

STRUCTURAL APPRAISAL REPORT

Existing Barn (Barn Two):-

Sycamore Grange,
Cross Drove,
Gedney Hill,
Lincolnshire.
PE12 0PZ



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Property:-	Existing Barn (Barn Two):- Sycamore Grange, Cross Drove, Gedney Hill, Lincolnshire. PE12 0PZ	Instructed:- Sep 2023 Survey & Report by:- JC Consultancy Limited
Client:-	Mr & Mrs S Smith c/o G R Merchant Ltd, 4 Wrights Mews, Holbeach Spalding Lincolnshire. PE12 7EE	Checked by:- J. Ellington BSc. CEng MStructE, FRSA, MIOd Authorised By:- J. Hicks BEng(Hons) MSc. PgDipCHE., MIOd
Reference:-	JC/23/09/7277-2	Issued:- Nov 2023

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1.0 BRIEF

- 1.1** JC Consultancy Limited was requested by Mr & Mrs Smith, to assess and comment on the structural condition of an existing barn, at Sycamore Grange, Cross Drove, Gedney Hill, Lincolnshire. PE11 4SE.

2.0 INTRODUCTION & SCOPE

- 2.1** The buildings forming the barn are located in a rural location within the Farmyard of Sycamore Grange, near Gedney Hill in Lincolnshire. The barn is accessible via the yard that leads off the highway known as Cross Drove.
- 2.2** The client has instructed a structural appraisal report is to be carried out in order to assess possible options for future development, change of use and conversion. The enquiry was received from the client's agent, G.R.Merchant Ltd in September 2023. The instruction to carry out the structural appraisal was provided by the clients agent via email correspondence dated 19th September 2023.
- 2.3** This report is to be regarded as confidential to the party to whom it is addressed, and it is intended for the use of that party only. No responsibility will be accepted to any other party in respect of its contents in whole or in part. Prior to the report or any part of it being reproduced or referred to in any documents, our written approval as to its form and content must first be obtained.
- 2.4** JC Consultancy Limited visited the barn on 6th October and 2nd November 2023, in order to carry out a structural appraisal survey.
- 2.5** The weather conditions at the time of the visits was overcast with periods of heavy rain.
- 2.6** The purpose of this report is limited to an opinion on the structural condition of the building. We have only reported upon those structural defects that materially affect the stability of the building and provided that these defects are reasonably detectable at the time of our inspection. Whilst we have used all reasonable skill and care in preparing this report it should be appreciated that we cannot offer any guarantee that the buildings will be free from future defects or that existing ones will not suffer from further deterioration. This report is limited to commenting on elements of the structural fabric only. No further assessment will be made to elements elsewhere in the property. Comments will relate to structural condition and performance of elements only.
- 2.7** This 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 any decorative finishes / plasters.

- 2.8 Decay associated to damp, fungal attack, insect infestation or contamination (including the presence of asbestos materials or similar) 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.
- 2.9 The inspection was of a visual nature only. There has been no opening up works involved in this investigation.
- 2.10 Any part of the structures that were hidden, covered or otherwise inaccessible, have not been inspected or commented upon. We therefore cannot guarantee that any such parts are free from defect.
- 2.11 The performance of the existing ground strata, general ground conditions and foundations may be referred to within this report; however, the ground conditions and foundations have not been fully inspected or investigated as part of this survey. 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.
- 2.12 The observations and defects noted within this report should not be read as a comprehensive inventory of each and every single item witnessed during our survey. Instead the records should be taken as an indication of the condition of the outbuildings 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 is a single storey, traditionally constructed, rectangular shaped building complete with a duo pitched roof structure. The barn has three masonry constructed external walls forming the gable ends and rear elevation. The front elevation is open fronted with a centrally located masonry pier supporting a timber eaves beam and roof structure.

Adjacent to the main barn is a smaller, single storey, traditionally constructed, rectangular shaped building complete with a duo pitched roof structure, that is divided via cross walls onto 4No small storage areas. This element has three masonry constructed external walls forming the gable end and front / rear elevations. The front elevation accommodates 4No Stable style door openings.

- 3.2 The buildings have been formerly used as agricultural use in the form of Stables / Storage.
- 3.3 The original construction date of the barns is unknown, but it is likely to be early to mid C20. The barns are understood to be generally in its original format. To the best of our understanding and belief the property is not Listed.
- 3.4 The general construction of the buildings under consideration consists of; -

Roof

The main 'Stable' barn has a profiled 'Big 6' style roof sheet covering over a traditional timber hand cut duo-pitched roof structure, consisting of timber purlins supported by a series of equally spaced timber 'A-Frame' style trusses. A timber tie is present between wall plates at mid span of the barn. The roof is supported over the open fronted elevation of the barn via a timber eaves beam spanning between a centrally located masonry pier.

