Structural Assessment

Haraldslea Farm Barn
Liberty Road
Newtown
Fareham
PO17 6LD

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EXAMINATION

The purpose of this report is to examine the viability of converting Haraldslea Farm Barn to a residential use with the emphasis on the suitability of the existing structure to support that change of use.

This report is prepared for the benefit of Deborah and Stephen Lambert and for the consideration of the LPA within an application for a residential conversion under Part Q. Mick Morris AADipl RIBA Chartered Architect cannot accept any liability to any other third-party for the whole or part of its content. It is based on my non intrusive visual inspection of the premises and information made available to me.

LOCATION

The barn is a portal framed agricultural building of some 550 M2 gross area. It is located close to Liberty Road Newtown Hampshire at the head of extensive pastureland with wooded areas in the middle distance. The building is located on higher ground that falls gently towards the fields and pastures to the south.

The barn itself is orientated on a north/south axis with a wide concrete hardstanding on the east side extending from the access point from Liberty Road to the North down beyond the barn to the pasture below. The main barn entrance is located on this eastern side. There is no specific yard but the hardstanding stretches around much of the barn perimeter with some metal stock fencing. On the South elevation a change of external ground level is reconciled with a 600 mm concrete step.

The main perimeter barn walling is dense concrete block 200mm wide varying in height up to 3 metres above ground level. Above that is mainly vertical slatted timber boarding to provide cover and ventilation and in one area there is corrugated sheeting above the 200 block walling. There are three metal stock gate openings to the West and North elevations. The roof is covered in corrugated fibre cement sheeting in pale grey. The main vehicular access and a pedestrian door are located in the East elevation.

INSPECTION

The building was inspected on the 14th of May 2024, weather mainly cloudy with light wind. The structure was inspected at ground level both internally and externally. Roof structural elements were inspected with assistance from binoculars. The foundations were not uncovered nor was any other structural element removed. This appraisal is based on the visual inspection alone.

STRUCTURAL FRAMING

This is a conventional steel barn building with the typical construction and materials used for many years in the UK for both agricultural and industrial applications. Indeed this is a system which continues to the present day. The whole is built around a steel portal frame system, in this instance being a series of hot rolled steel stanchions connected to similar pitched steel roof beams that in turn support cold folded steel roof purlins. The manufacturing company name appears on the upper gable ends usually indicating that assembly on site was carried out via this company or by their regular building subcontractors.

The probable intended use is reflected in the overall building design. A standard steel portal frame design with a low pitched roof has one slope extended down to a lower level. This would have provided a taller building element for the storage of hay and a lower roof element for the stock.

The structure is 27.5 metres in length from North to South and up to 19.8 metres in width. It has a standard dual pitch asymmetrical roof at approximately 12°. Measured under the main structure internal height varies from 5.14 metres at the higher eaves to 6.15 metres at the ridge with a lower height of 2.85 metres at the lower West elevation. The two gable ends are plain and un-hipped which is normal for these steel structures.

There are a series of 7 steel portal frames set fairly regularly on the East West axis at approximately 4600 metre centres, including each gable end. The bay widths vary slightly, which is normal practice. The upright universal beam columns of hot rolled steel are 254 x 146 UB 43 in cross section (a regular size) with a bolted connection to the pitched roof steel beams that are approximately (from ground level) of a similar size in cross section although they may be of a lighter weight per linear metre.

There is the usual steel bracing webs to protect against shear between columns and roof beams at the junctions. The centre connections of the two sloping roof beam members at ridge level are also braced with steel webbing and again this follows normal practice.

There is an additional steel post in the centre of the south elevation where the south elevation cladding terminates and an additional post in the north elevation to trim the large opening door. They are both of a similar size and specification to the main portal frame members. Where visible at the top junction they are bolted to the existing structure. In this building all the main steel structural members have bolted connections.

The portal frames are connected in the roof covering by galvanised steel purlins, these light weight beams running continuously over the main roof beams (with one exception) with a plate at eaves level to the east and west elevations to deal with the junction between the roof cladding on the wall cladding.

The purlins support a corrugated cement fibre type roof covering with regular sheeted translucent roof lights in the west slope in fibreglass with corrugations to match the main roofing material. These translucent lights are set over what would have been the lower roof west slope.

There is one larger element of corrugated wall cladding over the regular 200 dense block lower walling that is fixed to a pair of steel angle rails with a centre vertical steel wind post column 135 x 205 with the long axis North South at right angles to the wall plane better to resist imposed wind loads. The rails are connected to each column frame. There are also steel tubular wind bracing members present in the roof plane in the end bays of both gable ends. Again this is normal practice.

