

STRUCTURAL APPRAISAL REPORT

**Barn At Rectory Farm
Great Fen Road,
Boston,
Lincolnshire.**



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Property:-	Barn at Rectory Farm;- Great Fen Road, Boston, Lincolnshire. PE21 7PB	Instructed;- Feb 2021 Survey & Report by;- JC Consultancy Ltd Consulting Structural Engineers Feb 2021
Client:-	Mr G Dumore Rectory Farm, Great Fen Road, Boston, Lincolnshire. PE21 7PB	Checked;- J. Ellington BSc. CEng MStructE, FRSA MIOd Authorised;- J. Hicks
Reference:-	JC/21/01/5861	Issued:- Feb 2021

Directors

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STRUCTURAL APPRAISAL REPORT,

Barn at Rectory Farm;-

Great Fen Road,
Boston,
Lincolnshire.
PE21 7PB

Our Ref;- JC/21/01/5861

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1.0 BRIEF

- 1.1 JC Consultancy Limited was requested by Mr G Dunmore, to assess and comment on the structural condition of an existing barn located adjacent to Rectory Farm, Great Fen Road, Boston, Lincolnshire PE21 7PB.

2.0 INTRODUCTION & SCOPE

- 2.1 The barn is located within the grounds of Rectory Farm, in a rural location, on the outskirts of the market town of Boston in Lincolnshire.
- 2.2 The client currently owns the barn and has instructed a structural appraisal report to be carried out in order to assess the current structural condition and to evaluate the potential of future development / conversion.

This instruction to survey the barn was provided by the client on 5th February 2021.

- 2.3 This report should be read in-conjunction with documentation prepared and issued by the client's architect, JMAD Architecture.
- 2.4 This report is solely for the purposes of the client, client's agent and no other third parties. Transfer of this report to a third party is not permitted.
- 2.5 JC Consultancy Limited visited the property on 23rd February 2021, in order to carry out a structural appraisal survey.
- 2.6 Weather conditions at the time of the survey were bright and dry.
- 2.7 This report is limited to elements of the structural fabric of the property, i.e roof, walls and floors, and comments only upon their structural condition and performance.
- 2.8 The report does not contain observations, comments or recommendations to any non-structural items including, but not limited to drainage, electrical, heating and plumbing services, timber work and decorative plasters.
- 2.9 Decay associated to damp, fungal attack, insect infestation or contamination is outside the scope of our appointment or report. Any reference to decay associated to damp, fungal attack, insect infestation or contamination to either structural or non-structural items are observations only. As such we recommend that further advice is sought from specialists in the fields of damp, fungal attack, insect infestation or contamination in order to guarantee peace of mind from these potential defects.

- 2.10 The inspection was of a visual nature only. There has been no opening up works involved in this investigation. Wall finishes or floor finishes, where applicable have not been removed or lifted during the inspection.
- 2.11 Any part of the structure that was hidden, covered or otherwise inaccessible have not been inspected or commented upon. We therefore cannot guarantee that any such parts are free from defect. It should be noted that inspection of the fabric of the barn was limited in parts due to the presence of various goods internally.
- 2.12 The performance of foundations may be referred to within this report; however, the existing foundation system has not been exposed as part of this survey and as such we cannot guarantee that the foundation system is free from defect throughout.
- 2.13 The performance of the existing ground strata and general ground conditions may be referred to within this report; however the existing ground conditions have not been inspected therefore comments made will be based on analysis sought from indicative desktop sources including but not limited to the 'British Geological Society'. These sources generally provide sound interpretation, however local anomalies can occur, and as such we cannot guarantee their accuracy.
- 2.14 The observations and defects noted in order to prepare this report should not be considered as a comprehensive inventory of each and every single item witnessed during our survey. Instead the observations have been taken as an indication of the condition of the structure in general and should demonstrate the likely defects that may be present elsewhere in areas of the fabric that have not been surveyed or recorded.

