WE. Consulting Engineers
Black Barn
Fen Rd
Guyhirn
Wisbech
Cambs
PE13 4AA

Structural Survey Report

on
Units 1, 2 & 3 adjacent. Carlton Lodge

at
Carlton Lodge
Oxcroft Bank
Shepeau Stow

for
Mr. Ford

Job reference: WECE/23/247

Issue date: Apr 2023

1. Client

Mr. Ford
Carlton Lodge
Oxcroft Bank
Shepeau Stow

2. Brief and Introduction

2.1. Instructions were received from Mr. Ford to undertake a structural survey of Units 1, 2 and 3 adjacent Carlton Lodge, Oxcroft Bank, Shepeau Stow.

2.2. The purpose of the survey was to assess the structural condition of the existing group of agricultural units, thought to of been constructed between 1998 and 2001, with the intention of conversion to single storey residential dwellings. The units were advised as being previously used as a warehouse (Units 1 & 2) and cold store (Units 3).

2.3. The survey was undertaken on 16th March 2023 with Bradley Whyatt from WE. Consulting Engineers in attendance.

2.4. The survey was a visual inspection only. Access was typically good throughout, although we comment that some obstructions were present in the cold store which prevented access to some areas. Intrusive investigations were not undertaken.

2.5. We did not have access to high level roof members.

2.6. No monitoring or testing of materials was conducted.

2.7. The proposed conversions form part of a complex of agricultural buildings at Carlton Lodge. The units considered in this report are situated adjacent and to the northeast of Carlton Lodge. Unit 1 is adjoined to existing glass greenhouses situated southeast of the units.

2.8. In accordance with our standard practice, this report is for the sole use of the parties to whom it is addressed, and no responsibility is accepted to any third party for the whole or any parts of its contents.

2.9. The recommendations in this report are based solely on the findings of the site visit. We highlight that, other conditions may occur elsewhere on the site of which we have no knowledge and therefore cannot accept any responsibility.

3. Observations

3.1. Each unit is rectangular on plan. Unit 1 is approximately 9m x 18m, Unit 2 connected to the northwest side is approximately 12m x 19m, and Unit 3 perpendicular to the other two units and with access through an opening at the rear of Unit 2 and is approximately 9m x 17m. Eaves level for all buildings is around 3.5m above floor level. We comment that there is an internal cold store, kitchenette, and toilet around 5m x 12m up to eaves located within and to the rear of Unit 1 and partially into Unit 2 that prevented observations to the building and floor structure in that area.

3.2. Units 1 and 2 are similar. They comprise a profiled cladding supported on purlins and side rails over 4No. steel portal frames. From the main entrance on the southwest gable end of Unit 1, the first two bays are similarly around 6m for both units. There is variation in the last bays with Unit 1 being around 6m while Unit 2 was surveyed at around 7m. The roof pitch for both units was estimated to be between 15 and 20 degrees.

3.3. Unit 3 was determined to be constructed differently. 75mm thick cold store panels have been used to create the building envelope and roof finish. Along the long sides of the building the roof panels are supported directly by the side wall panels. We identified two lines of hot rolled steel purlins that have been provided at around 3m centres to support the roof cladding panels across the middle of each bay. The purlins take support from two simple steel frames located at third points of the unit; and additionally, by two hot rolled steel columns located under the purlin members at each end of the unit. The roof pitch was noted as only 1 or 2 degrees.

3.4. The Units are all interlinked. Access openings to the group of buildings are located on the front southwest facing gable elevation of Unit 1 consisting of a central, approximately 2.8m wide x 2.8m high, sliding door; a similar sized sliding door to the right hand side of the northwest end elevation of Unit 3; and a personal door into Unit 2 located in the gap between the rear elevation of Unit 1 and the side elevation of Unit 3. We note that the southeast elevation of Unit 1 has no side cladding below eaves level adjacent the glass green houses. Access to the green houses from Unit 1 is by means of a 2.8m high x2.8m wide glass sliding door set to one side of the middle bay.

3.5. Light-end gable frames have not been utilised in the construction of the portal frame buildings of Units 1 and 2. Gable and door posts provide lateral support to the gable end cladding side rails.

3.6. We can confirm the steel portal frames in Units 1 and 2 comprised of 178x102B rafters with haunches at the eaves and full depth end plates at the apex; and 178x102UB columns. Members appear to be galvanised. At the time of issuing this report no calculations have been undertaken for the steel frame members.

3.7. In Unit 3 the steel members were measured as follows: 100x50PFC purlin sections, 203x133UB beams supported on 152x89UB columns, and 90x90SHS purlin end columns. Again, appearing to be galvanised. Also, no calculations have been undertaken on these members as part of this report.

3.8. In-plane stability of Units 1 and 2 appears to be provided by the steel frames with moment resisting joints at the eaves and probably, to some degree, at the apex. The roof is braced on plan at opposite ends of each unit to provide lateral stability at roof level; we did not note any vertical bracing so we assume the external wall cladding system must be providing diaphragm action to provide out-of-plane stability to the columns.

