

STRUCTURAL REVIEW and APPRAISAL

at

**BARN and COWSHED, RYEBANK FARM
CLIMPING, WEST SUSSEX**

on behalf of

James Baird, Esq.

Prepared by
Gordon Lock

Reviewed by
Sameer Malik



	Structural Engineering
	Civil Engineering
	CDM Consultants
	Sustainability and BREEAM
	Traffic and Transport
	Flood Risk Assessments
	Highway Engineering
	Event Engineering

SWH Ref:- W01365
Date:- 20 October 2017

1.0 Introduction

1.1 Scott White and Hookins at the request of John Cooper of JCA Architects acting on behalf of Mr James Baird were commissioned to undertake a structural review of an existing single aisled barn and cowshed at Ryebank Farm and to give an opinion on the proposal for conversion in respect of complying with Arun District Council's Local Plan and policies as they apply to the conversion of rural buildings for residential use.

1.2 We were provided with the following documents prepared by John Cooper.

Drawings

- 1600/P01 Rev P2 Proposed Ground Floor, First Floor Plans plus South & West Elevations
- 1600/P02 Rev P2 Proposed Roof Plan, North & East Elevations plus Cart Barn West Elevation

Reports

- Heritage Statement prepared by Architectural History Practice
- Condition and Repairs Report prepared by JCA Architects
- Design and Access Statement prepared by JCA Architects

1.3 The writer visited site on Thursday 22nd December 2016 when he met the current tenant who gave a brief tour of the buildings. The current tenant has been using the buildings for over 15 years and carries out manufacturing of pre-cast concrete elements such as lintels and padstones but also materials used in hard landscaping.

1.4 This document is not a standalone structural inspection report but rather a review and commentary on the structural condition of the existing building along with indicative details of the timber repairs so that a full appreciation of the scope of works is understood. Therefore it is assumed that the reader has an appreciation of the context of the buildings. However for clarity we have incorporated into this report an extract from the Heritage Statement.

"The building consists of a large barn orientated north-south, with a former cart lodge giving off to the southwest at thirty degrees. There is a small modern lean-to attached to the north gable end of the barn.

The barn appears to be of seventeenth century construction, with later alterations. It is of five bays, and is aisled on the west side. It is externally faced in coursed flint, with brick quoins and dressings, except for bays 1 and 2 on the east side which have been rebuilt/refaced respectively in red brick and weatherboard and blockwork. The cart lodge is also build of flint with red brick quoins and dressings. Both buildings now have modern corrugated asbestos roof coverings."

- 1.5** Please note that we have not inspected the whole building nor have we inspected parts of the structure which are covered, unexposed or inaccessible and are therefore unable to report that any such part is free from defect; neither have we inspected any part of the building which is not mentioned in this report.

2.0 General Condition

- 2.1** The barn and outbuildings have been used for agricultural purposes and in more recent years as workshops for precast concrete manufacturing operations. The maintenance and any alterations required to suit changes in use have been done with materials and skills immediately to hand without consideration of the historical nature of the building. The structure of the buildings have therefore suffered a significant degree of damage.
- 2.2** The current atmosphere within the buildings is heavily laden with cement dust such there is a thick layer on all surfaces and within every crack and crevice. The result is that timber rot and decay may have been suppressed. It may be, following a deep cleaning operation that the degree of timber decay will be found to be more severe than from an initial observation.



Photo of cement dust within cracks and crevices of a main post

- 2.3** Roof spread to the main barn is of concern as this is causing outward thrust onto the external brick and flint walls plus structural failure of certain important timber members. The primary cause of the roof spread is failure due to the principal tie beam of the main roof trusses having been removed or severed or failed.



Photo of roof truss and main post with principal tie beam and diagonal brace severed and removed.



Photo of roof truss with failed principal tie beam.

- 2.4** The resultant roof spread has caused failure of the joint between principal rafter, principal tie beam, main post and eaves beam.



