wide x 120mm deep timber lintel and 70mm x 90mm timber post frames the large door opening. There was no protection to these timbers.
- 4.10 The original opening in the West elevation has been infilled with concrete up to a height of approximately 0.9m high with three to four blocks placed above. There is an element of horizontal displacement amongst the blocks.
- 4.11 The existing doors to the East elevation comprised hinged timber doors which are in reasonable condition.
- 4.12 All columns and framing are were slightly out of plumb by approximately 5mm to 10mm over a length of 1.0m. There were no signs of any significant structural distress.
- 4.13 The barn walls are 3.0m high and comprise 215mm thick hollow blockwork which appear to be partly built tight into the web of the steel columns. It appears this provides the longitudinal stability for the building as no standard bracing is present to the side elevations. Internally the blocks have been notched to accommodate the column and a mortar infill has been cast at the inside face to the recessed column flange to achieve a flush wall finish.

- 4.14 Generally, with the exception of the points noted above the walls are in good condition and no significant cracking was observed.
- 4.15 A vertical crack was noted in the East elevation blockwork wall, South of the double door opening. There appears to have been historical repairs carried out to this crack externally, however does not appear to have been repaired internally.
- 4.16 The ground floor construction appears to comprise a ground bearing concrete slab cast in four long strips. The slab is approximately flush with adjacent ground level. There is also a narrow concrete slab strip spanning between opposing columns. There were a number of random cracks, although these did not appear to be significant and we presume are associated with shrinkage. A large area was covered with stored materials therefore the area could not be fully surveyed. To the South elevation where there are two doors, there is a raised concrete plinth slab of approximately 200mm thick with a projection of 1.3m from the Southern blockwork wall.
- 4.17 Existing foundations were not exposed.
- 4.18 Rainwater goods to the North elevation are complete and currently discharge into a gully to the North West corner. Rainwater goods to the South elevation are missing/incomplete and currently discharge into a water butt. These will require replacement during the conversion works. Rainwater goods appear to be formed from an asbestos containing material and should be tested to confirm presence of asbestos and replaced and disposed of accordingly.
- 4.19 The single storey lean-to structure that would be demolished as part of the conversion works comprises blockwork walls with a mono-pitch roof. A timber telegraph post is built within the blockwork at the South East corner. During the inspection the ground bearing floor slab in the lean-to structure had cracked and settled to the South West area.
- 4.20 There was significant vegetation present in close proximity to the barn including mature coniferous trees approximately 6.0m from the North elevation. To the South elevation a mix of mature Ash and Hawthorn trees were present. A large fig tree and laurel was present adjacent the West elevation.
- 4.21 An existing septic tank was noted to the South West elevation and it is assumed this will be relocated/replaced to suit any conversion works.

5 CONCLUSIONS & RECOMMENDATIONS

- 5.1 The structural integrity of the building is sufficiently sound to facilitate the proposed end use.
- 5.2 The steelwork frame where visible from ground level appears sound with only surface rust present which would be addressed with wire brushing and repainting insitu with a rust inhibitor to promote longevity and prevent corrosion. However, some of the steelwork is encased by walls so there is a slight possibility that localised severe corrosion is present where not exposed.
- 5.3 The existing timber purlins are in a fair condition and suitable for the current use.
- 5.4 The overall stability of the frame will need to be reviewed in accordance with the proposed conversion works once a preliminary design scheme is produced. We would anticipate the existing structural elements to be tied to the new internal structure as this will further tie the frame and ensure that lateral deflections are limited to those acceptable for brittle finishes associated with a residential dwelling. Alternatively, subject to design calculations the steel frame may require strengthening to comply with current building regulations.
- 5.5 During conversion works we anticipate the existing fibre cement corrugated sheeting would be suitably disposed of and replaced with a new upgraded covering.
- 5.6 Consideration should be given to the proposed roof construction to avoid an increase in the roof loads however the installation of internal walls may offer additional support pending confirmation of the proposed final layout.
- 5.7 All rainwater goods will require replacement.
- 5.8 General blockwork repairs will be required where localised cracking has occurred. Repairs should be carried out by restitching using Helibar reinforcement. We consider the gable framing to be minimal and the lateral stability of these walls should be supplemented, e.g. by the buttressing of new internal walls during the conversion works.
- 5.9 The building is located within an area of anticipated Clay subsoils with numerous trees.
- 5.10 Consideration should be given to the design of new foundations and suspended floor construction if the existing slab is removed given the presence of mature trees in close proximity to the barn and the effect these will have on the underlying Clay subsoils.
- 5.11 Trial pits should be undertaken early on in the redevelopment of the site to confirm the existing foundation provision and to determine whether any underpinning is required to the existing structures.
- 5.12 The floor slab is in reasonable condition and likely to be satisfactory for overlaying with screed and insulation. If the upstand adjacent the South elevation were constructed on top of the floor slab, it may be possible to break out without damage to the slab beneath. If this was constructed monolithically with the floor slab, it is

