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STRUCTURAL APPRAISAL REPORT

Existing Barn off;-
Low Road,
Holbeach Hurn,
Spalding,
Lincolnshire



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Property;-	**Existing Barn at;-** Low Road, Holbeach Hurn, Spalding, Lincolnshire	**Instructed**;- Jan 2019 **Surveyed**;- Feb 2019
Client:-	**Mr & Mrs Butler** c/o G R Merchant Ltd 4 Wrights Mews, 12A Park Road, Holbeach, Lincolnshire PE12 7EE	**Survey & Report by**;- J. Ellington BSc. CEng MIStructE MIoD J. Hicks BEng(Hons) MSc, PgDip.CHE, MIoD
Reference:-	JC/19/01/4820	**Issued**:- Feb 2019

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The Institution of Structural Engineers

STRUCTURAL APPRAISAL REPORT,

Existing Barn at;-
Low Road,
Holbeach Hurn,
Spalding,
Lincolnshire

Our Ref;- JC/19/01/4820

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1.0 BRIEF

1.1 JC Consultancy Limited was requested by Mr and Mrs Butler, to assess and comment on the structural condition of an existing barn located at Low Road, Holbeach Hurn, Spalding, Lincolnshire.

2.0 INTRODUCTION & SCOPE

2.1 The barn is located off the highway known as Low Road in a rural location near the village of Holbeach Hurn, in Lincolnshire.

2.2 The client is currently purchasing 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 clients agent, G.R.Merchant Ltd on 30th January 2019.

2.3 This report should be read in-conjunction with documentation prepared and issued by the client's architect, G.R. Merchant Ltd.

2.4 This report is solely for the purposes of the client, clients 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 26th February 2019, 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. There are two timber lean-to structures adjacent the barn that provide covered storage areas. These structures have not been considered within this appraisal.

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 report 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. 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 barn is a two storey, rectangular shaped structure in the style of a former Hay Store / General Store. The barn is predominantly traditionally constructed.

3.2 The construction date of the barn is unknown, but it is likely to have been originally constructed during the early 1900's.

3.3 The general construction of the barn consists of; -

Duo-pitched Roof

A slate roof covering over a timber hand cut roof consisting of a series of timber king post style trusses, timber rafters, ties and purlins.

Walls

A combination of 330mm / 215mm wide, traditional solid wall construction consisting of clay masonry units laid in soft mortars.

Ground Floor

The ground floor consisted of concrete presumably laid directly on the ground. The concrete floors have been added at a later date but their specification is unknown.

First Floor

Timber floor boards, over softwood timber floor joists that span between loadbearing walls and intermediate timber beam / post arrangements.

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 Ampthill Clay formation (Mudstone) overlain by Tidal Flat Deposits of Clays and Silts.

3.5 There are no mature trees in close proximity to the barn. A number of small trees are present in overgrown areas around the rear elevation of the barn.

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; -

Roof Structure – 20-25%	(predominately localised areas of decayed timbers – and replacement of any split timbers / strengthening required around roof window installations etc). Note subsequent reports from specialists in the field of damp and decay will determine if any further losses and deemed necessary.
Masonry Walls –Approx. 25%	(generally low key re-build around local deformation, fractures and loss of units during creation of proposed openings). Front (west facing) and (south facing) gable elevations may require a degree of re-build following failure of existing lintels over large openings to from elevation.
First Floor – 20-25%	(predominately localised areas of decayed timbers – and replacement of any split timbers / strengthening required around stairwell installations etc) Note subsequent reports from specialists in the field of damp and decay will determine if any further losses and deemed necessary.
Ground Floor – 0%	(original floor has been replaced with a concrete ground bearing slab – retainment is envisaged if levels allow).

5.0 DISCUSSIONS & RECOMMENDATIONS

5.0.1 The prevailing condition of the remaining barn elements is considered reasonable / good. Some areas of existing masonry walls will require attention, but generally, the barn will require a low degree of intervention in order for it to accommodate a sensitive conversion into a habitable dwelling.

5.1 Roof Structure

5.1.1 The roof structure appears generally sound and in a reasonable condition. The roof is tied in parts due to the presence of a series of King Post trusses, therefore any roof spread accommodated by the roof structure in the past is likely to be minimal. When viewed externally, the ridge line of the roof is relatively level, and dishing on the roof slopes is minimal suggesting that it is performing reasonably well under loading from the roof finishes.

5.1.2 The current roof covering is slate. 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 potential 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.

5.1.3 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.

5.1.4 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 may involve the stripping of the roof 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.

5.1.5 Low key strengthening of rafter and purlin timbers will be required where any rooflight installation is proposed and general roof upgrades including new felt and insulations will need to be installed in accordance with the architect's requirements and roof specifications.

5.1.6 There is a lack of suitable rainwater discharge downpipes throughout the barn which has resulted in the localised wetting of masonry. Rainwater goods should be installed to any conversion to allow reliable discharge of rain water.

5.2 External Walls

5.2.1 The North - facing gable and East facing rear elevation walls are predominantly sound and should 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.

5.2.2 The West – facing front elevation contains a number of large barn-style openings at ground floor and further window and door openings at first floor levels. The large openings at ground floor have been formed via concrete lintel and post arrangements, which can be seen to have failed. The failure of these elements has resulted in distortion and cracking to the masonry walls that are adjacent and over the openings, and has also resulted in some cracking of the internal cross wall adjacent the junction where it meets the front elevation.

As such, a degree of careful re-build is expected to both the lower and upper levels of the front elevation, together with the internal cross wall in order to remove any distorted and fractured masonry. At planning stage, it would be prudent to allow for the installation of some steel 'goalpost' style frames should large openings be desired in the front elevation in order to improve the overall structural performance of the masonry wall.