Generally structural stability is provided by a combination of the portal frames themselves, the connection to their foundations (not uncovered in this inspection) and the diagonal wind bracing within the sloped roof planes at each end of the structure joined to the penultimate frames at each end.

Transverse stability is created by the portal frame system itself together with the frame anchoring into the ground via concrete pad foundations. This is the typical structural engineering design layout used in these structures.

The purlins and cladding rails are secondary structure giving rigidity between the steel portals and proving fixing and load transference to the main steel frame.

Because the building is arranged on a slope there is a small change of level about 500 mm halfway along its length. There is a simple but effective structural detail to arrange this change of roof level.

On one of the centre portal frames the upper or higher purlins are laid in the conventional position above the frame and fixed to it. At the same time a short vertical strut is fixed to this portal frame roof member and so the purlins for the lower element of the barn are fixed to these and are set effectively directly under mainframe member. The remainder of the portal frames lower down the slope are then set conventionally under the same purlins.

There is no waste of material and although the vertical change of level faces directly into the south westerly prevailing winds there has been no ingress of rainwater.

WALL AND ROOF CLADDING

Apart from the external door openings as noted the whole of the building external wall from ground level up to 3 metres is constructed in dense concrete block work laid in a conventional stretcher type bond with cement mortar. All the blockwork is 200 mm thick and is generally composed of a single concrete block of that width. The block work appears to have been laid in a professional manner with regular spacing and there is no sign of distress indicating that the walling is adequately supported on foundations.

Generally the blocks are placed and fit between the flanges of the steel structural columns that gives both a resistance to overturning and allows for differential expansion within the individual bays. Where there is a longer run of blockwork to the north elevation gable end that is longer than anywhere else in the building an additional centre 450 x 225 concrete block pier has been added for additional stability.

Above the level of the masonry is generally vertical slatted timber on framing giving shelter from weather whilst providing the necessary continuous ventilation for the stock and the hay. As noticed there is a single upper bay element in corrugated cladding similar to the roof.

FLOORING

At the centre of the barn running continuously along the long access from north to south is a concrete slab and low wall structure. The top of the concrete slab is visible in places and is 1500 mm wide.A wall structure 600 wide and 650 high is set over the footing and is constructed from a combination of 100 and 200 wide mm dense concrete blocks infilled with concrete. Set on it in places is large tubular iron framing.

The remainder of the floor is ballast covered or earth although substantial areas could not be uncovered.

STRUCTURAL CONDITION

In overall terms both the structure and the sub structure appears to be working satisfactorily. The centre distances between the main portal frames are relatively conservative in distance apart which in turn has reduced the stress on the cold folded galvanised steel purlins. All structured steel work appears to be upright with no movement or distortion from the originally installed positions.

There is some surface pitting to the main roof members although most of the main vertical column members have been re-primed relatively recently. From ground level it would appear that all bolts or similar structural connections are in place.

On two of the lower elements of the intermediate posts lowdown on the west elevation there was some de-lamination of the internal flange covering perhaps 500 mm in height on two of the members.

If a new walling system with the appropriate residential thermal performance was to be introduced these two small elements could be cut out and replacements welded in without difficulty. It is a very minor element of the whole system and has caused no distortion or distress to the present.

STRUCTURAL INTEGRITY

There are certain key structural elements that will remain and be included in the conversion to residential accommodation. In retaining the building it can be assumed that the essential works necessary will comprise of the following:

The replacement of the existing wall or roof coverings where they are damaged or may need minor upgrading with materials of similar weight.

Creating new window and door openings.

The construction of new internal walls in order to create individual rooms, eg bedrooms living rooms etc.

A new cross ventilated suspended floor set above the existing ballast and earth floor spanning between the existing structural elements.

The whole of the existing portal frame structural system plus the existing roof structures would entirely remain in situ.

The building would be recovered in suitable materials of a similar weight and rigidity to the existing cladding together with insulation to follow the Part L of the Building Regulations, the Conservation of Fuel and Power.

The introduction of windows and doors and the alterations of existing openings in the external cladding will not alter the integrity or the stability of the existing building's structural design.

The replacement of the roof covering will not alter the loading on the structure in any significant way.

The existing 200 wide dense concrete walling would be reduced only where reasonably necessary in overall height and in its place a new light light weight thermally efficient wall element suitable for the building to function as a dwelling house would be installed together with a new top chord bearing floor truss system to span between the external walling and the centre spine wall and foundation.

All the cladding material and new floor will be specified to apply an equivalent dead load to the existing support structure. In this way the existing framed structure and foundations will have sufficient structural capacity to support this cladding and floor in a conversion as required by Class Q - Permitted Development of Agricultural Buildings to Dwelling houses.

