

MW Consult Ltd

Civil & Structural Engineering Consultancy

Structural Appraisal

Project: **Structural Appraisal of Barn at
Tirlan Farm, Cilfrew, Neath**

Project Ref: **21/140** **Revision:** **A**

Client: **Catrin Stephens**

Prepared by:	Issue Date:
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A	Former use of building in section 3.1 amended.	05/07/2021

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1.0 Introduction

- 1.1 MW Consult Ltd has been instructed by Catrin Stephens (hereafter referred to as the Client), to undertake a structural inspection of an agricultural building located at Tirlan Farm, Cilfrew, Neath; and to subsequently prepare a written appraisal.
- 1.2 We understand that the Client is submitting a planning application to the local authority for permission to convert the existing stables for use as holiday let accommodation; and that a structural engineers report is required to support the planning application.
- 1.3 The report is also intended to assist the architect in preparing the detailed proposals and to assist the Contractors in pricing and undertaking the proposed works. It is possible that structural calculations and drawings may be needed at the detailed design stage once planning consent has been granted. The Contractor undertaking the works will need to be suitably competent and experienced in undertaking renovations of similar old buildings.
- 1.4 We have received a set of proposed architectural drawings which have been prepared by Prime Architecture; these drawings show the building to largely remain unchanged.
- 1.5 Our appraisal is based on a visual inspection of the building and contains our considered opinion in relation to its current structural condition. We will also outline our recommendations, in broad terms, for any necessary remedial works which are necessary.
- 1.6 We have not undertaken any excavations to examine ground conditions or foundations and have not investigated any parts of the structures which were covered, unexposed or inaccessible at the time of our visit, other than those specifically referred to in the report. We are therefore unable to report that any such parts of the structures are free from defect. Furthermore, we did not inspect any drains, services or finishes; or remove any vegetation, masonry or timbers, but we may make reference to such elements in the report.
- 1.7 Although a number of recommendations are made, this report should not be considered as a detailed schedule of defects to allow any proposed remedial works to be accurately quantified and priced. The Contractor will need to visit site and make their own assessment as to how much material and labour is needed to carry out the required works.
- 1.8 A visual inspection of the property was undertaken at 10.00am on the 29th June 2021.
- 1.9 The premises are at a rural location situated approximately 1.5miles to the north of the village of Cilfrew on the outskirts of Neath.
- 1.10 The following report sections should be read in conjunction with the appendices.
- 1.11 This report has been prepared for the Client and their design and construction teams. It is not intended for, and should not be relied upon, by any third party. No responsibility is accepted to any third party who may choose to rely upon it for their own purposes.

2.0 Executive Summary

- 2.1 The walls are all considered to be free from any major defects and are in reasonably good condition. The walls are considered suitable for retention, subject to minor remedial works.
- 2.2 Although some remedial works will be required but this is common for old stone buildings. These works will involve clearing vegetation and re-pointing mortar joints etc.
- 2.3 New facing stonework is to be added along the front and rear walls and to the top of the northern gable where the walls are currently built purely from blockwork. The new stonework will need to be suitable toothed into and tied to the existing masonry walls.
- 2.4 New window and door openings are to be formed as shown on the architect's drawings. These will require new precast concrete lintels to their heads to support the roof structure.
- 2.5 The concrete floor slab is considered to be suitable for retention.
- 2.6 A replacement roof structure is envisaged to create the desired 'vaulted' effect internally. New rainwater gutters, pipes and below ground drainage will also need to be installed.

3.0 Description of the Property

- 3.1 The building is a traditional single-storey stone building which occupies a rectangular footprint. We understand from the client that the building was originally constructed as four separate miners' cottages for a small mine located behind the property. We further understand that the building has been used for agricultural purposes from the 1930's onwards and was renovated for use as stables approximately 15 years ago.
- 3.2 The barns gable walls are constructed from solid stonework which has an approximate thickness of 550mm. The buildings front and rear walls are constructed from concrete blockwork and have a height of approximately 2.5m up to eaves level.
- 3.3 We understand from the client that the building was converted into stables at least 15 years ago as the building had fallen into a state of disrepair. It was at this time that the block walls were added, along with a replacement roof structure and a new floor slab.
- 3.4 Internally, the barn currently comprises a large main area, with small storage rooms that have been formed from timber stud partitions adjacent to the north-east and south-west corners. There are also a series of livestock pens which are constructed from timber studwork and built to a height of approximately 1.1m.
- 3.5 The roof structure which comprises prefabricated timber trusses has a duo-pitch slope and a central ridge line. The roof is finished with lightweight corrugated sheeting.
- 3.6 The site has an inherent downwards slope from north-west to south-east and as a result the external ground levels around the footprint of the barn vary. The ground profile along the front elevation and southern gable is flat, but raises slightly along the rear elevation towards the northern gable. Along the length of the northern gable the external ground level is in the region of 2.0m higher than the floor level inside the building. As such the northern gable wall is acting as a retaining structure, resisting external ground pressure.
- 3.7 We would estimate that the building is well in excess of 150 years old.

