



## STRUCTURAL APPRAISAL

### ON THE PROPERTY:

**'The Groves',  
Trentside,  
Amcotts,  
North Lincolnshire  
DN17 4AX**



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## 1.0 INTRODUCTION

1.1 This report has been prepared for Mr W. Smith, Bridge Farm, Butterwick Road, Messingham, Scunthorpe, North Lincolnshire DN17 3PA, following instructions received on Monday 6<sup>th</sup> April 2010.

1.2 A visual structural inspection report has been requested in connection with the current condition of the outbuildings which are situated at 'The Groves', Trentside, Amcotts, North Lincolnshire DN17 4AX. It is proposed that the outbuildings be converted and linked to create a new dwelling.

1.3 The property was visually inspected on Friday 9<sup>th</sup> April 2010. 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 that 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, pollution, asbestos, radon, methane or other gases, underground services or structures, springs, water courses, sink holes or the like, noises or vibratory nuisance/pollution.

## 2.0 GENERAL

- 2.1 The property at present comprises three small agricultural buildings, one of which is two-storey (the barn) and the remaining two are single storey. All of the buildings were, at the time of the survey, unused. Also on the southern elevation were two long single storey wings that were being used for animal accommodation at the time of the survey. They all form part of the outbuilding complex associated with 'the Groves' and it is proposed that the buildings be linked and converted to form a residential dwelling, by the present owners.
- 2.2 The three buildings comprised solid 9" brick walls with varying bond patterns. The building seemingly dates back some two hundred years (which is also the belief of the owner, although this would have to be confirmed). The roofing to the main barn was of traditional timber construction supporting clay tiling over. The roof structures to the remaining buildings (referred to as Building 2 and Building 3 in the context of this report) were of more *ad hoc* timber construction supporting corrugated metal sheeting over. Attached to both Buildings 2 and 3, there were further corrugated sheet structures (in poor condition); it is proposed that these will be demolished as part of the proposed redevelopment scheme and were not therefore inspected within the scope of this report.
- 2.3 The buildings have been in the present family ownership for many years and have been derelict for some time.
- 2.4 References to the orientation of the property in this report are generally as viewed from the access road to the property (taken as the southern elevation).
- 2.5 Reference photographs are included in the Appendix 1 of this report and a schematic layout of the buildings is also included.

### 3.0 **OBSERVATIONS**

#### 3.1 **Two storey Barn**

3.1.1 Inspection of the west elevation of the barn (Plate 1) revealed heavily weathered brickwork in the central section at first floor level with erosion of the mortar joints. Above the doorway in particular, the wall was heavily voided and in the soldier coursing there was a missing unit. At the right hand edge of the building (as viewed), there was particularly heavy weathering. A longstanding crack was noted in the heavily weathered sill and the timber door and framing was noted to be rotten. The right hand side doorway had been infilled at some time in the past and there was separation crack along both vertical junctions, with substantial mortar loss. To the left of the soldier coursing there was a 3-4mm wide separation crack. Above the left hand side of the first floor opening there was a 2-3mm diagonal crack that propagated upto the line of the roof slope. There was a similar crack (assessed as being 2mm in width) at the right hand corner.

3.1.2 On the north elevation of the Barn, there was substantial deformation in the line of the clay ridge tiles and further undulations were noted in the plane of the roof. The brickwork was again weathered and several individual brick units were very friable. The left hand gable wall (as viewed) had outwardly rotated at high level and at the eaves level there was a 10mm vertical crack that diminished to hairline at the mid height of the wall; the shape of this crack was symptomatic of the above rotational movement. A pattress plate had been installed at just above first floor height, presumably in an attempt to arrest the effects of eaves spread from the roof structure. There was no associated cracking or deformation in the immediate area of the pattress plate, suggesting that this installation had either had some success or that the observed movement related cracking in the walls had not been significantly progressive in nature. To the right of the pattress plate position there was a 1mm diagonal crack that stepped through the perpend and bed joints, but due to weathering the precise pattern of the crack was difficult to discern. There was a central vertical crack, assessed as being 1-2mm in width that propagated upto first floor height before diminishing to a hairline width. There was heavy algae growth in the eroded mortar joints at low level, but there were no further obvious signs of structurally significant cracking or distortion.

