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## STRUCTURAL ENGINEERS REPORT

ON

BARN TWO

GRANGE FARM

EAST NEWTON

EAST YORKSHIRE

HU11 4SD

September 2020

Job No. 20-8723

## **STRUCTURAL REPORT ON BARN TWO, GRANGE FARM, EAST NEWTON, EAST YORKSHIRE, HU11 4SD**

### 1.0 INTRODUCTION

1.1 On the instructions of Newton Farming Limited we visited the above site on 2<sup>nd</sup> September 2020.

1.2 We were commissioned to comment upon the overall structural condition of the principal elements to the building fabric as part of proposed Planning Application for conversion to alternative use.

1.3 At this stage we have not had sight of any details relating to the original construction, nor the proposed conversion. 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 detached 5 bay steel frame structure formed with external columns supporting a duo pitched roof, with lattice style roof beams supported on the external columns and an internal column of comparable height to the exposed columns on the southern elevation. The roof is clad with a profiled "Big Six" style sheeting to the northern pitch, and a replacement cladding to the other pitch. There is comparable profiled sheeting along the North and East elevations, and partially along the West elevation. Sections of this cladding are loose or displaced but in the case of the Western elevation have largely been removed.

1.5 Along the northern end of the structure, and continuing along both return elevations, there are reinforced concrete panel system used to retain the stored materials within the Barn.

1.6 At the time of our visit the Barn was in use as a grain store and we are therefore only able to carry out inspections of those accessible elements.

1.7 Barn Two occupies a gently sloping site falling down towards the southern elevation, reflecting the ground profile within the immediate vicinity. There is limited vegetation in

proximity to the Barn, including 'wild sown' vegetation against the main elevations, but little of significance in proximity to the main load-bearing elements.

1.8 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.

1.9 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 EASTERN ELEVATION

There is a blockwork infill between the columns from the reinforced concrete panel through to the southern end. This exhibit a significant number of displaced blocks and damage presumably associated with impact. There is cracking damage to the sheeting, but where the Gable columns are visible, we did not identify significant rotational or racking of the frame.

The concrete panels appear reasonably vertical and there is only nominal cracking along what appears to be vertical joints from the likely shutter system. This does not extend to any major degree nor does it reflect significant deformation of the mainframe.

### 2.2 NORTHERN ELEVATION

The main sheeted roof does not exhibit significant undulation or out a plane movement, nor is there major ill-fitting within the sheets. Some damage is probably a result of weathering and lack of maintenance but is little to suggest recent inadequacies.

The exposed columns at the two corners remain vertical and true, with little signs of deformation through the concrete panelling at the lower level. There are bolts consistent with the frame positions, and associated cracking running vertically through the concrete, but this does not appear to indicate significant structural movement within the main frame. Where the panels adjacent to the columns were accessible there was little to suggest rotational movement.

Damage was noted to the cladding element of the elevation, but this is not considered to be of major significance.

### 2.3 SOUTHERN ELEVATION

There is little signs of significant undulation or damage to the replacement sheeting to the roof pitch, which appears relatively true with only minor deviation around the eaves

and between truss positions. The remainder of the elevation is fully open with the columns extending down onto limited concrete plinths at ground level. There is no major rotational movement or racking of the mainframe.

The majority of the columns remain vertical and true about both axes, with the exception of the north-west corner column. This has buckled slightly about the weaker axis probably by around 15 – 20 mm, at approximately 2 m above floor level, and is probably a consequence of impact on the side of the column. The limited bracing at eaves level and upper section of the columns appear reasonably true.

The principal damage consistent throughout the frames is associated with surface rusting to all exposed faces. Where an inspection could be made this has generally not resulted in significant delamination or loss a section. There is some localised damage at the base of the columns. This can be rectified by strengthening or increasing the height of the concrete encasement.

#### 2.4 WESTERN ELEVATION

As indicated in the introduction most of the cladding has been removed leaving an exposed and open structure. The concrete panels at the northern end do not exhibit major movement nor does the edge post that restrains the panels.

