STRUCTURAL SURVEY – BARN AT TIPPETS FARM

Structural survey of the Barn at Tippets Shop and recommendations for the conversion into a residential dwelling

JOB NO. SE23-119

20th June 2023

ENTOS CONSULTING
CIVIL AND STRUCTURAL ENGINEERS

Structural survey – Barn at Tippetts Farm

Prepared By:

Alex Laird - Director
Civil and Structural Engineer

CEng MICE AIStructE MIPENZ M.ICOMOS
IntPE(NZ) MEng (Hons)

Entos Consulting Ltd
Coast Road
Porthtowan
Cornwall
TR4 8AJ

Date: 20.06.23
Reference: SE23-119
Status: Final

Contents

1 Executive Summary

A structural inspection of Tippetts barn has been carried out by Entos Consulting Ltd and structural report compiled outlining the main findings and recommendations for the conversion of the barn to a residential dwelling. Tippett's barn was an agricultural barn that is now unoccupied.

Based on the information contained in this report, and our inspection, we recommend that the existing barns can be converted into a residential dwelling without much structural intervention.

2 Introduction

Entos Consulting Ltd (Entos) has been engaged by Red Planning to carry out a structural inspection of the barn at Tippetts Farm. The purpose of the inspection is to determine the condition of the existing structure and provide an overview for the suitability of the building for conversion to a residential dwelling.

A structural inspection of the barn was carried out by Entos on the 5th of June 2023. The findings and recommendations from the inspection are described below.

3 Background

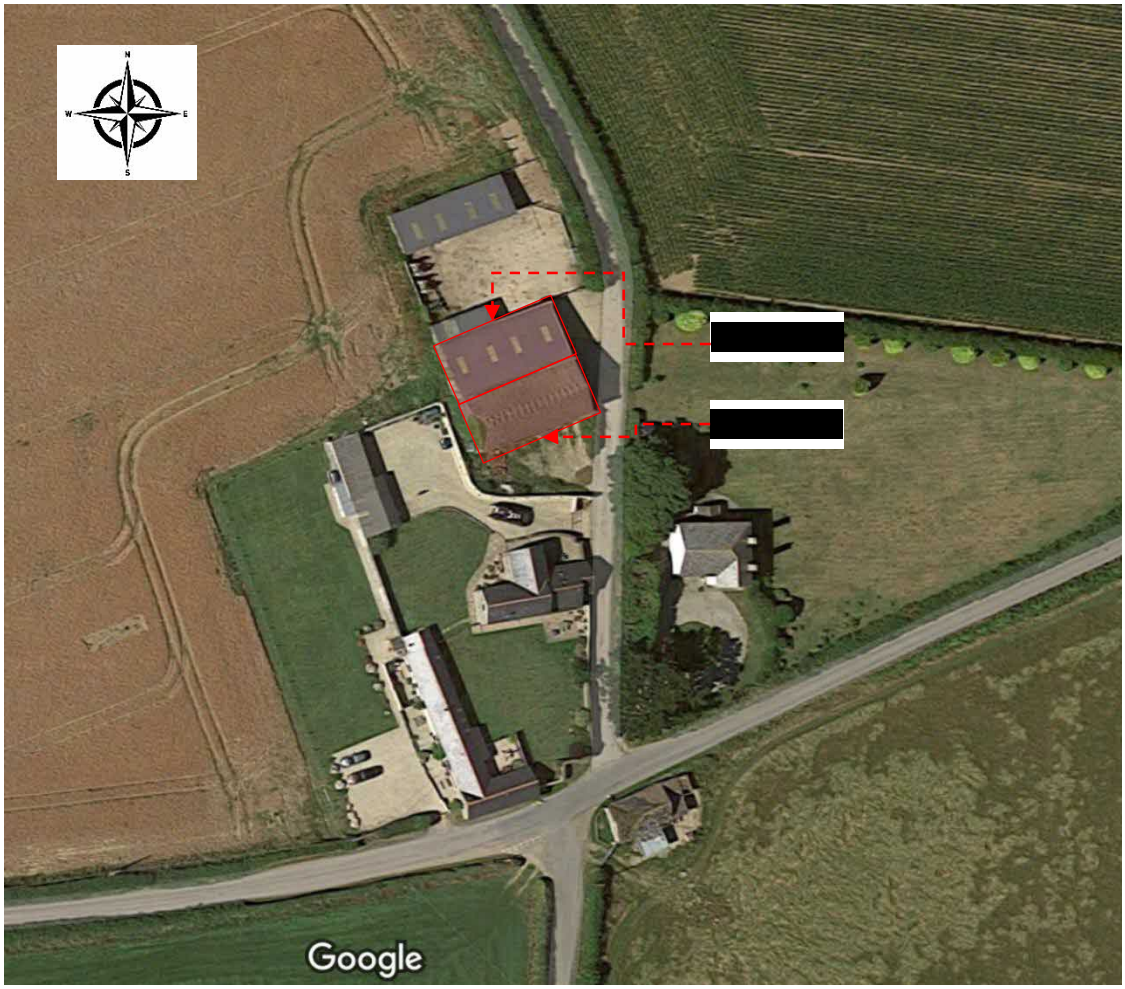
The barn consists of two areas labelled Barn 1 and Barn 2 shown *Figure 1*.

