

2021 8589

The Grain Store, Boggarts House Farm

Structural Report

Summary

The building a typical steel frame agricultural building.

There are some areas of corrosion to columns at low level that will require some repairs but overall, the existing building appears free from significant structural movement.

Replacement of the existing cladding with an insulated steel profile sheet will reduce existing roof loads.

The steel frame and the existing floor structure are suitable for conversion subject to some further investigations.

In conclusion we are of the opinion that the building is in reasonable condition for its age and subject to some localised repairs would be suitable for conversion to residential use.

Date of Report: 13/07/2022

Report Revision: A1

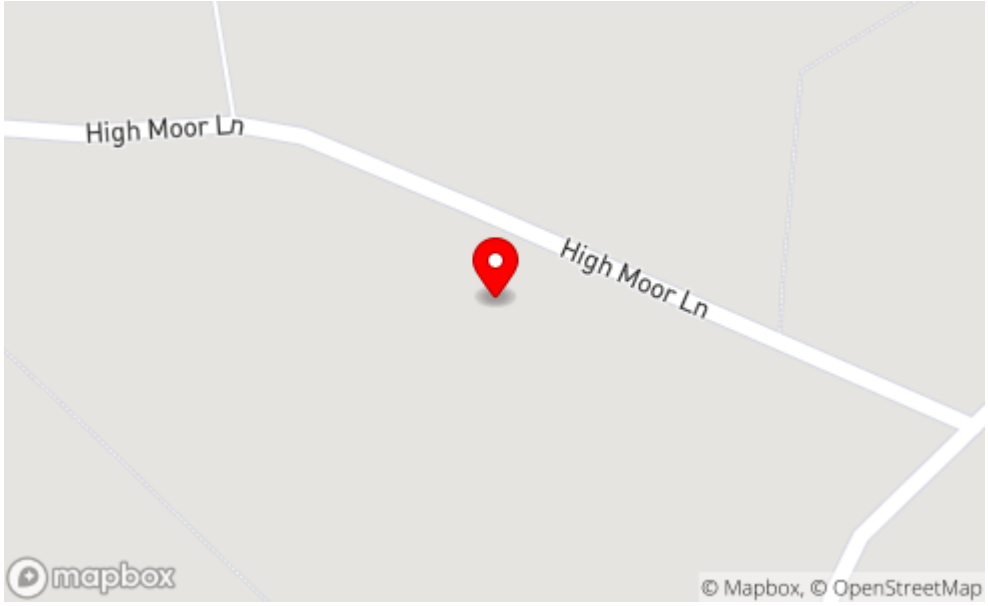
Revision	Author	Checked By	Approved By	Issued to	Issue Date
A0, First issue	Nick Forman IEng AMIStructE MICE	Nick Forman IEng AMIStructE MICE	Nick Forman IEng AMIStructE MICE	Client	21/09/2021
A1, First issue	Nick Forman IEng AMIStructE MICE	Nick Forman IEng AMIStructE MICE	Nick Forman IEng AMIStructE MICE	Client	13/07/2022

1. Client

Client	Mr W Ainscough
	Harrock Hall Estate Ltd
Address	Estate Office
	High Moor Lane
	Wrightington
	WN6 9QA

2. Subject Property

Address	The Grain Store
	Boggarts House Farm
	High Moor Lane
	Appley Bridge
	WN6 9PS

Property Location Map	
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3. Survey Overview

BDI Reference	20218589
Date of visit	27/08/2021
Time of visit	11:10 AM
Survey/Inspection by	<p>The Survey was undertaken by Nick Forman.</p> <p>Nick Forman is a qualified structural engineer, registered with the engineering council, and an associate member of the Institution of Structural Engineers and member of the Institution of Civil Engineers since 1993</p> <p>He has over 30 years' experience in low rise buildings and has reported on building defects for over 25 years.</p>
Weather at Time of Visit	Sunny, clear and dry
Background and reason for Structural Survey	<p>The existing agricultural building is to be converted to residential use.</p> <p>The report has been commissioned to consider the current structural condition and provide an opinion as the adequacy of the structure for conversion to residential use.</p>


4. Terms of Reference


Terms of Reference	Attend the subject property and undertake a visual Structural inspection and report upon the general structural condition of the building with reference to proposed conversion to residential use.
Survey Limitations	<p>We have not inspected the property for evidence of timber rot, infestation or Dampness to walls and floors.</p> <p>The report is limited to a visual inspection of the load bearing elements of the building structure and does not consider or report on the condition of doors/windows, roof coverings, flashings, gutter, finishes, services, etc.</p> <p>The external and internal observations are limited to aspects that we consider to be of relevance to the terms of reference. The observations relate to the significant aspects and should not be considered a detailed condition survey</p>