3.0 GENERAL DESCRIPTION

- 3.1 The main barn consists of a small, single storey, rectangular shaped, duo-pitched structure in the style of a former Stable Block. At the rear of this structure, there are 2No, single storey, open sided, mono-pitched barns, that face each other, forming a traditional U-shaped Crew Yard Area.
- 3.2 The general construction of the main barn consists of; -

Roof

The roof over the main single storey barn is duo-pitched supporting a profiled corrugated sheet roof covering. The roof has been 'over roofed' with irregular arranged battens to support the corrugated sheeting. The original roof structure remains, consisting of a timber hand cut raised tie system of principal trusses, collars, purlins and rafters. It is envisaged that the original roof covering, now removed, would have consisted of a clay pantile or slate roof covering.

The roof over the open fronted mono-pitch barns consists of a profiled corrugated sheet roof covering, over slender timber purlins, that span between timber support beams. The support beams are supported at the lower eaves level onto the brickwork walls, whereas at the open fronted, higher eaves level they are supported on a series of circular timber poles, founded on concrete plinths

Walls

The walls to the main single storey barn are predominantly 215mm wide, traditional solid wall construction consisting of clay masonry units, bonded in soft mortars. Some areas of infill panels using later brick units and blockwork are present.

The walls to the mono-pitched barns reduce in thickness over their height. The lower levels of wall are 440mm wide, fully bonded, reducing to 215mm wide at the upper section of the walls, and finally reducing to half brick thick at eaves. At eaves level, vented timber infill panels complete the elevations. The main walls consist of clay masonry units, bonded in soft mortars.

Ground Floor

There is a part concrete slab within the main single storey barn, specification of which is unknown.

The open fronted barns have no floors present, being an earth-based crew yard.

Foundations

Foundations were not inspected but are likely to consist of shallow corbelled masonry foundations bearing onto the ground strata below.

- 3.3 Published Geological records show the building to be within an area where the soil sequence consists of a solid formation of Ampthill Clay formation (Mudstone) at depth overlain by Superficial deposits of clays and silts (known as Tidal Flat Deposits).
- 3.4 There are no mature trees immediately adjacent the barn.
- 3.5 A shallow watercourse (dyke) runs parallel to the East facing elevation of the barn, with the top of the closest bank being approximately 2.5m away from the face of the walls.

4.0 SUMMARY OF OBSERVATIONS

(Read in conjunction with Section 2.14 of this report)

4.1 Roof

- Lightweight corrugated roof finish in reasonable condition – no missing elements noted.
- Roof Structure only partially inspected due to access, but consists of raised tie trusses, rafters and purlins - no missing elements noted.
- Slight undulation of ridge line.
- Racking of original timber noted.
- Defective / missing guttering / downpipes throughout.

4.2 Walls

4.2.1 North Elevation

- Minor fractures to masonry panels throughout.
- Lateral 'outward' movement to the upper section of the Elevation.
- Localised areas of infilled previous door / window opening.
- Localised areas of previous hard cement repointing.
- No guttering present guttering. – Evidence of splashback damage at lower levels of wall adjacent ground level.

4.2.2 West Elevation

- No significant defects noted.
- Gable incorporates a large timber door with timber lintel over.
- Localised areas of previous hard cement repointing.

4.2.3 South Elevation

- Lateral 'outward' movement to the upper section of the right hand gable elevation, below the timber infill panel. This is located where the wall reduces in thickness.
- Localised areas of previous hard cement repointing and previous local rebuild.
- Open joints to brickwork noted throughout.

4.2.4 East Elevation

- Minor fractures to masonry panels throughout.
- Considerable lateral 'outward' movement and bulging to the gable of the Main Single Storey Duo Pitched Barn.
- Lateral 'outward' movement to the upper section of the East elevation wall of Open Fronted Mono-Pitch Barns, below the timber infill panel. This is located where the wall reduces in thickness.

