

Popeley Farm, Gomersall – BARN 1 Structural inspection for planning

Version: 1.0

Description: For client and planning approval

Summary

An inspection of two steel portal frame barns, one traditional masonry field barn and one masonry workshop structure at Popeley Farm was performed by Richard Lines C.Eng, MIStructE on the 16th of February 2023. The four buildings have been named Barns 1 – 3 and the workshop, see section 1.0 for locations and definitions.

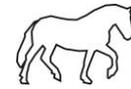


Figure 1: Satellite image of Popeley Farm, with the four structures inspected highlighted red (base image credit: Google Earth Pro.)

Barn 1 is suited to conversion, subject to the following recommendations:

- The roof covering being specified with a sufficiently lightweight build-up to manage the spreading effect at the eaves and stresses / deflections in the purlins,
- Lateral and longitudinal stiffening / bracing of the portal frames may be required to manage wind deflections, notably on the open side. This may most conveniently be achieved by provision of masonry or timber infill panels between the frames to form the building envelope.
- The foundations and the soil they bear upon should be exposed during works and confirmed against the likely increase in loading associated with conversion to a dwelling.

Project: Popeley Farm
Client: Mr J. Clay
Description: Structural inspection
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This inspection was concerned only with the structural aspects that were visible at the time. The structure was not dismantled, and it is assumed that the aspects visible were representative of the rest of the structure.

Any recommendations that are made are from the point of view of the author on the potential for conversion from a structural perspective and does not make any conclusion on the economics of conversion or the likelihood of the proposals achieving planning permission or meeting current building regulations.

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1.0 Site observations and layout

The inspection described in this report was carried out on a cool, overcast day with brighter intervals by Richard Lines C.Eng, MStructE on the 16th of February 2023. The barns are situated off of a private track from Muffit Lane, Gomersall in open grazing land. The site is situated on top of a small hill and is locally flat. No large scale drainage or geotechnical issues were apparent.

According to the British Geological Survey, the local bedrock geology is that of the 'Thornhill Sandstone' formation. In terms of surface deposits, no information is provided by the BGS geology viewer.

No local borehole records were available from the BGS, however clusters of investigations have been carried out around the extents of open land that Popeley Farm is situated on.

- To the north west, (BGS ref SE22NW476) trial pit investigations indicate sandstone at around 600mm below ground level,
- To the northeast, borehole (BGS ref SE22NW1102) indicate firm clays to around 4.5m below ground level,
- To the south southeast, borehole (BGS ref SE22NW489) indicates around 500mm of clay overlying coal, and
- To the southwest, borehole (BGS ref SE22NW340) indicates weathered mudstone clays / mudstone directly underneath the topsoil.

The site is **within** the coal mining reporting area according to the Coal Authority interactive viewer.

Reference to the various barn and workshop structures, in this report are made according to the definitions made in Figure 2. Figure 3 shows a more detailed plan of the structures with an indication of the arrangement of primary structural elements.

