

Orbis Consulting Engineers

Proposed Barn Conversion
Woolley Cross
Bude EX23 9PS

Structural Inspection Report

for Mr and Mrs Olde

1200-R01A
October 2020

Orbis Consulting Engineers

19 Cross Street
Barnstaple
EX31 1BD

01271 533050

Document Status

<i>Revision</i>	<i>Description</i>	<i>Date</i>
-	First issue	October 2020
A	Report updated for revised proposal to retain existing wall cladding	April 2021

Contents

1	Introduction and Brief.....	1
2	Site Inspection.....	2
3	Development Proposals.....	4
4	Discussion and Conclusions.....	5
5	Overall Conclusions.....	6

Appendix A

Photographs

Appendix B

Architect's drawing no. 0014-P002B

1 Introduction and Brief

- 1.1 Orbis Consulting Engineers Limited were appointed by Mr and Mrs Olde to carry out a structural inspection of a barn at Woolley Cross, Bude EX23 9PS. The barn is about 50m south of the property called Falcon Lodge. The purpose of the inspection and report is to determine if the barn is structurally suitable for conversion to residential accommodation in support of a Class Q Permitted Development application. The inspection and report therefore only consider the overall structural condition and general suitability for conversion.
- 1.2 This report has been prepared for Mr and Mrs Olde and their advisers in connection with a Class Q Permitted Development application for the proposed barn conversion. Orbis accept no liability to any other party for the whole or part of this document for any other purpose.
- 1.3 The inspection was of the structural elements only, and excludes comments on such matters as timber decay, damp proofing etc.

2 Site Inspection

Introduction

- 2.1 The inspection was carried out on 10 August 2020 by Martin Watts CEng MIStructE. The weather during the inspection was constant rain.
- 2.2 The inspection was limited to those areas that could be viewed from floor/ground level within the property boundary. No invasive investigations were undertaken.
- 2.3 The barn is a detached single storey building and is currently used for agricultural storage.
- 2.4 The building measures about 18m long (east-west) by 11m wide (north-south) overall. The front of the building is partially open and faces north. The roof is mono-pitch and falls towards the rear (south). The height at the front is about 4.1m to 4.4m depending on the varying floor/ground level, and the height at the rear is about 3.1m. The roof pitch is estimated as about 5 degrees.
- 2.5 Ground levels around the barn rise slightly towards the south and east, approximately matching the floor levels.
- 2.6 It is understood from the client that the barn is about 30 years old.
- 2.7 Photographs of the barn are included in Appendix A.

Building Inspection

- 2.8 The main structure is a steel frame, comprising five portal frames at about 4.5m to 4.6m centres. There are intermediate posts below the two gable portal frames.
- 2.9 The three clear span portal frames are formed from 203x133 UB column and rafter sections, fixed together using haunched bolted connections.
- 2.10 The two gable portal frames are 203x133 UB end columns, with 152x89 UB rafters and intermediate gable posts.
- 2.11 There is no diagonal roof or wall bracing.
- 2.12 All of the steel columns appeared to be plumb or close to plumb in both planes.
- 2.13 All of the steelwork is hot dip galvanized, and no significant corrosion of the steel frame was noted during the inspection.
- 2.14 There are timber purlins spanning between the portal frames. The purlins are estimated as about 62mm wide x 170mm high, at around 1.3m to 1.4m centres. The purlins support asbestos cement or fibre cement sinusoidal profile roof sheeting above.
- 2.15 There are timber cladding rails spanning between most of the columns. The cladding rails are about 170mm wide x 62mm high, typically at around 1.3m centres. The cladding rails support steel trapezoidal profile external sheeting. The two west bays are open at the front of the building therefore there are no cladding rails at this part.
- 2.16 The majority of the purlins and cladding rails are visibly deflected.
- 2.17 There are part-height concrete walls along the full length of the west and south (rear) elevations. The concrete walls are about 200mm thick, cast insitu between the columns. The walls extend up to about 1.4m to 1.8m height depending on the sloping floor level. The cladding starts at the top of the wall on the applicable elevations.
- 2.18 The concrete walls are cast on the ground, which appears to be approximately at the same level internally and externally. All of the concrete walls appear tight to the steel columns with no significant deflection or movement noted.
- 2.19 There is concrete around the columns at ground level. It is not known if this concrete is part of pad foundations supporting the columns, or concrete surround above foundation level.
- 2.20 The floor is unfinished earth, and slopes up towards the south and east. The lowest part is at the open part on the front elevation.
- 2.21 The roof is locally leaking in some areas, and it is possible that there is localised rotting of the purlins at these locations.