3.1.3 On the east elevation of Barn (Plate 2) there was a significant diagonal crack, symptomatic of past rotational movement above the left hand window (Plate 3

refers). The crack was assessed as being approximately 25mm in width at the window head and propagated to a width of some 50mm at the eaves level. Above the right hand corner of the same window there was a 15mm inwardly propagating crack that linked with the main crack and a second crack (upto 10mm in width) running in parallel. The crack had been re-pointed at some time in the past, seemingly without success although there was no obvious evidence of significant recent movement. The timber lintel over the window was distorted and had moved by some 25mm on the left hand bearing (as viewed), which correlated with the crack width at this location. Below the left hand window there was a further (and seemingly related) 5mm ostensibly vertical crack that opened to approximately 15mm in width at the window sill height. To the left of this position there was a further 2-3mm crack at low level. Both above and below the central window, there was a 2-3mm wide crack, but this did not seem to extend significantly down to the foundations. Both window frames were rotten. At the bottom left hand corner of the building, there was a 2-3mm wide longstanding crack and the surrounding brickwork was heavily weathered. At the apex, there was a missing brick unit. Trial Pit 1 (Plate 17) had been excavated adjacent to this elevation. The foundation had a corbel outstand of 15-20mm with a formation at 600mm below ground level. At the formation the soil still appeared to comprise top soil.

3.1.4 On the south elevation of the barn, there was a mound of built up ground against the side of the building. On the right hand side of the elevation, there was an area of very heavily weathered brickwork, with several individual units so badly eroded that they will require replacement as part of any refurbishment scheme. Below the pargett plate position, there was a further area of heavily eroded brickwork and some fissures in the mortar joints. The size and pattern of the cracking was a little difficult to establish due to the weathering that had taken place. Below this position there was again some algae growth at low level, but there were no further obvious signs of structurally significant cracking. Substantial deflection in the ridge line of the clay pan tile roof was again noted.

3.1.5 Inside the barn, there was no access to the first floor (and the floors timbers themselves showed signs of rot), but a limited 'head and shoulders' inspection of the first floor area revealed a traditional timber roof construction, which although distorted was seemingly in reasonable condition bearing in mind the relative exposure to the elements. It should also be noted that with sarking felt in place (visible in Plate 5), re-roofing must have taken place in the more recent past. From Plate 4, it can be seen that the large crack noted on the outside of the building was

mimicked internally and daylight was clearly visible through the fissure. The window and door framing timbers (Plate 5) had succumbed to the effects of rot/insect infestation over the years. At ground floor level, the walls had been painted at some time in the past, but had mostly flaked away. On the west wall there was a 5mm separation crack at the left hand side of the infilled door opening brickwork. On the right hand side as viewed there was a 10-15mm wide separation crack; both of these had seemingly longstanding origins. To the right hand side of the hook position, there were a series of outwardly propagating cracks (upto 5mm in width in the worst cases). The timber lintel over the door was distorted. On the south wall there was heavy erosion in the brickwork and the mortar joints, particularly at low level, which could be attributed to the soil and rubble banked against this wall externally. At the junction with the east wall there was slight separation cracking, but no further obvious signs of structurally significant distress. On the east wall (Plate 6) the crack patterns again replicated the external observations and there was further minor cracking in the flaking paint finishes with further signs of erosion at low level. Occasional timber inclusions within the wall were noted. On the north wall there was further erosion at low level and some missing brick units. Towards the right hand side of this wall, there was a 3-4mm wide inwardly propagating diagonal crack with a second minor crack above. Both of these had apparently longstanding origins.