Photo of failed joint. Note diagonal braces missing between post and eaves beams

- 2.5** In addition the main posts to the main barn trusses appear to have been installed 180 degrees from their correct orientation. In practice this means that the jowel at the top of the post instead of providing additional support to the bottom boom is now supporting the eaves beam. Due to this orientation of the main post and with the outward thrust on the eaves beam the jowel is failing.



Photo of jowel sheared from post.
Note missing diagonal brace between main post and principal tie beam.

- 2.6** In addition to outward thrust from the roof, a number of main posts have been severed with steels inserted to give restraint to the west side aisle. This has weakened the post causing further roof spread.



Photo of severed main post due to insertion of steel ties to west side aisle
Note basic diagonal provided between main post and principal tie beam but diagonals missing between main post and eaves beam.

- 2.7** There are also signs of general timber decay resulting in loss of connection and or continuity.

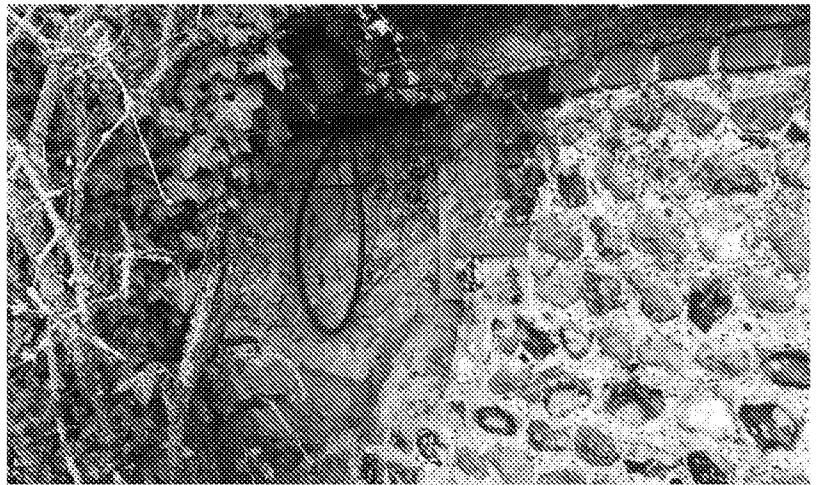


Photo showing timber decay to principal tie beam with loss of section causing joint to be ineffective.

- 2.8** Masonry external walls are also suffering from the outward thrust from the roof but also from inappropriate alterations and poor maintenance.



The front elevation has two narrow piers either side of the main doors into the barn. The outward thrust from the roof is pushing the side elevation away and the flint panel is not providing any restraint.



Outward thrust has also caused failure to side elevations resulting in partial collapse of the wall. Vegetation is also causing damage.



Alterations and repairs have also been undertaken with inappropriate materials.

3.0 Indicative Repairs

- 3.1 Rafters.** The rafters vary in terms of material, with oak, pine and modern softwood all being noted. Their condition also varies along with their spacing. The roof covering is currently light weight corrugated sheets and this is being replaced with clay tile covering with a modern insulated roof construction and internal ceiling finish. A number of rafters will need to be replaced while others can be repaired with a scarf joint.

It is probable that for the majority of the roof covering additional rafters will be required in partnership with the existing timbers to appropriately support the new covering.



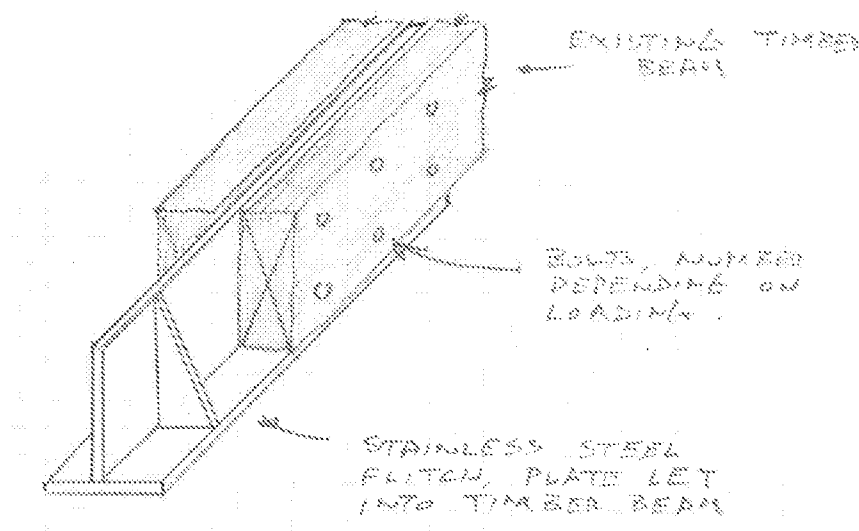
- 3.2 Principal Rafters.** A number of the principal rafters have failed at the joint with principal tie beam and main post. These rafters in some cases will need replacing while others can be repaired using a scarf joint.



