

**Grange Farm Barns
Wiseton**



**Structural Inspection Report
For
MD Langley & Sons Ltd**

PC/6772
July 2022

Grange Farm Barns, Wiseton

Contents

- 1 Introduction
- 2 Details of the Buildings
- 3 Inspection and Recommendations
- 4 Conclusions

1 Introduction

At the request of Mr Langley of MD Langley & Sons Ltd a structural inspection was undertaken of the barns at Grange Farm on 14 July 2022 to determine their structural suitability for conversion to habitable accommodation.

2 Details of the Buildings

The buildings consist of three double storey barns and two single storey agricultural outbuildings probably built in the 19th Century with two small single storey stores probably built in the 20th Century. The buildings are currently used for agricultural and domestic storage. It is proposed to develop them as four separate units A-D as shown in figure 1. Trial pits were excavated prior to the inspection to expose the existing foundations.

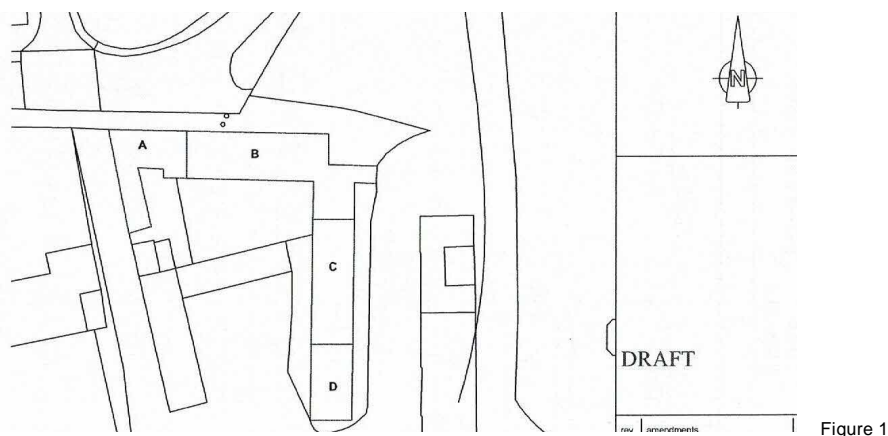


Figure 1

3 Inspection and Recommendations

UNIT A

This unit consists of a two storey barn with a single storey outbuilding and small store attached to the south elevation.

Two Storey Barn

The roof consists of tiling supported by timber rafters, purlins and trusses [Photograph 1].



Photograph 1

Grange Farm Barns, Wiseton

The timbers appear to be in good structural condition and there is no evidence of any significant distortion or distress. Strengthening work is not considered to be necessary.

Once the tiles are removed the timbers can be checked for any deterioration and localised repairs undertaken as necessary.

The first floor consists of 175x63mm floor joists at 400mm centres supported at midspan by a 270x100mm timber beam spanning between walls with an internal timber support post. The joists are of adequate size for domestic loading and can be retained provided there is sufficient headroom. However there has been some rot at the ends of two joists and they will require replacement or repair [Photograph 2]. The main timber beam is



Photograph 2

undersized for domestic loading and will require strengthening or replacement. In view of the headroom under the beam it is probable that replacement with a shallower steel beam in the depth of the joists would be preferable to replacement with a larger timber beam. The timber post would also require replacement with a steel post or cross beam.

The ground floor consists of brick laid directly onto soil. The floor does not have adequate insulation or dampproofing and requires full replacement.

The external walls consist of solid brickwork, are relatively plumb and are in good condition. Some localised repointing of eroded joints and some localised replacement of frost damaged or missing and loose bricks will be required. All repointing should be in a suitable lime mortar.

