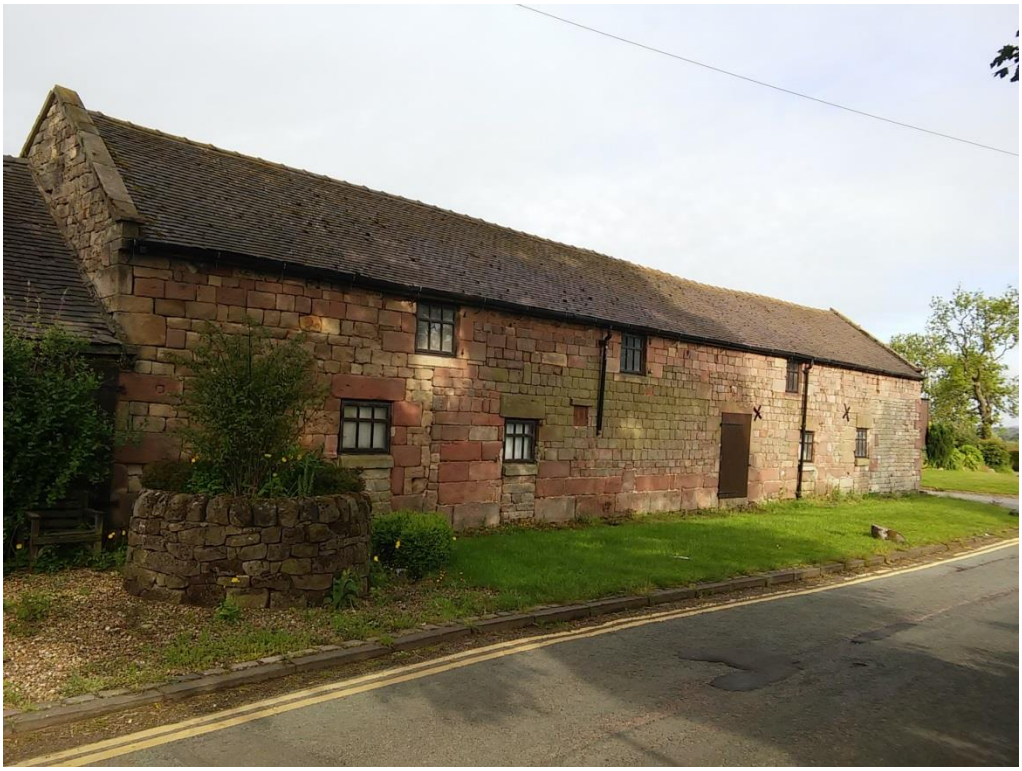
# Middle Hulme Grange - Barn
# Meerbrook, Leek

## Structural Condition Report
## June 2015
## Project 1554 Revision 01



# REVISION HISTORY

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| Rev00<br>Rev01 | 15th June 2015<br>17th June 2015 | Draft Issue<br>Issue to Sammons |

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# EXECUTIVE SUMMARY

1. Middle Hulme Grange barn is generally in a good structural condition. Most of the structural repairs and alterations implicit as part of the 2002 planning approval for conversion to small retail units and workshops were carried out, and have performed satisfactorily for the last 10 years or so. The finishing works were not completed, and this has meant that the majority of the structure is still readily visible.

2. The design imposed loadings which relate to the new proposed use will typically be less than those required for the intended use in 2002.

3. There is no evidence to suggest the foundations and substructure are inadequate for the intended new use.

4. It appears that minimal works have been carried out to the main external walls. These have deformed historically, in several locations, primarily as a result of lateral thrusts applied from the traditional nature of the roof structure. Whilst the new internal mezzanine deck will help to restrain the walls from future movements, the fixings between it and the walls are likely to be into the inner skin of masonry only. It is therefore recommended that additional stainless steel ties are used to tie the inner and outer skins of masonry more effectively. These can be installed from the inside at regular spacings about 300mm or so below eaves level and also 200mm or so below the mezzanine floor soffit.

5. There is no evidence to suggest that the new concrete ground floor slab will not be adequate for the intended new use.

