

Structural Engineers Report For:

Plas Nantyr, Farm Office and Staff Facilities
Nantyr. LL20 7DD

STRUCTURAL SURVEY

Prepared for:



REF: N2815-01

Document Control

Project	Plas Nantyr, Farm Office and Staff Facilities Nantyr. LL20 7DD
Client	
Vale Consultancy Ref:	N2815-01

Document Checking:

Prepared By: NEDW LLEWELYN Signed:

Checked By: MATT JONES Signed:

Verified By: MATT JONES Signed:

Issue	Date	Status
1	18th October, 2023	First issue

RE: Structural Inspection – Plas Nantyr, Farm Office and Staff Facilities
Nantyr. LL20 7DD

Following our appointment, we undertook an inspection of the above property, which was performed on Thursday 3rd of August, 2023. The inspection was instructed to survey the property to determine if the structure is adequate for the conversion into a habitable building.

Our findings are restricted to structural matters only. This report is based on a visual inspection of all exposed surfaces.

This report shall be for the confidential use of our client, and the report shall not be reproduced in whole, or in part, or relied upon by a third party without the express written authorisation of Vale Consultancy.

Description

This barn is a detached two storey building, located near Plas Nantyr Manor House. The building in question was once used as an office and staff facilities building (**photograph 1**).

The building consists of a duo pitched roof, with a small front gable above the front entrance door. There is also a gable at the rear of the property with an intersecting roof (**photograph 2**).

The walls are primely random rubble solid masonry walls, with some areas been infilled over the years presumably due to localised collapses etc. The front elevation has been rendered and painted white, whereas the rear elevation is exposed masonry.

The roof structure consists of timber king post trusses, supporting timber purlins, which subsequently supports timber rafters. The roof covering is a corrugated sheeting, material unknown.

The first floor of the building is a suspended timber floor, with the joists spanning back to front.

The ground floor is a pebbled stone floor, sitting directly on earth.

Observations

It appears that adjoining buildings were once present, abutting this building. At the rear of the building, holes are present in the masonry along the back elevation, at location where typically floor joists would bear. Therefore, these holes could either represent location of historical joist bearing or rafters bearing.

There is also a sloping render line, along the rear face of the rear elevation (**photograph 3**), which suggest that some type of lean-to building was abutting the rear elevation at some point in the past. Similar sign could be found at the front elevation, which suggest that a lean-to building had presence here also.

Internally, the roof structure appeared to be in a poor structural condition. The central timber king post truss appeared to be significantly rotted at the bearing at rear elevation (**photograph 4**). Wet rotting at the bearing of the king post truss was apparent at location of historical rebuild of the rear elevation wall. This suggest that possibly, the roof at this location was once defective and leaking, allowing water into the rear elevation wall, and subsequently causing some movement and water ingress into the property. Hence localised rebuild.

The defective bearing of the king post truss had resulted in the truss to drop towards the rear elevation (**photograph 5**).

Other bearing, towards the front elevation of a king post truss was also heavily rotted (**photograph 6**).

Overall, we would comment that the roof structure has passed the end of its life and therefore requires rebuilding.

The timber floors also appear to be of a poor structural condition. Many of the floor timber transfer beams appeared to be heavily rotted, and therefore require replacement (**photograph 7**).

The timber floor towards the rear elevation, below the location of rotted king post truss has partially collapsed. This has occurred likely due to persistence water ingress rotting the timber joists and transfer beams and subsequently causing them to collapse (**photograph 8**).

The condition of the external walls as a whole seemed consistence with buildings of this age and type.

Localised re-building was noticed along the rear elevation of the building. Furthermore, it appears that a historical doorway has been bricked up at the ground floor, below the panel of blockwork rebuild.

At the front elevation, the wall panel above the front door appears to be bowing outward slightly (**photograph 9**). This typically is a result of outward force exerted by the roof structure, usually due to deflecting purlin members.

As previously mentioned, there was once an extension extending out from the front-right hand side of the building. Since the demolition/ collapse of this extension, the corner of the remaining building has been left open, where originally the extension walls were toothed into the main wall. This corner has been left open, without capping as seen in **photograph 10**.

The ground floor does not have an adequate bearing structure to conform to current building regulations.