5.2.3 The South-facing gable wall was observed to be accommodating a degree of angular distortion for its height. The wall displayed both inward and outward lateral movement, the cause of which is likely to be the stresses accommodated following the failure of the aforementioned lintels over the openings on the front elevation. Again, at planning stage it would be prudent to allow for a degree of careful re-build to both the lower and upper levels of this gable elevation in order to remove any distorted and fractured masonry, although on further inspection the installation of suitable tie bars and strapping at floor levels may be sufficient in order to allow the majority of the original wall fabric to remain in-situ.

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

5.2.5 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.

5.2.6 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.

5.2.7 Any defective timber lintels and arch backing timbers should be replaced throughout. Any timber wall plates that are present within the walls should be removed and replaced with remedial brickwork infill.

5.2.8 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 levels and possibly the long term action of livestock presence within the barn. Following a more in-depth inspection by a mason, general brickwork repair maybe required to lower panels, including replacing / turning decayed units.

5.2.9 Ideally, any proposed layout by the architect should introduce cross walls / partitions at ground floor and more importantly at first floor. This would significantly increase the stability of the barn, and partition walls can be utilised to assist the support of floor and roof structures should room layouts allow.

5.3 First Floor

5.3.1 The first floor that is present consists of floor boards over floor joists spanning between loadbearing walls and timber support beams.

5.3.2 The floor is accommodating a degree of undulation, which again is likely to have been contributed to by the lintel failure to the front elevation discussed earlier.

5.3.3 Whilst a number of the timbers were displaying signs of decay, it is possible that the some of the floor could be retained as part of any conversion. Any strengthening required to resist undue deflection can normally be achieved via the introduction of additional joists as required. Any new partition walls at ground floor level can be utilised to assist the support of the existing floor structure should room layouts allow.

5.3.4 Following a thorough inspection by an experience joiner, together with the results of a damp and timber survey conducted by a specialist it may be deemed necessary to conduct localised repair joists and replacement of the principal timber beams. Further strengthening will be required in order to form any stairwell openings proposed by the architect. Due to previous exposure and decay all floorboards will need replacing.

5.4 Ground Floors

5.4.1 The existing ground floor slab consists of a later installed concrete floor slab. The slab has not suffered from any significant cracking, settlement or deterioration. Loadings being placed upon the floor slabs from a proposed conversion will be minimal. If floor levels allow, there is the potential that the floor slabs remain in-situ, and should be complimented with DPC, insulations and screeds to the architects' specification. Prior to commencement of works to the floor we recommend that the slab thickness is obtained via a core drill to confirm its suitability to remain.

5.4.2 Should the existing slab be of insufficient thickness / construction to remain, it will need to be replaced with a ground bearing, concrete ground floor slab to typical architects specification.

5.4.3 We do not recommend that the floor slab levels are raised substantially to that which are currently present, as the process of raising the floor levels will undoubtably place an increase in stress and outward force upon the lower levels of the wall panels.

5.5 Foundations

5.5.1 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 taking into account their age and previous uses, the foundations appear to be performing satisfactorily.

5.5.2 It is likely that the foundations in parts have accommodated greater loads during their lifetime as agricultural and storage 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.

5.5.3 Should during the course of planning and design stages it become apparent that some of the foundations do require a degree of attention, assistance could be provided by a replacement floor slab as opposed to traditional underpinning. The slabs can be adapted to assist in the performance of the walls and foundations in the form of a partial underpinning system. This can be achieved by casting in Reinforced Concrete 'fingers' cut into the walls as part of the slab construction. This should assist in improving the overall structural performance of the building if deemed required, however based on our initial observations it is unlikely that this will be required.

5.5.4 The remaining foundations are likely to be extremely shallow, and should additions be added to the footprint of the remaining barn, we would recommend that Reinforced Concrete 'Raft' style foundations should be utilised for these areas of extensions.

The introduction of 'Raft' style foundations will assist in keeping any proposed foundations to a similar depth as the existing, reducing the risk of future differential movement between existing and reinstated masonry walls.

5.5.5 The external ground levels should be landscaped and prepared to ensure that they do not exert pressures on the base of the walls. 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.

5.6 General

5.6.1 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.

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.

6.0 CONCLUSIONS

6.1 The barn has survived reasonably well considering its age and previous use and is ideal for sensitive restoration and conversion into a habitable dwelling.

6.2 The buildings basic, rectangular shape, together with the presence of a first floor, a cross wall, solid wall construction and tied roof, 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.

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 building. The majority of loss of the original fabric is due to the materials being subjected to the elements. Ensuring the barn is 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 The main cause of structural movement witnessed on the fabric of the barn is likely to have been contributed by the failure of the lintels over and around the large openings to the front elevation. We predict this catalyst of movement can be addressed during the conversion stage via the installation of suitable strengthening elements.

6.5 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.

6.6 The potential losses perceived in this report are for guidance only. It is not uncommon for additional losses to occur once works commence as material fatigue and other catalysts of material failure may only present themselves following intrusive opening up works.

6.7 Section 5.0 of this report highlights a series of recommendations that should be considered at Planning and Tender Stages should a conversion be progressed. Further inspections and considerations will need to be conducted as works progress to ensure that the remaining and any proposed additions comply with Part A (Structure) of the Building Regulations.

6.8 Consideration of any 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 2019

7.0 PHOTOGRAPHS.



Photograph # 1



Photograph # 2



Photograph # 3



Photograph # 4



Photograph # 5



Photograph # 6



Photograph # 7



Photograph # 8



Photograph # 9



Photograph # 10



Photograph # 11



Photograph # 12

END OF REPORT