

FORMER COACH ROAD FARM, CUT LANE, KNOWSLEY, L33 3AQ

STRUCTURAL SURVEY OF DUTCH BARN TO FORM CONVERSION TO DWELLING & PIGGERY



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Appendix 1 – Roof Load Calculations

1.0 Background and Instructions

- 1.1 Brian N Robinson was instructed by the client Mark Groves of Ormskirk Skip & Recycling Limited to undertake a full structural survey of the existing Dutch barn at the former Coach Road Farm.
- 1.2 Brian N Robinson is the author of this report and is a qualified structural engineer and member of the Institute of Structural Engineers (registration number 064458126) and has over 40 years of post-qualification experience.
- 1.3 This report has been commissioned following an earlier appraisal also undertaken by the Author to support a previous planning application to convert the barn. However, that appraisal was limited in its scope as it was purely visual and undertaken from ground level and excluded unseen elements of the structure.
- 1.4 This updated survey addresses those limitations and supports a new planning application. This has been informed by:
 - Intrusive investigation of the below-ground structure using trial holes to expose the foundations and sub-base;
 - Close inspection of the superstructure using a cherry picker;
- 1.6 The site visit was conducted on, 19/04/2024, to undertake the inspection.
- 1.7 The survey is for the private and confidential use of the client for whom the survey was undertaken to support an application for planning permission. Brian N Robinson Structural Engineer cannot accept any responsibility for any use of the contents of this report by any third party.

2.0 Dutch Barn

2.1 Observations



- 2.1.1 The barn is a standalone structure and would appear to have been constructed within the mid-20th century, and from local knowledge has been in use for at least the last 70+years.
- 2.1.2 The lower portion of the external structure is constructed of 225mm thick blockwork showing no signs of settlement or movement.



- 2.1.3 The barn is a steel framed structure with timber trusses and roof purlins, the roof being clad with asbestos /cement corrugated sheeting 8mm thick. The barn is partially open and the enclosed elevations are clad with timber sheeting supported by

timber sheeting rails which span horizontally between the supporting columns, with 225mm thick concrete block masonry, tied into the columns ,at the lower level.

- 2.1.4 Trail pits to expose the substructures were excavated by hand, where the size and foundation depths were investigated and the existing ground conditions were examined to determine the allowable ground bearing pressure.
- 2.1.5 The ground floor slab is 125 -160mm thick concrete ground bearing floor slab. The blockwork lower walls are constructed off concrete strip foundations.
- 2.1.6 The steel columns are on concrete foundations average 900mm deep.
- 2.1.7 The roof is supported off 14No. 8" x 4" RSJ (equivalent to a 203 x 102 x 23kg universal beams as columns, set in around the external at an average of 4.6m centres. The columns shows signs of light surface rusting only with no loss of section.
- 2.1.8 A close inspection showed there were no visual signs of decay, wet rot or beetle attack to the timber trusses and there is no signs of distortion or distress in any of the roof truss members.
- 2.1.9 The timber roof purlins are average 1200mm centres and support the roof cladding and spanning between the main trusses. The timber roof purlins are at regular centres support (average 1.2m). .
- 2.1.20 The corrugated roof sheets would appear to be of asbestos/cement and would require removal in a controlled manner and taken to an appropriate waste disposal site. These do not provide any structural support.
- 2.1.21 The slab, steel structural frame and roof structure are considered to be permanent and substantial construction, external cladding and roof covering will require replacement as part of the conversion work, this would not amount to a rebuild.

2.2 Substructure

- 2.2.1 The existing concrete slab and column pads will be retained, with insulation added to satisfy building regulations and for energy-efficiency. The interior of the barn is to have a non-structural insulated concrete ground bearing floor slab to comply with current building regulations.