4.3 Ground Floor

- There is a part concrete slab within the main single storey barn, specification of which is unknown. Various changes in levels.
- Floor covered with various stored material throughout – inspection limited.
- The open fronted barns have some areas of brick sets forming hardstanding, but no floors present. The remainder being an earth-based crew yard.

4.4 Foundations

- Not inspected, but likely to be corbelled masonry.
- No evidence of significant settlement.

5.0 CONCLUSIONS

- 5.1 The existing range of barns have survived reasonably well considering their age and previous agricultural use. They are considered as being suitable for a sensitive restoration and conversion into a habitable dwelling. It is obvious that there has been a degree of movement of the barn fabric, however taking into account the age of the buildings, we conclude that the majority of the movement appears to be long-standing and historic.
- 5.2 The buildings basic, rectangular shapes and solid external walls, results in it being a reasonably robust structure which can be seen to have only lost a small amount of original fabric during its lifetime. No immediate structural intervention is deemed required at this stage in order to prepare the barn for accommodating a conversion scheme.
- 5.3 In structural terms many of the defects which have been highlighted in this report have little or no significance to the overall stability of the building. The majority of any original materials being lost is due to the materials being subjected to the elements and a lack of general maintenance. The main cause of any structural movement witnessed on the fabric of the barn is likely to have been contributed by the localised failure of the original roof structures, previous alteration to wall panels and subsequent masonry around openings, slight degree of localised settlement over its lifetime and general stresses inflicted upon the fabric during previous uses. We predict these catalysts of movement can be addressed during the conversion stage via the installation of suitable strengthening elements and general low-key repair where applicable in order to provide a durable structure.
- 5.4 Undoubtedly, there will be some loss of original fabric during any conversion process. This occurs in almost all conversions of this type, and generally cannot be avoided. The majority of loss is usually due to general material fatigue, timber roofs being exposed to the elements during its lifetime, or masonry walls accommodating significant levels of structural movement. However, having considered the existing arrangements, we envisage the overall loss of original fabric in this instance will be low. If the proposed conversion is carried out with care and a sympathetic approach to the existing materials, we see no reason why the barn will be subject to any long-term progressive movement in the future following the completion of a conversion.
- 5.5 Preliminary Architectural Schemes for the proposed barn conversion have been produced. A schedule of any Structural Engineering works required as part of a conversion can be progressed which will usually be conducted during the preparation of a Local Authority Building Regulation submission. In order to assist with the progression of the architectural design, we have highlighted potential structural items to consider overleaf, in Section 6.0.

6.0 ITEMS TO CONSIDER AT CONVERSION DESIGN / BUILDING REGULATION STAGE

6.1 Roof Structure – Main Single Storey Duo Pitched Barn

The original roof structure has been previously over roofed and currently supports a lightweight corrugated sheeting material. There was evidence that the original roof structure had become distorted, with slight racking to timbers evident. It is unlikely that in its current arrangement the existing roof structure would be able to support a reinstated slate / tiled roof covering, insulation and ceilings envisaged as part of any conversion, without further distortion.

Attempting to strengthen existing roof elements is possible, however a replacement roof would reduce the degree of stresses on the existing supporting walls and will prove to be the most practicable solution. We therefore recommend that consideration is made for a replacement roof structure as part of any conversion scheme.

6.2 Roof Structure – Open Fronted Mono-Pitch Barns.

The roof structure currently supports a lightweight corrugated sheeting material. Existing timbers are unsuitable to remain as part of any conversion.

New mono-pitched roof structures will need to be incorporated as part of any conversion scheme.

6.3 External Walls - Main Single Storey Duo Pitched Barn

The external walls have a reasonable thickness and satisfactory height to thickness ratios. The walls will require a degree of sympathetic attention, but the amount of loss of original fabric is likely to be low.