6. Fire protection of the mezzanine floor is absent and therefore needs to be fitted.

7. There are various locations where timber noggins should be fitted to the mezzanine floor timbers in order to comply with Building Regulations.

8. The re-roofing works appear to perform satisfactorily. The degree of longitudinal tying of the main timber purlins appears minimal and it is recommended that additional “BAT” type 30x 5 section galvanised ties are added across each of these joints.

9. A structural assessment of the two long span end bay roof purlins is advised, and strengthening effected as the calculations might prove necessary.

# SCOPE AND LIMITATIONS

- This report, which is intended to support a change of use planning application, has been prepared for the sole use of Mr R Barlow, Middle Hulme Grange, Blackshaw Lane Meerbrook , Leek ST13 8SW and their subsequent, authorised agents. It should not be relied upon or used by any unauthorised third parties, and Sine Aequalis Ltd can take no responsibility for such subsequent use, or reliance. Additionally, by receiving it and acting on it the client, or any third party, accepts that no individual is personally liable in contract, tort or breach of statutory duty including negligence.

- The findings are taken from a 1.5 hour walk round inspection carried out on 15th June 2015. The weather for the survey was dry and cloudy.

- The inspection is based on a limited knowledge of the history and maintenance of the building. No supporting documents confirming the age and full details of the construction of the building were made available. Much of the building structure is however visible as conversion works were started about 10 years ago but not completed. Works advised as having been carried out at that time include: re-roofing with new spars and insulation; removal of at least 3 layers of ground floor slab / finishes; insertion of new mezzanine floor steels and timbers, and laying of a new concrete ground floor slab.

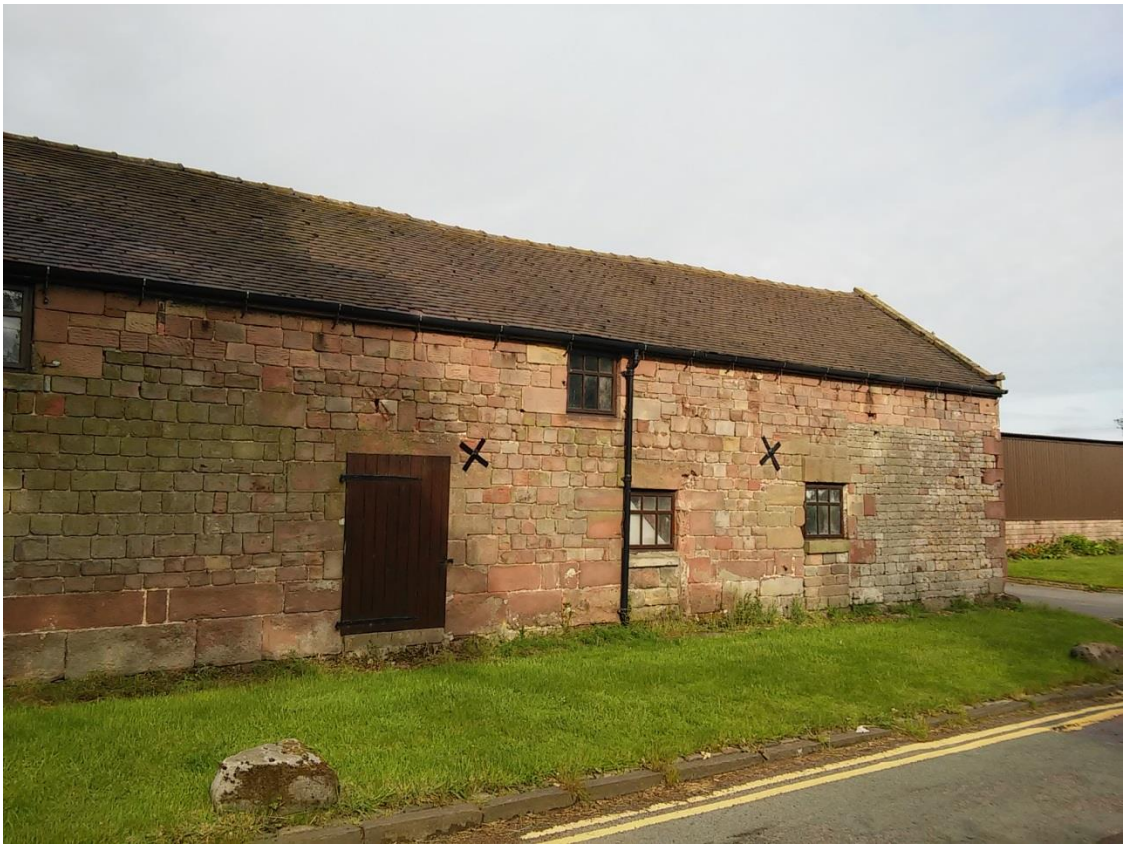
- No special access equipment was used and no intrusive opening up to view critical structural details was carried out.