Recommendations

- It is recommended that the main roof structure is upgraded with modern construction, such as timber rafters and ridge beam to accommodate the increased loading from insulation and plasterboard. Subject to the architect/ council's requirements, the finishing of the roof can stay as corrugated sheeting or slates, fixed onto new treated battens, vapour-porous sarking membrane and insulation underneath to the architect's specification. It is not possible to reinstate the timber truss due to wet rotting. The new rafters should be fixed on to a timber wall plate, fixed down the external front and rear elevations of the property with stainless steel straps at 1.5m centers.
- The perimeter of the eaves should be capped using steel A252 mesh in 200mm deep layer of lean mix concrete, after all loose stonework is removed. This capping concrete tie will act as a tie for the whole external walls of the building to avoid any further outward leaning, whilst keeping water out from the wall construction.
- We suggest that the front right hand corner of the building is tidied up, by re-toothed stonework from front elevation into the side elevation.
- We then recommend installing Helifix Helibars across the re-toothed front corner of the building. The location of the required stitching can be found within **Appendix B – SK01**. Product data sheet for the crack stitching installation can be found within **Appendix C**. The bars should be 6mm in diameter and should pass the end of the corner by a minimum length of 1000mm.
- All of the stonework should be raked out and repointed using Lime Based Mortar. Natural Hydraulic Lime 3.5 (NHL 3.5) allows the breathability of the building whilst allowing some degree

of flexibility for shrink. All of the loose pointing and open joists should be raked out and repointed using NHL 3.5 mortar.

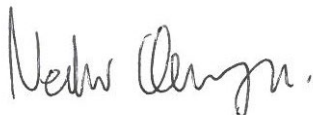
- The timber lintels on the front elevation should be replaced with concrete lintles. We recommend using PCC 140x100mm for these openings, if they are 1.2m or less in span.
- We recommend that the first floor is upgraded with modern timber joists. The joists should be bearing on to timber wall plate, resin anchor bolted into the internal face of the external walls. The timber wall plate should be 150x50mm C16 and bolted into the wall with M10 resin anchor bolts at 450mm centers. We would also recommend running the breathable membrane behind the timber wall plate to avoid potential rotting.
- We recommend that a new ground bearing slab is poured, unless the current one can be proven to be a minimum depth of 100mm. The new ground bearing slab should be 100mm thick, bearing on a 150mm later of Type 1 material. Insulation and DPM requirements should be provided by the architect.
- New gullies and rainwater goods should be installed around the whole building and connected to a stormwater soakaway a minimum distance of 5.0m away from the building. The soakaway should be designed by a competent person, after infiltration testing is carried out on the ground.

Conclusions

It is of our professional opinion that generally the overall structural condition of the barn is adequate and only requires localised rebuild in areas and re-roofing for the barn. No major or extensive structural repairs are required to convert the main shell of the building into a habitable space, and if the refurbishment follows the above recommendations and in line with current building regulations, I would consider the building a good contender for a barn conversion.

If you have any queries regarding this report or require any further information please contact our office at the above address.

Yours sincerely



Nedw Llewelyn BEng (Hons) MSc CEng MICE

On behalf of Vale Consultancy

Enclosed:

Appendix A – Photographs

Appendix B – Structural Sketch

Appendix C – Product Data Sheet



Photograph 1



Photograph 2



Photograph 3



Photograph 4



Photograph 5



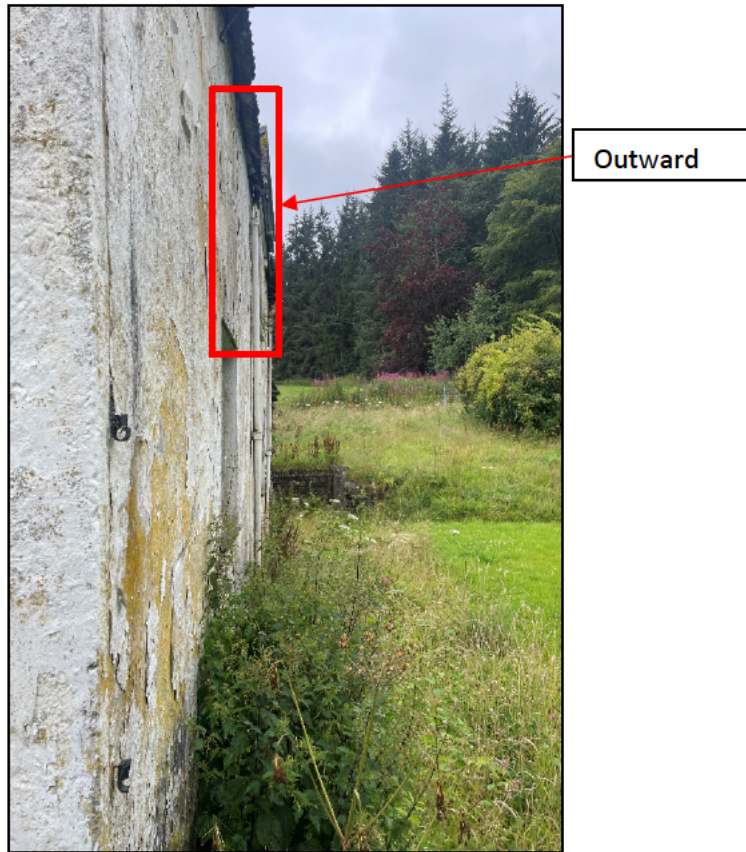