The upper section of the North Elevation wall has suffered a degree of lateral 'outward' movement, which is likely to be the result of the defective roof structure. Allowance for localised rebuilding of walls at eaves level should be incorporated into the conversion scheme to this elevation.

The East elevation gable wall has accommodated lateral 'outward' movement. Architectural schemes indicate that this gable is to be reconfigured as a glazed gable, which will provide the opportunity to locally repair any remaining fabric to this gable.

The West elevation gable wall did not display any noticeable defects and should not require any significant intervention.

6.4 **External Walls - –Open Fronted Mono-Pitch Barns.**

The walls to the mono-pitched barns reduce in thickness over their height. The lower levels of wall are 440mm wide, fully bonded, reducing to 215mm wide at the upper section of the walls, and finally reducing to half brick thick at eaves.

It is envisaged that the thicker sections of the wall on all elevations can remain with little intervention required. The upper reduced section of the East and West Elevation walls has suffered a degree of lateral 'outward' movement. Allowance for localised rebuilding of walls at eaves level, as part of the proposed high-level window arrangements should be incorporated into the conversion scheme on all elevations.

6.5 **External Walls – General**

- 6.5.1 The amount of cracking present on the remaining fabric is minimal. Any minor fractures present will require only low-key intervention and repair, and small areas of localised brick turning / replacement will be required where individual brick units have failed.
- 6.5.2 The performance of any masonry panels suffering fractures, localised movement etc. can be improved by low key stitching using the 'Helifix' masonry repair system, which involves installing remedial 'Heli-bar' rods into the bed joint of the masonry at regular vertical centres. We recommend that allowance is made for the application of this system to localised areas of all masonry panels. More information can be seen at www.helifix.co.uk.
- 6.5.3 Any areas of hard cement re-pointing previously carried out on the elevations should be carefully removed and replaced with a sympathetic soft lime based mortar. Other areas of weathered masonry joints were prevalent amongst the elevations and should be repointed in a similar fashion. In this instance we do recommend that allowance is made for all elevations to be repointed at planning and tender stage, however, during conversion works each panel can be considered in its entirety and may only require localised areas of repointing upon further investigation.
- 6.5.4 Any defective masonry arches, timber lintels and arch backing timbers should be replaced throughout. Any timber beams over large openings that are to remain should be replaced. Any timber wall plates that are present within the walls should be removed and replaced with remedial brickwork infill.
- 6.5.5 Lower sections of the walls do accommodate localised areas of defaced units, predominantly caused by continued wetting as a result of surface water splashback off the adjacent ground level. Following a more in-depth inspection by a bricklayer / mason, general brickwork repair maybe required to lower panels, including replacing / turning decayed units.

- 6.5.6 In order to reduce the loading placed upon the existing perimeter walls, and to enhance the overall performance of the structural fabric, we would recommend that a new inner leaf wall is constructed within the inside of the perimeter walls of the Main Single Storey Duo Pitched Barn, essentially forming a structural 'box within a box'. The new wall construction can be designed to accommodate the loadings from the replacement roof structure. The new wall could be constructed using loadbearing blockwork, or alternatively a lightweight loadbearing timber studwork could be adopted. The new wall should be constructed off a remedial floor slab that is discussed further in Item 6.6 of this report.
- 6.5.7 It is understood that the current open fronted section of the Mono-Pitched Barns will be replaced with new cavity walls. This proposal is sensible and will improve the overall structural performance of the barns, as well as providing suitable support for the proposed replacement roof structure.