## 3.2 Building 2

3.2.1 On the eastern wall of Building 2 (Plate 7), there was an inwardly propagating 5mm wide diagonal crack at the top right hand corner of the door opening and a similar but handed 3mm crack above the left hand side. With a 3mm horizontal bed joint crack at this location also, it would appear that the damage was associated with lintel deficiency. At the apex (on the forward gable section) there was a 2-3mm wide ostensibly horizontal crack. Towards the right hand corner (as viewed) there was a 2-3mm wide diagonal crack just below the roof slope that quickly diminished to hairline in width and at low level, there was an inwardly propagating 1mm wide crack. The remainder of the brickwork was weathered with some friable individual brick units that will require replacement. On the backward gable there was a 5mm wide crack below the left hand slope and a second 2-3mm wide crack towards the left hand edge of the building. Below the right hand slope, the friable brickwork was heavily eroded and there was a 5mm crack towards the right hand



- 3.2.5 In the store on the east side of the building the concrete floor again contained longstanding cracks, but there were no obvious signs of significant undulation. The presence of an animal pen restricted inspection (Plate 10), particularly on the east wall, but on the division wall there was a 3mm diagonal crack above the small opening and a 2mm wide crack propagating from the side. On this same wall, there was a central 1mm wide mainly vertical crack from mid height upto apex level and at the right hand eaves, there were fissures in the friable brick wall. The mortar loss, however, made it difficult to establish any discernable crack pattern. There was cracking above the door (reflecting the external observations), but no further obvious signs of structurally significant cracking or distortion in the remaining walls (where visible).
- 3.2.6 Inspection of the west elevation of the building (from within the corrugated sheet shed to the west of the building) revealed heavily eroded and friable brickwork once again particularly at the position of the previous flue. Over the door position, the brickwork was in a state of semi-collapse and a 20mm crack was noted above the left hand side of the door (as viewed). Towards the left hand side of the elevation the visible brickwork on the inner leaf did not appear to be mortar bonded and the brickwork over was again in a state of semi-collapse.
- 3.2.7 The Kitchen area was derelict (and appeared to have been so, for some time). The quarry tiled floor was very uneven and the timber roof supporting the corrugated sheeting was exhibiting signs of rot. Daylight was visible along the roof line. On the eastern wall the panel of masonry above the door was as viewed from outside. A 75mm wide separation crack had developed at the junction with the south wall and the whole panel was in a seemingly precarious state (predominantly relating to lintel failure but possibly also attributable to some historical outward rotational movement in the side walls –refer to Plate 11). On the south wall the render was generally damp and had boxed in several areas. At  $\frac{3}{4}$  height, there was a 2-3mm wide horizontal crack close to the junction with the east wall (and close to the area of partial collapse above). To the right of the door position, in the main part of the wall, there were a series of mainly vertical cracks in the rendered finishes; these were assessed as being upto 2mm in width and all had longstanding origins. At the junction with the north wall, there was a 10-12mm wide separation crack. On the south wall the render had again boxed and was damp affected. There was a 2mm ostensibly vertical crack at a central position the diminished at approximately the mid height of the wall to a hairline width. Adjacent to the junction with the west wall, there was a 2-3mm wide horizontal crack at high level with a 1mm wide

diagonal crack below. On the western wall (Plate 12), the render was heavily boxed, particularly over the fireplace. To the left of the fireplace there was an area of missing render but no further obvious signs of structurally significant cracking. At the junction with the north wall there was a 2-3mm wide separation crack. On the north wall itself the render was damp and boxed once more and was missing in a section below the window position. There was a 1mm vertical crack below the window sill, but this did not significantly propagate down towards ground level. There was a further area of damaged render above the top right hand corner of the window and a hole had developed to the right of this position.