There is, however, lateral defamation of the main internal post which has moved by more than 25 mm relative to foundation level. This again has buckled outwards, probably because of impact damage similar to that referred to previously. There is also impact damage along the bottom rail to the northern section, but otherwise the principal damage is again surface rusting. Other than pitting and some lamination at the base of the columns this remains limited.

### 3.00 INTERNAL OBSERVATIONS

The sheeted roof both to the profiled section and replacement cladding is supported on a series of limited section steel purlins spanning between the main lattice trusses at approximately 4.5 m centres. Generally within the purlins there is little evidence of major deformation, although there is continued surface rusting similar to that noted elsewhere.

The deformation of the Western Gable has been referred to previously and there has also been impact damage to one of the internal posts. The extent of this is approximately 15 mm in a 600 mm spirit level about the weaker axis. There is further movement into the plane of building, but this is significantly less pronounced. Other than the general rusting of the steelwork we did not identify major structural damage to the internal column.

The columns to the northern elevation, where accessible, are partially encased within the concrete and we could only access the internal face at the lower level. The general steel sections appear true but there is further delamination to the steelwork over the lower 250 mm or so. This is a direct consequence of dampness. We also noted deterioration to an isolated steel at lower level, although the reason for this steel member cannot be confirmed.

Along the eastern elevation the deformation of the blockwork reflects that noted externally, but generally the frame appears otherwise relatively true.

The floor is undulating consistence with previous usage and stored materials. There are concrete surrounds to the base of the internal columns, some of which have been damaged presumably during continued use of the space. Otherwise there is little evidence within the visible slab construction that suggests major differential settlement.

#### 4.00 COMMENTS, RECOMMENDATIONS AND CONCLUSIONS

- 4.1 It is evident from our inspection of the structural frame that it has not been the subject of significant maintenance or repair for a considerable period. As a consequence, there has been surface rusting to all exposed steel faces although the majority of this appears relatively superficial. The main damage has occurred at the base of the columns where these are exposed and not protected by the concrete plinths. Here delamination and loss of section was noted over the lower 250-300 mm within isolated columns. This will require treatment and further protection in the form of strengthening using additional sections or encasing in concrete following removal of the delaminated and loose materials.
- 4.2 It is equally evident that the building has not been the subject of major lateral deformation or out of plane movement. Most of the columns remain vertical and true about both axes. Individual columns have clearly been subject to impact damage, most notably at the Western Gable and one of the internal columns, and this has deformed the main steel posts. Depending upon the proposed refurbishment it may be necessary to replace the more adversely distorted columns or strengthen with alternative structure.
- 4.3 The exposed steelwork will have to be cleaned of all loose rust and delaminated steelwork. The exposed faces will then require to be painted with an appropriate surface treatment. Some of the smaller sections, such as the purlins, may require replacement of additional members introduced. As with any strengthening of the main frames the full extent of these works will only become apparent during the formal structural design as part of the Building Regulation element of the works.
- 4.4 Within the sheeting there is staining and algae growth, and we have highlighted general weathering of the external structure at lower level. This was all relatively limited at the time of our inspection and can be treated during the refurbishment scheme.
- 4.5 Along the eastern elevation we noted the deformation of the infill panels between the columns. This is probably a consequence of impact as the main frame to the Gable appears reasonably true. We note that the grain is stored against these walls and it is likely that the damage is a direct consequence of the use of the machinery to remove the grain at the appropriate times.

- 4.6 It should be appreciated that all our comments are based upon a single visual inspection of the structure without the benefit of a final long-term assessment, investigations or testing of materials used in the construction. We are therefore unable to categorically state that the limited or localised deformation and movement noted within the principal structural fabric has all ceased. It is our opinion based upon the visual evidence, however, that the main structure remains in an acceptably stable condition.
- 4.7 We have made a number of comments with regard to localised repairs and possible strengthening required as part of any refurbishment scheme. These are limited to individual sections and we are reasonably satisfied that the refurbishment will not require extensive reconstruction to arrest ongoing structural problems.

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For and on behalf of Dudley Consulting (Hull) Ltd