3.9. Stability of Unit 3, both in and out-of-plane will be provided by diaphragm action of the cold store panels; and possibly (although not confirmed) by any positive connections to Unit 2.

3.10. The roof cladding to Units 1 and 2 appeared to be a historic fibre cement sheet (such as Profile 6, approximate weight 0.17kN/m^2) supported on cold rolled steel sections at a maximum of around 1.375m centres.

3.11. The wall cladding to Units 1 and 2 appeared to be a single skin metal sheet (such as TKS1000-4, approximate weight 0.07kN/m^2) supported on cold rolled steel sections at a maximum of around 1.800m centres. We noted that some of the cold rolled anti-sag system members were missing.

3.12. In Units 1 and 2 there was no visible distortion to rafter members, columns were generally plumb and aligned within normal construction tolerances and the ridge line when viewed from the ground was consistent. In general, there were no signs of distress in the steel frame members and no visible indications of settlement at any column.

3.13. In Unit 3, whilst everything generally appeared in serviceable condition, we comment that some of the columns supporting the roof steelwork appeared to be out-of-plumb. Without specialist measuring equipment it was not possible to determine if this was due to local member distortion or overall misalignment of the whole section. In addition, the two beam members across the building may be displaying signs of excessive vertical deflection, although this was difficult to confirm without access.

3.14. The existing concrete floor slabs, thickness and reinforcement details not confirmed, have been constructed with joints located typically down the middle of each unit. And in the case of Units 1 and 2, additionally adjacent (typically offset 150-300mm) and parallel with the flanges of the portal frame and gable columns.

3.15. The existing concrete floor slabs in Units 1 and 3, over areas that were clear of obstructions, appeared in good structural condition with no visible evidence of irregular cracking, spalling of concrete or exposure of reinforcement. We comment that the floor slab in Unit 3 was predominantly obscured by stored compactly stacked plastic crates on pallets. In Unit 1 however, there would appear to be several irregular surface cracks throughout although we noted without obvious signs of differential settlement.

3.16. Externally the units are surrounded by a field on the northeast elevation and the previously mentioned glass greenhouses on the southeast elevation. Whilst on the northwest and southwest elevations there are external concrete slabs. We noted that the existing building downpipes currently discharge directly onto the external slabs.

4. Conclusions and Recommendations

4.1 The structural condition of the existing units is generally good considering their intended agricultural purpose and age with little or no visible defects in the primary load bearing members.

4.2. With allusion to the Architectural drawings by Swann Edwards ref: SE-1910-1000 and 1100, we comment that the proposed single storey layouts could be constructed using light-weight timber frame methods to create the desired layouts without subjecting the existing structures envelope to additional loadings.

4.3 We comment that if the proposed new walls and ceilings are appropriately tied in laterally with the existing structural members, this will only enhance the over stability of the existing structures through diaphragm action.

4.4 Proposed timber frame load bearing walls could be founded on the existing structural slabs, although some localised repairs may be required in Unit 1. Or alternatively, perhaps a better solution as there is likely to be a requirement to provide insulation at ground level, the existing structural slabs could be considered as part of a sub-base to be overlain with high compressive strength load bearing insulation overlain with a new reinforced concrete structural slab (that will act as a raft and keep foundation pressures low) and nominal screed finish. Subject to levels being suitable.

4.5 We previously commented (3.15) that there is irregular cracking in the existing floor slab of Unit 1. On close inspection the surface edges of the cracks were generally considered to be aligned along their length. We suggest that the cracks are likely to be the result of thermal movement as opposed to settlement or differential settlement. We comment that this slab is closest to the glazing and as such may be subject to a larger variation in temperatures to the other slabs. On this basis and without intrusive investigations, we advise the proposal discussed above in 4.4 should still be suitable for Unit 1.

4.6 Should approval for conversion be granted, we advise that the column members of Unit 3 are checked for vertical alignment and ensured they are within normal construction tolerances of vertical, 6mm over height. Amend as required. We comment that we consider that the deflection of the beam members in Unit 3 is not such an issue in this case as the existing finishes are not brittle and the proposed ceiling can be supported independent of the existing beams. In Units 1 and 2, secondary structural components, the missing side rail anti-sag system members should be installed.

4.7. The existing units' downpipes that are currently discharging onto the external structural slab will need to be connected to a suitable drainage system. We expect that any new drainage system will be designed and installed to current Build Regulations.

4.8. We advise that the detailed structural design of this conversion project should be undertaken by suitably qualified persons. Further investigations may be required to confirm some parts of the existing units' structural components, to be confirmed by appointed persons.

4.9. Overall, subject to suitable structural design (to include load assessment), we consider that the existing building structure of Units 1, 2 and 3 is suitable for the proposed single storey domestic conversion.