### 3.3 Building 3

3.3.1 Inspection of the west elevation of Building 3 (Plate 13) revealed some past re-pointing below the bottom left hand corner of the window. There was some undulation in the clay pantile roof ridge line and one of the central ridge tiles was broken. The brickwork was generally fire-cracked and slightly weathered. Some erosion in the joints had taken place (even in those joints that had been re-pointed), but there were no obvious signs of structurally significant cracking in the brickwork on this elevation. The attached shed on the north side of the building (constructed in corrugated sheeting and timber), is to be demolished as part of the proposed renovation works and has not been inspected under the scope of this report. Trial Pit 4 (Plate 18) had been excavated adjacent to this elevation. The foundation had a corbel outstand of 60mm with a formation at 400mm below ground level. At the formation the soil still appeared to comprise moderately stiff clay.

3.3.2 On the south gable elevation of the building (Plate 14) there were a pair of forked 3mm cracks propagating from the right hand top corner of the window opening. Below both the left and right hand bottom corners of the same window position, there were inwardly propagating diagonal cracks; these were both assessed as being approximately 2mm in width. The brickwork had been re-pointed at low level and some general erosion was again evident. There were, however, no further obvious signs of structurally significant cracking or distortion.

3.3.3 Inspection of the eastern elevation of Building 3 revealed slight undulation in the plane of the clay pantile roof. There was a central 2mm wide ostensibly vertical crack and some minor crazed cracking in the weathered mortar (again a distinct

pattern was difficult to discern). At low level there was missing mortar around some of the individual brick units and moss/algae growth was prevalent

- 3.3.4 Internally there was separation cracking at the edges of the concrete floor (Plate 16) and the walls were damp at low level with heavy mortar loss from joints in places. On the south wall there was a 10mm wide inwardly propagating crack above the left hand corner of the timber lintel over the window and a similar 2mm wide crack above the right hand corner. On the northern wall there was a missing brick unit at low level to the left hand side of the door as viewed. In the remaining walls there was staining related to ingress of damp over the years, but no further obvious signs of structurally significant cracking or distortion. The ceiling was underdrawn in fibrous type boarding which could possibly have an asbestos content.

#### 4.0 CONCLUSIONS AND RECOMMENDATIONS

- 4.1 The buildings inspected were generally in a moderate to poor condition from a structural viewpoint. Bearing in mind the present 'agricultural type' usage, the Barn and Building 3 were obviously in very poor decorative order, both externally and internally. Building 2 was in a state of dereliction having not been used for dwelling accommodation purposes for some time. From anecdotal and visual evidence, the buildings have 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 barn building, which is particularly evidenced by the crack patterns on the east elevation of the barn and the presence of pattress plates tying the building in a north south direction. Whilst the movement appears ostensibly to be of historical origin corroborating the owner's anecdotal evidence, the level of observed movement on the east wall was significant (being greater than 25mm in width, it would be classified in the BRE Digest 251 (Assessment of damage in low-rise buildings) as category 5 (very severe damage)). It is our opinion that an underpinning scheme is adopted for the support of the barn walls. The extent of this work will depend upon the soil conditions encountered and the architectural detail for the proposed refurbishment (which is unknown at this time). For the remainder of the buildings (and subject to the recommendations below), whilst the foundations are seemingly founded within the clays underlying the top soil, the depth is relatively shallow and would therefore should also be underpinned (to the appropriate depth and width). If these buildings are to form part of any two storey accommodation scheme in the future then we would recommend that the new structure should 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 new 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 from the original walls. The original walls would then be tied to the new masonry leaf as part of the re-construction. It is also understood that there may be a potential

flooding issue. With this type of foundation arrangement, appropriate levels can be relatively easily incorporated.