The smaller 'Store' barn has a lightweight 'Metrotile' or similar roof covering over a timber duo-pitched roof structure.

Walls

The main barn has three masonry constructed external walls forming the gable ends and rear elevation. These walls are predominantly 215mm solid wall construction consisting of clay masonry units, bonded 'Flemish Garden Wall' style in soft mortars.

The open fronted elevation of the barn has a central 440mm square masonry pier providing support to the roof structure.

The smaller building is constructed using single leaf brickwork consisting of clay masonry units in soft mortars. The front elevation accommodates 4No Stable style door openings.

Ground Floor

The ground floors consist of concrete floor slabs of unknown specification.

Foundations

Foundations to the main barn consist of a continuation of the masonry wall below ground level approx. 275mm supported off a 175-200mm thick, rough cast concrete foundation system bearing onto the ground strata below. The overall depth of the foundation system below ground level was in the order of 500mm.

Foundations to the smaller barn consist of a continuation of the masonry wall below ground level approx. 300mm, which projected using a single 75mm corbel at its base bearing onto the ground strata below.

- 3.5 Published Geological records show the building to be within an area where the soil sequence consists of a solid formation of Oxford Clay Formation (Mudstone) at depth overlain by a considerable thickness of Tidal Flat Deposits (Clays & Silts).

4.0 OBSERVATIONS & CONCLUSIONS

- 4.1 The existing barns are in a reasonable structural condition considering their age and previous use, however the buildings have suffered from a degree of movement in the past. Whilst some movement may be related to foundation movement, the general 'open plan' arrangement of the main barn, with a slender, partially tied roof structure and an open fronted elevation consisting of a basic timber beam and masonry pier arrangement, together with the single leaf wall construction of the smaller barn, does make them susceptible to progressive movement over time.
- 4.2 There was no evidence that the overall structural stability of the buildings have been comprised during their lifetime and the principal fabric forming the buildings is considered to be suitable for a sympathetic conversion. As with the majority of 'Agricultural Use' buildings of this style and arrangement it should be understood that in order for a conversion to be undertaken, a degree of structural repair and reinstatement works will be required and maybe exhaustive in parts.
- 4.3 The existing foundations to the barns are relatively shallow and appear to have suffered from historic movement. The long, rear elevation (West facing) of the main barn has been subject to a small degree of lateral movement whereby the masonry panel has slipped slightly on the slate dpc at approximately mid panel. Both the rear wall of the main barn and the smaller barn does accommodate some localised cracks, suggesting that a degree of vertical movement has also been accommodated by the foundations supporting this wall.

The cause of the movement to the foundations and subsequent cracking to the wall is likely to be principally due to the shallow depth of the foundation and associated variations of moisture within the clay based soils, however consideration also has to be given to the general relaxation and deflection of the supported slender hand cut roof structure which will have exerted a degree of stress upon the wall and subsequent foundations.

In order for a conversion to be undertaken, remedial works to foundations via the addition of engineer designed ground floor slabs will be required in order to prevent the building from accommodating further, progressive foundation movement.

- 4.4 The existing roof structure to the main barn was noted to be slender in construction and supported only a lightweight roof covering. Whilst the roof has provided its primary function during its lifetime of offering protection from the weather and elements to the internal fabric, it was noted that the roof timbers were exhibiting deflection and distortion.
- The existing roof structure is not deemed suitable to be incorporated within a conversion.

A new roof structure will be required throughout within any conversion process, which should help to eliminate a principal catalyst of stress within the original wall fabric. In order to protect the original masonry fabric and foundations from long term stress, we recommend that the new roof structure is supported off a remedial inner leaf wall of loadbearing blockwork, which itself can be constructed off an engineered remedial ground floor slab. This is a typical proposed arrangement in conversions of agricultural buildings of this age and nature and is discussed further in Section 4.5

- 4.5 The original wall construction to the barns have suffered from movement. The rear elevation wall does accommodate some localised defects as highlighted and with the omission of any cross walls within this area of the main barn, results in a reasonably long, continuous, unrestrained masonry panel. Furthermore, the general relaxation and any roof spread of the hand cut roof structure, which in this instance will be exacerbated by the timber beam and pier arrangement of the front elevation, which offers little resistance to the thrust stresses associated with roof relaxation, will have contributed to stresses imposed upon the rear elevation wall. It was noted that the cracking to the rear wall of the main barn has been repaired / infilled at some point during its lifetime, and the former repair had not re-opened to any significant degree which does suggest that movement is not particularly progressive at this time.

The remainder of the walls including the gable walls of the barns do not exhibit any significant structural defects.