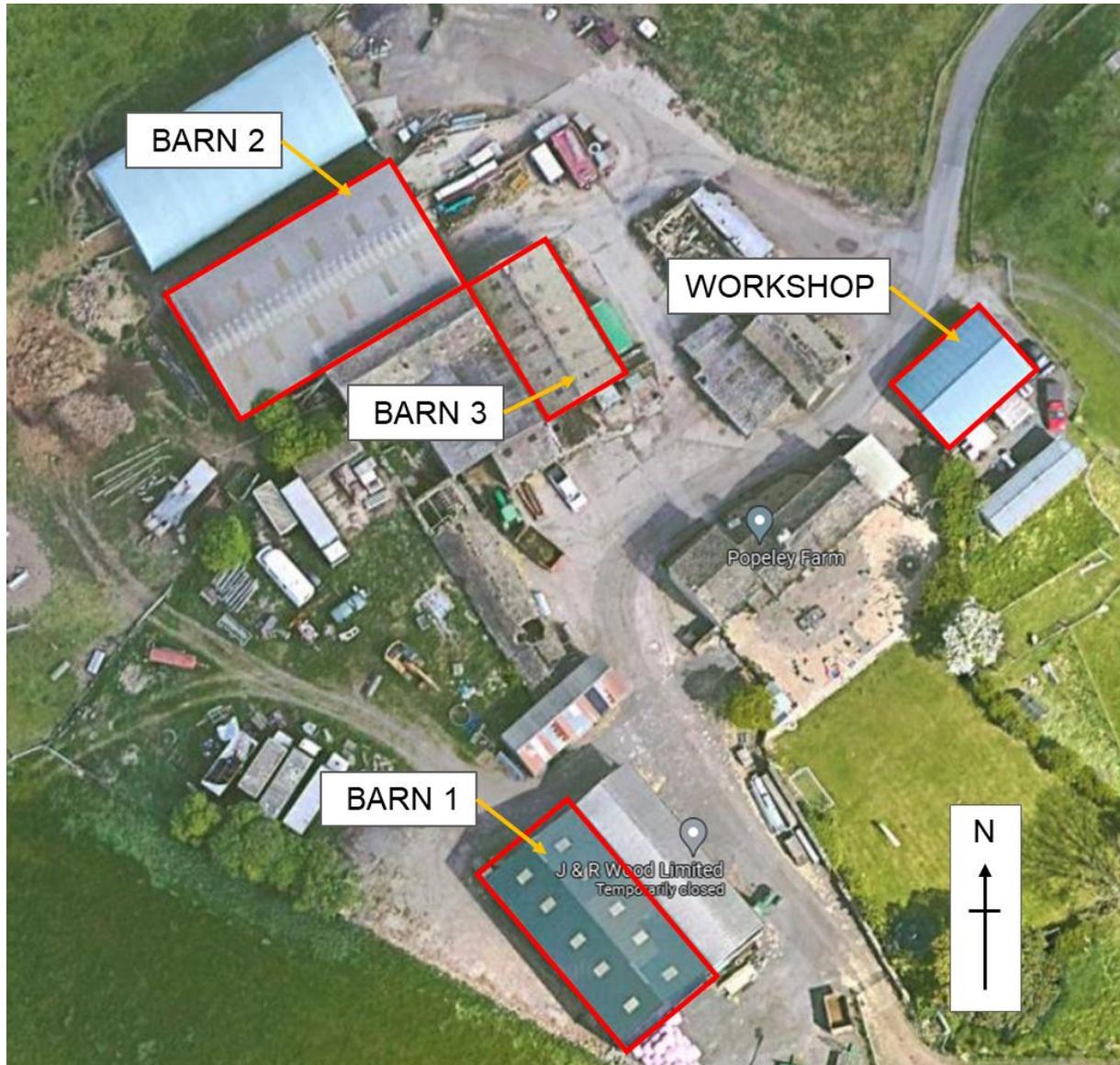


Figure 2: Site layout and nomenclature of the barn and workshop structures (base image credit: Google Earth Pro.)

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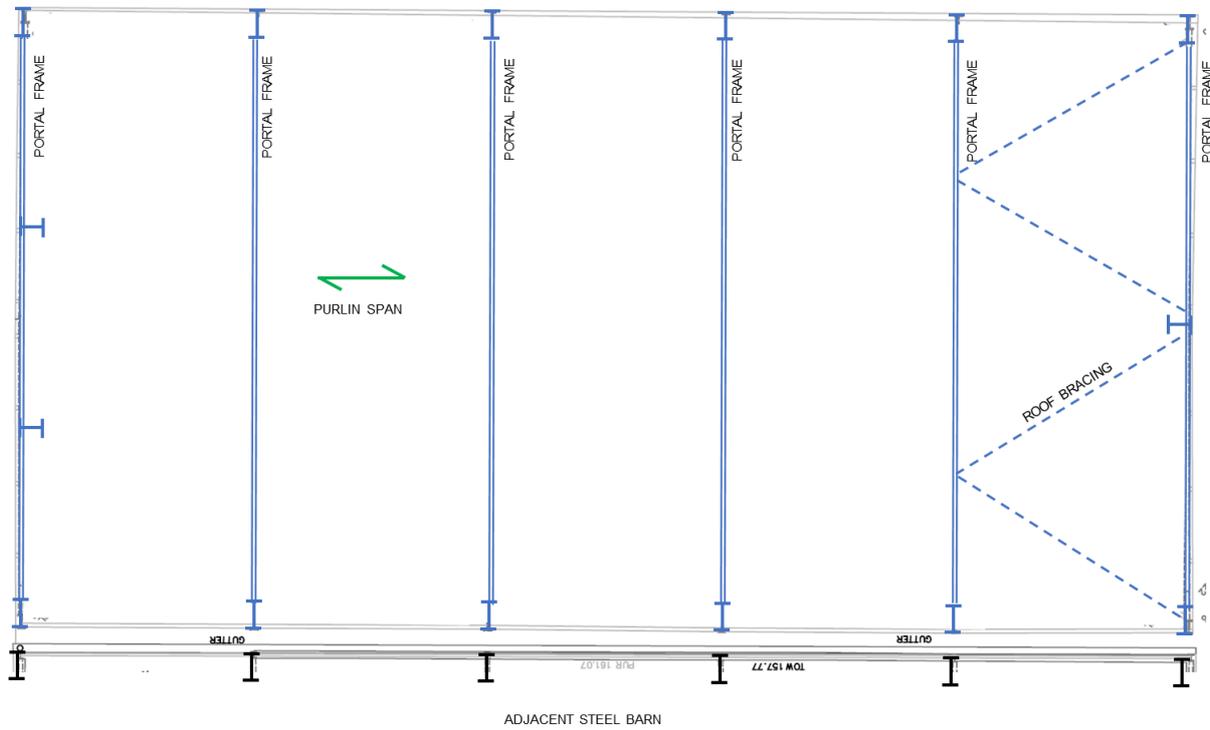


