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STRUCTURAL ENGINEERS REPORT

ON

BARN TWO

OLD HALL LANE

ROXBY

NORTH LINCOLNSHIRE

March 2018

Job No. 19-8274

STRUCTURAL ENGINEERS REPORT ON BARN TWO, OLD HALL LANE, ROXBY, NORTH LINCOLNSHIRE

1.0 INTRODUCTION

1.1 On the instructions of Ettridge Architecture Ltd, on behalf of The Trustees of the Elwes Children's 1989 Settlement, we visited the above site on 18th March 2019.

1.2 We were instructed to carry out structural inspection of the Barn in order to prepare a report confirming the current condition of the building. It is understood that a Planning Application is to be made for conversion of the Barn to domestic use, but at this stage we have not had sight of the formal proposals.

1.3 This report has therefore been prepared for inclusion within the Planning Application based solely upon the visual evidence available at the time of our visit.

1.4 Barn Two is a single storey detached building constructed in load-bearing stone walls, with brick reveals and arches over the main openings. Brick Quoin returns were noted to both gables, in a comparable manner to those of the door and window reveals. The walls support a centrally ridged pantile covered roof structure. Internal walls are constructed in brickwork.

1.5 The barn occupies a relatively level plot with the main farm access along the eastern end, and a manicured lawn to the north. This includes a tree in excess of 5 m in height which is growing directly against the front wall. Along the southern and western elevations the land is generally overgrown, and in some cases this has meant that close inspection of the structure impractical. Otherwise the general vegetation is some distance from the barn, including trees within the footprint of the adjoining farm building.

`1.6 This report is confined to the structural aspects as detailed above. This report does not constitute a full building survey and excludes certain items such as those listed below:

- The decorative condition of the property
- The condition of the property with respect to dampness, dry rot, timber infestation and the like
- The condition of services
- The condition of roof, floor, wall and ceiling coverings
- The location of the property, its value and other aspects such as searches and boundaries, etc.

1.7 At this stage we have not undertaken any testing of materials, monitoring, breaking out or long-term investigation. No inspection has been made of timber or other parts which were covered, unexposed or inaccessible, and no comment can be made on the condition or quality of such materials.

2.0 EXTERNAL OBSERVATIONS

2.1 NORTHERN ELEVATION

The roofline clearly exhibits areas of localised failure with ill fitting and missing pantiles. There is rippling of the remaining ridgeline presumably relating to the internal wall positions. Generally, however, the deformation within the roof structure is probably only in the region of 75 mm.

At the brick return with the Western elevation the wall is reasonably true, but there is some shattering of the faces of the stone and minor separation from the brick quoin. The detail around the adjoining opening does not exhibit major deformation although there is a slight lean towards the gable. This has not been reflected by major cracking damage through the brick soldier course directly above the opening.

The stonework to the main wall is reasonably vertical with no signs of major bowing or lateral deformation relative to the eaves. There is weathering to several areas of the mortar, with spalling and cracking to individual stones. Generally this relates to areas of inadequacy within the rainwater goods where continued seepage has occurred on to the wall.

The brick soldier details above the central windows and main door do not exhibit significant structural movement although there is slight displacement towards the centre. Through the stone coursing directly above the window the damage primarily relates to the weathering referred to previously with little to suggest major structural movement.

At low-level the damage to the individual stones again relates to weathering and the likely wetting/freezing cycle, although this is reasonably limited. It has resulted in shattering of several stones at the eastern gable, with spalling of the jointing with the feature brick quoin. This brickwork has rotated slightly towards higher level with displacement along the stone joint. This probably exceeds 20 mm, although it has been made significantly more onerous by spalling and erosion to the mortar. Within the stone work in the immediate vicinity there is further open jointing, and indications of possible cracking damage, although this remains relatively limited.

2.2 WESTERN GABLE ELEVATION

Other than the brick quoin returns the elevation consists of stone with the wall not exhibiting major rotation relative to foundation level. There is minor deviation through the upper apex, but some of this is probably attributable to weathering. At the return with the Northern elevation there is erosion of the mortar packing, and some minor cracking around a steel fixing built within the wall. This probably writes to deterioration within the building steel, and is not reflected by major rotational movement through the main body of the elevation.

