STRUCTURAL APPRAISAL

ON THE PROPERTY:

'Manor Farm',
Church Lane,
Cadney, Near Brigg,
North Lincolnshire
DN20 9HR

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1.0 INTRODUCTION

1.1 This report has been prepared for Mrs K. Spence, c/o Manor Farm, Cadney, near Brigg, North Lincolnshire DN20 9HR, following instructions received on Thursday 5th March 2019.

1.2 A visual structural inspection report has been requested in connection with the current condition of the house at Manor Farm, Cadney, near Brigg, North Lincolnshire DN20 9HR. It is proposed that the existing barn structure be converted to create a new dwelling.

1.3 The property was visually inspected on Wednesday 13th March 2019. This report has been prepared on information available on site only.

1.4 Details within this report are confined to structural aspects as detailed in item 1.2 above. This report does not constitute a full building survey and specifically excludes items generally considered in a Surveyors report such as those listed below:-

The decorative condition of the property.
The condition of the property with regard to dampness, dry rot, timber infestations and the like.
The condition of services.
The condition of roof, floor and wall and ceiling coverings.
The location of the property, it's value and other aspects including boundaries, searches, etc.

1.5 No testing of materials, monitoring, breaking out or long term investigation has been undertaken. We have not inspected woodwork or other parts of the structure which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the property is free from defect.

1.6 No comment is made in the report as to the presence of new or old mine-workings or tunnelling, heavy metals, chemical, biological, electromagnetic or radioactive contamination. Further, there is no comment on pollution, asbestos issues, radon, methane or other gases, underground services or structures, springs or water courses, sink holes or the like, noises or vibratory nuisance/pollution.

2.0 GENERAL

2.1 The property at present comprises a series of agricultural buildings/barns, some of which were in a state of dereliction and others used for general storage. The spaces were subdivided at ground floor level and open plan at first floor level (occupying the footprint of the main central barn only). The external barn brickwork, although weathered, was in reasonable condition particularly with regard to the age of the building (see below), but there were isolated areas of heavier historical cracking and distortion. The roof covering to the single storey buildings in particular were not weathertight or had suffered partial collapse. Due to the nature of past usage, the building was in relatively poor decorative order, especially where the roof construction had become compromised. It is proposed that the barn is to be converted to a single residential dwelling by the present owners.

2.2 The barn was built in solid brickwork (single brick thickness English garden wall bond with headers every fourth course), and seemingly dates back to the early nineteenth century (although this would have to be confirmed). From anecdotal evidence, the building has been in the ownership of the present family since before the Second World War). On the main central barn area, the roofing was of traditional timber construction comprising a series of 'substantial' raised tie trusses supporting purlins and rafters with corrugated roof sheeting over. Large timber tie beams also crossed the building at eaves level. The first floor construction comprised timber floor boards on joists, again with substantial intermediate support beams. The single storey ground floor areas all had clay pantile roof coverings in various states of disrepair (and partial collapse in some instances). No sarking felt was in place and in several instances daylight was visible through the tiling joints. The timber doors, windows and frames were generally in poor condition. Flaking paint and the onset of rot was evident in many cases.

2.3 References to the orientation of the property in this report are generally as viewed from Church Lane (taken as the north elevation).

