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STRUCTURAL INSPECTION

OF

BARN BUILDINGS

AT

CLIFF HOUSE FARM

FOR

MR D DAWSON

Date of Inspection **13th February 2011**

Reference No. **11/101**

1.0 INTRODUCTION

1.1 General

1.1.1 The EPOC Group was appointed by Mr D. Dawson to carry out a structural appraisal of Barn Buildings at Cliff House Farm

1.1.2 The following report shall be for the sole use of Mr D Dawson this report should not be reproduced in whole or in part or relied upon by third parties for any use without the expressed written authority of The Epoc Group. This exclusion shall not apply to any party acting for Mr D. Dawson having a strictly professional interest in the specific matters to which this report relates.

1.1.3 This report relates only to the following barn buildings
a) Laith Barn (excluding block built structure to Southern elevation)
b) Eight Cattle Barn
c) Three Cattle Barn
d) Tractor Shed

1.1.4 This report is based on an inspection of visible, exposed and accessible parts of the structural fabric of the barn buildings under consideration.

1.1.5 The objective of this report is to establish the structural condition of the barn buildings and *make recommendations for remedial works to convert into dwellings.*

1.1.6 Cliff House Farm is located approximately 2.0kM South of Penistone in South Yorkshire.

1.1.7 Access to the site is via an unmade track off Mortimer Road

1.1.8 The inspection was carried out on 22nd February 2011. At the time of the inspection the buildings were being used to house livestock and store hay.

1.1.9 The site consists of four barn buildings and a farmhouse. The farmhouse was occupied at the time of the inspection and does not form part of this structural report.

1.1.10 To the clients knowledge neither the barns nor the farmhouse are listed.

1.1.11 The Cliff House Farm dates back to pre-1850.

5.0 TRACTOR SHED & ANNEX

UNIT 4

5.1 OBSERVATIONS

5.1.1 General Observations

5.1.1.1 The Tractor Shed comprises stone masonry walls supporting a timber roof. The Annex building is a single storey structure of similar construction to the Tractor Shed. At the time of the survey both roofs were covered with stone slate tiles.

5.1.1.2 The Tractor Shed and Annex form a complex of buildings on Cliff House Farm. At the time of the survey the Annex was being used to house livestock

5.1.1.3 At ground floor level the West elevation of the Tractor Shed is open.

5.1.1.4 There are many large trees surrounding the building within a 5.00m radius.

5.1.2 East Elevation – Tractor Shed

5.1.2.1 This wall is constructed in random stone masonry approximately 350mm thick. The elevation is generally in good condition with no cracking or movement noted. There are remains of ivy growing over a small part of the elevation. **(Photograph 49)**

5.1.2.2 The pointing to this wall is in fair condition with minor mortar loss from joints.

5.1.2.3 The gutter and rainwater downpipes to this elevation are missing

5.1.2.4 At the Southern end of this elevation the wall is connected to an adjacent building. The condition could not be assessed as it was covered in vegetation and an existing timber structure.

5.1.2.5 There are two small trees located within 1.0 metre of this elevation. **(Figure 5) (Photograph 50)**

4.1.2.7 A trial pit was excavated on this elevation. The pit extended 400mm below ground level which was also the underside of the foundation. A 100mm widening of the wall was noted 100mm below ground level and was 300mm deep. The ground encountered in the trial pit was 200mm of topsoil on yellow gravelly weathered Sandstone with some clay content. Many small tree roots were present in the trial pit. **(Photograph 51)**

5.1.3 West Elevation – Tractor Shed

5.1.3.1 This elevation is constructed in random stone masonry at first floor level which is supported by a timber beam. In turn the timber beam is supported on the North and South elevations and two internal columns. The two columns are constructed in coursed masonry and are approximately 350mm x 350mm with a wider capping stone. There are three openings at ground floor level two large spans and a single shorter span. All the stonework in this elevation is in generally good condition. **(Photograph 52)**

5.1.3.2 The timber beam supporting the first floor is a single 350 x 350 section timber. There is a lead flashing between the wall above and the timber beam. Over the right hand long opening the top of the timber beam has suffered wet rot caused by water leaking through the lead flashing. The wall above has settled and a small section of masonry has loosened. Generally the timber beams are in good condition and do not exhibit any permanent deflections. **(Photograph 53 & 54)**