- The survey is limited to the main structure of the building and is intended to look at any major structural issues which might affect the proposed conversion works for use as holiday let accommodation. The survey does not include roof coverings, guttering, cladding, secondary fixings, windows, doors, and any other items of a non-structural nature.

# INSPECTION FINDINGS

## 1. FOUNDATIONS AND SUBSTRUCTURE

It was not possible to directly inspect the foundations and substructure. These have been assessed through visual inspection of the superstructure. For an agricultural building of this typology and age it is probable that the main perimeter walls are founded at shallow depth – within 500mm or so of the external ground levels. For this reason there will inevitably have been some historical structural movements of the walls associated with ground movements due to changes in soil conditions such as temperature (frost in winter) and moisture content (drying due to prolonged periods of drought in the summer). Evidence of possible historical ground movements is however minimal. It is possible that some of the lack of verticality of the main walls is due in part to longterm differential compression of the soil directly beneath the walls, however there is no evidence of significant defects within the superstructure which would suggest that the foundations and substructure are not performing adequately. Stone coursing generally appears even and level relative to similar buildings of the same age. This is the case even at locations along the length of the barn where it will have been extended in the past. From the appearance of the east wall it is likely that the barn building was extended on 2 or 3 occasions.



Partial View of Main East Wall – note coursing appears quite regular without excessive vertical distortions

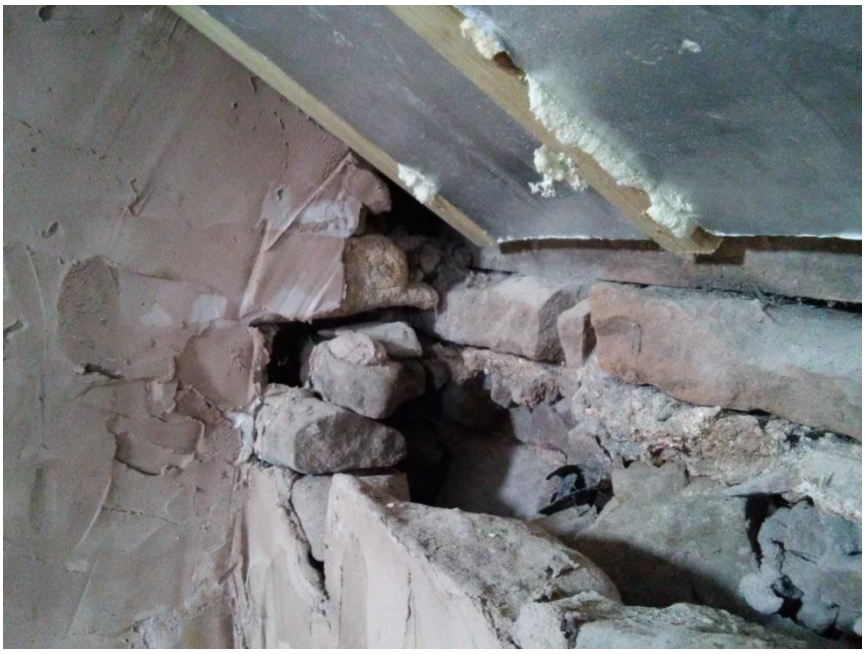
## 2. LOADBEARING MASONRY WALLS

The two main elevations to the barn are to the east and west sides. The south end connects to a lower roof level single storey store room and thence to the main farmhouse. The north gable closes off the far end of the barn building.