unlikely that this could be reused without significant damage to the slab, therefore requiring replacement.

- 5.13 General works would also include clearing vegetation and removing moss and algae growth from blockwork and repair/repoint block walls as required.
- 5.14 It would be standard practice for any conversion scheme of this type to comply with Building Regulations, which would have certain implications upon foundation design, roof design, any additional loadings to the fabric etc. which would need to be reviewed during the detailed design stage.

6 LIMITATIONS

- 6.1 This report is 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 Orwell Structural Engineers Limited.
- 6.2 Unless specifically referred to, our report has been undertaken on a visual basis from ground level and therefore our comments are based upon what could be reasonably seen from that location.
- 6.3 We have not inspected any parts of the structure that are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the structure are free from defect.
- 6.4 This visual structural inspection was commissioned to report on the suitability of the structure for conversion from agricultural into residential use. This report should not be construed either in whole, or in part, as a full structural survey. No structural assessment by calculation has been undertaken which would be necessary prior to any final scheme details being drafted.

Report produced by:

David Wardley IEng AMIStructE EngTech TMICE
Incorporated Structural Engineer

Signed:

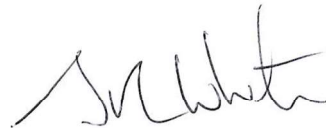


Date: 19 August 2022

Counter signatory:

Steve White BEng (Hons) CEng MIStructE MICE
Chartered Structural Engineer

Signed:



Date: 19 August 2022

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7 PHOTOGRAPHS



7.1 North elevation of barn obscured by vegetation



7.2 North East corner of barn showing proximity of vegetation



7.3 East elevation



7.4 South elevation showing lean-to and existing vegetation



7.5 West elevation



7.6 General internal view of barn structure looking East



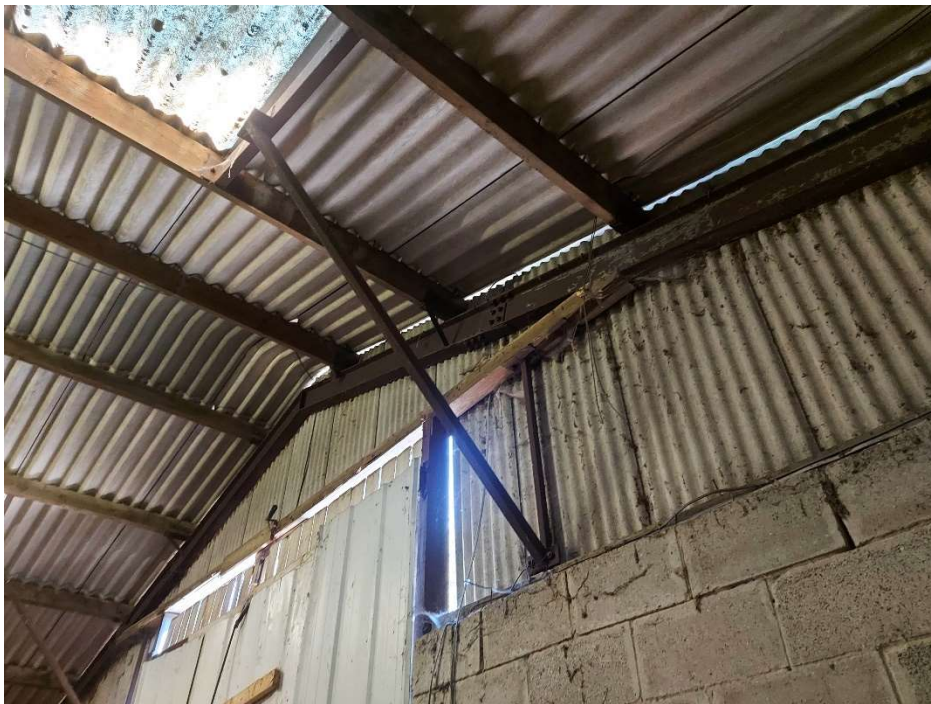
7.7 Internal view of West gable elevation showing original opening partially infilled



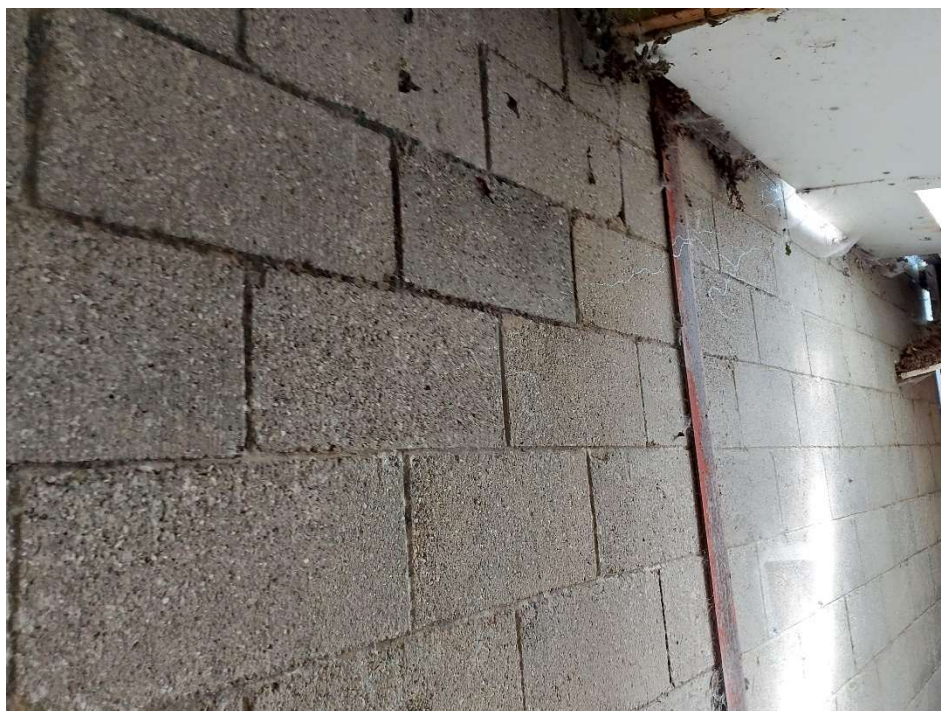
7.8 Detail of existing splice to steel rafters