Similar erosion and damage to the stone has occurred near to the Southern return where we would note the rainwater downpipe discharges directly onto ground level. Isolated bricks have crumbled away and there is open jointing along the brick quoin. At low-level within the stone there is further erosion of the mortar joints and some areas of shattering at the eaves. Further shattering of individual stones were noted throughout the southern section directly below the roof, including some pockets through the external stone skin. We would also highlight the poor condition of the brickwork to the chimney stack which appears to be unstable.

2.3 SOUTHERN ELEVATION

As indicated in the introduction there is significant overgrown vegetation against the main wall making access for inspection impractical. Where the wall could be viewed from the western return there is minor undulation across the eaves, but no major bowing of the wall itself. The return brickwork is reasonably true as is the feature around the westerly opening. The damage through this section primarily relates to weathering, with erosion to mortar joints and spalling to individual stones.

The main roof structure reflects the undulation noted previously within the ridgeline and there is a significant area to the centre of the roof which has completely failed. Displaced and dislodged pantiles are visible in the general vicinity and there is damage at the eaves because of vegetative growth within the masonry. This has resulted in displacement to a

number of bricks above the more easterly openings, as well as damage across the mortar.

The central section of Stone wall exhibits a small degree of rotation outwards from foundation level, but this is not been reflected by major cracking damage. There is spalling and shattering to individual stones, particularly where the rainwater goods have failed, with slight damage to the brick arch over the near central opening. Hairline cracking runs through the mortar around the opening although the brick quoin reveals do not exhibit significant out of plane movement.

Where the vegetation is growing within the brickwork above the eastern doorway there has been displacement to the stones, and this will require localised rebuilding above the brick feature. This brickwork remains reasonably true as does the reveals to the adjoining window. The stone pier between the openings has been the subject of major shattering to the external finish because of failure of the rainwater goods. This continues through to the lower level, although the general stonework leading to the eastern gable remains relatively true. Erosion and spalling of the mortar joint has occurred at the junction between the stone and the brick quoin return with weathering to a number of the facing bricks. The damage has not been reflected by a significant cracking with the return with the elevation remaining relatively true.

2.4 EASTERN GABLE ELEVATION

The southern return remains reasonably true and within the main stone section there is little evidence of bowing or lateral deformation. The apex is reasonably true and other than isolated shattering and spalling to the stones below the roof line there is a little through this section.

More severe shattering stonework and spalling, however, has occurred directly below the roof at the southern return where a section of the roof has failed. Vegetation is growing within the mortar and has led to dislodging to some joints and there is shattering as a result of the wetting/freezing cycle. This remains a relatively localised issue, however.

3.0 INTERNAL OBSERVATIONS

3.1 WESTERN ROOM

Within the brickwork internal wall line there is slight debonding relative to stonework and minor cracking extending to low level. This suggests minor movement of the stone walls outwards, although the weathering discolouration suggest this is probably long-standing. Within the brick reveals to the main opening there is little of significance and only minor separation of the stone at the return with the gable.

There is a stack against the gable which would appear to be predominantly independent of the main structure. It has separated by around 15 mm at low-level with some displacement and dislodging of the stack itself.

Partial collapse of the roof has occurred and there is weathering to the gable in the immediate vicinity. The majority of this appears to be directly related to weather ingress through the section of failed roof. Generally, however, there is little signs of distress within the masonry.

3.2 CENTRAL WESTERN ROOM

The roof has completely collapsed across the southern pitch, but originally was constructed with rafters spanning onto purlins. These in turn were built within the brick internal walls which appear to be at least 215 mm thick.

Against the northern elevation there is some cracking to reflect that noted previously. It is consistent with slight movement of the stone wall but does not continue to any major degree. Weathering discolouration visible within the brickwork suggests the movement is probably long-standing and there is little evidence of continued separation against the northern wall. Similarly through the near central wall opening the degree of deformation remains limited and the principal damage through the internal structure relates to weathering and the failure of the roof.

3.3 CENTRAL EASTERN ROOM

The roof is again constructing with rafters spanning onto mid height purlins, with the purlins having deflected towards the centre consistent with the limited movement noted externally.

Relative to the stored materials there is minor cracking and weathering around the return with the main external elevations, although this has not been reflected by significant separation against the more central wall. There is evidence of movement through the Western internal wall adjacent to the door opening, where the timber lintel has deteriorated significantly. Separation between the frame and the brickwork then continues as cracking damage through the brickwork diagonally towards the eaves before running parallel to the roof finish. This cracking has a width in excess of 5 mm but has been the subject of notable weathering and discolouration.