There is evidence, at various locations, of the walls having been pushed outwards relative to their alignment at ground level. This has resulted in a variable lack of verticality of the walls. The degree of 'out of plumb' of the walls is not excessive, and is common in buildings of this age and nature. It is possible that some of the lack of verticality is due to internal splitting / spread of the walls – such that the outer skin of masonry leans more than the inner skin. This is difficult to assess without taking accurate measurements as the nature of the rubble fill used within the facing units used externally and internally, and numbers and locations of 'through / tying' stones is not known. Window reveal closers do not show any signs of cracking of the recent render to suggest ongoing separation of the inner and outer wall skins.

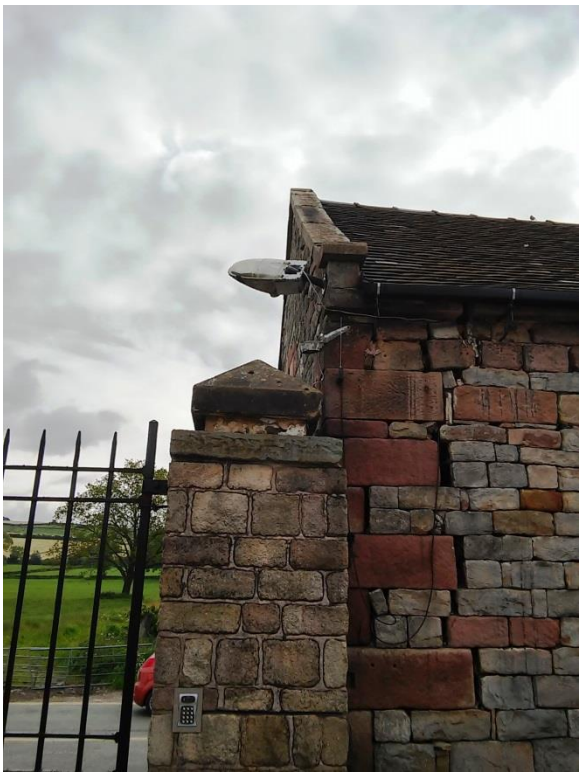
It is understood that previously there were a number of main cross walls within the building and that some of these have been removed. Removal of these cross walls has reduced the overall building stability and degree of restraint of the side walls, however the insertion of the mezzanine deck has undoubtedly provided a substantial degree of new and effective internal restraint.

Evidence of splitting of the end gable wall at the southeast corner at high level between the purlins



Typical cross wall to main side wall junction at roof eaves. Where exposed, the rubble fill within the main side wall cavities appears loose, and may have contributed to the lack of verticality of the external faces by settling within the void and causing relative spreading of the inner and outer leaves.

At the northwest corner of the barn, the gable wall appears to have been pushed northwards by the west side wall. This could have been caused by multiple effects such as solar thermal on a long expanse of tight jointed wall and / or cyclical freeze thaw acting on a build-up of snow and ice at the roof corner. Internally the walls have been rendered (advised about 10 years ago). There is no recent evidence, such as cracking of the render, to suggest that this movement is ongoing. The building owner also advises that the corner has been buttressed when the site entrance was remodelled.