3.3 Purlins. Purlins appear to be generally in good state of repair and condition. However, their dimensional size will need to be checked so that their ability to support the new roof covering can be reviewed. It may be necessary that purlins will need strengthening with pairing with additional timbers.

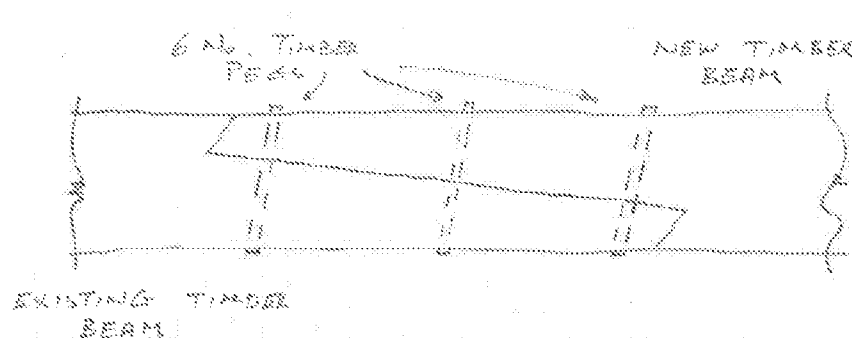
3.4 Principal Tie Beams. A number of these timbers need to be reinstated, replaced and or strengthened. The form of the repair will be dependent on what work needs to be undertaken to restore the horizontal tie to the roof structure.

The use of scarf joint to splice in new timbers will be necessary as will the reconstruction of joint between principal rafter and post. It may be necessary to introduce metal straps or fabricated shoes to ensure structural continuity.



3.5 Eaves Beams.

The majority of the eaves beams are in place but like the purlins, their dimensional size needs to be checked so that their ability to support the new roof covering can be reviewed. If appropriate, new timbers can be inserted using a scarf joint. It is important that they are adequately tied both vertically and horizontally to the main post and principal tie beams.

