

Boston Office: 01205 317540

✉ **Morgan House, Gilbert Drive,
Boston, Lincolnshire, PE21 7TQ**

Louth Office: 01507 601214

✉ **Meridian House, 41 Eastgate,
Louth, Lincolnshire, LN11 9NH**

STRUCTURAL APPRAISAL REPORT

**Existing Farm Buildings at;-
The Chestnuts,
Cheal Road,
Surfleet,
Spalding,
Lincolnshire**



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Property;-	Existing Farm Buildings at;- The Chestnuts, Cheal Road, Surfleet, Spalding, Lincolnshire	Instructed;- August 2018
Client:-	Mr M Garner The Chestnuts, Cheal Road, Surfleet, Spalding, Lincolnshire PE11 4BA	Survey & Report by;- J. Ellington BSc. CEng MStructE MIO D J. Hicks BEng(Hons) MSc, PgDip.CHE, MIO D
Reference:-	JC/18/08/4594	Issued:- Oct 2018

Directors

J C Ellington BSc. CEng MStructE FRSA MIO D

J L Hicks BEng(Hons) MSc. PgDipCHE, MIO D

J C Consultancy is a trading style of J C Consultancy Limited

Registered in England 05973101

Trading Address Morgan House Gilbert Drive Boston Lincolnshire PE21 7TQ

Registered Office 75 High Street Boston Lincolnshire. PE21 8SX

VAT Reg. No. 895 1511 07

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The Chestnuts,
Cheal Road,
Surfleet,
Spalding,
Lincolnshire

Our Ref;- JC/18/08/4594

SYNOPSIS

The report provides commentary of observations made during a structural appraisal survey, and identifies the defects witnessed within the fabric of the buildings.

The report concludes that the buildings have survived well considering their age and previous use and are ideal for sensitive restoration and conversion into a habitable dwelling.

The report recommends and describes various low key strengthening and remedial details to the roof, walls and floors that should be conducted as part of any conversion process.

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1.0 BRIEF

- 1.1 JC Consultancy Limited was requested by Mr M Garner, to assess and comment on the structural condition of an existing range of barns located at The Chestnuts, Cheal Road, Surfleet, Spalding, Lincolnshire.

2.0 INTRODUCTION & SCOPE

- 2.1 The barns are located within the grounds of The Chestnuts, in a rural location off Cheal Road, near the village of Surfleet, Lincolnshire.
- 2.2 The client owns the property and has instructed a structural appraisal report to be carried out in order to assess possible options for future development. This instruction was provided by the client's architect, JB Architectural Design Services.
- 2.3 This report should be read in-conjunction with documentation prepared and issued by the client's architect.
- 2.4 This report is solely for the purposes of the client and no other third parties.
- 2.5 JC Consultancy Limited visited the property on 19th September 2018, in order to carry out a structural appraisal survey.
- 2.6 Weather conditions at the time of the survey were warm 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, including carpets 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, either by permanent finishes such as, but not limited to wallpaper, decorative plasters, suspended ceilings, or carpets, or by items of furniture, either fitted or freestanding, have not been inspected or commented upon. We therefore cannot guarantee that any such parts are free from defect.
- 2.12 The performance of foundations may be referred to within this report; however the existing foundation system has only been expected via a single hand excavated trial hole, 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 property 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. In order to demonstrate the condition of the original fabric, potential loss percentages have been provided in Section 4.0 of this report.

3.0 GENERAL DESCRIPTION

- 3.1 The barns are located within the grounds of the farmhouse known as The Chestnuts, in a rural location off Cheal Road, outside the village of Surfleet. The barns are a mix of single and two storey barns, located in a typical U- shaped arrangement surrounding a former Crew Yard when viewed on plan. The barns are predominantly traditionally constructed.
- 3.2 The construction date of the barns is unknown, but they are likely to have been constructed during the late 1800's to early 1900's. They appear to have formerly been used as general agriculture type buildings, including a two storey hay-loft, and single storey barns for the keeping of livestock and general storage.

The main buildings appear to be generally in their original format, however a series of modern blockwork walls have been introduced at a later date within the barns at the rear of the complex. Elsewhere, minor alterations have occurred during the lifetime of the buildings, including adjustment of openings and introduction of concrete floor slabs.

For the purpose of this report, the building will be referenced as follows.