5.1.3 West Elevation – Tractor Shed (Continued)

5.1.3.3 The pointing to this wall is in fair condition with some localised deep mortar loss from the joints.

5.1.3.4 No bulging or movement was noted in this elevation.

5.1.3.5 The gutter and rainwater downpipes to this elevation intact and in fair condition.

5.1.3.6 At the Southern end of this elevation the wall is connected to an adjacent building. The client informed The Epoc Group that this building was a pig sty. This structure is constructed in random course stone masonry and in good condition. **(Photograph 55)**

5.1.4 South Elevation – Tractor Shed

5.1.4.1 The South elevation is a gable wall and is constructed in random coursed masonry. This wall is in good condition with no signs of cracking and settlement. **(Photograph 56)**

5.1.4.2 This elevation is partly obscured by an adjacent structure.

5.1.4.3 Some minor bulging of the wall was noted to this elevation.

5.1.4.4 The pointing to this wall is in fair condition with mortar loss from some of the joints

5.1.4.5 The wall is topped with copings stones that remain intact and in good condition.

5.1.5 North Elevation – Tractor Shed

5.1.5.1 The North elevation is a gable wall and is constructed in random coursed masonry. This wall is in good condition and showed no signs of cracking, settlement or bulging. **(Photograph 57)**

5.1.5.2 The pointing to this wall is in fair condition with mortar loss from some of the joints

5.1.5.3 The wall is topped with copings stones that remain intact and in good condition.

5.1.6 Roof – Tractor Shed

5.1.6.1 The roof is a duo pitch with gables on the North and South elevations.

5.1.6.2 The roof is covered in stone slate tiles and ridges. The stone slates are in good condition and intact over most of the roof area. **(Photograph 49 & 52)**

5.1.6.3 The ridge line is undulating along the whole length

5.1.6.4 The roof slopes also exhibit sagging or undulations and in one location at the South end of the West facing slope the roof has partially collapsed. **(Photograph 51 & 52)**

5.1.6.5 The roof structure consists of timber king post trusses at third points span between the East and West elevations. The trusses support purlins located a midpoint of the roof slope which in turn support timber rafters. On the West facing roof slope one of the timber purlins has failed and the timber rafters has dropped. This coincides with the sagging of the roof in the same location. All the remaining timbers are in good condition and are free from signs of insect infestation or rot. **(Photograph 58 & 59)**

5.1.7 Internal observations – Tractor Shed

5.1.7.1 The tractor shed comprises of two storeys. The first floor is accessed via timber steps located at the Southern end. The stairs were in reasonable condition.

5.1.7.2 The walls internally are constructed in random coursed stone masonry. Where visible they are in good condition and showed no signs of cracking or movement. **(Photograph 60)**

5.1.7.3 Large section timber joists (measured at 75 x 275 @ 500 centres) span between the East and West elevations. On the West elevation they are supported by the 350 x 350 timber beam. The joists are strutted at midpoint with timber herringbone struts that are missing in places. **(Photograph 60 & 61)**

5.1.7.4 The timber joists support timber floorboards. From first floor level it was difficult to assess the condition due to the amount of debris. Although, the floor did not deflect excessively the floorboards felt very springy. From the underside holes in the floorboards could be observed. **(Photograph 62)**

5.1.7.5 The floor of the Tractor Shed was constructed in stone flags. The floor was uneven and used for storage.

5.1.7.6 Headroom to the underside of the truss ties at first floor level was approximately 1700mm.

5.1.8 East Elevation – Annex

5.1.8.1 This elevation is constructed in random stone masonry and is in fair condition. There are some large blocks of stone within the wall and some brickwork patch repairs at eaves level. **(Photograph 63)**

5.1.8.2 At eaves level outward bowing of the wall was observed.

5.1.8.3 The pointing to this elevation is in poor condition with open and eroded joints.

5.1.8.4 Guttering and rainwater downpipes were completely missing to this elevation.

5.1.8.5 Three large trees are growing within 5.0 metres of this elevation two of which are 2.0 metres and 1.50 metres away. **(Photograph 63)**