- 3.8 The conversion proposals involve adding new stud partitions internally to create separate rooms, as well as adjusting door and window openings in the external walls. For the purpose of this report the 'front elevation' is that which faces east towards the farmhouse.

4.0 Observations - Externally

- 4.1 The outside faces of the walls are all plumb without any evidence of leaning, bulging or any other significant defects. The original stone walls are considered to be in reasonably good condition for a building of this age and form of construction.
- 4.2 With the exception of the southern end of the front wall and both ends of the rear wall, the front and rear walls are otherwise constructed from 215mm wide concrete blockwork. Piers are present to the rear wall and a larger pillar is situated adjacent to the stable door opening. Furthermore, the section of north-facing gable above eaves level is built from blockwork. The block walls are all considered to be in a good condition and are free from any notable defects. These walls are clearly not part of the original stone-walled barn.
- 4.3 Former window openings are evident to the front and rear walls adjacent to the southern gable and have been filled-in with a mixture of brick and stone many years ago. The original brick reveals and arches are still in place framing out the perimeters of these old openings. The original and infill masonry is considered to be in a reasonable condition.
- 4.4 To the southern gable there is a section of brickwork located towards the centre of the wall measuring roughly 1.2m by 1.2m. Presumably this was constructed to either infill a former opening or to repair a defect. In any event, this brick-built section is free from any significant issues, although there are a few gaps to the sides of the lowest brick course.
- 4.5 There are a few minor patches of vegetation growing on the face of the northern gable as well as to the faces of the stone walls at the barns south-western corner.
- 4.6 There are minor instances of loose/weak mortar joints to the stonework which is by no means uncommon for a former stone barn. There are also minor instances of open joints where the mortar has perished due to weathering over a prolonged period of time. These relatively common issues are very minor and are to be expected with old stone buildings.
- 4.7 To the front elevation, the window and door openings to the blockwork section of the wall have precast concrete lintels to their heads. These lintels are free from any apparent defects. The stable door has a large timber lintel which also appears free from any issues.
- 4.8 The roofs ridge line runs consistent across the length of the barn indicating that the roof structure is not sagging; the roof finishes are considered to be in reasonable condition.
- 4.9 Timber fascia boards are present along the front and rear elevations and these display patches of mould and apparent water ingress as a result of wind-driven rain. The ends of the rafters are also visible, but these generally appear to be dry and free from defects.
- 4.10 Steel uplift restraint straps have been provided along the front and rear walls to restrain the wallplates against wind loads. These straps are fixed to the outside faces of the walls.
- 4.11 Rainwater gutters and downpipes serve the front roof slope, whereas the rear roof slope has a gutter but no pipes. The front elevations rainwater pipes discharge onto the ground.

5.0 Observations - Internally

- 5.1 Similarly to when viewed from the outside, the inside faces of the external walls are plumb and are considered to be in reasonably good condition for the age of the building.
- 5.2 The timber stud walls to the small storage rooms and livestock pens are non-structural.
- 5.3 Where the northern gable wall is acting as a retaining structure there are no signs of any defects and the wall appears to be adequately retaining the external ground pressures. A section of the masonry to this wall is concealed from view by a plastered finish which has begun to break down due to its age. The face of the masonry has patches of mould which appear to be a result of damp ingress from ground-water penetrating through the wall.
- 5.4 Similarly to when viewed from the outside, the door and window lintels along the front elevation were found to be free from any apparent issues.
- 5.5 The ground floor comprises a concrete slab of unknown thickness. The surface of the slab appears relatively flat across the footprint of the barn. While the top of the slab was partially concealed from view in some of the livestock pens there was no evidence of any structural defects such as crack damage to the slab. However, we suspect that there is no insulation and potentially also no damp-proof membrane present beneath the slab.
- 5.6 The roof structure comprises standard prefabricated roof trusses at regular spacings. The trusses are considered to be free from any notable defects, although there are a few minor instances of mould and staining, particularly adjacent to the rear eaves. Timber wallplates are present along the heads of the front and rear walls, although these could have been affected by moisture ingress through the walls. The wallplates have been strapped down the external faces of the blockwork walls using steel uplift restraint straps. However, the gable walls have not been strapped into the roof structure with lateral restraint straps.