- **Barn 1 - The main two storey former hay-loft barn - considered as South facing.**
- **Barn 2 - The single storey garage barn is considered as East facing**
- **Barn 3 - The single storey storage barn is considered as North facing.**

- 3.3 The general construction of the barns consist of; -

Duo-pitched Roofs

Barn 1 – A slate roof covering over a hand cut roof consisting of timber rafters, trusses, collars, purlins and ties. The underside of the rafters has a sarking board applied.

Barn 2 – Predominately cement fibre profiled sheet roof covering over a slender hand cut roof consisting of timber rafters, trusses, collars, purlins and ties.

Barn 3 - A tile roof covering over a hand cut roof consisting of timber rafters, trusses, collars, purlins and ties.

Walls

Barn 1 - Predominantly 330mm wide, traditional solid wall construction consisting of clay masonry units laid in a lime based mortar. Some of the upper walls reduce to 215mm wide traditional solid wall construction consisting of clay masonry units laid in a lime based mortar.

Barn 2 - Predominantly 215mm wide, traditional solid wall construction consisting of clay masonry units laid in a lime based mortar.

Barn 3 – A combination of 215mm, traditional solid wall construction consisting of clay masonry units laid in a lime based mortar, with integral piers forms the North facing elevation wall, whilst the wall dividing the barn with the former crew yard has been reconstructed using a modern aggregate concrete block.

First Floor

Barn 1 – Hay-lofts have softwood timber floor joists spanning between loadbearing walls and timber beams, with timber floorboards over.

Barn 2 – N/A

Barn 3 – N/A

Ground Floor

Barn 1 – The ground floor consisted of a relatively modern, concrete, ground bearing floor slab, the specification of which is unknown.

Barn 2 - The ground floor consisted of a relatively modern, concrete, ground bearing floor slab, the specification of which is unknown.

Barn 3 - The ground floor consisted of a rough cast type concrete, ground bearing floor slab, the specification of which is unknown.

Foundations

Foundations were not inspected as part of this preliminary report, however they are likely to consist of shallow corbelled masonry foundations bearing onto the ground strata below.

- 3.4 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) overlain by Tidal Flat Deposits (Clays & Silts).
- 3.5 There are no significant mature trees in close proximity to the walls of the barns. A medium height tree (species unknown) is located approximately 5 metres from the North East facing corner of Barn 2. A couple of small saplings are present adjacent to the walls of Barn 2, and a number of climber species of ivy are present on various walls throughout the complex.

4.0 SUMMARY OF OBSERVATIONS

(Read in conjunction with Section 2.14 of this report)

Based on initial visual observations conducted during our survey, we estimate that the likely loss of original fabric during a typical conversion will be as follows;-

Barn 1 - The main two storey former hay-loft barn - considered as South facing.

Roof Structure – 5-10%	(predominately localised areas of decayed timbers – and replacement of any split timbers)
Masonry Walls – 5%-10%	(minor re-build around local deformation, fractures and loss of units during creation of proposed openings).
First Floor – 10-15%	(predominately localised areas of decayed timbers – and replacement of any split timbers)
Ground Floor – 0%	(original floor has been replaced with a concrete ground bearing slab – retainment is envisaged if levels allow)

Barn 2 - The single storey garage barn is considered as East facing

Roof Structure – 100%	(original roof finish is profiled sheeting over a slender roof structure – replacement is envisaged)
Masonry Walls – 5%-10%	(minor re-build around local deformation, fractures and loss of units during creation of proposed openings).
First Floor – N/A	N/A
Ground Floor – 0%	(original floor has been replaced with a concrete ground bearing slab – retainment is envisaged if levels allow)

Barn 3 - The single storey storage barn is considered as North facing.

Roof Structure – 20-100%	(depending if repair / replacement considered – original roof finish is clay pantile that can be removed, retained and reinstated.
Masonry Walls – 10%-15%	(minor re-build around local deformation, fractures and loss of units during creation of proposed openings).
First Floor – N/A	N/A
Ground Floor – 100%	(original floor has been replaced with a rough cast concrete ground bearing slab – reinstatement is envisaged)

Note;- Barn 3 – The North facing elevation wall has been reconstructed using a modern aggregate concrete block, and various buttresses have been added at a later date. As these elements are not original they have not been considered within the figures noted above .

5.0 DISCUSSIONS & RECOMMENDATIONS

5.1 Roof Structures

5.1.1 Barn 1

The roof structure appears generally sound and in a reasonable condition. The roof appears well tied with a combination of collar ties and eaves ties present. Whilst there is a degree of distortion to the ridge line of the roof, its overall appearance suggests that it is performing adequately under loading.