Photograph 6



Photograph 7



Photograph 8



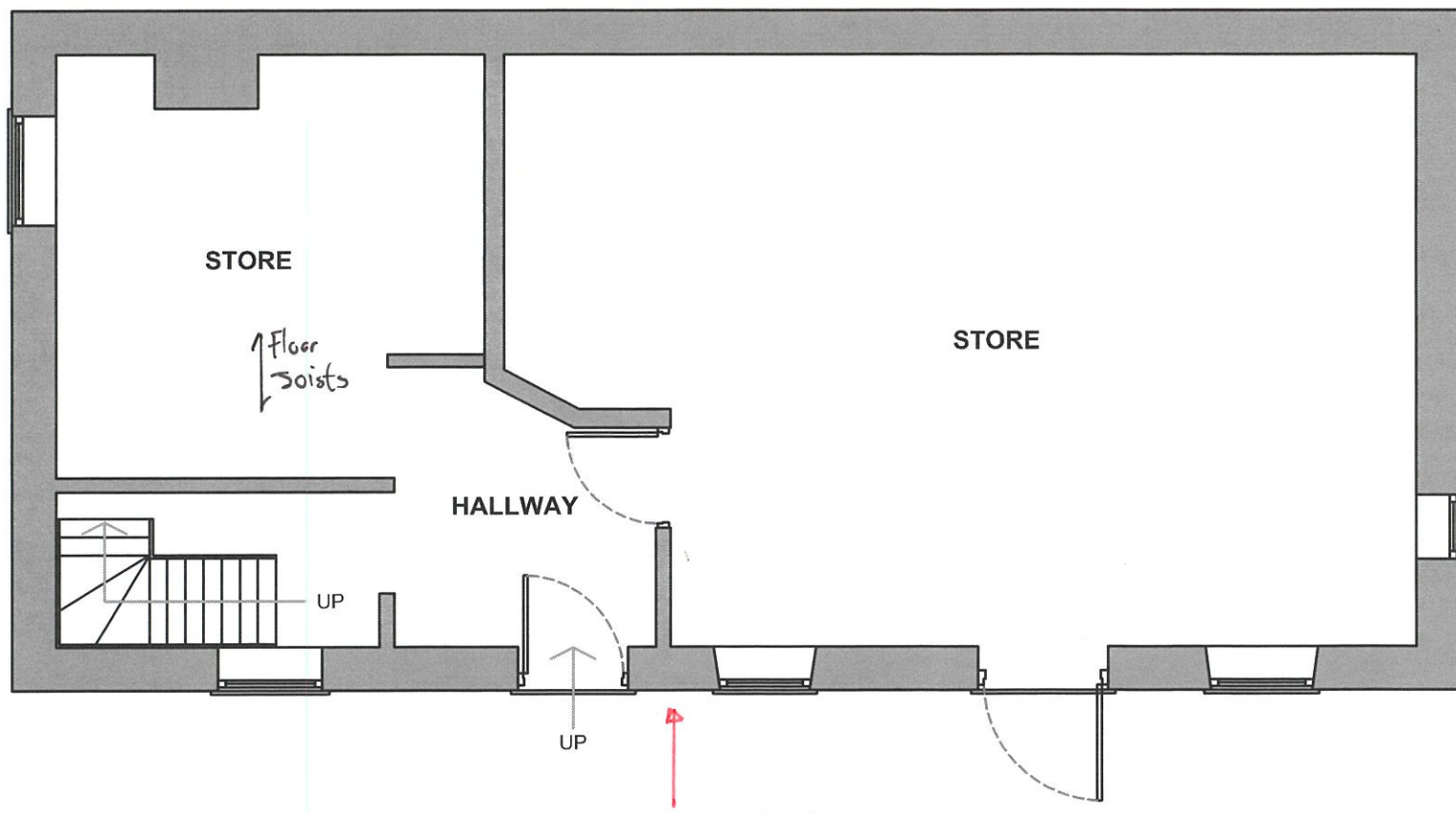
Photograph 9



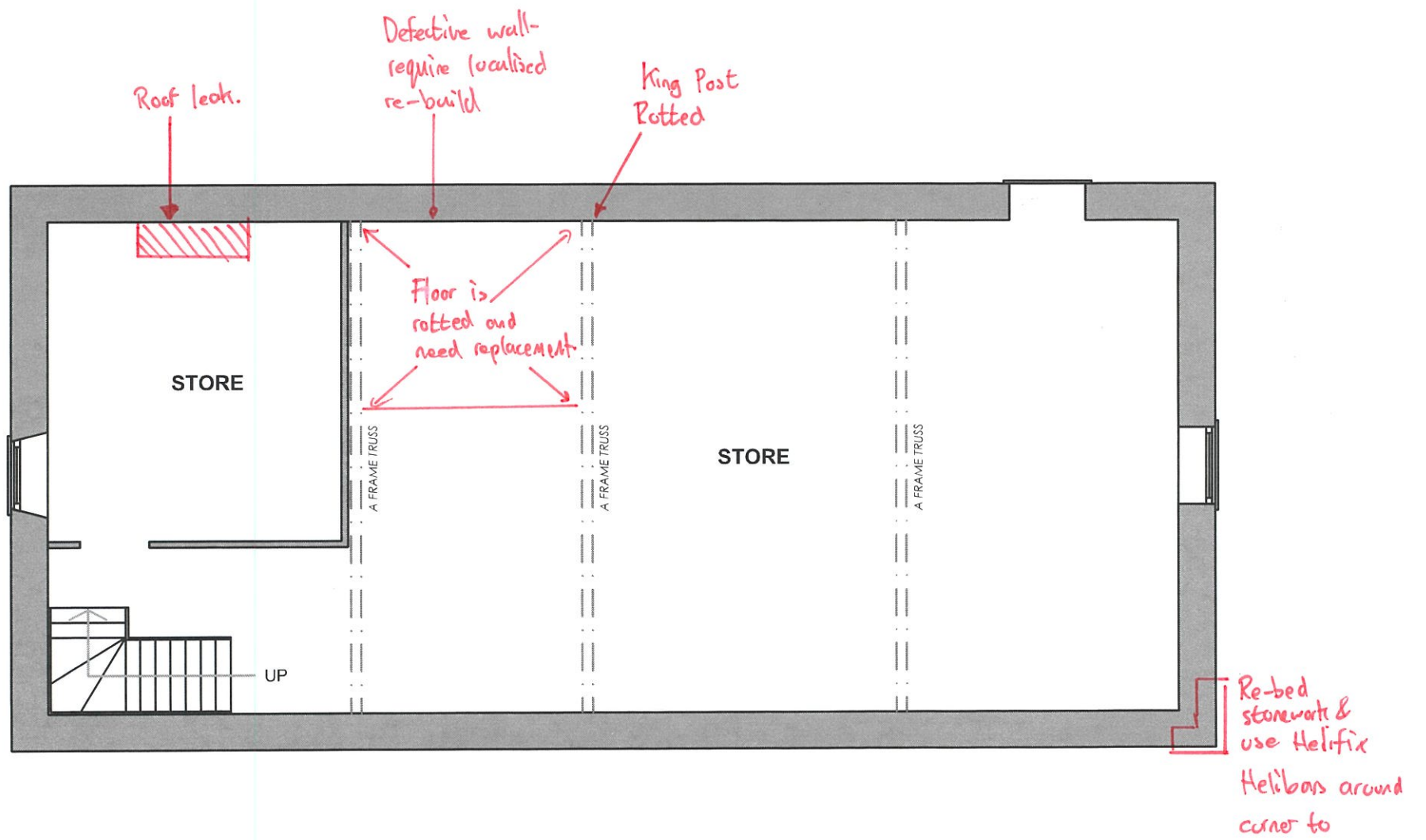
Photograph 10

Appendix B – Structural Sketch

N2815- st01
Defect Diagram.



