

Popeley Farm, Gomersall – BARN 2 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 2 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,
- Checks on the cement fibre type roof sheets / cladding for asbestos before starting works.
- Grouting the shim stacks under the exposed baseplates
- Lateral stiffening of the portal frames may be required 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. Their depth

Project: Popeley Farm
Client: Mr J. Clay
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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, MIStructE 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.

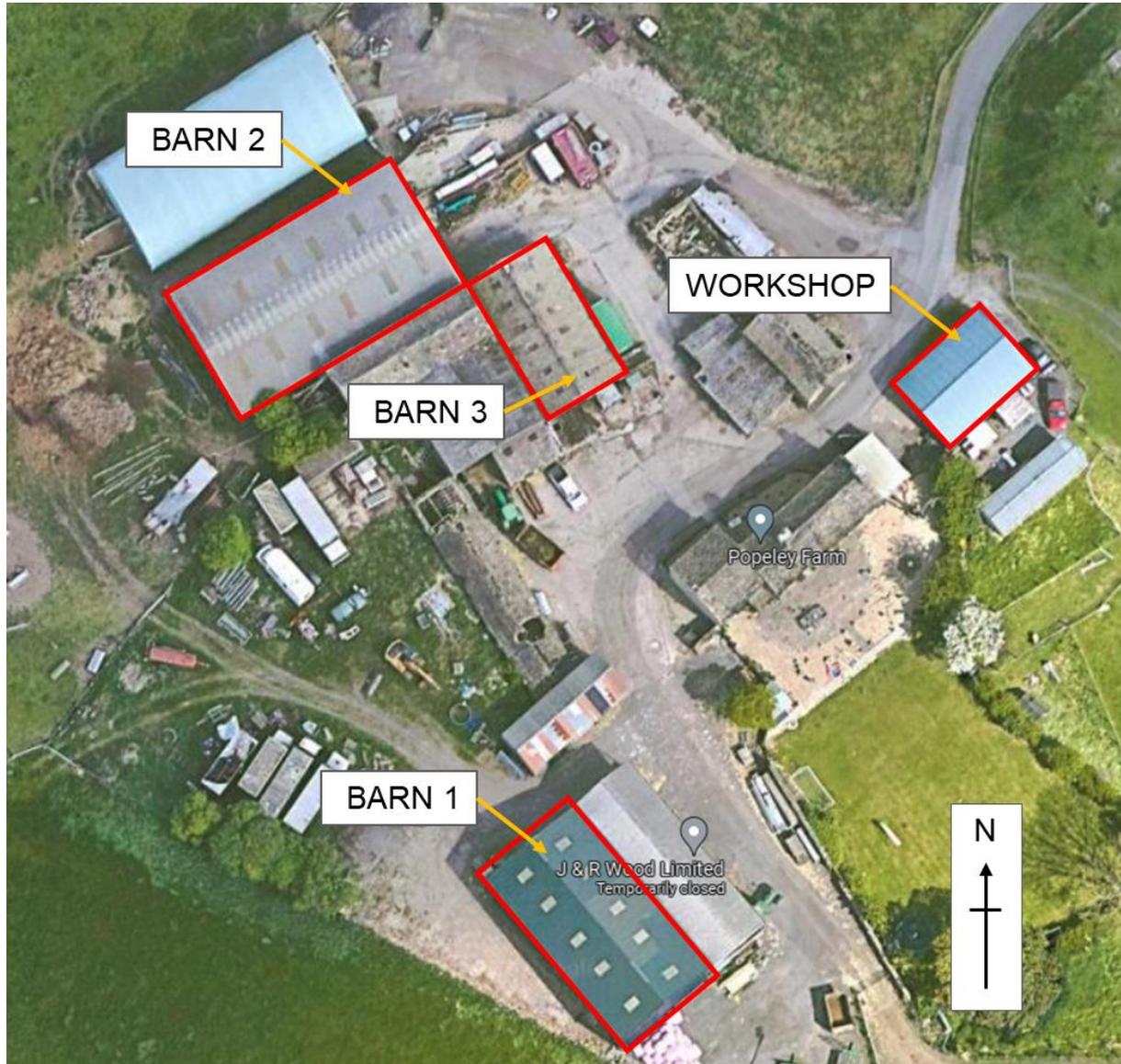


Figure 2: Site layout and nomenclature of the barn and workshop structures (base image credit: Google Earth Pro.)