6.6 **Ground Floors**

- 6.6.1 The existing concrete floor slab in the Main Single Storey Duo Pitched Barn is of unknown specification and no ground floor slabs are currently present in the Open Fronted Mono-Pitch Barns. As such, a new floor slab is required throughout and therefore allowance should be made for the installation of a new ground bearing, concrete ground floor slab to typical architects' specification, incorporating suitable damp-proof systems, insulation and screeds as required. If the floor slab is to be utilised as providing support for the new inner leaf wall (as recommended in item 6.5.6 of this report) then it should be engineer designed as a reinforced concrete flat slab to ensure that it can safely accommodate and distribute the loadings applied.
- 6.6.2 Should a suspended floor system be required, i.e for floor level purposes, we recommend that a new engineer designed ground bearing floor slab as described in 6.6.1. is initially cast at lower levels, which can then support independent sleeper walls for a suspended system, We do not recommend that the any suspended floor system is supported on the original wall fabric, as this will undoubtedly place an increase in stress upon the lower levels of the wall panels and subsequent foundations.

6.7 **Foundations**

- 6.7.1 Based on our initial observations of the superstructure, there was little evidence to suggest that the foundations of the barns have suffered significant failure. All barns of this age and arrangement suffer from a degree of settlement, however considering its age and previous uses, the foundations appear to be performing satisfactorily. A small amount of settlement may have occurred in the past; however, it is envisaged that the movement highlighted is historic, and the defective superstructure fabric can be addressed and repaired without the need for invasive foundation repair in the form of underpinning.

- 6.7.2 The majority of the load being placed upon the foundations is resultant from the self-weight of the substantial walls that will not increase as part of any conversion. As a result it is likely that the additional loads being placed upon the foundation system from a proposed residential conversion is negligible compared to that of the existing arrangement and as such we do not foresee that any form of underpinning or foundation enhancement is required.
- 6.7.3 The existing foundations are likely to be shallow, therefore care will need to be taken when installing ground floor slabs to ensure that the existing foundations are not undermined. We recommend that sub-base excavation underneath proposed floor slabs should be kept to a minimum depth to assist. The specification of the slab build up can be designed as part of the proposed floor slab works recommended in item 6.6 of this report.
- 6.7.4 The external ground levels are variable around the rear of barn, and as such they should be landscaped and prepared to ensure that they do not exert pressures on the base of the walls. The remaining vegetation' climbing shrubs, trees etc. that are growing immediately adjacent to the fabric of the barn should be removed. Controlling surface rainwater and introducing a gravelled apron / French drain around the external perimeter of the walls will assist in reducing softening of the ground and subsequent foundation movement in the future.

6.8 General

- 6.8.1 Whilst reference to damp is outside the scope of this report (see 2.9), it can be seen that the structure, has suffered from a degree of water penetration over the years.
In addition, the crew yard area has been used for the housing of livestock.

As such it is essential that advice and any required treatment from specialists in the field of damp, decay and any ground / fabric contamination from previous animal / livestock use should be carried prior to the conversion, in order to ensure that damp, timber decay and contamination are not trapped within the fabric post completion.

- 6.8.2 Consideration of any conversion proposals should be done only following liaison with your Architect, and guidance from, the Local Authority Planning and Building Control Departments.

JC Consultancy Limited

Consulting Structural Engineers

February 2021

7.0 PHOTOGRAPHS.



Photograph # 1
(North Facing Elevation)



Photograph # 2
(North / East Facing Elevation)



Photograph # 3
(East Facing Elevation)



Photograph # 4
(Part West Facing Elevation)



Photograph # 5
(South Facing Elevation)



Photograph # 6
(South Facing Elevation)



Photograph # 7
(Mono-Pitched Barn – Facing Crew Yard)



Photograph # 8
(Mono-Pitched Barn – Facing Crew Yard)



Photograph # 9
(Typical Mono-Pitched Barn Wall)



Photograph # 10
(Typical Roof – Duo-Pitched Barn)



Photograph # 11
(Typical Roof – Duo-Pitched Barn)



Photograph # 12
(Typical Roof – Mono-Pitched Barn)



Photograph # 13
(Floor Slab Duo-Pitched Barn)



Photograph # 14
(Brick Sets / Earth Crew Yard - Mono-Pitched Barn)

*******END OF REPORT*******