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STRUCTURAL ENGINEERS REPORT

ON

BARN ONE

GRANGE FARM

EAST NEWTON

EAST YORKSHIRE

HU11 4SD

September 2020

Job No. 20-8723

STRUCTURAL REPORT ON BARN ONE, 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 2nd 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 One is a two span duo-pitched precast concrete structure, with a lean to element along the northern elevation. It is clad in profile 'Big Six' type roof sheeting with comparable cladding to the upper elements of all external elevations. Infill to the perimeter between the main frames is formed in blockwork with limiting buttressing to side elevations. No additional gable posts are provided to the southern end of the Barn, although there has been additional steelwork introduced around the main openings through the central pitched roof section.

1.5 Along the northern end there is a raised storage area support on joists spanning from the internal block walls through to the northern elevation. There is a further partially steel plated ground floor raised above the general area of the building. This forms a lower 'well' area possibly associated with previous usage of the building. Not all parts of this storage area were accessible at the time of our visit.

1.6 The Barn occupies a gently sloping plot falling towards the southern boundary consistent with the general ground profile within the site. There is various vegetation along the southern elevation but generally the building is surrounded with hard standing or the main

lawned paddock along the western side. The main vegetation is growing approximately 5 m from the southern face of the building.

1.7 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.

1.8 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 SOUTHERN ELEVATION

The sheeted roof does not exhibit major undulation or distortion, although there is a limited degree of damage probably associated with impact from the foliage. The upper timber boarding across the elevation is partially removed and within the infill blockwork there are a number of areas of loose or damaged blocks. Generally this appears to be consistent with previous usage rather than an ongoing problem.

The main concrete frame columns do not exhibit significant out of vertical or plane movement and there is no significant racking of the elevation when viewed from the end columns.

2.2 WESTERN ELEVATION

The blockwork infill along the southern end is severely damaged with bowing and leaning into the plane of the building consistent with likely vehicle impact. Through the sheeting of the upper gable of the lower monopitch there is little of significance although the timber boarded infill has distorted in line with the blockwork.

The central columns to the frame remain relatively vertical to both sides of the main opening. Slight damage has occurred to the concrete edges, but this is not indicative of a major loss of section. There have been alterations to the structure, with the introduction of elements fixed to concrete, but there is little immediate vicinity to suggest this has caused issues with the main fabric.

At the northern end of the gable the blockwork is more true with only nominal cracking damage. Slight misplacement has occurred to the profiled sheeting, although this is consistent with this material. The sheeting above the main opening to the centre of the building is again damaged in places and there is apparent deviation through the clad steel angle rail at the bottom of the sheeting. We would note the presence of ad hoc bracing back to the portal frames when viewed internally. Otherwise the damage is more maintenance related

2.3 NORTHERN ELEVATION

The main sheeted roof exhibits slight deviation at the junction with the main portal frame but within the panel of the sheeting there is little evidence of major deformation. Slight deviation is noted between panels but there are no major areas of displaced panels or damage fixings. Localised sections of sheeting have broken away, but this is limited in relation to the main body of the structure.

The base of the precast concrete columns to the main frame are visible between the block panels and using a 600 mm spirit level we did not identify significant racking or out of vertical movement to any columns. At the eastern end there are various other elements of structure fixed to the columns, primary relating to gate an alteration to the store area. Other than surface deterioration of the steelwork, and associated cracking damage in the blockwork, there is little of recent significant through this elevation.

2.4 EASTERN ELEVATION

At the southern end there is a lean-to store structure independent of the mainframe and apparently butt jointed to the original walls. Through this original blockwork there is isolated displacement consistent with likely vehicle impact and damage to the timber cladding between the blockwork and the main sheeting. The remaining element of a flashing suggest alterations to an original door. A steel post coincides with the edge of that door, with surface deterioration and rusting, but no major deviation playing.

At the main column, however, there is falling of the concrete at the haunch element and exposure of one small section of the reinforcement. This has occurred over an approximately 200 mm length with little through the remaining exposed concrete to this or the associated columns. Slight spalling has occurred below the haunch connection, with localised loss of section, but this is relatively limited in isolation.

Within the main central section we noted the presence of steel framing as restraint to the blockwork and this is reasonably true with no major lateral or vertical displacement. There

is surface rusting and limited delamination, but this is not sufficient of caused significant loss a section to the main elements.

Along the junction with the lean-to and mainframe the internal column does not exhibit significant movement or damage. Where the concrete frame could be viewed from the ground level we did not identify significant spalling or exposed reinforcement to this frame.

3.00 INTERNAL OBSERVATIONS

There are various plant and stored materials along the southern end of the building but where we were able to examine the main portal columns along the southern elevation there is only limited deviation by around 2-3mm in a 600mm long spirit level. No significant racking was noted and through the exposed concrete we did not identify significant loss of section or exposed reinforcement. There is local chipping of the concrete edges, possibly associated with previous impact, but little evidence of loss of structural integrity.

The eastern elevation and along the southern return is covered in various moss and algae growth and there is clear cracking through the blockwork consistent with lateral displacement. This is more pronounced along the western elevation where we highlighted the deformation of the block panels when viewed externally. This is probably the consequence of continued usage of the building and the lack of any significant restraint or buttressing to what is effectively in 1800 mm high block wall.