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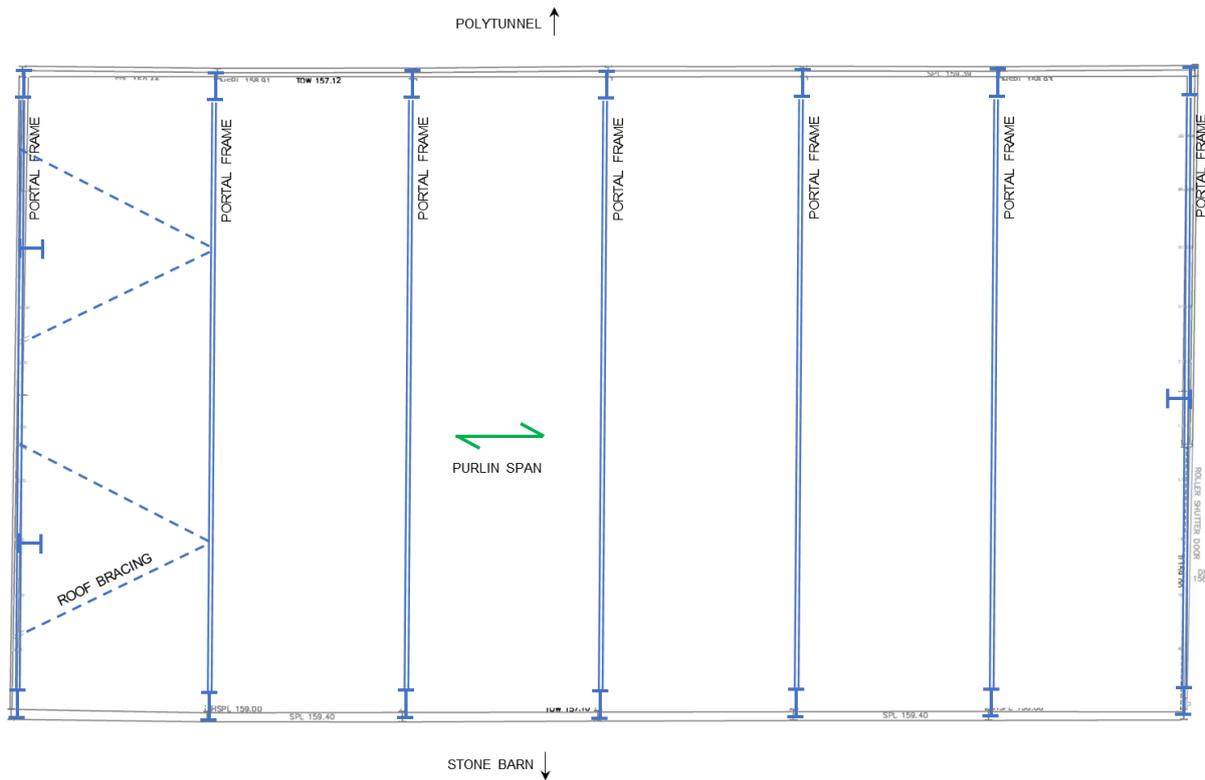


Figure 3: Barn 2 general structural arrangement (base image modified from MET Consultancy Group. original survey drawings)

2.0 Barn 2

2.1 General comments

Barn 2 is a classical steel portal frame barn which is likely to be older than Barn 1. Remains are evident of a previous barn structure on the footprint of Barn 2 and it appears (although this cannot be confirmed without invasive inspection) that Barn 2 may have been partly built from the original barn's foundations. The barn was in service as a cow-shed during the inspection, and therefore some areas were not available for close inspection.