Figure 3: Barn 1 general structural arrangement (base image modified from MET Consultancy Group. original survey drawings)

2.0 Barn 1

2.1 General comments

Barn 1 is a typical modern agricultural steel portal frame structure, complete with modern profiled metal roofing and cladding sheets to ground level on three sides. The fourth side is open to the adjacent barn.

Barn 1 is suited to conversion, subject to:

- The roof covering being specified with a sufficiently lightweight build-up to manage the spreading effect at the eaves and deflection of the purlins,
- Lateral and longitudinal stiffening of the portal frames to manage wind deflections, and
- The foundations and the soil they bear upon should be exposed during works and confirmed against the likely increase in loading associated with conversion to a dwelling.

2.2 Roof

The roof over Barn 1 is a typical provision of plastic coated profiled metal sheets supported from timber purlins, which themselves bear onto the primary steel portal frames.

The timber purlins are in sound condition but are slender and the roof build-up should be carefully specified to avoid excessive stresses or damage to brittle internal finishes. Any timber to be retained should be inspected during works for decay and infestation by an expert.

2.3 Walls

A typical provision of profiled cladding supported from timber and cold rolled steel side rails has been installed. It is unlikely that these elements will be included in conversion plans, but would be suited from a structural perspective with careful architectural detailing to isolate the internal finishes from the relatively flexible outer cladding and supports.

The north-western (front) gable is clad from the south-eastern side elevation to the centreline under the roof apex and the remaining half is open. The cladding here has been supported with cold rolled steel side rails in contrast to the timber provided in the remainder of the structure.

2.4 Steel frames

Barn 1 is a classical agricultural steel portal frame structure, formed of six portal frames formed from UB 254 x 146 x 31 beam elements. The gable frames have been provided with additional vertical members (two UB 178 x 102 x 19 at the south-eastern/rear gable and a single UB 203 x 133 x 25 at the north-western / front gable) to assist the installation of cladding. The primary steelwork has been painted with a red oxide finish and some light corrosion was observed.

The beams have been connected at the eaves and apex with haunched moment-resisting bolted connections to develop the required portal frame behaviour.

Four steel circular hollow section (CHS) braces have been provided in the roof to transfer wind loading from the gables to the main frames via the purlins and roof sheets.

The main frames have not been formally braced in the longitudinal direction. This implies that the frames are either formally built in with a significant foundation at their base to develop bending in their minor axis to transfer load to the ground, or are relying on the cladding forming a 'stressed skin' diaphragm to stiffen the walls in the longitudinal direction.

The cladding is only present on the southwestern elevation, and the north eastern elevation is open to the adjacent barn. Regardless of the design intention and construction details of the foundations

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noted in the previous paragraph, the barn has an eccentric distribution of stiffening elements and is likely to develop rotational / torsional motions during high wind events. Bracing or other stiffening such as masonry or timber infill walls should be provided during conversion.

2.5 Floor and foundation

The floor is a compacted dirt type which should clearly be upgraded to suit conversion to a dwelling.

The foundations were not exposed for inspections. Agricultural frames typically utilise mass concrete pad foundations and if the ground conditions noted in the 'site observations' section are also present at Barn 1 are likely to be suited to an increased loading associated with conversion to a dwelling.



Figure 4: External view of the north-western (front) gable of Barn 1.



Figure 5: External view of the south-western elevation.



Figure 6: Internal view of Barn1, noting the red painted steel portal frames, timber purlins, timber side rails, compacted dirt floor and an asymmetric provision of side cladding.

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Figure 7: Independence of Barn 1 from the adjacent barn structure (image LEFT), robust haunched eaves connections (image RIGHT).

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Figure 8: internal view of the south-western (rear) gable framing (image LEFT) and the north-western gable framing (image RIGHT).

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3.0 Conclusions

Barn 1 is suited to conversion, subject to the following recommendations:

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- Lateral and longitudinal stiffening / bracing of the portal frames may be required to manage wind deflections, notably on the open side. This may most conveniently be achieved by provision of masonry or timber infill panels between the frames to form the building envelope.
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