3 Development Proposals

- 3.1 The proposed development is conversion of the barn to a dwelling, as shown on the Architect's drawing in Appendix B.
- 3.2 The conversion works relevant to the structure are summarised as follows:
- i. Add reinforced concrete ground bearing floor slab.
 - ii. Replace roof sheeting.
 - iii. Add door and/or window openings on all elevations.
 - iv. Add timber studwork liner wall to all external walls, with the front elevation wall set back to expose the steel columns.
 - v. Add timber studwork internal walls.
 - vi. Add ceilings throughout. Ceiling at high level in the main open plan living space.

4 Discussion and Conclusions

- 4.1 The building is generally in good structural condition for its age and type.
- 4.2 The steel frame and concrete walls do not show any signs of significant movement or distress.
- 4.3 The purlins and cladding rails are over-stressed and need to be replaced or strengthened, taking into account any additional loads for the replacement roof build-up, ceiling and wall build-up where applicable.
- 4.4 Overall stability is currently achieved by a combination of the portal frames, diaphragm action of the roof and wall cladding, and the concrete walls.
- 4.5 Overall stability will be reduced by the provision of new window and door openings, and the set back of the front wall. In order to compensate for this and further enhance stability the timber studwork liner walls and all internal walls should be plywood sheathed and tied to the steel frame horizontally and vertically. The liner walls and internal walls should be full height. Ceilings should incorporate plywood sheathing or bracing to provide diaphragm action.
- 4.6 Where new window openings are cut into the existing concrete walls, the openings should be limited to the size of the windows only, not full height.
- 4.7 The proposed floor slab should be at a relatively high level to avoid undermining the existing concrete walls. The slab should be designed to support the liner walls and internal walls, carrying loads transferred from the steel frame.
- 4.8 The existing foundation details are not known. There are currently no signs of foundation movement therefore the foundations can be considered adequate for the conversion provided that the replacement roofing system does not significantly exceed the weight of the existing sheeting which is estimated as about 16kg/m².
- 4.9 Detailed design of the conversion structural works should be undertaken by a Structural Engineer.

5 Overall Conclusions

- 5.1 The building is structurally suitable for conversion to residential accommodation.
- 5.2 The associated structural works likely to be required as part of the conversion are discussed in Section 4.

Appendix A

Photographs



Front (north) elevation



End (west) elevation



Rear (south) elevation



End (east) elevation



Internal view looking west



Internal view looking east



External wall (inside of north elevation)



External wall (inside of south elevation). Concrete wall at low level.



Typical portal rafter to column connection.



Typical purlin to rafter connection.



Typical cladding rail to column connection.



Typical interface between concrete wall and column. Concrete cast into column.



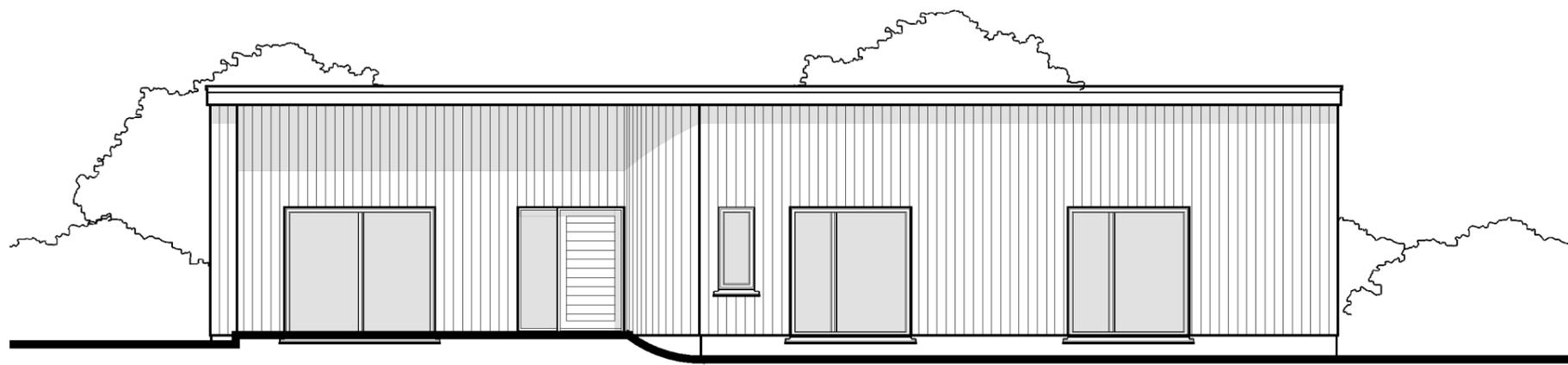
Interface between concrete wall and south west corner column.