5. General Description of Building and site


Building type	Agricultural Building, Grain Store
Age of Property	Circa 1970
Structural Form	Steel Frame
Structural Stability	Braced Frame
Number of Stories	1
External Walls	External elevations are partially clad formed with cladding rails and sheeting
Roof Covering	Concrete based profiled sheeting assumed possible asbestos based.
Roof Structure	Timber purlins supported on steel trusses supported on steel columns
Upper Floors	None
Ground Floors	Concrete Ground Bearing
Internal Walls	None
Cellar/Basement	None
Site Topography	Generally level left to right, generally level front to rear but slopes slightly to the rear and left corner.
Retaining Walls	To the rear left corner, the ground floor is around 450 to 600mm above external ground levels and there is a block perimeter wall that appears to form a retaining wall.
Trees and Vegetation	There a number of trees close to the rear of the left wing of the building.
Site Geology	<p>A site investigation has not been undertaken.</p> <p>A review of the British Geological Survey data suggests the following:</p> <p>Superficial Deposits (soils): TILL Devensian Clay Sandy Gravelly Silty</p> <p>Bedrock: Sandstone.</p>


6. Observations


No	6.1
Location	Front Elevation
Description	General view front of building. The building is L-shaped on plan and the elevations are referenced to the left or right wing of the plan shape.
Photograph	


No	6.2
Location	Left Wing
Description	<p>Left wing of building consists of a steel frame with columns supporting steel trusses. The elevations to the front and left of the left wing are partially clad.</p> <p>The cladding appears likely to be asbestos-based cement panels.</p> <p>The steel grain silos within the building are independent of the steel frame and do not form part of the building structure.</p>
Photograph	


No	6.3
Location	Left Wing
Description	<p>The steel columns to the left wing have minor surface corrosion. The columns generally appear to be in reasonable condition.</p> <p>At the column bases the corrosion is more advanced to a number of the columns.</p> <p>The base of the columns has been encased in concrete.</p>
Photograph	


No	6.4
Location	Right Wing
Description	<p>The right wing of the building is an open steel frame.</p> <p>The structure formed with a gable frame supporting long span roof ridge beam and front elevation eaves beam.</p> <p>This differs in arrangement to the left wing as there are no steel roof trusses.</p>
Photograph	


No	6.5
Location	Right wing rear elevation
Description	<p>General view of the rear elevation of right wing.</p> <p>The elevation is fully clad.</p> <p>Note the external ground level reduces to the rear left corner of the building.</p>
Photograph	

No	6.6
Location	Right wing rear elevation
Description	<p>To be left end of the building at the junction of the right and left wing rear elevations the external ground level is around 450mm to 600mm lower than the internal floor level.</p> <p>The visible low level block work appears likely to act as a retaining wall to the hardcore/substrate below the floor slab.</p>
Photograph	

No	6.7
Location	Left wing rear elevation
Description	<p>The rear elevation of the left wing is partially clad to the left end and fully clad where the elevation adjoins the right wing.</p> <p>There are a number of trees in close proximity to the elevation.</p>
Photograph	

No	6.8
Location	Right wing front elevation
Description	There is significant corrosion evident to the to the column to the right front corner. Corrosion has affected the full thickness of the column web.
Photograph	

No	6.9
Location	Right wing front elevation
Description	Minor impact damage to the column midway along the right wing front elevation.
Photograph	

No	6.10
Location	Left wing ground floor
Description	Typical internal view showing steel roof truss supporting timber roof purlins
Photograph	

7. Discussion and Conclusions

The building a typical steel frame agricultural building.

The building structure consists of a steel frame supporting steel trusses, ridge beams and timber purlins and cladding rails.

The ground floor in the building is formed with a concrete floor slab which we assume will be ground bearing.

We would anticipate that the column foundations will consist of concrete pad foundations and external walls where blockwork will have traditional concrete strip footings.

Stability of the building structure against wind load appears to have been achieved by cantilever columns within the left wing where the roof has steel trusses and by stiffer moment type connections within steel frame to the right wing section of the building.

The building is in reasonable condition structurally with some minor corrosion to the steel structure.

There is more advanced and significant corrosion to the lower sections of a number of the existing columns and localised repairs will be required to these columns

We noted no evidence of significant foundation or lateral movement affecting the existing building structure.

We have considered the impact of conversion to residential use on the existing structure as follows:

Roof structure

It is assumed that the existing cement based profile sheet is likely to be replaced as it is likely to contain asbestos.

Replacement of the profiled cement sheet (circa 30kg/m SQ) with an insulated composite roof sheet/panel (circa 12kg/m SQ) will result in a net reduction of dead load to the existing structure.

Wind load and live load will remain unchanged.

Recovering of the roof with a composite insulated roof sheet/panel with therefore not have an adverse affect on the building roof structure and steel frame.

The reduction in dead load due to replacement of the cement based sheets with a composite panel will provide available dead load for services and ceiling finishes without increasing the load to the steel frame.

Available load for finishes and services to the roof structure would be around 18kg/m SQ based on the saving from the replacement cladding.

The estimated weight of ceiling finishes and services

Plaster board and skim on timber frame 11.5kg/m SQ

Services with ceiling void	5kg/m SQ
Total additional weight	16.5kg/m SQ

There is therefore load capacity if the existing roof structure to accommodate replacement cladding and domestic finishes.