There is a 10mm wide vertical crack in the party wall with unit B [Photograph 3-view from unit B]. This is due to historic foundation movement combined with a lack of bond in the



Photograph 3

Grange Farm Barns, Wiseton

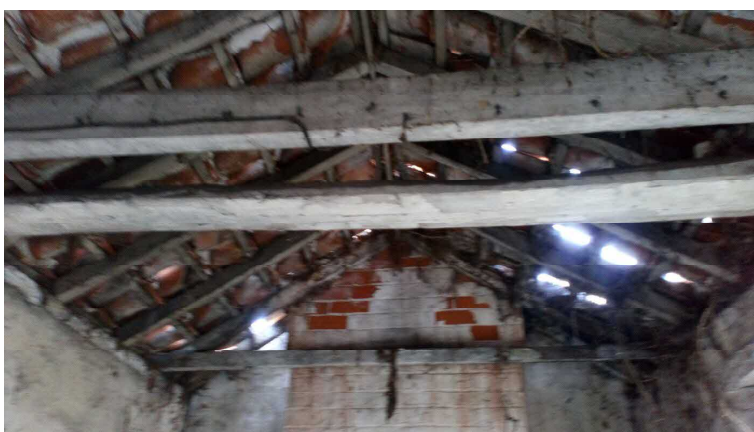
brickwork and is not structurally significant. The crack can be repointed but it would be prudent to strengthen it with 1m long Helifix bars in the bedjoints at 225mm vertical centres.

The brick arch lintels are in good condition and can be retained. However there is evidence of sagging to timber lintels and a lack of lintel to some openings with the brickwork being supported off the timber window frames. New galvanised steel or concrete lintels should be installed.

The foundations consist of a stone footing projecting 100mm from the face of the wall and founded on natural sand at a depth of 700mm below ground level. This footing is considered to be structurally adequate for the refurbishment and strengthening is not required.

Single Storey Outbuilding

The roof consists of tiling supported by timber rafters. There are no purlins or ridge beam and roof spread has occurred. Some timber ties have been introduced at eaves level but it is unlikely that they are fully effective and further roof spread will probably occur during times of heavy snow loading [Photograph 4]. In addition there has been some



Photograph 4

deterioration of rafters due to water ingress. It will be necessary to replace the affected timbers and to strengthen the roof by installing a timber or steel beam under the ridge. In view of the extent of repairs and strengthening work required to this roof it is recommended that it is fully replaced.

The ground floor consists of brick laid directly onto soil. The floor does not have adequate insulation or dampproofing and requires full replacement.

The external walls consist of solid brickwork and lean outwards by up to 20mm over a 900mm height, probably due to being pushed out by the roof spread. This has not affected their stability and they can be retained provided roof spread does not occur in the future. This movement has resulted in vertical gaps up to 10mm wide between the external walls and the internal wall and an 8mm wide vertical gap with some lateral displacement in the brickwork at the junction of the west elevation with the two storey building. There is no bonding between these walls and therefore these junctions would always have been susceptible to opening up. This is not structurally significant and the walls can be retained although it would be prudent to strengthen the junctions with galvanised steel L straps at 450mm vertical centres, hidden behind the new internal linings.

There is diagonal cracking up to 5mm wide in the internal wall and in the gable wall above the doorway. This damage is due to foundation movement and requires repointing.

Grange Farm Barns, Wiseton

The remainder of the brickwork to the walls is in reasonable condition. Some localised repointing of eroded joints and some localised replacement of frost damaged or missing bricks will be required particularly on the west elevation. All repointing should be in a suitable lime mortar. However the chimney stack has suffered from extensive erosion and is beyond practical repair [Photograph 5]. If a chimney is required in the final



Photograph 5

refurbishment scheme then it will have to be rebuilt in matching masonry.

The timber lintels are inadequate in size and have sagged. New galvanised steel or concrete lintels should be installed. The brick arch lintel over one of the doors on the east elevation has dropped by 10mm and will require rebuilding.

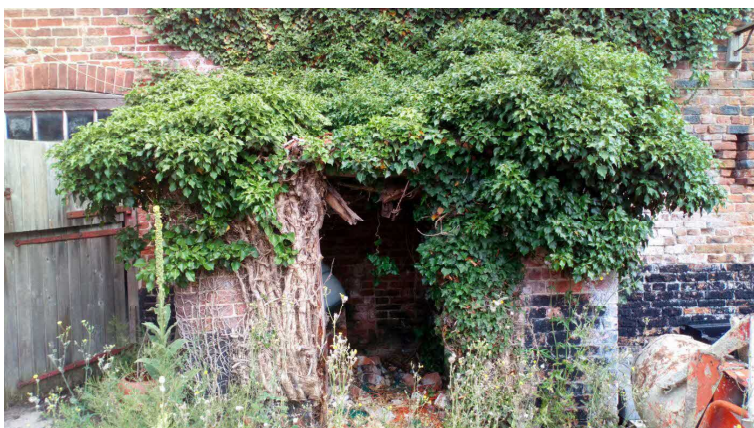
The foundations consist of a brick footing projecting 100mm from the face of the wall and founded on natural sand at a depth of 350mm below ground level. This footing is shallow and is susceptible to seasonal movement which has probably caused the diagonal cracking to the building. Therefore the footing is considered to be structurally inadequate for the refurbishment and underpinning is required.