Concrete around column at ground level.

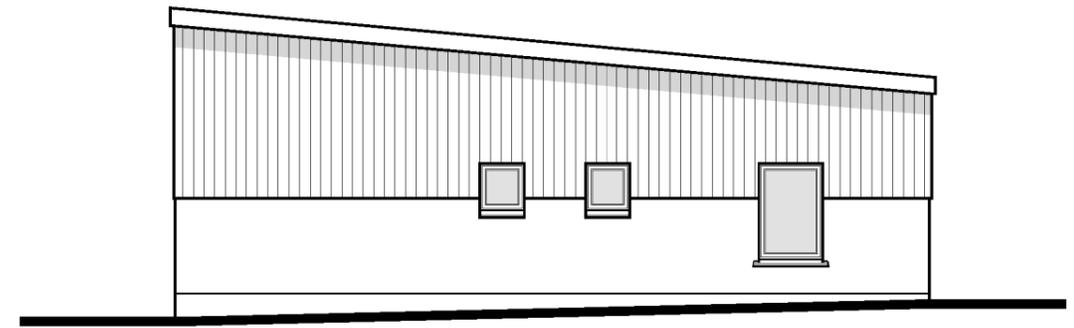
Appendix B

Architect's drawing no. 0014-P002B



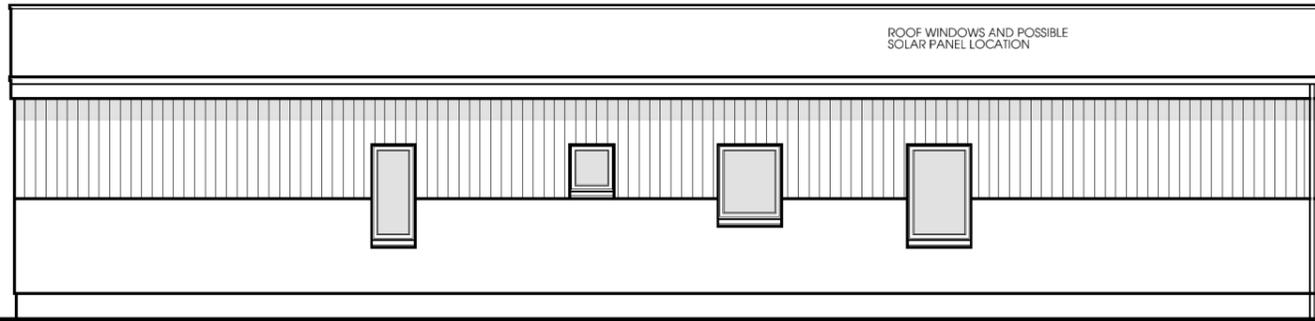
NORTH ELEVATION

0 1m



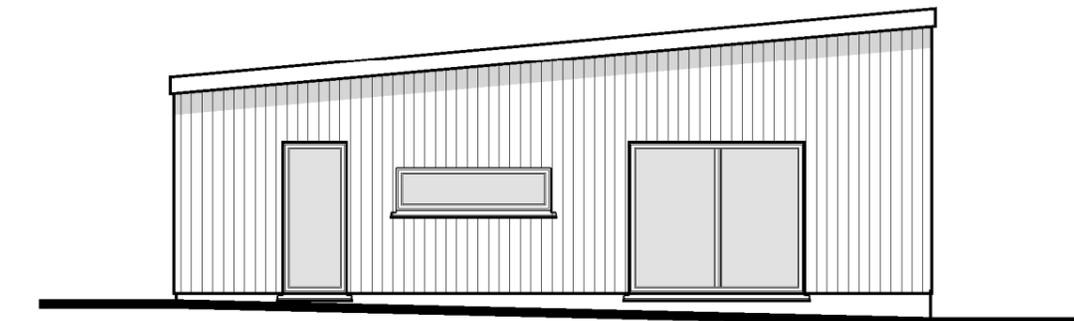
WEST ELEVATION

0 1m



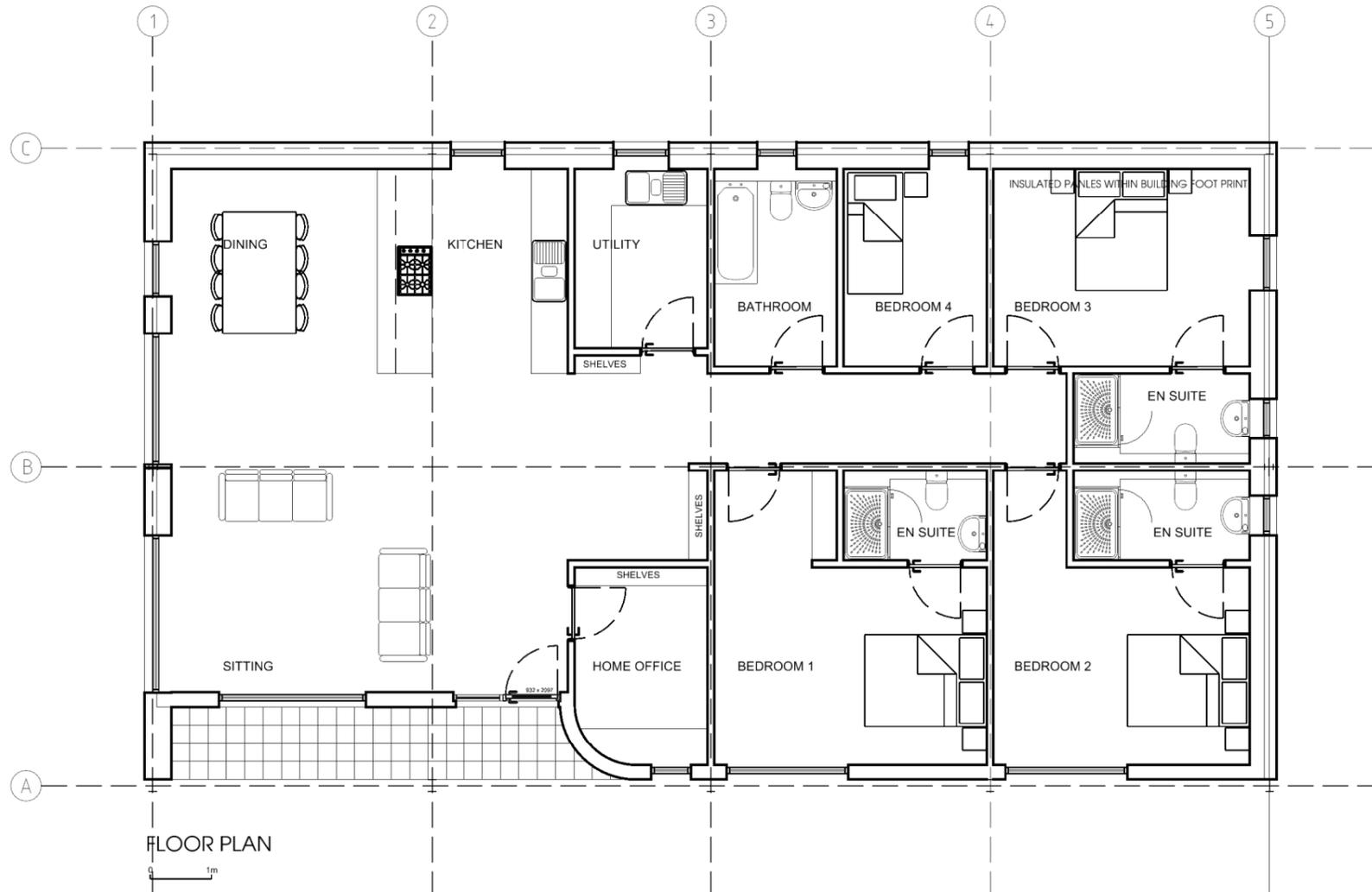
SOUTH ELEVATION

0 1m



EAST ELEVATION

0 1m



FLOOR PLAN

0 1m

ROOF - LIGHT GREY PROFILED SHEETING
 EXISTING CLADDING RETAINED
 LIGHT GREY DOOR AND WINDOW FRAMES

1 FLOOR PLAN AND ELEVATIONS		
2 PROPOSED CONVERSION OF BARN WOOLLEY CROSS MORWENSTOW		
3	Mr and Mrs Olde	
4	planning	
5	1:100	
6	sept 2020	
7	MSP	0014-P-002 B