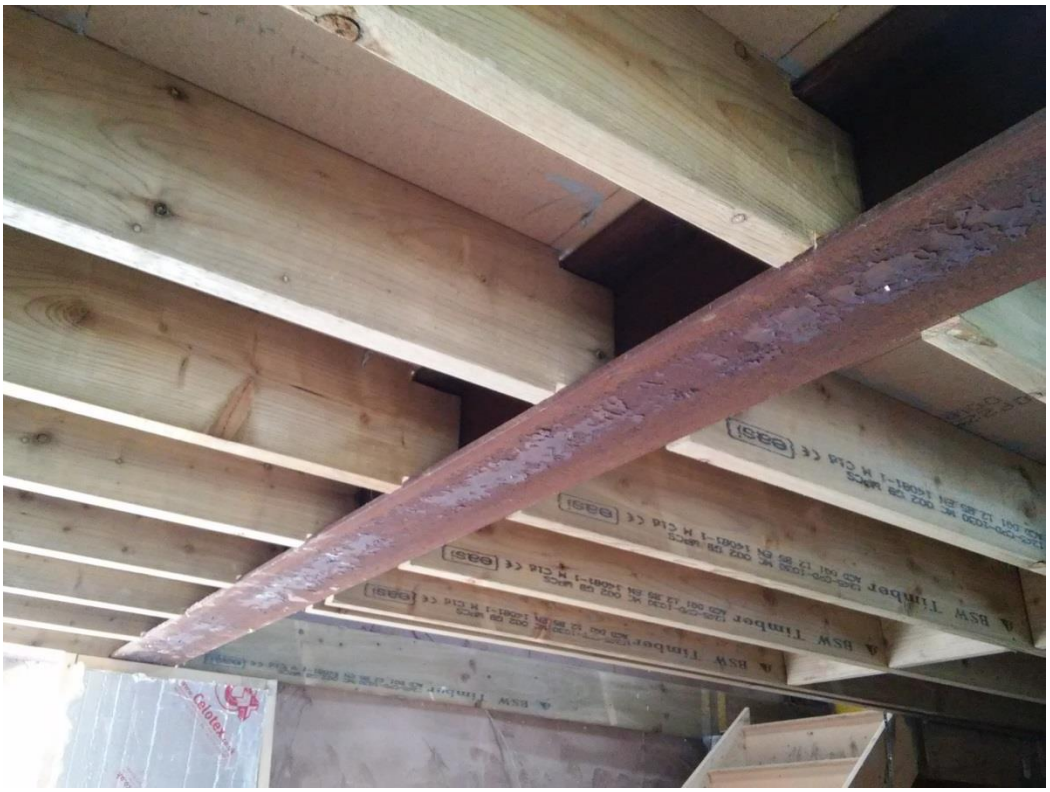
View of the open joints indicative of the north gable wall having been pushed away from the west side wall more at the top than towards the base. This now buttressed by the adjacent recent substantial gatepost.

3. GROUND FLOOR SLAB

The internal floor of the barn has been replaced with a relatively recently cast ground bearing concrete slab. The details of this are not known, but it appears to be performing adequately for the current use – joinery workshop, and storage. Since the proposed use does not involve any increase in loading it is considered reasonable to assume that the slab will be adequate in future. As the slab has been cast quite some time ago then any future shrinkage effects will be negligible. Application of new floor finishes should therefore be easily effected.

4. FIRST FLOOR DECK / MEZZANINE

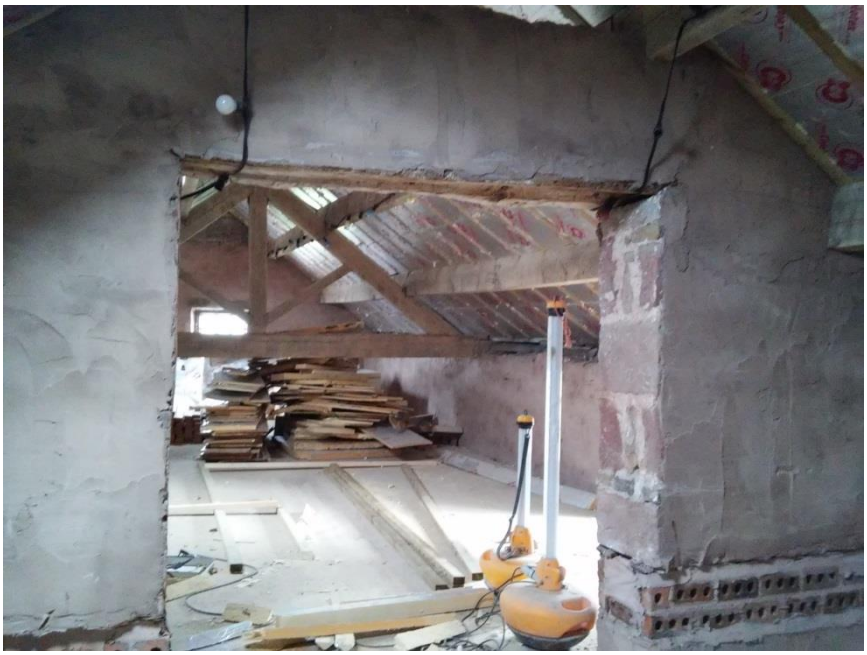
A timber joisted mezzanine floor has been inserted to all but the southernmost bay of the main length of the barn. It is understood that this was designed and built to be suitable for retail use, and as such the load capacity will be in excess of the proposed new use. The structure of the deck is fully visible in all areas. The joists are marked as structural grade timber and the steel sizes used appear appropriate. A degree of "finishing off" will be necessary to complete the floor integrity, with some lines of support noggins to be added as well as all of the fire protection.