The current roof covering is slate with a timber sarking underlying the rafters. As such the roof has accommodated a reasonable degree of loading throughout its lifetime without undue deflection. As with the majority of barn roofs, we do anticipate that some strengthening works will be required in order to accommodate further loadings from insulations and ceiling finishes however, loss of original timbers is likely to be low, and we foresee no reason at the time of writing for this roof structure not to stay in-situ during conversion.

As per usual in a conversion of this nature, allowance should be made for the repair of any decayed timbers, many of which may be hidden until works commence. Most fatigued timbers will occur where they have been exposed to continued wetting or are in contact with masonry elements. With a timber sarking being present, our inspection of timbers was extremely limited. We observed a small amount of evidence of water penetration on the underside of the sarking board.

A more detailed inspection of the roof timbers should be carried out by specialists in the field of damp and timber decay in conjunction with the conversion, in order to ensure that damp and timber decay are not trapped within the fabric post completion. This is likely to involve the stripping of the slate finish to allow inspection. Any timber repairs, including that of any decayed rafter feet, purlin / beam ends and wall-plates as advised by the specialist should be undertaken.

New felt and insulations will need to be installed in accordance with the architect's requirements and roof specifications.

5.1.2 Barn 2

The current roof covering is extremely lightweight, as such the timbers forming the roof structure are slender and are not suitable to accommodate any additional loading from conversion.

Therefore, we recommend that a replacement roof structure is allowed for within this barn. A replacement roof structure would be welcome as it would greatly enhance the overall structural robustness of this element. The roof structure should be engineered in order that it does not exert any lateral loading (thrust) to the top of the existing walls. This can be achieved via an engineered hand cut roof solution incorporating ridge beams and/or purlins, or a prefabricated style tied roof truss system.

5.1.3 Barn 3

The pantile roof covering to this barn is missing in parts resulting in many of the timbers being exposed to the elements. However, the roof structure to the barn appears generally sound and in a reasonable condition. The roof is tied, with purlins and high collar ties present, however with no eaves ties or ceiling joists in place, it does result in the roof being susceptible to roof spread.

We do anticipate that a reasonable amount of strengthening works will be required in order to accommodate further loadings from insulations and ceiling finishes and to enable the roof to remain in-situ. Strengthening could be achieved via the introduction of additional tie timbers, or to make use of anticipated partition walls that are likely to be built within the barn.

The option of a replacement roof structure within this barn should also be considered. Similarly to Barn 2, a replacement roof structure would be welcome as it would greatly enhance the overall structural robustness of this element. Ultimately the decision for replacement against repair of existing should be explored further following the further investigation of existing timbers.

If repair of the existing roof is to be undertaken, allowance should be made for the attention of any decayed timbers, as previously described for Barn 1 (5.1.1)

New felt and insulations will need to be installed in accordance with the architect's requirements and roof specifications.

- 5.1.4 There is a lack of suitable rainwater discharge downpipes throughout all the barns which has resulted in the localised wetting of masonry. Rainwater goods should be repaired / installed throughout all areas of the barn complex to allow reliable discharge of rain water.

5.2 Walls

5.2.1 Barns 1 & 2

The walls to the original barn construction are predominantly sound and require little attention. The walls have reasonable height to thickness ratios, and as such do not appear to have been subjected to any form of significant stress.

A localised area of upper masonry on Barn 1 (between upper openings on the South facing elevation) was displaying a degree of lateral distortion, and therefore consideration should be made for the installation of suitable tie bars, or, if deemed required a small area of localised rebuild between and adjacent to the existing openings.

Elsewhere minor fractures require repair, and small areas of localised brick turning / replacement will be required where individual brick units have failed.

The performance of any masonry panels suffering minor fractures, localised cracking 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.

This technique can be used to stitch cracks, tie any partitions that have become disconnected from flank walls and repair masonry arches. In addition, the system can also be used to provide restraint between masonry walls and timber floors. More information can be seen at www.helifix.co.uk.

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 works each panel can be considered in its entirety and may only require localised areas of repointing upon further investigation.

Any defective timber lintels and arch backing timbers should be replaced throughout. Any timber wall plates, and previous feed bin / troughs that are present within the walls should be removed and replaced with remedial brickwork infill.