5.1.9 West Elevation - Annex

5.1.9.1 This elevation is constructed in random stone masonry and is in fair condition with no signs of cracking or settlement. There are some large blocks of stone within the wall and some patch repairs at eaves level. **(Photograph 64)**

5.1.9.2 At eaves level outward bowing of the wall was observed.

5.1.9.3 The pointing to this elevation is in poor condition with open and eroded joints.

5.1.9.4 Guttering and rainwater downpipes were completely missing to this elevation.

5.1.10 North Elevation - Annex

5.1.10.1 This is a gable elevation and is constructed in random stone masonry and is in fair condition with no signs of cracking or settlement. **(Photograph 65)**

5.1.10.2 The slopes of the gable are capped with stone copings that are in good condition and intact to both slopes. **(Photograph 66)**

5.1.10.3 The pointing to this elevation is in poor condition with many open and eroded joints.

5.1.10.4 There is a window opening to this elevation with a stone masonry lintel and cill. Both are in good condition. The timber window frame is intact but in poor condition.

5.1.11 South Elevation - Annex

5.1.11.1 This is a gable elevation and is constructed in random stone masonry and is in good condition with no signs of cracking, settlement or bulging. **(Photograph 67)**

5.1.11.2 The verges to the gable are in poor condition with missing pointing

5.1.11.3 The pointing to this elevation is in good condition with minor mortar loss.

5.1.11.4 There are two openings to this elevation. Above the door openings is a section of timber cladding incorporating a window opening. The timber doors, panel and window are in reasonable condition.

5.1.11 Roof - Annex

5.1.11.1 The roof is covered in stone slate tiles with are intact over the whole roof area. The tiles are in good condition albeit covered in moss. **(Photograph 63 & 66)**

5.1.11.2 Sagging and spreading of the ridge line and roof slopes was observed.

5.1.11.3 The timber structure comprised of timber purlins at mid slope and a ridge board span between the North and South elevations. In turn rafters span between the ridgeboard, purlins and East and West elevations. **(Photograph 68)**

5.1.11.4 Permanent sagging and bowing of the timber purlins was observed.

5.1.12 Internal Observations - Annex

5.1.12.1 Internally the walls are constructed random stone masonry. Generally, they were in good condition. Some cracking was observed to the underside of the window opening. **(Photograph 69)**

5.1.12.2 The floor of the barn could not be fully assessed as it was covered in livestock bedding. In areas where this could be removed the floor was constructed in stone flags that were in good condition.

5.2 DISCUSSION

5.2.1 Overall the Tractor Shed and Annex are in good condition.

5.2.2 The external walls to all the elevations are in very good condition with no major settlement or movement noted. Some outward bowing of the East and West elevations to the Annex were noted. The walls and foundations to both buildings are capable of withstanding the current loading regime.

5.2.3 Generally, the pointing was in poor condition with large areas of erosion and open joints.

5.2.4 Rainwater gutters and downpipes were generally in poor condition and were missing to most elevations.

5.2.5 The timber roof structure to the Tractor Shed was generally in good condition with a localised area of damage to one of the purlins. Although, no permanent deformations other than the failed purlin were noted the tiled roof did exhibit sags and undulations. The Annex roof structure was in poor condition with sagging and bowing purlins. This has contributed to the sagging of the roof covering and outward bowing of the walls to the East and West elevations at eaves.

5.2.6 The slate tiles were intact over the whole of both roofs and were in good condition. Sagging and spread of both the roofs is probably due to the weight of the stone tiles. Consideration should be given to replacing them with lighter modern equivalents.

5.2.7 Timber windows and doors were generally in reasonable condition. However, they are not suitable for reuse in the refurbishment.

5.2.8 The timber first floor structure and supporting beams to the West elevation of the Tractor Shed were generally in good condition. The timber floorboards are in fair condition although there are indications that they may be coming to the end of their serviceable life. Local damage to the top of the main timber beam has allowed the stone masonry immediately above to become lose. The remaining timber beam should be inspected. Although the top of the beam has suffered damage it is not showing signs of any excessive deformation.