- 4.3 With the exception of the larger cracks on the east elevation of the two-storey barn, where localised rebuilding will be required, for all 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 and minor localised re-building will be required for the damaged arch. The separation cracking at masonry walls interfaces should be tied using 30 x 5 x 1200 (min) galvanised straps. The observed cracking elsewhere within the buildings are 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 only be given to cosmetic repair only, for such items (and lintel replacement with localised rebuilding as necessary in the worst cases). Wall inclusions and indeed the internal lintels were noted to be of timber construction. 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 likely damage the new decorations.
- 4.4 Widespread re-pointing will be required externally to ensure weather-tightness and some replacement of more severely weathered areas of brickwork is envisaged. An appropriate injected damp proof course will also need to be introduced. In Building 2, there will be a requirement for more significant reconstruction, where the west wall has partially collapsed (if this building is to remain derelict for any further significant length of time, we would strongly recommend that the brickwork over the door is taken down, to prevent the risk of injury to any persons entering). In Building 3, specific advice should be sought regarding the potential asbestos content of the existing ceiling boarding. The banked soil against the buildings should also be removed as a matter of course.
- 4.5 The roof to all three will have to be re-built (hopefully reutilising the existing roof tiles for the Barn) both due to a lack of weather tightness and in the case of Building 2, the fact that the present roof covering comprises merely corrugated sheeting. The new roof should incorporate sarking felt and insulation materials

compatible with the latest building regulations recommendations. The walls should be securely tied to the ceilings and first floor members via 30 x 5 x 1200 (min) galvanised straps at approximately 1500mm centres.

- 4.6 It is our belief that a specialist timber consultant should be appointed to examine the condition of any roof and floor timbers, wall plates and other timber inclusions, if they are to be retained, in order to ascertain the need for repairs or remedial work as necessary. The effects of rot, fungal or insect infestation will naturally have a weakening effect on the structural members. It is also necessary to replace existing door and window framing which have succumbed to the effects of rot and damage from the elements over the years, although specific advice on this matter is outside the scope of this particular report.
- 4.7 It is understood that the building drainage is dissipated directly to the surrounding ground. Any new drainage scheme should incorporate connection to the local surface water system or appropriately designed soakaways.
- 4.8 We recommend that the tree to the south of Building 2 (albeit fairly remote on the boundary of the property) be maintained as part of any ongoing management scheme for the property. Whilst it does not appear to have been a major contributor to past movement in the building; it nevertheless lies within the influence zone of the foundations. If the tree is allowed to mature within what could be a shrinkable clay soil, it is possible that its presence could become influential on the building in the future.
- 4.9 Notwithstanding the above comments it is our opinion that the suggested scheme incorporating a single storey link structure between the buildings is practical and achievable provided that the above structural remedial repairs are incorporated within the scope of the works. It should further be noted that any new interconnecting structures, will likely significantly enhance the existing walls in terms of restraining effects.
- 4.10 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.

Report undertaken by: \_\_\_\_\_

  
J B Kenny

APPENDIX 1 – Photographs



Plate 1 West elevation of the tow storey Barn.



Plate 2 East elevation of the tow storey Barn.



Plate 3 Substantial cracking on the east wall (external view).



Plate 4 Substantial cracking on the east wall (internal view).



Plate 5 Roof structure over the western gable wall of the barn.



Plate 6 Cracking at ground floor level on the east gable of the barn.



Plate 7 Eastern elevation of Building 2.



Plate 8 Southern elevation of Building 2.



Plate 9 Northern elevation of Building 2.



Plate 10 Western elevation of Building 2 (from within storage area).



Plate 11 Partially collapsed brickwork panel over the door to the derelict living accommodation (Building 2).



Plate 12 Roof construction over the east wall of the derelict living accommodation (Building 2).



Plate 13 Western elevation of Building 3.



Plate 14 Southern elevation of Building 3.



Plate 15 Roof panelling over doorway to Building 3.



Plate 16 Low level dampness within Building 3



Plate 17 Trial Pit 1.



Plate 18 Trial Pit 4.

APPENDIX 2 - Schematic Site Layout