7.9 Detail of existing rafter and timber purlin connection



7.10 Detail of diagonal brace to East elevation (similar detail opposite end)



7.11 External view of blockwork built into steel column on South elevation



7.12 General view of existing internal slab and plinth upstand to South elevation of barn

8 SUPPLIED PROPOSED DRAWING



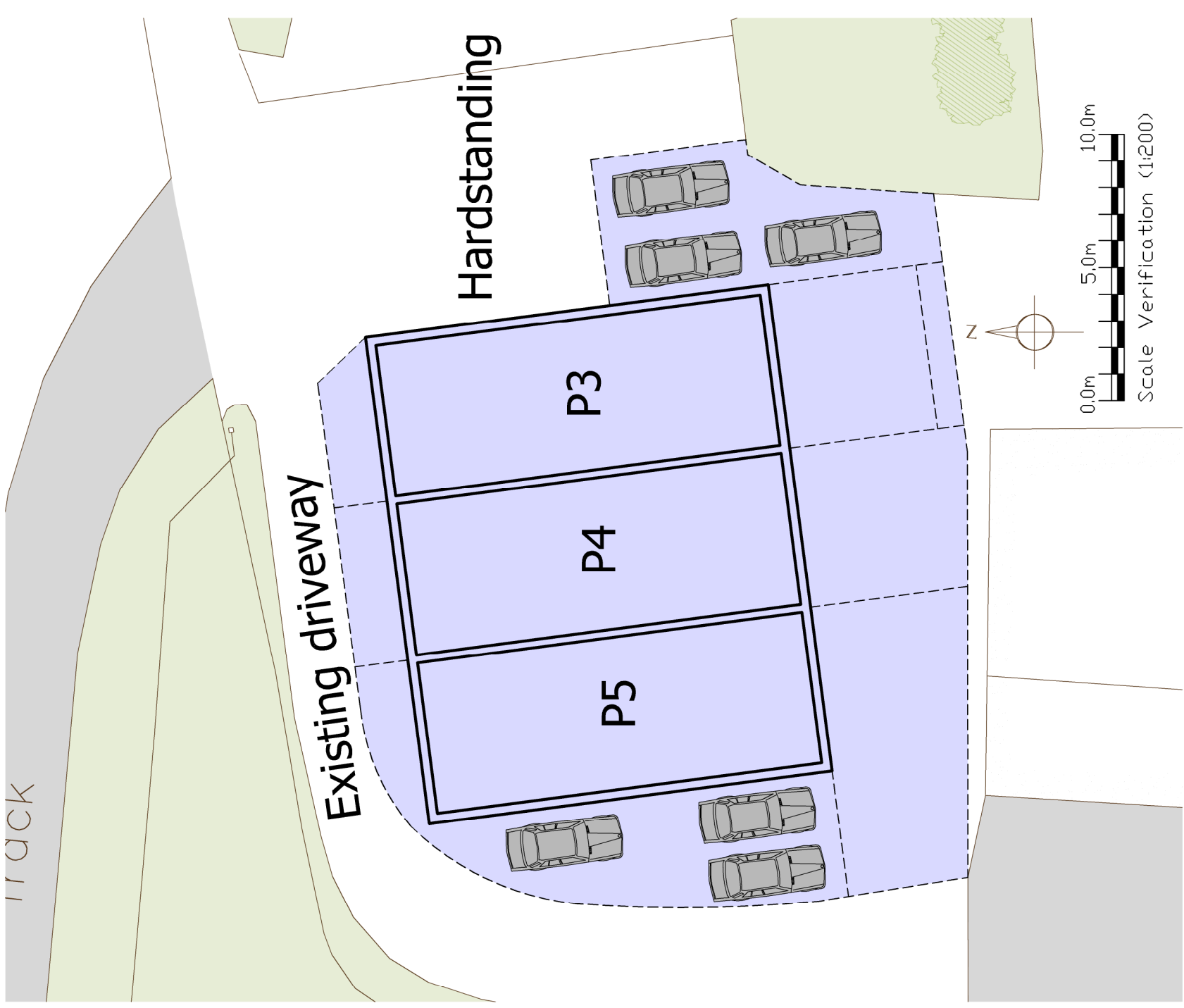
P3 85m²
Floor Area

P4 85m²
Floor Area

P5 85m²
Floor Area



Scale Verification (1:100)



Scale Verification (1:200)

Revisions

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77921 - SK10

Revision

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