Any defects uncovered in the existing structure can be repaired during the conversion works.

New internal work separate for the external walling and roof structure will be required to comply with the Building Regulations Part A, Structure.

The substitution of a corrugated steel roof cladding system for the existing fibre cement corrugated sheeting would not involved a material change in dead loading in the roof zone due to the similarity in shape, fixing and comparative weight of the existing and proposed coverings.

ARCHITECTURAL DESIGN OF THE CONVERSION

The accompanying architectural proposals have been developed from an examination of the character and condition of the existing building together with its setting. This report has identified the key elements which it is anticipated will be retained as part of the conversion works

The height, and proportions of this building would permit a residential conversion over a single floor without compromise to ceiling heights. The plan form comfortably allows for a five bedroom dwelling with all necessary requirements.

The spaces provided such as bedrooms and living rooms would comfortably exceed the UK government minimum standards for new dwellings.

The openings for doors and windows would provide for an adequate level of light and ventilation and general amenity

It would be possible to comply with the current building regulations including Part L Conservation of Fuel and Power.

The orientation on a principally around north south axis, plus east and west orientation allows for good day lighting and amenity to all the habitable rooms. The building is close to a public highway with a solid access surface joining to it and a reasonable site visibility splay.

The conversion would provide the building with a very high level of passive thermal insulation. This would in turn keep the building heating load to a reasonable minimum. The existing surrounding ground would enable a layout of pipework for a ground source heat pump without interference to any natural features or trees.

CONCLUSION

This is a conventional modern steel framed barn. It is a permanent and robust structure. It is capable of conversion within the current guidelines. With experience of these agricultural structures either as new buildings or as renovations and conversions I can state that it is quite capable of conversion without the need for re building.

This building is suitable for the proposed conversion in line with the National Planning Policy Framework for the sustainable re-use of buildings under the Class Q within the Town and Country Planning (General Development Order).

The principal structural elements of this building being of a permanent and substantial construction can be retained with the addition of openings for doors and windows in such a fashion as to allow for conversion to a dwelling house.

Such new openings created would not affect the structural stability of the existing building. To complete the conversion internal work would need to be undertaken. The localised damage to the two portal posts can be repaired without any alteration to the existing structural system and with minimal interference.

Mick Morris AADipl RIBA
Chartered Architect   May 2024

Mick Morris AADipl RIBA Chartered Architect

In private practice for 27 years. Graduate of the Architectural Association School of Architecture. Winner of several awards from The Portsmouth Society for restorations and conversions of buildings of many different scales and materials. Listed buildings dealt with range from the first Elizabethan Era (c 1575), the Georgian period, through the Victorian and Edwardian eras up to Lord Foster's RIBA Gold medal award winning and listed IBM building of 1972. The architect is also Civic Trust regional finalist and winner of the Best New Building City of Portsmouth 2010.

Two large conversion and restoration projects were included in the 2018 edition of 'The Buildings of England South Hampshire.' One project structure, the Former Royal Marine Garrison Church, forms the entire Conservation Area. This is Conservation Area No 26 St Andrews Church Portsmouth.

Other projects include work on churches, urban and rural, a 1930s synagogue with much earlier internal fittings, former, dwellings, existing school buildings, warehouses, farm buildings including grain barns and farm houses, a medieval dovecote and Fort Southwick - one of Palmerston's Follies. Recently a new tea house and shop on a The Lavender Farm at Selborne Hampshire has been built. Many of the conversions are of listed buildings or of local importance.

Projects involve the appraisal of building fabric and structure, the suitability for adaption or reuse and the methods by which such structures can be adapted for different functions . Other appraisals and surveys regarding the character or architectural, social or historic quality of buildings and landscape have been undertaken to advise both clients and planning authorities.

The Lord Foster IBM Cosham building (built 1972) Listed Grade 2, had had the iconic structural glass facade condemned by specialist engineers as being unsafe and capable of progressive collapse in high winds.The entire four sided facade was stabilised and invisibly repaired under my supervision by specialist contractors. The facade was in fact the main reason for the building's awards and subsequent listing.

IBM Cosham Hampshire, now called Lynx House (HM Revenue and Customs).

Photos show structural steel, aluminium and glass facade of the Grade 2 listed building. With the structural integrity failing repairs has to be effected to every panel and frame member throughout the building facades in order to stabilise the curtain walling yet retain the existing character. Each glass panel being 1.8 x 3.6 metres and 10 mm thick and weighing more than 162 kg per sheet, was suspended in a unique structural neoprene gasket system originally designed and employed on American high rise office buildings of the 1960s and 70s. It should be noted that the original brief was for the building to be only a temporary structure.