2.4 Reference photographs are included in the Appendix 1 of this report and a location map is included in Appendix 2.

3.0 OBSERVATIONS

3.1 EXTERNAL

3.1.1 On the front (northern) elevation of the building (Plates 1 - 5) the roof had a corrugated asbestos cement sheet covering on the central two storey section and heavy moss growth was noted. The ridge line was slightly uneven and localised damage was noted adjacent to each gable. The cast iron rainwater goods were damaged and sections were missing. On the right hand single storey part of the building, the roof comprised clay pantiles that were distorted, broken and uneven. At the extreme right hand side of the building (hip roof section), the roof had partially collapsed (Plate 3). The clay pantile roof over the left hand single storey section was in poor visual condition. Tiling was also uneven and damaged in places and substantial vegetation growth was noted in the hip valley guttering (Plate 4). The brickwork was weathered and mortar loss was evident in the perpend and bed joints in several instances, especially at low level where dampness in the walls was also evident. On the right hand side of the building (single storey section), the brickwork was of varying type (and age); the garage area was seemingly a later infill. Above the left hand side of the door accessing Room 2 (refer to appendix 2 for a layout plan), there was a left to right 3-4mm wide 'stepped' diagonal crack, propagating up to eaves level (and the area of collapsed roof over); this appeared to have longstanding origins. Over the Garage door the steel runner (visible in Plate 1) was noted to be corroded. On the central two storey barn section (Plate 3) the wooden door at first floor level was noted to have flaking paint finishes and the timber sill was rot affected. The paint finishes on both the large and small door at ground floor level were also flaking. Localised damage was noted within the diamond brickwork feature above the low level small door position and to the left of the central window position. Some historical mortar re-pointing was noted; this had not significantly re-cracked. The remaining area of wall on the central part of the building were in seemingly good visual condition, there was no obvious signs of distortion around the pattress plate positions and no evidence of any further structurally significant cracking or distortion. The timber door to the Stable area had been repaired over the years but remained in a visibly poor condition and the timber lintel was rotten at the right hand bearing position. Below the sill of the window to the left of the Stable door, there was a 4-5mm wide 'stepped' diagonal crack that returned on itself, before diminishing in width to 1mm at low level. Above the same window opening, there was a further 'stepped' crack (through the mortar perpend and bed joints). This was assessed as being 8mm wide at the window head, reducing to 3mm as it propagated up to the roof slope over. The timber shutter on the window to the left

of this position was also noted as being rotten. At high level on this left hand corner of the building there was minor localise brickwork damage that could possibly be attributable to nominal historical outward movement in the roof.

3.1.2 On the eastern elevation of the two storey part of the building (Plates 6 and 9), the original brickwork at lower level was weathered with some erosion noted in the mortar joints, but there were no obvious signs of structurally significant defect. In the upper section, newer brickwork had been used to form the gable wall. Again there was surface weathering, but there were no obvious signs of structurally significant cracking or distortion. On the end elevation of the single storey part of the building (Plate 7), there was a 2-3mm wide central crack that diminished to hairline in width as it propagated further down the wall. Outward distortion and localised damage in the brickwork was also noted at high level, which appeared to by symptomatic of historical roof spread effects. Further, slight misalignment of the wall, overrunning the damp proof course (dpc) at low level, was noted. No further structurally significant cracking was noted in this wall elevation. Settlement was noted in the plane of the clay pantiles over (which correlated with the observed outward movement in the wall) and there was tile damage at the left hand edge of the roof (as viewed).

3.1.3 Inspection of the rear (southern) elevation of the barn (visible in Plates 8 - 11) again revealed stained and weathered brickwork that appeared to be in reasonable overall condition (particularly bearing in mind the age of the building). In Plate 10, it can be seen the block paved path had heavy moss growth (seemingly exacerbated by the shadowing effect of the adjacent building), undulated and had rotated away from the building over the years. The retaining wall behind, however, did not exhibit any obvious signs of structurally significant distress. At the eastern end of the building the timber roof fascia members all exhibited signs of rot. The leading edges of the roof tiling were again noted to be loose and damaged (as referred to above) and at the pier interface on the right hand side of the building (as viewed), there was a 1mm wide longstanding vertical separation crack. Remnants of past paint finishes and a black band to dado height (presumably a past damp prevention measure) were noted (Plates 10 and 11), but again despite being weathered, the brickwork in the central building section appeared to be in relatively good visual condition. The cast iron rainwater goods were damaged in several instances on the western single storey part of the building (Plate 11) and the clay pantile roof over, contained areas of loose tiles and localised damage; indeed a distinct slope in the roof line was noted between the chimney stack position and the interface with the two storey building. In this single storey section, the brickwork was more heavily eroded and some of the individual

brick units appeared to be 'friable' and had succumbed to heavy erosion. Damaged brickwork was also apparent on the corner of the building. The timber 'stable-type' door paint finishes were flaking and in several instances to underlying timbers appeared to be rotten. To the right of the infilled door position, there was an outward bulge in the plane of the wall (Plate 11), but any discernible crack pattern was difficult to identify in the weathered brickwork.