6.0 Conclusions & Recommendations

Walls

- 6.1 We are of the opinion that all of the external walls are typically free from major defects and can be retained as part of the proposed renovation, subject to minor remedial works.
- 6.2 The above assessment is subject to the completion of the remedial works which are outlined below. These works are not presented in any particular order and the contractor responsible for undertaking the works will need to assess the order in which they wish to undertake the works and prepare the appropriate risk assessments and method statements.
- 6.3 All patches of vegetation shall be carefully removed with use of a suitable herbicide.
- 6.4 Generally, any mortar to the stone walls which is found to be unduly loose will require its joints to be carefully raked-out and then be re-pointed. Any open joints should also be re-pointed as necessary. For stonework construction, the new mortar will need to be lime-based as this provides a degree of flexibility to accommodate thermal-relating movement. We would envisage that all mortar joints to the building would be completely re-pointed as a matter of course for aesthetic purposes. Alternatively the exact extent of re-pointing works could be left to the discretion of the contractor and agreed directly with the client.
- 6.5 Where minor gaps are present these will need to be infilled using masonry and mortar.

- 6.6 The internal stud partitions are all non-structural and can be easily removed.
- 6.7 Any new internal walls which will be required as part of the proposed conversion works will need to be afforded suitable head restraint to the floor, ceiling and roof structures.
- 6.8 Where new openings are to be formed in the existing walls, suitable new lintels will be required. We would envisage that precast concrete lintels are used in lieu of timberwork.
- 6.9 In order to convert the building for residential use, the means of preventing moisture ingress through the current stonework walls will need to be considered. We suggest that consideration be given to providing new timber stud lining walls built off the floor slab.
- 6.10 As the external ground levels along the part of the rear elevation and the entire length of the northern elevation are higher than the barns internal floor level, we recommend that the external ground levels are lowered to coincide with the internal floor level. This will reduce the likelihood of ground-water from coming in contact with and soaking through the stone walls which could result in damp ingress into the building. It will be necessary to take care when lowering levels to ensure that the existing walls are not undermined.
- 6.11 The architectural proposals involve providing new facing stonework along the concrete blockwork walls for aesthetic purposes. This will need to be suitably toothed/bonded in to the existing stonework at its ends and also be suitably tied to the existing blockwork using stainless steel wall ties installed in accordance with the Building Regulations.

Ground Floor

- 6.12 The ground floor slab is evidently relatively new and is free from any structural defects. We therefore recommend that the slab remains in place to avoid causing disruption to the bases of the masonry walls. However, a suitable damp-proof membrane will need to be installed above the slab as will suitable insulation in order to comply with the Building Regulations. A concrete levelling screed will need to be provided above the insulation.

Roof

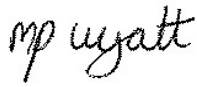
- 6.13 At present, the roof structure is considered to be in an acceptable condition for use as stables. However, some of the timbers will likely have become damp especially at eaves level. The current lightweight roof finishes are proposed to be replaced with traditional slate and a plasterboard ceiling will be needed internally. This will lead to an increase in weights on the roof structure. While prefabricated roof trusses are usually designed for these weights, calculations would ideally be needed to prove the roof structures adequacy
- 6.14 In any event, the client's proposals are to have vaulted ceilings over approximately two thirds of the buildings footprint. This will necessitate the removal of large sections of the roof trusses and replacement with a vaulted 'cut roof'. As such, we recommend that the simplest solution would be to remove the trusses in their entirety. A new roof structure can then be constructed which will likely involve steel ridge beams and loose rafters etc. The exact roof structure will need to be designed by a structural engineer at the detailed design phase, once the outcome of the planning submission has been determined.
- 6.15 Before the replacement roofs can be constructed, the contractor will need to check the wallplates and if necessary replace them with new. The contractor will also need to ensure that the spacing of the uplift restraint straps complies with current regulations. Additionally, the replacement roof structure will need to be strapped to the gable walls.

Rainwater Disposal

- 6.16 The replacement roofs shall have rainwater gutters fixed at eaves levels with rainwater pipes set at appropriate positions. The rainwater pipes shall discharge to gulleys and a below ground drainage system. Rainwater pipes should not be allowed to discharge at the base of the walls as this will risk softening the subsoils which could lead to settlement or subsidence of the walls if left to continue for a prolonged period of time.
- 6.17 The below ground drainage system should be designed to carry rainwater away from the building and discharge of it into a soakaway or an alternative suitable point of discharge.

We trust that our report is to your understanding and is fit for your purposes. However, should you have any queries and/or wish to discuss matters further please do not hesitate to contact us.

Yours sincerely,



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Appendix – Photographs



Photograph 1 – Front elevation, viewed from the south-east corner.



Photograph 2 – Front elevation, viewed from the north-east corner.



Photograph 3 – Rear elevation, viewed from the south-west corner.



Photograph 4 – South-facing gable elevation.



Photograph 5 – North-facing gable elevation.



Photograph 6 – Internal view of building, facing northwards.