3.1 Barn 1 is constructed from timber frames constructed from triple 300x50 timber posts supporting double 300x50 rafters supporting a lightweight corrugate roof. The timber columns are braced with diagonal timber members. One end of the monopitch timber frame is supported on the concrete portal frame of the adjacent barn. Barn 1 was added onto Barn 2 at a later date.

3.2 Barn 2 is constructed from precast concrete portal frames; the barn was constructed circa 1970 and was supplied by the manufacture Atcost. These types of barns were supplied by Atcost Pre-cast Structures throughout the country in the 1950's to 70's.

3.3 The concrete portal frames are evenly spaced throughout the barn. There are 5 portal frames supporting precast concrete cladding rails, purlins, and ridge beam.

3.4 Currently the buildings are unoccupied but previously had been used agriculturally.



[redacted]

4 Survey

A visual structural survey was carried out by Entos. No intrusive opening up was undertaken. Our survey was based on the following information:

Visual structural inspection.
The original structural and architectural drawings were not located; however, some reference material was used to assess the capacity of the Atcost barn.
No original design calculations or specifications have been provided to assist the assessment of the existing structures.
Some basic 2D analysis has been carried out to determine the structural capacity of the barn.

5 Findings

We have summarised our main findings below, these should be read in conjunction with the attached photo plate, Appendix A.

5.1 Findings Barn 1:

5.1.1 The barn has a series of timber frames supporting the main roof structure. A 2D analytical analysis of the timber frame has shown that the existing roof structure has capacity to support a lightweight roof and associated imposed loads as defined in the current building code of practice.

5.1.2 Bracing has been placed laterally and longitudinally throughout the barn. The braces are providing support to the main roof rafters and lateral restraint to the main timber frames.

5.1.3 The existing timber walls are formed from timber cladding rails and infill panelling. The cladding is agricultural and not load bearing.

5.1.4 The existing ground bearing slab has been capable of supporting agricultural loading and shows little sign of distress.

5.1.5 The main timber frames are plum and show no sign of over deflection or stress from excessive loading.

5.2 Findings Barn 2:

5.2.1 The open plan barn consists of 5 precast concrete frames. The frames provide both the lateral and gravitational load resisting system.

5.2.2 The Gable ends are constructed from block walls up to the mid height of the barn. The blockwork is in good condition.

5.2.3 There is a stone wall located between the two walls which is in reasonable condition however, unlikely to have a concrete strip foundation.

5.2.4 The main concrete portal frames were in good condition. A couple of the cladding rail and purlins have some minor spalling. The main columns are cast into the ground in concrete pad foundations, there was no signs of distress on the concrete portal frames.

5.2.5 There was a small opening in the roof believed to be caused by machinery hitting the roof. There is also some damage to one of the clad walls again believe to be caused by machinery hitting the wall. The damage noted was non-structural.

6 Recommendations

Based on the findings listed above we have made several recommendations in relation to the conversion of the existing barns to a residential dwelling:

6.1 Barn 1:

6.1.1 The existing timber frames will be suitable to support a lightweight roof, provided the main bracing remains in place.

6.1.2 The existing shell of the structure is suitable to be integrated with a residential dwelling, the existing cladding could remain insitu although, architecturally may not be appropriate.

6.1.3 The existing ground bearing slab has been used to support agricultural loadings therefore, should be capable of supporting residential loading.

6.2 Barn 2:

6.2.1 The existing precast concrete frames, purlins and cladding rails are in good condition. The main frames were plum and appeared not to be overstressed.

6.2.2 The barn is open plan and provides scope for various uses, including conversion into a residential dwelling. There would not be any substantial loss of original structural elements during conversion.

6.2.3 At the time of construction Atcost frames were designed to resist loads of at least 80% of the stated loads, in the codes of practice at the time BS6399 (0.75kN/m^2). Our current day codes of practice require the frames to resist (0.6kN/m^2) which equates to 80% of 0.75kN/m^2. Therefore, the frames will be suitable to support the loads for a residential conversion.