3.1.4 Inspection of the western side elevation of the two storey part of the building (Plate 12) also revealed brickwork, although weathered, in relatively good condition, but below the southern roof slope in the newer section of brickwork some of the individual brick unit faces were heavily eroded. The roof was damaged at this position and some individual bricks appeared to be loose and vegetation growth was apparent. On the west elevation of the single storey building (Plates 13 and 14), the partial collapse of this section of the clay pantile roof was again apparent and vegetation growth was noted at the eaves level. Above the window on the left hand side of the building the soldier coursing had slipped and there was a 2-3mm wide crack that propagated up towards the eaves (Plate 14). This cracking had propagated through past mortar re-pointing (although these repairs were themselves weathered and longstanding). An outward bulge in the wall was noted within the infilled door position, but the re-pointed brickwork showed no obvious signs of significant re-cracking, suggesting that the movement was historical and not significantly progressive in nature. Above the door arch (accessing Room 1), there was a 4-5mm wide longstanding vertical crack. The historical re-pointed mortar had, however re-cracked at this position. There was an area of heavier mortar loss to the left of the door position, but there were no further obvious signs of structurally significant distress or distortion.

3.2 INTERNAL

3.2.1 Inspection of Room 1 on the rear western side of the building (Plate 15) revealed daylight visible within the clay pantile roof. The room was in a derelict condition with the rendered wall finishes perished (particularly at low level). The traditional roof timbers were also noted to be distorted and seemingly rot affected in places. The concrete floor slab was not clearly visible due to surface material. In the eastern wall, there was a substantial crack (Plate 16) that appeared to be symptomatic of outward rotational movement in the building structure at this point. Whilst the cracking appeared to have longstanding origins, the width of the fissure was noted to be some 20mm at high level. On the western wall, there was a longstanding10mm wide crack above the right hand side of the door reveal and a further 4mm wide diagonal crack above the left hand side. Plaster repairs had been undertaken to the right side of this crack, but these were also seemingly historical and in poor visual condition. The timber door itself was rot affected and in poor condition. On the south wall there was a 3-4mm wide diagonal crack that propagated up to the interface with the western wall, plaster was missing in patches along the line of this crack. On the north wall, there was a 5-6mm wide diagonal crack that propagated from the left hand top corner of the room down to a central position at low level.

3.2.2 Inspection of Room 2 on the front western side of the building (Plates 17 and 18) revealed a collapsed area of roof beyond the hip over the northern section and the extent of tiling seemingly precariously supported on a partial damaged and rotten roof structure. The rendered wall finishes were perished, particularly at low level, where the ingress of damp had occurred over the years, with heavy mildew growth noted also. Where repairs had been made to the rendering at low level and around the door position, this too had deteriorated and re-cracked over time. The concrete floor slab, where visible, contained historical cracking. On the north wall (visible in Plate 18), there was a 2mm wide historical crack adjacent to the right hand top corner of the door opening and there was a second 1-2mm wide crack below this. On the east wall, there was a 2-3mm wide diagonal crack (possibly relating to historical racking effects) to the left of the door position (accessing the Garage). There was crazed cracking in the finishes above the door head. On the south wall there was a 2-3mm wide diagonal longstanding crack that propagate from the right hand top corner (shared with the west wall). On the west wall there was a 2mm wide mainly horizontal crack over the window position and a pair of 3-4mm wide diagonal cracks travelling from the bottom right hand corner of the window reveal (visible in Plate 17). Areas of missing/partially repaired plaster finishes were noted at low level.