5.2.2 Barn 3

The wall forming this barn consists of a combination of original brickwork to the North facing side elevation and East facing rear elevation, and modern blockwork to the South facing side elevation adjacent the former Crew Yard. The original parts of the wall incorporate a series of internal piers and external projecting buttress structures. The original walls are in fair condition but are likely to require a degree of additional restraint to remain in-situ. This could be provided by the installation of suitable tie bars, or, if architectural layouts provide a series of cross wall partitions, these could also be utilised to reduce the effective length of the long flank walls and assist in the overall performance of the existing fabric. We recommend that partition walls and tie bars are installed prior to the removal of the rear buttressing structures.

All walls that have been later constructed out of modern blockwork are deemed unsuitable to remain in-situ, and we recommend that allowance is made for these to be demolished and reinstated off a suitable foundation system. In order to allow removal of the modern blockwork, the existing roof structure will need to be temporarily propped if it is to remain in-situ.

Elsewhere on the original fabric minor fractures can be repaired using the Helifix system and repointed as described in 5.2.1, and small areas of localised brick turning / replacement will be required where individual brick units have failed.

5.3 Ground Floors

5.3.1 Barns 1 & 2

The existing ground floor slabs to Barns 1 & 2 consist of a later installed concrete floor slab. They have not suffered from any significant cracking, settlement or deterioration. Loadings being placed upon the floor slabs from the proposed conversion will be minimal. If levels allow we recommend that the floor slabs remain in-situ, and should be complimented with DPC, insulations and screeds to the architects' specification.

5.3.2 Barn 3

The existing ground floor slab to Barn 3 consists of a rough cast concrete floor slab. We recommend that allowance is made to replace all this slab with a ground bearing, concrete ground floor slab that is suitable to accommodate loadings from the proposed use, including nonloadbearing partitions. Slabs should be installed at levels to suit architects' requirements, and should incorporate suitable DPC, insulations and screeds to the architects' specification.

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, and we recommend that the slabs are engineer designed in order to achieve suitable performance whilst keeping slab thickness and sub-base requirement to a minimum.

5.4 Foundations

Based on our initial observations of the superstructure, there was no evidence to suggest that the foundations on any of the barns have suffered significant failure.

It is likely that the foundations have accommodated greater loads during their lifetime as agricultural barns than they will accommodate from a proposed residential conversion.

As such we do not foresee that any form of underpinning or foundation enhancement is required to the majority of the existing barn complex.

Depending on the proposed scheme, allowance should be made for the introduction of new concrete strip foundations, in order to provide support for proposed loadbearing partition walls, together with any previously installed blockwork walls that are being carefully demolished and reinstated.

Similarly, to the floor slabs, we recommend that care should be taken during any excavation and installation of internal strip foundations. The existing foundations should not be undermined or disturbed as part of this installation, and we recommend that the foundations are engineer designed to keep them as shallow as possible.

5.5 Finally, whilst reference to damp is outside the scope of this report (see 2.9), it appears that the structure, particularly Barn 3, 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 timber 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.

6.0 CONCLUSIONS

- 6.1 The range of barns have survived reasonably well considering their age and previous use and are ideal for sensitive restoration and conversion into a habitable dwelling.
- 6.2 The buildings basic, rectangular shapes, together with the presence of various floors, braced cross walls, solid wall construction and piers, results in them being a complex of robust structures which can be seen to have only lost a small amount of original fabric during its lifetime.
- 6.3 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 buildings. The majority of loss of the original fabric is due to the materials being subjected to the elements. Ensuring the outbuildings are weather-tight should be addressed even if a full conversion or restoration is not going to take place. Failure to do so will accelerate the decay and deterioration of the remaining fabric.
- 6.4 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 roof members being exposed to the elements during its period of non-use, 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 reasonably low.
- 6.5 Section 5.0 of this report highlights a series of recommendations including various low key strengthening and remedial details to the roof, walls and floors that should be considered as part of any conversion process.

JC Consultancy Limited
Consulting Structural Engineers

October 2018

7.0 PHOTOGRAPHS.



Photograph # 1 - Barn 1



Photograph # 2 - Barn 1



Photograph # 3 – Barn 1



Photograph # 4 – Barn 1



Photograph # 5 – Barn 1



Photograph # 6 – Barn 1



Photograph # 7 – Barn 1



Photograph # 8 – Barn 2



Photograph # 9 – Barn 2



Photograph # 10 – Barn 2



Photograph # 11 – Barn 2



Photograph # 12 – Barn 2



Photograph # 13 – Barn 3



Photograph # 14 – Barn 3



Photograph # 15 – Barn 3



Photograph # 16 – Barn 3

END OF REPORT