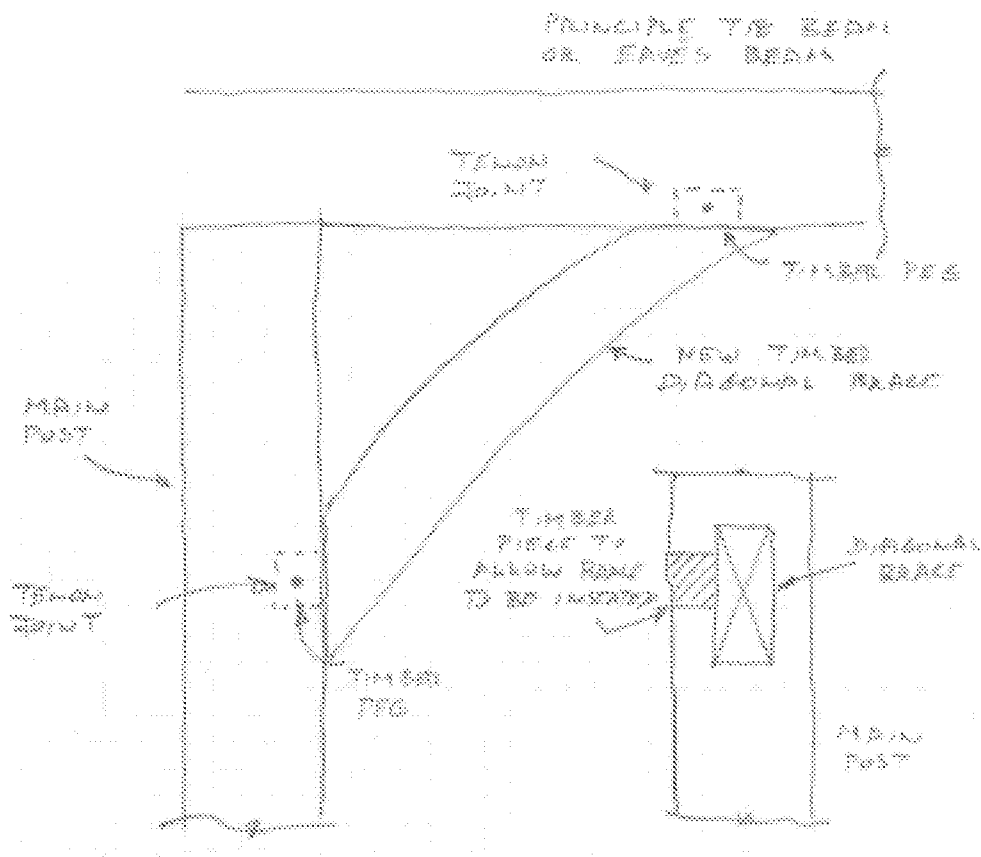


3.6 Main Posts.

The main posts are in poor condition due to decay, damage from inappropriate alterations and in our opinion being built into the barn with incorrect orientation. It may possible to salvage some of the posts but it may be more appropriate to reuse the salvage timbers for repairs in other parts of the buildings and insert new posts.

3.7 Diagonal Braces.

The majority of the diagonal braces are missing and to provide lateral stability to the buildings these need to be reinstated.

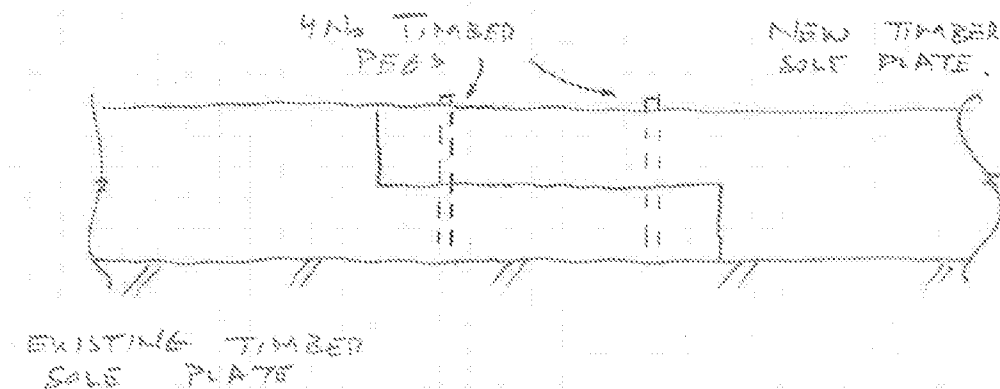


3.8 Aisle Tie Beams.

The steel double angle ties need to be replaced with appropriately sized timber beams with connection to both the main posts and the external wall plate.