However, in order to protect the existing rear elevation wall of the main barn from further distortion it will need to be enhanced with a series of remedial works, including an improvement in its overall restraint. Ideally any layout proposed at conversion stage should introduce some cross walls at regular centres that tie perpendicular into the rear elevation, or alternately if an open plan layout is required, small steel frames could be incorporated to replicate the restraint of a cross wall. Notwithstanding the above, even after improvement to its lateral stability, we confirm the existing rear wall should not be used to support the loading of a replacement roof structure. As an alternative we recommend new inner leaf blockwork walls are to be constructed off a reinforced ground floor slab to support all new roof structures. The remedial inner leaf wall can be constructed using standard 100mm blockwork units which can be set out to form a cavity between the original masonry. The implementation of a reinforced concrete slab, which will act as an internal raft foundation, will ensure that additional loadings and stresses placed upon the existing foundations are limited and controlled.

A similar approach of providing a new inner leaf blockwork walls constructed off a reinforced ground floor slab to support all new roof structures should be adopted to the smaller Store barn, however due to its small footprint, consideration could be made for this element to be reconstructed should planning policies allow.

- 4.6 Following the improvement in overall restraint and the installation of a remedial floor slab and remedial internal blockwork leaf discussed in Section 4.5, the remedial works required to the remainder of original wall fabric of the barns is generally low key and will be limited to repair of localised areas of defective brickwork, general crack stitching, repointing, and replacement of any existing lintels / timbers over openings.

Some localised areas of re-build of the original masonry walls may be required following the removal of the roof structures, however it is envisaged that following improvements to the overall restraint of the walls, the percentage of loss of original fabric will be low.

It is envisaged that the overall stability of the existing pier forming the front elevation of the main barn will be enhanced via the constriction of infill panels between the pier and gable walls in order to form an enclosed structure as part of any conversion.

- 4.7 Based on the appreciation and knowledge of overriding ground conditions in this area, should any conversion be complimented with extensions, additions or rebuilds to the footprint of the original building, we recommend that all new elements are constructed off engineered, reinforced concrete raft style foundations, which should be designed to accommodate the loadings within the clay-based soils and to ensure existing shallow foundations of remaining adjacent structures are not overloaded.

- 4.8 In conclusion, having considered the existing structural arrangement, we are satisfied that conversion of the buildings is possible, however it should be understood that in order for a conversion to be undertaken, structural repair and reinstatement works will be required as described and maybe exhaustive in parts.

We confirm that subject to following the recommendations made within this report, together with a suitable specification prepared by an architect, the fabric of the building could demonstrate compliance with Part A (Structure) of the Building Regulations, and the repair of the original elements described will enhance the overall performance of the building.

5.0 RECOMMENDATIONS TO CONSIDER AT PLANNING / DESIGN STAGE

- 5.1 As discussed within this report, conversion of the buildings is possible, however it should be understood that in order for a conversion to be undertaken, structural repair and reinstatement works will be required. In order to enhance the performance of the principal elements and to avoid significant loss of original brickwork we have assumed the following recommendations would be incorporated into any proposed conversion scheme.
- 5.2 We recommend that the existing ground floor systems are to be removed and replaced with a ground bearing, concrete ground floor slab as part of any conversion. The slabs should be engineered to ensure that it is suitable to accommodate loadings from the proposed use, including a proposed inner leaf blockwork which supports the new roof structure. Once installed, the slabs will act as internal raft type slab systems, which will minimise any additional loadings placed upon the existing foundations. This should assist in improving the overall structural performance of the buildings.

Whilst the new floor slabs will need to be placed upon a hardcore sub-base, we recommend care should be taken during any excavation and installation of sub-bases. The existing foundations should not be undermined or disturbed as part of the sub-base installation, however the slabs can be engineer designed in order to achieve suitable performance whilst keeping slab thickness and sub-base requirement to a minimum. We recommend that existing foundation levels to all walls are confirmed via trial pits prior to completing remedial slab designs.

The floors should also incorporate insulation and damp-proof systems as specified by the architect to meet current regulations. Damp proof membranes should be applied underneath the floor slab which should be continuous with any damp-proof systems that are applied to the walls.

- 5.3 We recommend new inner leaf blockwork walls are to be constructed off the reinforced ground floor slab using standard 100mm blockwork units and can be set out to form a cavity between the original masonry.

In order to protect the existing rear elevation walls from further distortion it will need to be enhanced with a series of remedial works, including an improvement in their overall restraint. Ideally any layout proposed at conversion stage should introduce some cross wall at regular centres that tie perpendicular into the rear elevation at regular centres, or alternatively a series of steel frames may be required if an open plan arrangement is desired.