The lower brick coursing to the internal wall does not exhibit significant rotational movement and the degree of deformation around the return with the southern elevation is limited.

3.4 EASTERN ROOM

The roof is constructed with rafters and purlins with a central King post truss built within the stone walls. Localised failure was noted within the roof finish with deterioration of the exposed rafters. Where the vegetation growth was noted externally above the openings this has resulted in areas of loose stone and some spalling of the joints.

The major damage to the southern elevation is associated with continued weather penetration, with erosion to the joints and algae growth. Where the main body of the construction could be viewed, however, there is little of major significance although we would highlight the cracking damage above the door through the internal wall. This extends through the painted brickwork up to the eaves level timber plate, before continuing diagonally above. Again the cracking damage is relatively limited, with noticeable weathering on the edges of the 5 mm cracking.

Where the internal wall meets the northern elevation there is minor separation cracking of the brickwork, but generally where the stone has been covered in the paint finish, or the stable troughs are still present, there is little evidence of significant structural movement.

Around the area failure of the roof against the Eastern elevation this deterioration evident within the timber plate associated with eaves level with continued erosion and weathering as a consequence of the ongoing weather penetration.

4.0 COMMENTS, RECOMMENDATIONS AND CONCLUSIONS

4.1 It is evident from our inspection that the barn has not been the subject of significant maintenance or repair for a considerable period of time. As a consequence there has been failure of the roof structure with displaced and dislodged Pantiles as well as whole sections of collapse. The weather penetration has caused damage through the internal finishes although the majority of this relates to spalling and erosion to both stones and mortar joints.

4.2 Externally failure of the rainwater goods has allowed continued water discharge to the external face of the stones with consequential shattering under the ongoing wetting/freezing cycle. This has led to significant damage of some areas of the stonework, although it is relatively limited by comparison to the external perimeter as a whole.

4.3 Where access to the external walls was possible we did not identify major rotational movement or indications of bowing. There is slight movement around the eaves, but this has not been reflected by significant structural cracking. Relative to ground level the movement is not significant by comparison to the width of the wall.

4.4 Through the internal walls we highlighted minor separation from the stone elevations as well as slight cracking. Some of this is due to deterioration within the timber members built within the walls and continued weather ingress. The scale of the damage is not indicative of significant movement with the weathering suggesting that it is long-standing. Based upon this evidence we do not consider that major stabilisation will be required.

4.5 In maintaining the stability of the structure, it is important that the internal walls are more adequately tied through to the stonework, or that alternative and suitable buttressing is introduced within the conversion scheme. The stone around any new openings can be stabilised using a proprietary grouted system in conjunction with appropriate wall ties. It would also be prudent to tie the internal walls through to the external stonework using a masonry enforcement scheme cut into the joints and injected to ensure the integrity of the bond. Provided these works are primarily precautionary as there is result little evidence of significant movement within the main fabric.

4.6 The issue main issue therefore relates to the roof structure. Failure has allowed significant weather ingress with ongoing damage to the timbers. As part of any conversion works it is likely that replacement rafters and purlins will be required over a significant portion of the roof, along with suitable treatment of the retained timbers.

4.7 Throughout our observations we have made a number of comments regarding deterioration within the timber work, particularly where this relates to members built within the walls. Algae growth and staining was also noted both at higher-level and possibly associated with dampness. These comments are no way constitute a report with regard to such matters, however.

4.8 We therefore recommend that specialist advice is obtained. The specialist should confirm the condition of the building with regard to dampness, timber deterioration and infestation, Appropriate treatment can then be incorporated within the conversion works to ensure that the long-term stability of the building is not further compromised.

4.9 It should be appreciated that all our comments are based upon a single visual inspection of the existing structure without the benefit of any long-term assessments, investigations or testing of the materials used in construction. We are therefore unable to categorically state that all movement observed within the building fabric has ceased. It is our opinion based upon the visual evidence, however, that the main elevations remain in a structurally stable condition with the limited cracking damage a consequence of long term movement. We are therefore reasonably satisfied that the barn can be incorporated within a sympathetic conversion into a habitable space without the requirement for extensive reconstruction works.

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For and on behalf of Dudley Consulting (Hull) Ltd