6.2.4 Based on our survey and analysis the existing structure has the capacity to accommodate gravity, lateral and imposed loads required for a residential conversion without the need for structural strengthening.

6.2.5 Whilst reference to contamination, including the identification and survey of asbestos based materials, is outside the scope of our reports, we must highlight that the use of asbestos materials was common practice during the original construction of these types of building. This can include asbestos content within roof sheeting, wall cladding, eaves, and fascia boarding, as well as within any insulations and foam based intumescent sprays. We therefore recommend that further advice is sought from specialists in the fields of asbestos survey, protection and removal during any design and planning stages, to guarantee peace of mind from the potential hazards when dealing with materials of this kind.

7 Summary

The barns are in reasonable condition for their age and type of construction. Barn 1 the lean-to barn will need some additional structural works, but the shell is suitable for residential conversion. Barn 2, the concrete framed Atcost barn lends itself to a residential conversion with little to non-structural intervention.

8 Limitations

Our report is based on a visual inspection only. Some non-structural damage is mentioned but this is not intended to be a comprehensive list of non-structural items. Calculations have been limited to simple 2D analysis. No other analyses have been performed. This report is prepared for Red Planning to assist with a planning application for the conversion of the barn into a residential dwelling. It is not intended for any other party or purpose.

8.1 Appendix A
Photo plate

Reference	Photo
Photo 1 - North Elevation Barn 1	

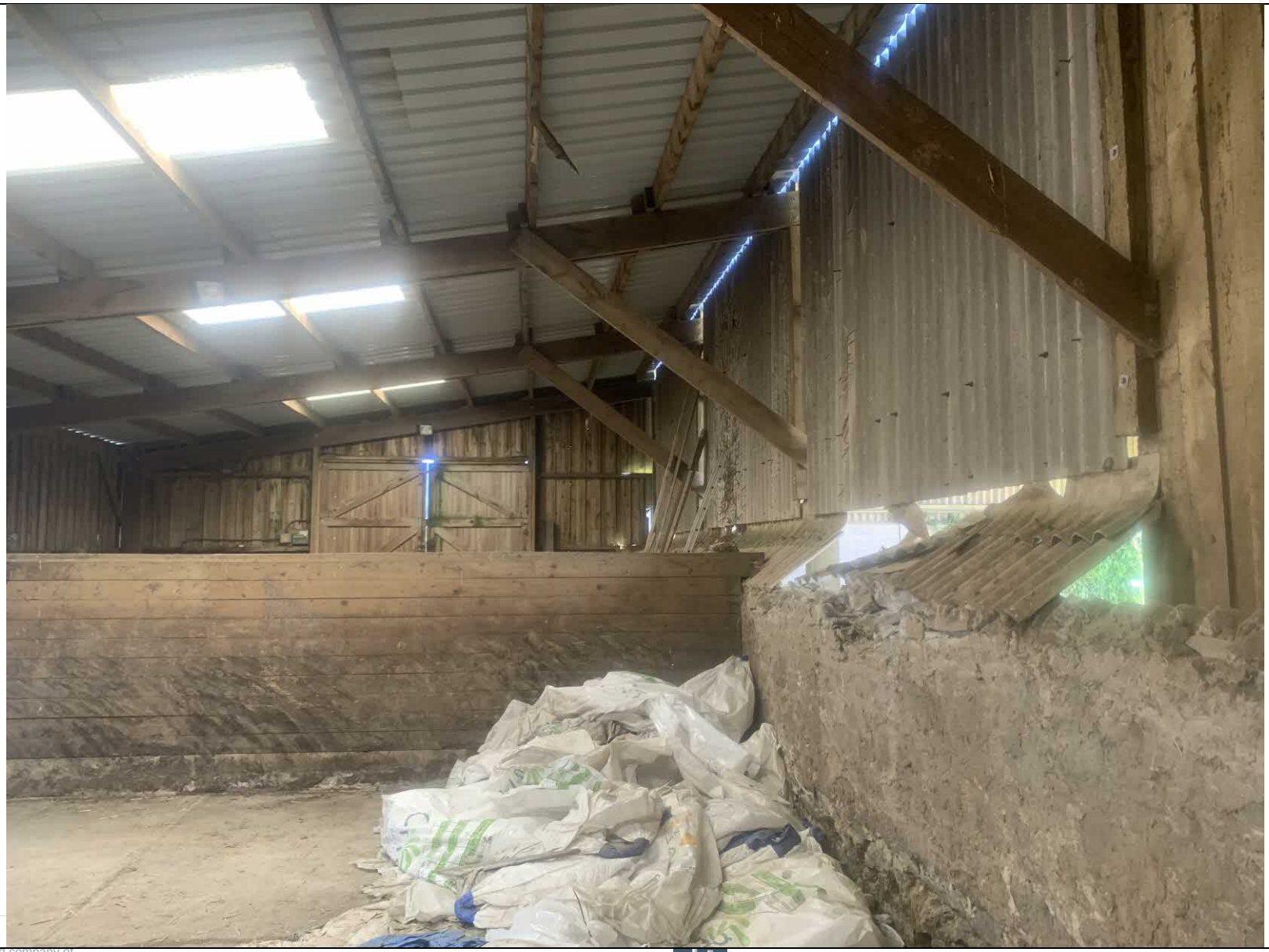
Photo 2 – Internal bracing barn 1	

Photo 3 – Stone dividing wall	

Photo 4 – South elevation Barn 2	

Photo 5 – South elevation Barn 2	

Photo 6 – Damage to cladding Barn 1/2	

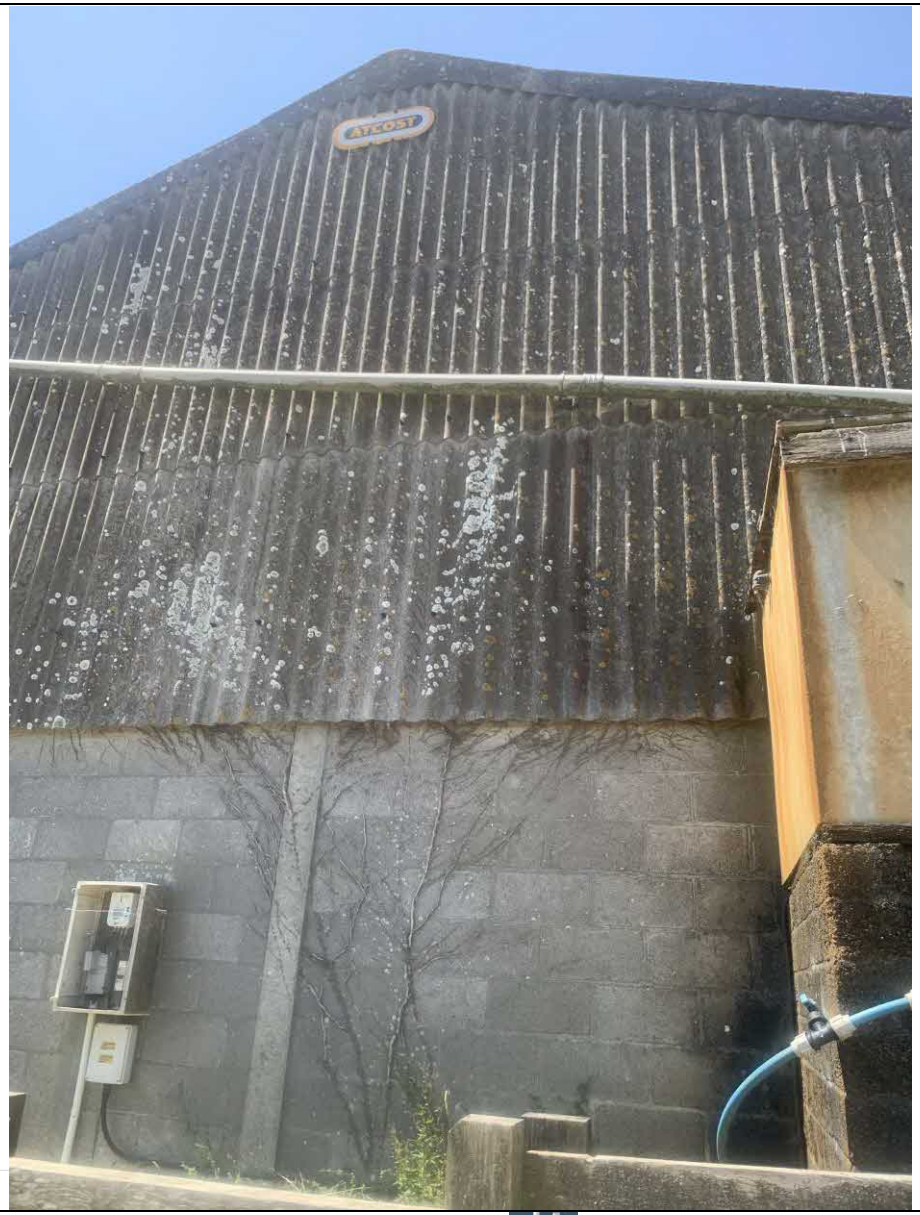
Photo 7 – Atcost Barn 2		

Photo 8 – Spalling concrete on cladding rails