3.2.3 Inspection of the Garage area on the western side of the building (Plate 19) revealed painted walls and a concrete floor that was uneven in places. Daylight was again visible in the joints between the loose clay tiles. The timber roof truss construction was of varying type and there were visual signs of rot. The timber purlins were relatively lightweight and had distorted under the weight of the roof. The western wall, with a deteriorated black paint band at low level, was seemingly free from obvious structurally significant cracking or distortion. On the south wall the timber lintel over the window contained shakes and appeared to have deteriorated under the effects of rot. There was a 1.0mm wide diagonal crack in the wall above this position, but the remaining wall elevation, was free from any signs of structurally significant distress. On the eastern wall (Plate 20), there was a 20-25mm wide crack at the interface with the south wall that propagated into the building. This was indicative of historical outward rotational movement in the building. There was a light timber lintel above the central door position and a 1-2 mm wide horizontal (again longstanding) crack was noted in the brickwork over. To the right of the doorway (as viewed) there was a 3mm wide 'stepped' diagonal crack that travelled towards the north wall interface. A substantial timber beam formed the lintel over the large opening on the north wall (visible in Plate 19). This in turn supported the principal tie member. The condition of these timbers was generally seemingly reasonable although there was some surface deterioration. There were no obvious signs of structurally significant cracking or distortion in the sections of exposed brickwork wall to each side of the main door, but flaking paint and onset of rot was noted in the wooden door.

3.2.4 Inspection of the main central barn at ground floor (Plates 21 and 22) revealed timber flooring members over, which again had surface dampness evident, but were in reasonable visual condition. There were no obvious signs of structurally significant cracking in the brickwork (essentially exposed but with the occasional legacy of past render/plaster finishes) walls. Some mortar was missing from joints occasionally, but the overall visual condition was good. The floor was mainly of brick paver construction although a substantial area had been excavated. A significant slope in the floor (some 200mm towards the eastern end of the building) was noted, but this was believed to be by design for practical 'washing out' purposes, rather than building movement. The timber floor joists were supported by a pair of substantial cross beam members, that were effectively also acting as a building tie as they were 'strapped' at each end to external pattress plates. Some surface dampness and insect borings were noted in these members.

3.2.5 Inspection of the Stable on the eastern side of the building (Plate 26) again revealed a compromised roof construction with daylight visible between loose roof tiles. The rafters also appeared to have 'racked' in an easterly direction over the years. The traditional timber roof members appeared to be rot affected in several instances. Viewing of the concrete floor was made difficult by the presence of straw, but whilst uneven, there did not appear to be any significant undulations. The masonry paint on the exposed brickwork walls had worn away over the years. There were, however, no obvious signs of structurally significant cracking or distortion in the walls.

3.2.6 In Room 3 on the farthest eastern side of the building (Plates 28 - 30) daylight was again visible through the clay pantile roof in several instances. The battens appeared to be rotten, but the rafters and indeed the principal king post roof truss (visible in Plate 30) appeared to be in reasonable visual condition (this should of course be verified by a timber specialist where re-use is proposed). In the west wall, at the junction with the south wall, there was a 10-12mm wide longstanding diagonal crack at high level (Plate 29) and a further downwardly propagating crack (assessed as 3mm in width) extending into the building. On the eastern wall there was a 2-3mm historical horizontal crack at high level, with some outward movement in the masonry adjacent to the roof line (correlating with the external observations. The remaining walls appeared to be in reasonable visual condition from a structural perspective, with no further obvious signs of structurally significant cracking or distortion evident.

3.2.7 First Floor

The main central barn building at first floor level (accessed via a ships ladder (Plate 23)) had a traditional timber roof (visible in Plate 24) comprising asbestos cement sheeting carried on purlins; all supported on a collared trusses, with principal tie members crossing the room. Between the sheeting joints, daylight was visible in some instances. Whilst the condition of the principal timber members was seemingly sound, there was dampness and rot evident (and indeed signs of past insect infestation). The plastered walls were again in reasonable condition, with no obvious signs of structurally significant cracking, although the plaster finishes were missing or perished just above the floor level on the north wall. There was a 1mm wide vertical crack below the left hand tie beam position and slight outward rotational movement in the brick walls were noted at high level. An outward bulge was also noted in the south wall, but there were no further sign of obvious structurally significant distress. The floor timbers appeared to be in reasonable condition, although there was one area of localised deterioration (seemingly from bird dropping build up) – Plate 25.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 The building inspected was generally in a fair condition from a structural viewpoint, bearing in mind the age of the barn, but due to the present 'practical' usage were obviously in poor decorative order, both externally and internally. From anecdotal and visual evidence, the building has not been subject to substantive maintenance or repairs for several years. Opinion in respect of necessity for refurbishment, repair and upgrading of finishes, decorations, joinery, plasterwork, services, etc., does not, however, come under the scope of our report. Our following comments, therefore, relate mainly to matters associated with structural stability/integrity.