Along the internal valley there is a concrete frame and infilled section, with the main roof sheeting supported on series of profiled concrete purlins across the full length of the structure. The infill roof consists of rafter members tied to the mainframe using steel straps, comparable to those at the ridge. The haunch detail is of substantial restraint provided by the columns and/or bolting to the mainframe.

Near the centre of the Barn there is significant staining to one of the rafter members presumably due to seepage from the gutter system. There is surface deterioration within the strap and clear evidence of some delamination. This will require repair during the proposed refurbishment.

Through the main columns along this internal line there is no major deformation. Where the staining coincides with that noted above it appears to be surface related with no major spalling of the concrete or loss of section. This includes the area of the column where it extends below the concrete slab.

At the northern end we have highlighted the storage section, and this appears to be of hollow block wall at low level supporting the raised higher level storage. The lower blockwork is partially rendered and within the finish there is minor cracking and isolated damage, but no major indications of lateral displacement. Likewise through the upper block wall there is little other than predominantly vertical cracking to the blockwork along the change in material. This is probably more thermal related and does not follow a step suggestive of recent instability.

Where the most western store was accessible there is evidence of dampness at lower level, but through the principal lining to the main structure we did not identify significant stepped cracking or fractures. Indeed relative to the abutment with the main frames there was little to suggest recent movement.

As indicated previously not all stores were accessible and in some places the boarding had been removed and we were unable to carry out a full inspection. Generally, however, we did not identify significant structural cracking damage to the lower walls suggestive of an active problem or any major movement relative to the main frames.

At the eastern end we did note that the blockwork projects into the plane of the room along all elevations, including encasing of the frames to the northern elevation. Here the wall may be of reinforced concrete, as opposed to the hollow block walls referred to previously. A full inspection was not possible to allow us to confirm this, however.

Where the main columns were visible there was little to suggest recent movement. Isolated spalling and chipping to the edges of the concrete columns was noted, but we did not identify significant exposed reinforcement or associated delamination of the concrete surface suggestive of underlying issues with the reinforcement cover.

4.00 COMMENTS, RECOMMENDATIONS AND CONCLUSIONS

- 4.1 It is evident from our inspection of the building that it has not been the subject of significant deformation during his lifetime. Where the columns to the precast concrete portal frames were accessible, they remained relatively vertical and true. There was no major deformation or racking of the structure under the applied loads, with little to suggest inadequacy within the main frames.
- 4.2 Externally we identified minor movement within the sheeted roof although the majority this is the consequence of the nature of the construction allied to the lack of significant maintenance. The internal purlins did not appear to exhibit significant deflection or loss of section under the wetting/freezing cycles. As with the main portal frames we are therefore reasonably satisfy that they are adequate for retention as part of the refurbishment, based on our inspection from ground level.
- 4.3 Within the gable elevations there have been a number of alterations, including partial infilling to the main central opening and provision of blockwork panels. In the case of this blockwork at the southern end of both gables there is clear deviation and cracking damage. This is almost certainly a consequence of vehicle impact, to what are effectively poorly buttressed block panels, rather than inherent instability the mainframe. These blockwork panels will need replacing as part of any conversion or recladding scheme.
- 4.4 Along the northern elevation alterations have included the construction of what appears to be an independent raised storage area, above the ground floor stores where the floor is again raised above the general shed level. It is presumed that the floor was part of previous usage which required some form a bund. This appears to have been primarily formed with hollow block walls although the detail around the main frame columns suggest some possible concrete retaining along the northern elevation. Not all storage areas were accessible, but we did not identify significant signs of structural movement within the perimeter walls at lower level suggestive of current inadequacy.
- 4.5 Throughout our observations we made various comments regarding algae growth and staining of the masonry, although the majority of this is not of great significance. There is however significant staining to one of the concrete frames along the internal valley line.

This extends across the infill rafter section down to meet the main column, continuing through to lower level.

- 4.6 Where the column could be inspected there was little visual evidence of significant loss of section or loose materials because of ongoing delamination from the underlying reinforcement. We could not access the rafter section, but from the visual evidence that does not appear to be any major issues with this frame. As part of the refurbishment, however, these columns the concrete sections will need to be cleaned. It would also be prudent to check the rafter section in particular to assess any loss of cover to the reinforcement.
- 4.7 On one of the columns of the eastern elevation we have highlighted an area of exposed reinforcement and there are other areas with chipping or damage to the concrete surface. This is relatively limited by comparison to the building as a whole and is not suggestive of major structural problems. It will be necessary to clean the exposed reinforcement and treat all damage surfaces with an appropriate epoxy type concrete repair system to ensure that the long-term integrity of the frames are not affected.
- 4.8 It should be appreciated that all our comments are based upon a single visual inspection of the existing structure from ground level. As such we have not undertaken any long-term assessment, investigations or testing of the materials used in construction. We are therefore unable to categorically state that the limited damage and deterioration within the main structural frames has ceased.
- 4.9 It is our opinion based upon the visual inspection, however, that the principal elements of the precast concrete frame remain vertical and true, with little evidence of racking or lateral displacement. Some rebuilding and repairs will be required to the perimeter blockwork construction, but we are reasonably satisfied that the building can be incorporated within a sympathetic conversion scheme without the requirement for extensive reconstruction of the principle structural elements.

R F DUDLEY
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For and on behalf of Dudley Consulting (Hull) Ltd

BARN ONE, GRANGE FARM, EAST NEWTON