Ground Floor Structure

The ground floor structure appears to be a ground bearing concrete floor.

The loading resulting from the agricultural use will far exceed the load resulting from proposed residential use.

We would anticipate that the existing concrete floor is between 150mm to 200mm thick and is likely to be reinforced with steel reinforcing mesh.

We noted no evidence of significant deformation of the floor that would be indicative of settlement.

Subject to future site investigations we would anticipate that the existing floor slab is likely to be suitable to accept residential load.

The existing ground floor is not likely to have any insulation or damp proof membrane.

There will be a requirement to incorporate insulation and a damp barrier within the ground floor and this could be achieved by insulating and damp-proofing over the existing concrete floor slab and providing a screeded floor finish over the DPM/insulation.

First Floor Structure.

At present there is no first floor structure within the building.

Given the height of the building there is adequate height to accommodate a first floor structure.

The new first floor would be of timber construction and would be supported via steel beams off the existing supported off the existing columns.

We have analysed a typical column within the existing building with the addition of the proposed floor loads.

The introduction of first floor beams to existing columns shortens the effective length of the column making them less slender and this increases the stiffness/stability of the building and existing steel frame against wind load.

We have completed preliminary calculations that indicate that the existing columns are adequate to support the load from the first floor.

Internal walls at first floor could be stud partitions as there is no requirement to support the roof structure.

Existing Foundations

Given the age and construction of the building we would anticipate that the steel columns to the frame have concrete pad foundations.

These are likely to be founded deeper than the minimum requirement of 450mm as defined in the building regulations.

A site investigation will be required to establish the existing foundations.

There is a likelihood that clay may exist on site and if present an assessment of risk due to seasonal clay volume change will be required. This will also need to consider the impact of vegetation and trees.

Supporting the first floor via the existing columns will increase load to the existing foundations and the impact on the foundations would need to be assessed. Total column load is in the region of 60kN this is not overly high and a pad foundation around 0.8 x 0.8m would typically be adequate in soils of bearing strata over 100kN/m² SQ wick would be typically a soft to medium clay and medium sand

From our inspection and preliminary assessment we would conclude the following.

1. The roof structure will accommodate a insulated cladding system, services and finishes without the need for significant strengthening.
2. The building columns have capacity to support increased load from first floor timber floors and beams.
3. The installation of a first floor structure supported off the existing columns will stiffen the structure and increase capacity against wind load and increase lateral stability.
4. The typical increased column loads would be accommodated with pad foundations of relatively small sizes in medium strength soils.
5. The ground floor appears to be a ground bearing concrete floor that would be adequate to accommodate domestic loading.

In conclusion we are of the opinion that the building is in reasonable condition for its age and subject to some localised repairs would be suitable structurally for conversion to residential use.

9. Summary

The building is a typical steel frame agricultural building.

There are some areas of corrosion to columns at low level that will require some repairs but overall, the existing building appears free from significant structural movement.

Replacement of the existing cladding with an insulated steel profile sheet will reduce existing roof loads.

The steel frame and the existing floor structure are suitable for conversion and preliminary calculations indicate the columns can accommodate additional load from a first floor structure.

In conclusion we are of the opinion that the building is in reasonable condition for its age and subject to some localised repairs would be suitable for conversion to residential use.

Appendix A | Understanding This Report

This report is written for the benefit of the named client in relation to the subject property only. It should not be used for any other purpose, and may only be copied to a third party with the permission of the Client or BDI structural solutions.

The scope of this report is limited to the consideration of the issues described under the term of reference.

Unless specifically referred to in the report we have not inspected woodwork or other parts of the structure, which are covered, unexposed or inaccessible and are therefore unable to report that any such part of the property is free from defect.

The various sections of the report contain information as follows:

General Description of Property

A brief summary of the type of building. This is factual information and does not describe the condition of the property.

Background

Outlines the reasons for the client instructing BDI structural solutions to carry out the survey and report. Any special instructions or particular relevant background information given to us will also be included in this section.

Observations

The damage or other characteristics of the subject property are described in this section. Factual observations are recorded, including any measurements taken, but opinions on causes and recommendations are not given in this section.

Discussions and Conclusions

This section summarises our expert consideration of the damage and any other characteristics relating to the subject property. In many cases the options will be discussed and where appropriate the advantages and disadvantages of different solutions are discussed.

Suggested Timescale and Budget Costing

Where appropriate we give an indication of the timescale that should be considered for any recommended solutions. Where budget costings are provided these are purely provided as a guide and are based upon our experience of costs of similar repairs to similar properties. Accurate costings should be obtained from suitably qualified and experienced building contractors.

Queries

We try wherever possible to avoid the use of unfamiliar technical terms or jargon and to provide practical technical advice. If you are unclear about the meaning of any words or phrases, or the conclusions of our report, please call us and we will clarify matters for you. If necessary we will revise and reissue this report.