4.2 With reference to the points raised in section 3.0, we are of the opinion that there has been some past rotational movement in the building. This was seemingly associated with lack of adequate tie provision and evidenced by the presence of pattress plates at first floor level and the cracking at the interfaces of the internal walls with the external walls, particularly within the western single storey parts of the building, where dilapidation was at its worst. Indeed in the part of the building it was felt that the level of rotational movement had contributed to the partial collapse of the roof. Due to the extent of observed degradation in this side of the building and the fact that once the roof has been removed there will be relatively little structure remaining, consideration should be given to demolition/rebuilding in this area (re-utilising existing materials where possible). This would allow for new construction on appropriate foundations and avoid the need for underpinning and extensive repairs to already dilapidated walls. The movement generally, however, appears ostensibly to be of historical origins. For the remainder of the building (and subject to the recommendations below), the walls will need to be effectively tied to the new or retained construction, thus introducing the necessary stability and inhibit the potential for the rotational movement that has been experienced in the past.

4.3 The new structure within the main retained parts of the building could comprise an internal leaf of blockwork founded on an internal *quasi* raft foundation, which would also form the ground floor slab (incorporating a damp-proof membrane and insulation in accordance with the modern building regulations). The loads from the roof, first floor and the blockwork would be transferred directly into this element (cantilevered from an eccentric integral ground beam) and thus relieving the load to the original walls. The original walls would be tied to the new masonry leaf as part of the re-construction. Whilst this is perhaps the preferred solution in respect of providing enhanced building stability and allow for incorporation of 'standard' insulation

provision, the level of observed degradation in the main part of the building is not so great that a dry-lining solution would be precluded; although specific architectural advice should be sought in this respect.

4.4 Extensive external re-pointing of brickwork, to ensure the future weather-tightness of the building will be naturally required as part of the refurbishment.

4.5 For those cracks identified as being in excess of 2-3mm in width, we recommend that these should be stitched using proprietary resin injected repair ties (e.g. 'helibars'), prior to any decoration work. The observed cracking elsewhere within the building is in our opinion of lesser importance and is also essentially of an historical nature and would only be classified in the BRE Digest 251 (Assessment of damage in low-rise buildings) as category 1 or 2 (very slight to slight) and therefore aesthetic in nature. Consideration should therefore be given to cosmetic repair only, for such items (and lintel replacement with localised rebuilding as necessary in the worst cases). Timber wall inclusions and timber lintels (with the possible exception of the large 'feature' beams) over the door and window openings were noted. Independent of the need for replacement of the latter under perceived strength shortfalls or rot/insect attack, they should be removed as part of the refurbishment of the property where possible. If they were to be retained internally and simply plastered over, then introduction of heating into the new dwelling could lead to thermal volumetric change, which would in turn damage the new decorations.

4.6 The roof to the barn will have to be re-constructed (possibly re-utilising the existing roof timbers – see item 4.6 below) due to a lack of weather tightness and indeed extensive observed damage to the existing roof tiling and in the case of the central barn, the replacement of the corrugated sheeting. Structural capacity checks would need to be undertaken, if there were to be a significant increase in the weight of the roof. The new roof should incorporate sarking felt and insulation materials compatible with the latest building regulations recommendations. The internal division walls will need to be locally rebuilt at high level and robustly strapped to the external walls to inhibit possible future cracking at these interfaces. All walls, as a matter of course, should be securely tied to the roof rafters and new first floor members via 30 x 5 x 1200 (min) galvanised straps at approximately 1500mm centres. This in turn would render the external pattress plates as being effectively decorative in nature only (if retained).