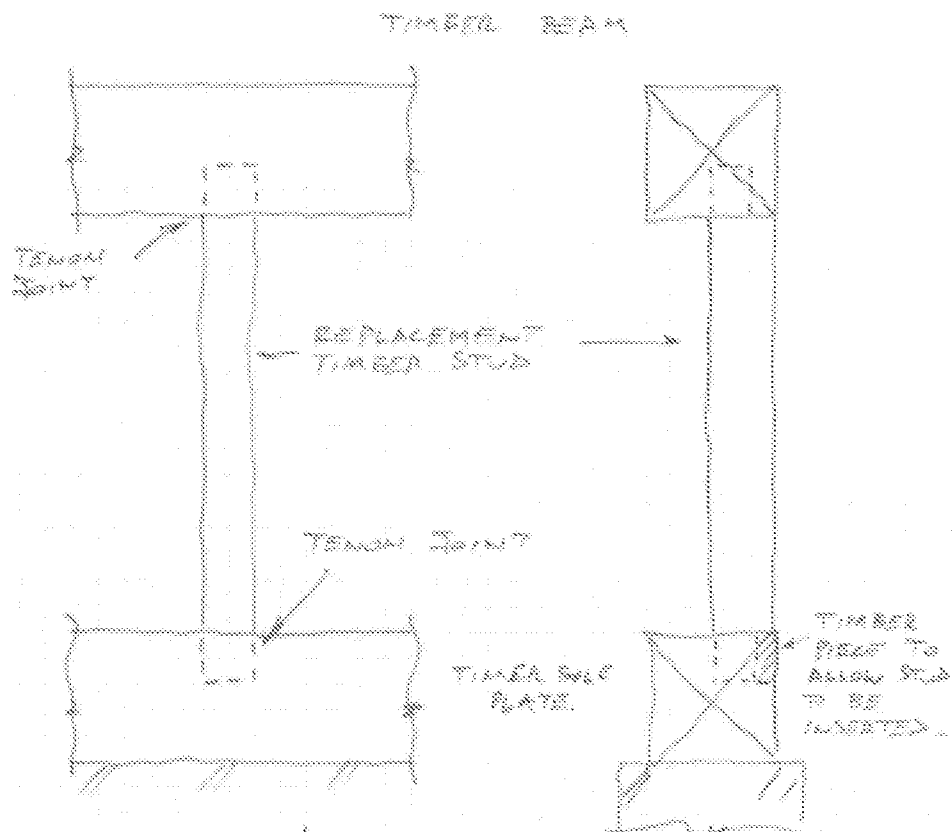
3.9 Wall Plates.

A number of the wall plates need to be replaced and this can be undertaken by inserting new timber beam using a halved joint.



3.10 Timber Stud Panels.

There is a limited amount of original timber stud panelling but where it does exist, some repairs are necessary with replacement studs in a manner indicated below.



3.11 Masonry Walls.



Masonry panels need to be rebuilt in a number of places to provide improved robustness and remove inappropriate materials.

In respect of flint panels these need to be appropriately sized with brickwork framing in order to provide structural stability. In respect of the south elevation panels, we recommend that the tall flint panels are reduced into two or even three smaller panels with brick framing providing the necessary robustness to the corner of the building.

Further details in respect of the proposed masonry repairs can be found in the Condition and Repairs Report prepared by JCA Architects.

3.12 Ground Floor.

The ground floor construction is a mixture of concrete, bedded brick and compacted earth. The condition generally is uneven and poor. It will be necessary for the whole floor to be replaced with a suitable reinforced concrete floor construction.

3.13 Foundations.

The foundations to the existing structure does not require wholesale underpinning but improvements will be required in localised areas to accommodate increased loading due to the construction internally of a first floor. In addition improvements may be required where new service entries and below ground drainage is installed.

4.0 Conclusions

- 4.1** The single aisled barn and adjoining cart barn have suffered over time due to alterations and lack of maintenance. However the basic structural form and principal members are all in place and with good craftsmen, the restoration of these buildings is possible and should be encouraged.
- 4.2** The major requirement is to provide stability and connection continuity in order to provide a robust structure than can support the imposed loading from snow and wind but also a new roof covering which will be inherently be heavier than the current corrugated sheeting.
- 4.3** The current spread of the existing structure will be checked from further movement as part of the repair and restoration work. When the existing roofing material has been removed, it may be possible during this phase of the project to pull back some, if not all of the spread that has occurred.
- 4.4** In conclusion it is our opinion that the proposals comply with Arun District Council's Local Plan and policies in respect of conversion of rural buildings for residential use. Namely that the buildings are structurally sound, of permanent construction, and are capable of conversion without rebuilding or significant alteration. In addition we are of the opinion that these buildings are of historic importance and that the proposal will have no adverse effect on the character and appearance or features of historic interest.

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October 2017

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