Report prepared by

B. Whyatt

B. Whyatt BSc (Hons)
for and on behalf of WE. Consulting Engineers

Appendix A: Google Maps

WE.
CONSULTING
ENGINEERS

01945 479 689 mail@we-engineer.co.uk WE. Consulting Engineers, Black Barn, Fen Rd Guyhirn, Wisbech, Cambs, PE13 4AA

Registered in England: 13095460



Image 1. Building location plan

WE. CONSULTING ENGINEERS
01945 479 689
mail@we-engineer.co.uk
WE. Consulting Engineers, Black Barn, Fen Rd
Guyhirn, Wisbech, Cambs, PE13 4AA
Registered in England: 13095460

Appendix B: Site Photos

WE.
CONSULTING
ENGINEERS

01945 479 689 mail@we-engineer.co.uk WE. Consulting Engineers, Black Barn, Fen Rd Guyhirn, Wisbech, Cambs, PE13 4AA

Registered in England: 13095460



Photo 1. Units 1 and 2 Front Gable (Southwest) Elevation



Photo 2. Unit 2 Side (Northwest) Elevation

WE. CONSULTING ENGINEERS

01945 479 689 mail@we-engineer.co.uk WE. Consulting Engineers, Black Barn, Fen Rd Guyhirn, Wisbech, Cambs, PE13 4AA

Registered in England: 13095460



Photo 3. Unit 3 End (Northwest) Elevation



Photo 4. Unit 1 Gable Elevation and the Unit 3 Corner (Northeast) Elevation



Photo 5. Unit 1 Steel Portal Frame – Unit 2 similar



Photo 6. Unit 1 Gable End Portal Frame – Unit 2 similar

WE. CONSULTING ENGINEERS

01945 479 689 mail@we-engineer.co.uk WE. Consulting Engineers, Black Barn, Fen Rd Guyhirn, Wisbech, Cambs, PE13 4AA

Registered in England: 13095460



Photo 7. Unit 3 Steel Frame and Concrete Floor Slab



Photo 8. Unoit 1 Concrete Floor Slab with Irregular Cracks

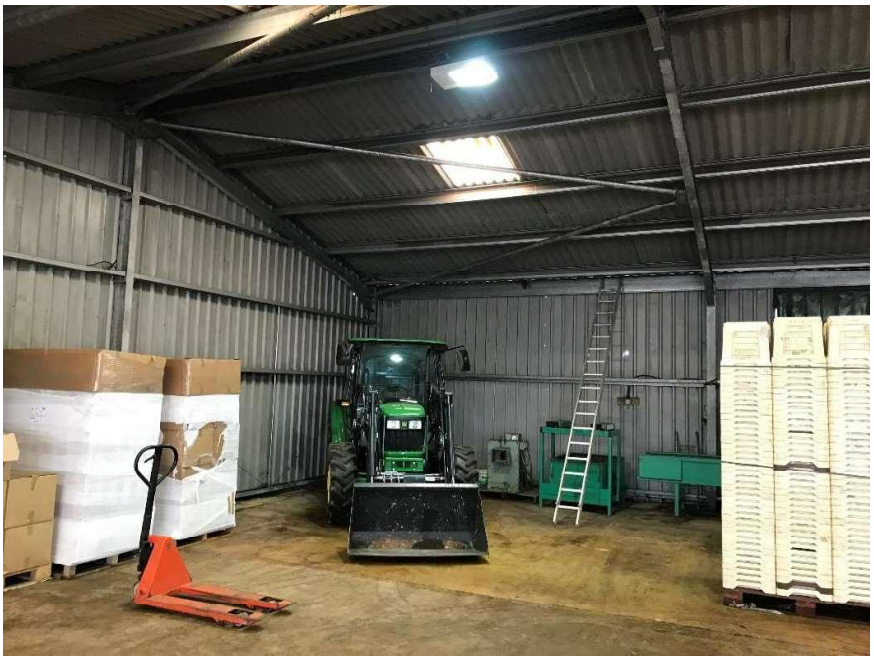


Photo 9. Unit 2 Steel Portal Frame, Gable End Portal Frame and Structural Slab

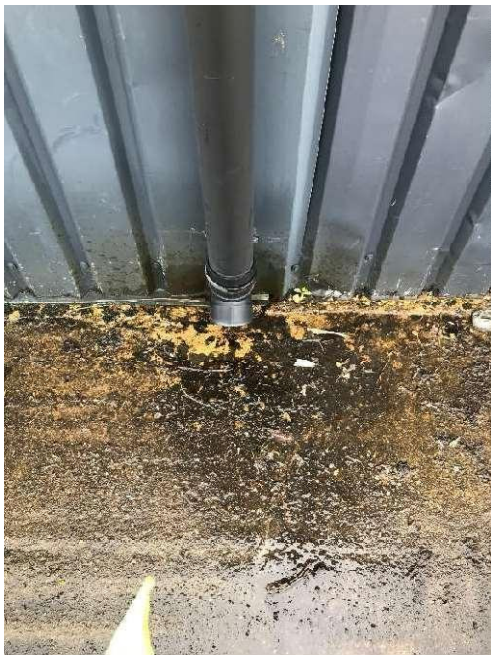


Photo 10. Downpipe Discharging on External Slab