4.7 It is our belief that a specialist timber consultant should be appointed to examine the current condition of the roof and floor timbers, wall plates and other timber inclusions in order to ascertain the need for repairs or remedial work as necessary. The roof timbers in particular have obviously been exposed to the elements over the years and are likely to have suffered to various extents (but will need to be replaced in several instances due to obvious visible damage). The effects of rot, fungal or insect infestation will naturally have a weakening effect on the structural members. It is also highly likely that window framing (as appropriate) will have to be replaced, although specific advice on this matter is outside the scope of this particular report.

4.8 All guttering, downpipes etc., should be replaced as part of the conversion works. It is understood that the refurbished property will be connected via new drainage to the nearby mains system or soakaways as appropriate.

4.9 We recommend that trees, hedges and shrubs around the building (including those within the neighbouring property) are maintained as part of any ongoing management scheme for the property. Whilst they do not appear to have been a major contributor to past movement in the building, some nevertheless lie within the influence zone of the foundations. If the hedging is allowed to mature within what could be a clay soil, it is entirely possible that its presence could become influential on the building in the future.

4.10 Notwithstanding the above comments it is our opinion that the current scheme as proposed is practical and achievable provided that the above structural remedial recommendations/repairs are incorporated within the scope of the works.

4.11 It should be appreciated that this report has been prepared on the basis of a single visual inspection of the premises and that we have not, to date, undertaken any monitoring, long-term investigation or testing of construction materials. Therefore, despite our suspicion that it is ostensibly of a historical nature, we cannot categorically state that no future movement within the building will arise.

Inspection undertaken by: [redacted]

EUR ING **J B E Kenny** BEng MSc CEng MICE MIStructE MCIOB

Date: 29th March 2019

APPENDIX 1 – Photographs

Plate 1 Northern elevation of the barn complex (western side).

Plate 2 Collapsed roof over Room 2.

Plate 3 Northern elevation of the barn complex (central section).

Plate 4 Uneven roof tiling around valley between the Stable and Room 3.

Plate 5 Cracking above the right hand window (Room 3).

Plate 6 Eastern elevation of the Main Barn (First floor level).

Plate 7 Eastern elevation of the building (forming Room 3).

Plate 8 South elevation of the building complex (eastern end).

Plate 9 South eastern corner of the Main Barn.

Plate 10 Feature arches on the south elevation of the Main Barn.

Plate 11 Plate 8 South elevation of the building complex (western end).

Plate 12 Damaged brickwork on the south western roof slope interface on the Main Barn.

Plate 13 Western elevation of the barn complex (comprising Rooms 1 & 2).

Plate 14 Cracking over west elevation window opening.

Plate 15 Compromised roof within Room 1.

Plate 16 Rotational cracking on the eastern wall within Room 1.

Plate 17 North eastern corner of Room 2.

Plate 18 Missing section of roof and perished plaster walls within Room 2.

Plate 19 Dampness within the timber floor members in the smaller ground floor Garage area.

Plate 20 Eastern wall within the ground floor Garage area.

Plate 21 North eastern corner of the Main Barn (dampness noted in principal timber adjacent to the pattress plate strap).

Plate 22 Main ground floor barn area (looking east).

Plate 23 Ship ladder access to the first floor storage area.

Plate 24 Roof construction over the first floor of the Main Barn.

Plate 25 Damaged floor timbers (seemingly associated with bird droppings).

Plate 26 North eastern corner of the Stable.

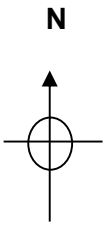
Plate 27 North western corner of the Stable.

Plate 28 North eastern corner of Room 3.

Plate 29 Cracking at high level in the south western corner of Room 3.

Plate 30 Principal Roof truss in Room 3. Daylight visible sporadically within roof tiling.

Appendix 2 Map Location



Ground Floor Plan (diagrammatic only)