A similar approach of providing a new inner leaf blockwork walls constructed off reinforced ground floor slabs to support all new roof structures should be adopted to the smaller Store barn, however due to its small footprint, consideration could be made for this element to be reconstructed should planning policies allow.

- 5.4 The existing roof structures will need to be replaced. We recommend that all new roof structures are of cut roof construction to an Engineers design, or alternatively a prefabricated roof truss system by specialist supplier could be adopted. The new roof structures should be supported onto the new inner leaf blockwork and may need to incorporate extended rafters to achieve the required fascia detail over the original masonry wall at eaves.
- 5.5 The original Timber beam / pier arrangement forming the front elevation of the main barn should be enhanced via the constriction of infill panels between the pier and gable walls in order to form an enclosed structure as part of any conversion.
- 5.6 Elsewhere the performance of all walls that accommodate fractures 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 over any open cracks. Similar Helifix systems can be used to improve the tie between any new cross walls and junctions with the external elevation walls. Any areas of hard cement re-pointing previously carried out on any brickwork that is to be retained should be carefully removed and replaced with a sympathetic soft lime based mortar. Other areas of weathered masonry joints should be repointed in a similar fashion. Any timber lintels / backing timbers that are present over any openings should be replaced throughout.
- 5.7 Whilst reference to damp is outside the scope of this report it can be seen that the structure has suffered from a degree of water penetration over the years.
As such it is essential that advice and any required treatment from specialists in the field of damp and decay should be carried out in conjunction with the conversion, in order to ensure that damp and timber decay are not trapped within the fabric post completion.
- 5.8 Rainwater goods should be reinstated / installed to any conversion to allow reliable discharge of rain water.
- 5.9 Any extensions or additions to the footprint of the original building should be constructed off engineered, reinforced concrete raft style foundations.

Finally, we confirm that this report is for advice and guidance only, and that consideration of any conversion, alteration and extension proposals should be done only following liaison with the Architect, and guidance / Approval from the Local Authority Planning and Building Control Departments.

JC Consultancy Limited

Consulting Structural & Civil Engineers

Nov 2023

6.0 PHOTOGRAPHS



Photograph # 1 (Main 'Stable' Barn - Front, East Facing Elevation)



Photograph # 2 ('Store' Barn - Front, East Facing Elevation)



Photograph # 3 (Main 'Stable' Barn North Facing Gable Elevation)



Photograph # 4 ('Store' Barn - North Facing Gable Elevation / West facing Rear Elevation)



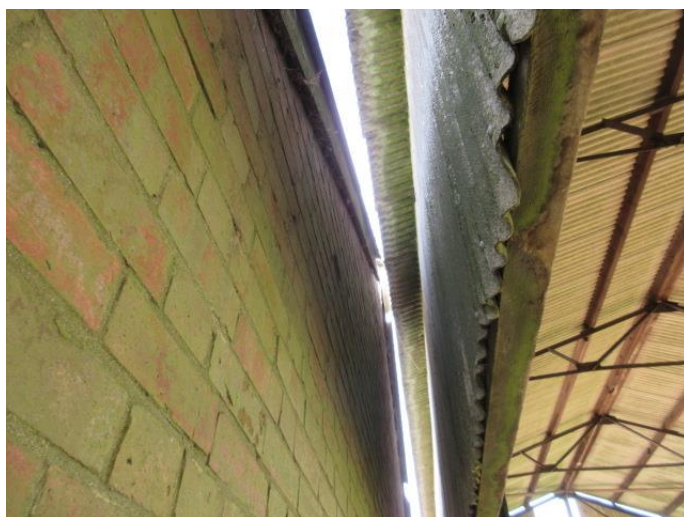
Photograph # 5 (Rear, West Facing Elevation)



Photograph # 6 (Main 'Stable' Barn - Rear, West Facing Elevation)



Photograph # 7 (Main 'Stable' Barn - Gable, South Facing Elevation)



Photograph # 8 (Main 'Stable' Barn - Gable, South Facing Elevation)



Photograph # 9 (Typical Roof / Eaves Timber Beam onto Central Pier)



Photograph # 10 (Typical Roof)



Photograph # 11 (Main 'Stable' Barn - Localised Cracking to Rear Elevation)



Photograph # 12 (Localised Cracking to Rear Elevation - Internal Brickwork – Crack Formerly Repaired)



Photograph # 13 ('Store' Barn - Localised Cracking to Rear Elevation)



Photograph # 14 (Main 'Stable' Barn - Typical Foundation)



Photograph # 15 (Main 'Stable' Barn – Rear Masonry Panel – Horizontal Movement on DPC)



Photograph # 16 (Main 'Stable' Barn – Rear Masonry Panel – Horizontal movement on DPC)



Photograph # 17 ('Store' Barn - Typical Foundation)

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