Typical soffit view of the recent mezzanine deck – some lines of support noggins and all of the fire protection are yet to be installed

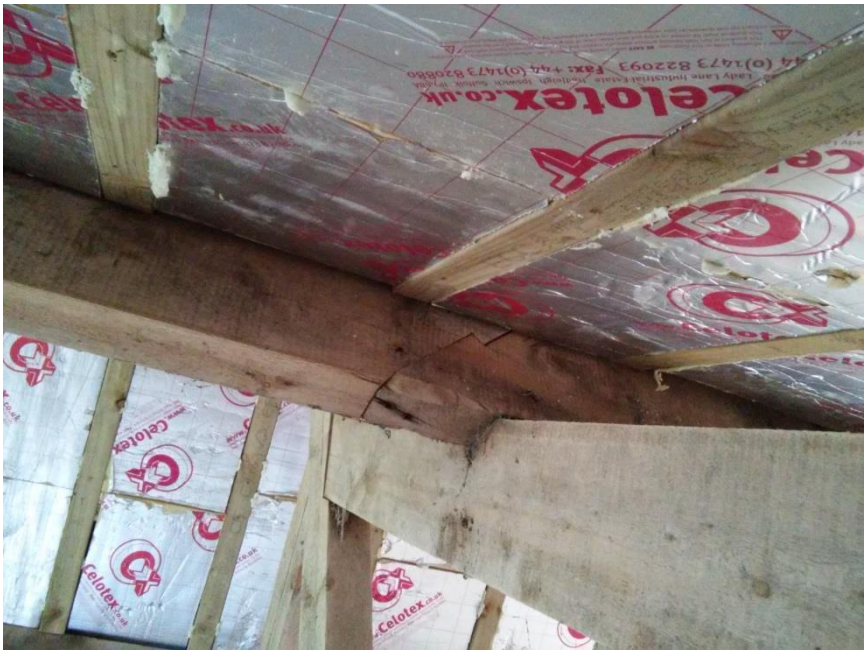
## 5. ROOF STRUCTURE

Works carried out subsequent to the Planning Permission in 2002 include the replacement of the roof spars, and tiling, and the insertion of a membrane and rigid insulation boards.
It is believed that the main purlins and kingpost trusses are original and have been retained. The purlins appear to be in good condition, although the 2 bays towards the north end are longer spans than typical, and there are quite obvious creep deflections present. The ridge line of this portion of the barn is also noticeably deformed.
There is evidence of insect attack in several of the main timbers, but this does not appear serious or ongoing.
The proportions of the sections used, and jointing of the kingpost trusses appear sensible and normal.