2.3. Superstructure

- 2.3.1 The existing super structure to the Dutch Barn will be retained.
- 2.3.2 The lower blockwork walls would all be retained and overclad with facing brick as per the architect's drawings.
- 2.3.3 It is concluded that all of the existing structure that forms the Barn is capable of carrying the loads imposed.

3.0 The Piggery



The building appears to have been built at the same time as the original farmhouse and has been used as both a piggery and a garage for farm vehicles.

Overall there is little or no sign of movement or settlement, the brickwork being in good condition considering it's age.

The walls are constructed of 235mm thick brickwork built off brick thickened out foundations.

The roof is a slate roof on timber t & g boards on 150 x 75 timber purlins and ridge pole supported at the open end on steel posts.

The floor is a concrete slab of unknown thickness and shows no sign of damp or cracking.

The roof may require support from new rafters between the existing purlins to support any insulation layer proposed.

4.0 Discussion and Conclusion

4.1 Dutch Barn

- 4.1.1 The key question is whether or not the existing barn structure is capable of conversion to the proposed new use. The proposed development involves the conversion of the barn to a dwelling and requires the existing timber trusses, steel columns, and block walls to support the loads and transfer them to the foundations.
- 4.1.2 The existing roof to the Dutch Barn is lightweight roof and is supported off the existing steel columns.

The approved documents of the Building Regulations - Part A Structure state:-

Section 4 Re-covering roofs

4.3 Where the work involves a significant change in the applied loading the structural integrity of the roof structure and supporting structure should be checked.

4.4 A significant change in roof loading is when the loading upon the roof is increased by more than 15%.

Existing loading on the roof = 0.76kn/m^2

Maximum allowable loading = $0.76\text{kn/m}^2 + 15\% = 0.76\text{kn/m}^2 + 0.115 = 0.87\text{kn/m}^2$

Any new roof be designed is to be of lightweight construction with a maximum loading of 0.87kn/m^2

The roof build up proposed by the Architect comprises 3.5mm thick aluminium raised seam roofing on 10mm thick plywood with 150mm thick Kingspan K107 insulation board, with 12.5mm thick plasterboard producing a loading of 0.81kn/m^2

This would be within tolerance allowed and would negate the need for a full design check.

Appendix A contains the loading calculations.

- 4.1.3 The Dutch barn is considered structurally stable and capable of being converted having been insitu for more than 70 years. The steel trusses and posts of the building frame are considered to be permanent and sufficiently substantial for conversion. The extent of works will clearly comprise retention of all the structural building elements including the steel frame, blockwork walls, and roof structure, with replacement of cladding and new window and door openings. This would not amount to a re-build.

4.2 The Piggery

The overall structure of this building is suitable for the proposed use of a garden room and outside toilet/shower.

A handwritten signature in black ink, reading "Brian N Robinson". The signature is written in a cursive, flowing style with a period at the end.

Brian N Robinson
IEng, IMIStructE Structural Engineer

APPENDIX A

ROOF LOAD CALCULATIONS

EXISTING ROOF

8mm THICK ASBESTOS = 16 kg/m^2

LOADING

ASBESTOS = $16 \times 9.8/1000 = 0.16$
IMPOSED = 0.60
 0.76 kn/m^2

ALLOWABLE LOAD = $(0.76 \times 15\%) + 0.76 = 0.87 \text{ kn/m}^2$

PROPOSED ROOF

0.7mm THICK RAISED SEAM ALUMINIUM ROOF = 3.59
10mm THICK PLYWOOD = 4.30
150mm THICK KINGSPAN K107 INSULATION BOARD = 5.68
12.5mm THICK PLASTERBOARD = 8.30
 21.87 kg/m^2

WEIGHTS TAKEN FROM MANUFACTURER'S DATA

LOADING

ROOF = $21.87 \times 9.8/1000 = 0.21$
IMPOSED = 0.60
 0.81 kn/m^2

SATISFACTORY – COMPLIES WITH THE REQUIREMENTS OF THE BUILDING REGULATIONS.