5.2.9 The trial pit that was dug on the East elevation of the Tractor Shed revealed that the foundations were very shallow (400mm below ground level). The ground encountered was gravelly weathered Sandstone with some clay content. The trial pit contained large amounts of small tree roots.

5.2.10 Large trees were located within 5.0 metres of the Annex. Two in particular are located with 2.0 metres of the East elevation. These trees have large branches that reach over the Annex and pose a safety risk if they fall. No major cracking or movement was noted the East elevation in the vicinity of the tree. Due to the granular nature of the subsoil the Annex and the Tractor Shed may not be suffering movement due to seasonal moisture changes caused by the trees. In addition, the building and trees may also be in equilibrium as the trees will have matured after the Tractor Shed and Annex were built.

5.3 CONCLUSIONS

5.3.1 The Tractor Shed and Annex are generally in good condition and suitable to be converted to a dwelling. The walls are in good condition and there are no signs of any major movement.

5.3.2 All the external walls should be repointed in lime based mortar.

5.3.3 The timber roof structure to the Tractor shed is in good condition with the exception of the failed purlin. The Structural adequacy of the roof timbers should be assessed for the new loading regime.

5.3.4 The roof structure to the Annex is in poor condition and should be replaced.

5.3.5 The existing slate tiled roof should be removed and new under felt installed. If serviceable the existing tiles can be reinstalled. Consideration should be given to replacement of the existing stone slates with modern concrete equivalent to reduce the loading of the roof structure, walls and foundations. New gutters and downpipes should also be installed.

5.3.5 The existing first floor should be assessed to determine its suitability to carry the new loads. The floor boarding requires replacement as it is unserviceable. The first floor will require lowering to increase headroom to the underside of the kingpost truss ties at first floor which currently is only 1700mm.

5.3.6 The timber beam to the West elevation requires repair of the rotten sections. The load carrying capacity should also be assessed.

5.3.7 The foundations to the external walls to the East elevation are very shallow. At present the structure is stable and the foundations appear to be capable of withstand the existing loads. As the proposal is to convert the Tractor Shed to a two storey dwelling and the Annex is to remain single storey the loading on the walls and foundations may not increase. However, the loading should be assessed to determine whether and remedial works are required.

5.3.8 The quality of the construction of the existing floor is unknown and should be replaced with a fully designed solution incorporating a damp proof membrane.

5.3.8 The three existing trees located within 5.0 metres of the Annex should be pollarded. The trees located within 2.0 metres from the Annex should be cut back such that no branches extend over the barn for safety reasons. Removal of these trees is also considered an option. Advice should be sort from an arboriculturist on how to remove the trees to prevent distress and damage to the existing structures. The two small trees adjacent to the East elevation of the Tractor Shed should be removed.

It is recommended that the following work is carried out to allow the barn to be converted to a dwelling

- **Carry out repointing to all the elevations using a suitable lime mortar.**
- **Check loadbearing capacity of all existing walls and foundations and underpin if necessary.**
- **Install roofing felt and either new roof covering or reinstate existing tiles. Install new rainwater goods. (New materials to be agreed with Planning Authority)**

- Check structural capacity of existing roof to the Tractor Shed to carry new loads and strengthen if necessary and replace failed purlin.

- Replace existing roof to Annex

- Check the structural capacity of the existing first floor timbers and reuse if possible. Lower the floor to give sufficient headroom at first floor level.

- Carry out repairs to the timber beam to the West elevation of Tractor Shed where beam has suffered roof and reinstate masonry wall above. Check load carrying capacity of beam and strengthen if necessary.

- Construct a new concrete ground floor slabs to Tractor Shed and Annex incorporation a damp proof membrane. The slab to be able to withstand any possible seasonal moisture changes in subsoil.

- Install restraints in accordance with building regulations to existing walls and roof.

- Carry out pollarding of three large trees within 5.0 metre radius of barn. Trees growing within 2.0 metres of the barn are to be pollarded such that on branches extend over the barn or fully removed without causing distress or damage to the Annex or Tractor Shed. The small trees adjacent to the East elevation of the Tractor Shed should be removed.

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