Existing Ground Floor Plan



Existing First Floor Plan

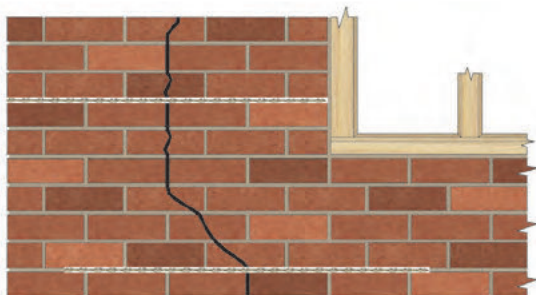
Appendix C – Product Data Sheet

Crack Stitching

A reliable and cost-effective means of repairing and stabilising cracked masonry

Applications

- Rapid and permanent solution to cracked masonry
- Suitable for all forms of masonry structure



Over 100 standard repair specifications are available online, covering all common structural faults.
Relevant Repair Details: RDs CS0 to CS 4



For further Product Information, Case Studies and download Repair Details go to:

www.helifix.co.uk/products/remedial-products/crack-stitching/



Features

- Fully concealed, non-disruptive repair solution
- More reliable than crack injection methods
- HeliBond cementitious grout is injectable and rapidly produces high compressive strength
- HeliBars and HeliBond grout combine to create excellent tensile strength within the masonry
- No additional stresses are introduced during installation
- Masonry remains flexible enough to accommodate normal building movement
- Tensile loads are redistributed
- Reduces likelihood of further cracking nearby
- Avoids costly and disruptive taking down and rebuilding



HeliBar is inserted into HeliBond grout within a cut slot

Installation Procedures

1. HeliBar to be long enough to extend a minimum of 500mm either side of the crack or 500mm beyond the outer cracks if two or more adjacent cracks are being stitched using one rod.
2. Where a crack is less than 500mm from the end of a wall or an opening, the HeliBar is to be continued for at least 200mm around the corner and bonded into the adjoining wall or bent back and fixed into the reveal, avoiding any DPC.
3. For solid masonry in excess of 300mm thick and in a cavity wall where both leaves are cracked, the wall must be crack stitched on both sides.
4. If there is render, this thickness must be added to the depth of slot. Crack stitching must be installed in the masonry and never in the render.
5. Ensure the masonry is well wetted or primed to prevent premature drying of the HeliBond due to rapid de-watering, especially in hot conditions. Ideally additional wetting of the slot should be carried out 1 to 2 minutes prior to injecting the HeliBond grout.
6. Do not use HeliBond when the air temperature is +4 °C and falling or apply over ice. In all instances the slot must be thoroughly damp or primed prior to injection of the HeliBond grout.



1. Rake out or cut slots into the horizontal mortar beds, a minimum of 500mm either side of the crack



4. Using the HeliBar Insertion Tool, push one HeliBar into the grout to obtain good coverage



2. Clean out slots and flush with clean water and thoroughly soak the substrate within the slot



5. Insert a further bead of HeliBond over the exposed HeliBar, finishing 2mm from the face, and 'iron' firmly into the slot using the HeliBar Insertion Tool



3. Using the HeliFix Pointing Gun, inject a bead of HeliBond along the back of the slot



6. Re-point the mortar bed and make good the vertical crack with CrackBond TE3

Slot Depth and Spacing

	Single skin/ Cavity wall	Solid Masonry		
		Up to 102.5mm	102.5mm to 225mm	Over 225mm
Depth of slot	25 – 35mm	25 – 40 mm	25 – 40mm	On both sides
Vertical Spacing	Every 4 – 6 courses, 300 – 450mm			

Technical Specifications

Material:	Austenitic stainless steel Grade 304 (1.4301) or 316 (1.4401)
Diameter:	6mm (or 4.5mm for thin mortar joints)
Tensile strength (6mm HeliBar):	10 kN
0.2% Proof stress (6mm HeliBar):	900 N/mm ²
Length:	To extend 500mm either side of the crack or outer cracks, if more than one
Standard lengths:	1m, 1.5m and 2m – in packs of 10. May be cut to length on site
Height of slot:	Full height of mortar bed or approx. 10mm if cut through the masonry unit
Bonding agent:	HeliBond cementitious grout. 1 x 3ltr HeliBond = 10 linear metres of crack stitching
RECOMMENDED TOOLING	
For cutting slot up to 40mm deep:	Twin-bladed cutter with vacuum attachment or angle grinder or hammer and mortar chisel
For mixing HeliBond grout:	3-jaw-chuck drill with mixing paddle
For injection of HeliBond into slots:	Helifix Pointing Gun CS with mortar nozzle
For smoothing pointing:	Standard finger trowel
For inserting HeliBar:	HeliBar Insertion Tool