Barn 2 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 deflection of the purlins,
- Checks on the cement fibre type roof sheets / cladding for asbestos before starting works.
- Lateral stiffening of the portal frames may be required 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. Their depth should be checked and an assessment made as to the stability of the slope onto which they bear.

2.2 Roof

The roof over Barn 2 is a profiled cement fibre sheet system with a large proprietary ventilated ridge supported from timber purlins, which themselves bear onto the primary steel portal frames. The composition of the roof sheets is unknown and should be inspected and tested for asbestos prior to stripping works.

The timber purlins appear to be in sound condition (from distant inspection) 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

The walls have been formed in two sections, the lower dwarf walls are constructed from 215mm thick shell bedded hollow concrete blocks laid in cement mortar, and above this timber Yorkshire boarding has been provided to the roof line.

The north-eastern (front) gable features a steel column (UB 254 x 146) directly underneath the ridge which divides the gable into two halves. One half has been built with a dwarf wall in the same fashion as noted for the other walls with light mesh screening to eaves level and then timber Yorkshire boards from eaves level to the roof slope above. The other half of the gable features a large opening with steel framing for the roller shutter door.

The south-western gable has been provided with two smaller (UB203 x 133) posts to support the cladding.

The timber cladding has been supported from timber side rails which are mounted on steel cleats welded to the portal frames.

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2.4 Steel frames

Barn 2 is constructed around seven steel portal frames which are themselves composed of UB 254 x 146 x 31 columns and estimated UB 203 x 133 principal rafters of an unknown section weight. 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 rolled steel angle (RSA) 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. Stability is provided to both side elevations by means of the concrete masonry dwarf walls which abut the webs of the steel columns (in lieu of steel bracing).

The masonry has not become cracked or otherwise distressed and therefore it can be concluded that this arrangement has provided sufficient stability to date and the addition of further material to infill the bays such that a weather tight envelope can be formed for the proposed dwelling will provide further stability.

2.5 Floor and foundation

The floor is a textured concrete provision, which is believed to slope towards the front gable to aid drainage. This floor is likely to be suited to conversion provided no structural elements (such as columns) are supported by the floor surface. However, these floors are unlikely to be insulated or have modern damp proof provisions.

The foundations were not exposed for inspection, but some of the concrete pads are exposed and are visible. It is not immediately clear whether these concrete pads are the original provision to the barn which stood on this site previously, are purpose built or a combination of the two.

The depth of these foundations is unknown and should be checked in relation to modern recommended minimums during works.

The exposed top edges of the pad foundations means that the base plate connections of the steel frames to the pads are also visible. One particular location indicates that the base plates have not been properly grouted after shimming/levelling under the column base plates and it is recommended that all base plates are grouted during works to provide an efficient transfer of load to the foundation.

The foundations to the north-western elevation are situated close to the top of a step down in ground levels. This step down has been left as a slope. Checks on the depth and hence the long-term stability of these foundations should be made and these foundations underpinned to the base of this slope or the frames tied at their base if necessary during works to mitigate against the possibility of the foundations moving down this slope over the longer term under the outward thrust developed by the portal frame action at their base.

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Figure 4: External view of the north-eastern (front) elevation of barn 2.



Figure 5: External view of the south-western elevation of barn 2.

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Figure 6: Typical internal view of Barn 2.



Figure 7: Internal view of the roof structure in barn 2



Figure 8: Internal view of the timber Yorkshire board cladding and masonry dwarf walls in Barn 2.



Figure 9: Un-grouted base plate.

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Figure 10: Haunched eaves connection and mesh screen above the masonry dwarf wall internally on the south-eastern elevation.

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Figure 11: Sloping ground at a change in levels on the north-western elevation. Note the slightly larger footprint and cropped timber and steel columns of a previous structure (image LEFT), Structural independence of Barn 2 and the adjacent masonry structure (image RIGHT).



Figure 12: Exposed pad foundation at the western corner, possibly a new purpose-built provision.



Figure 13: Exposed pad foundation at the north-western elevation, noting the cropped steel channel – possibly indicating that this pad is a reused provision.

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3.0 Conclusions

Barn 2 is suited to conversion, subject to the following recommendations:

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