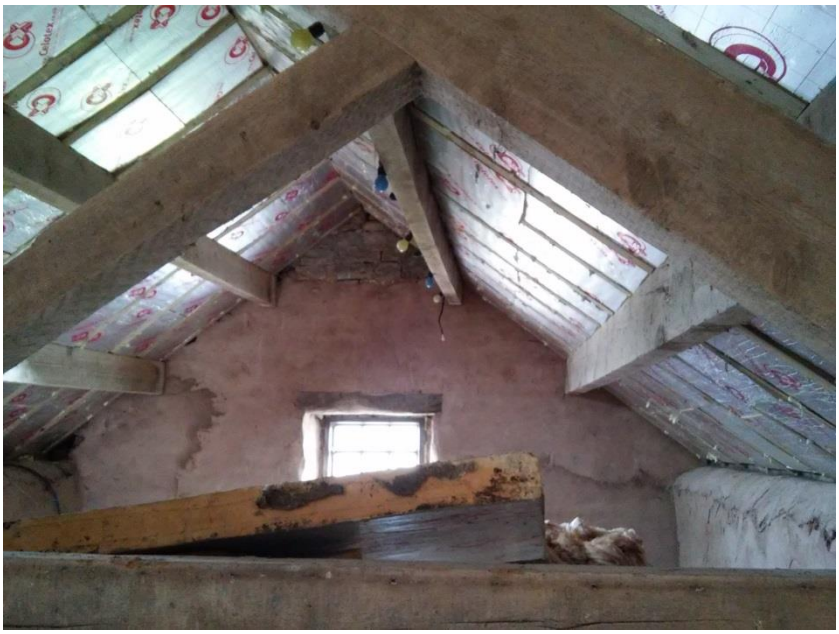
Internal view looking to the northeast corner, showing the 2 long span bays at this end of the barn.

The foreground internal crosswall is a new insertion on the line of a pair of steel tie beams which have since been cut and incorporated into the wall.

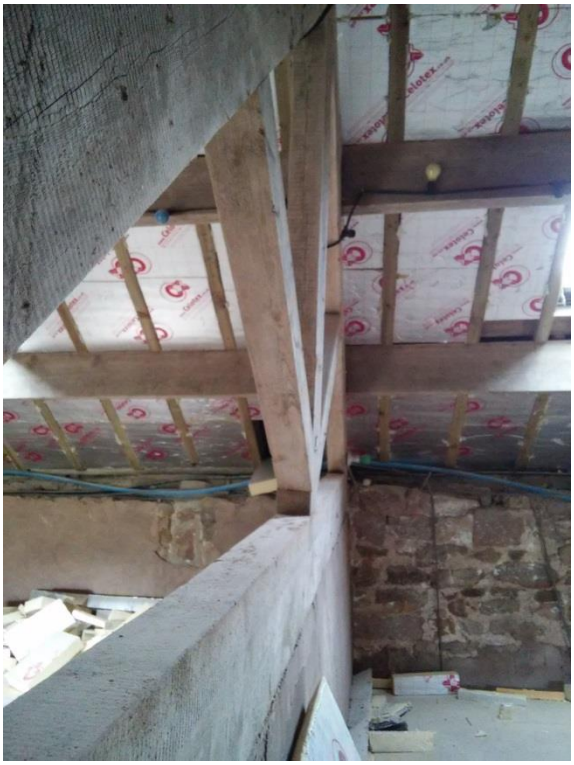



Typical scarf joint between purlins over truss lines. Butt joints have been utilised over cross walls.
The tying action which can be achieved with these joint details is limited. However, since new upgraded tiling battens have been used, and if it is assumed that the butt joints between these are well staggered then the longitudinal tying of the roof can be considered adequate.

The re-roofing works retained the use of a central ridgeboard. The purlins are orientated with their main structural axes set vertical. The bases of the new spars are fixed to a traditional wallplate aligned with the outside face of each main side wall. With this structural arrangement the vertical gravity loads applied to the roof continue to exert lateral thrust onto the walls. This thrust derives from arch action at the apex ridgeboard, as the ridgeboard is insufficiently rigid to act as a vertical support on its own. Ideally there should be eaves level cross tie timbers which transfer this thrust internally across the barn, such that there is no need for reliance on the side walls for lateral support.



Typical roof arrangement which is very traditional but does result in outward thrusts being applied to the tops of the main sidewalls



Two of the main kingpost trusses have distorted out of plane. This probably occurred during a period when the roof was in a poor state of repair such that the degree of lateral restraint was inadequate, and the moisture content of the timbers was high due to ingress of rainwater. This is not of serious structural concern.