Small Store

The roof of the small store has collapsed and will require full replacement

The ground floor could not be inspected but probably does not have adequate insulation or dampproofing and will require full replacement.

The walls of the small store are obscured by ivy but are likely to be in poor condition and require extensive rebuilding [Photograph 6].



Photograph 6

Grange Farm Barns, Wiseton

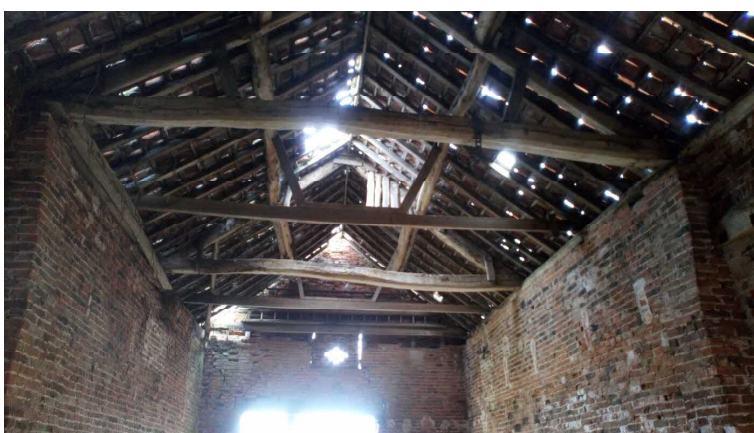
No trial pit was excavated against the small store and the details of the foundations will have to be confirmed if this building is to be retained..

UNIT B

This unit consists of a large double storey barn with a section of single storey outbuilding attached to the south east corner and a small store attached to the east elevation of the outbuilding. The remainder of the single storey outbuilding comprises unit C.

Double Storey Barn

The roof consists of tiling supported by timber rafters and large, rough cut, purlins. The purlins are supported by a mixture of timber frames and timber props off timber beams [Photograph 7]. There is evidence of deterioration due to water ingress of one purlin



Photograph 7

and of the wallplate to the north elevation which will require localised repair with additional timbers or dowels and resin subject to detailed survey. Once the tiles are removed all timbers can be checked for any deterioration and localised repairs undertaken as necessary.

The rafters, purlins and frames appear to be of adequate size and there is no evidence of any significant distortion or distress. Strengthening work to these elements is not considered to be necessary. However the timber beams supporting the purlin props are inadequate and appear to have sagged. It will be necessary to strengthen these elements by either replacing them with a timber frame or bolting steel to the sides.

The ground floor consists of brick laid directly onto soil. The floor does not have adequate insulation or dampproofing and requires full replacement.

The external walls consist of solid brickwork. There are internal brickwork piers either side of the original openings in the north and south elevation. These piers reduce in size towards the roof [Photograph 8]. There are also a few internal brick piers that have either



Photograph 8

Grange Farm Barns, Wiseton

been terminated at midheight of the external wall or have been removed. The north wall leans outwards by up to 75mm in a 900mm wide height. The south wall leans inwards by up to 50mm in a 900mm height. There is diagonal and vertical cracking up to 50mm wide in the east gable wall some of which has been repointed in the past and has re-opened [Photograph 9]. The timber lintel over the main door in the gable sags and the brickwork



Photograph 9

coursing adjacent to the door dips towards the north east corner. The brickwork in the north elevation near the gable wall appears to be newer indicating that it may have been rebuilt or that openings may have been filled in [Photograph 10]. There was an additional



Photograph 10

doorway in the gable wall into the single storey outbuilding which would have resulted in high bearing pressures under the section of pier between the openings although this opening has now been partially infilled.

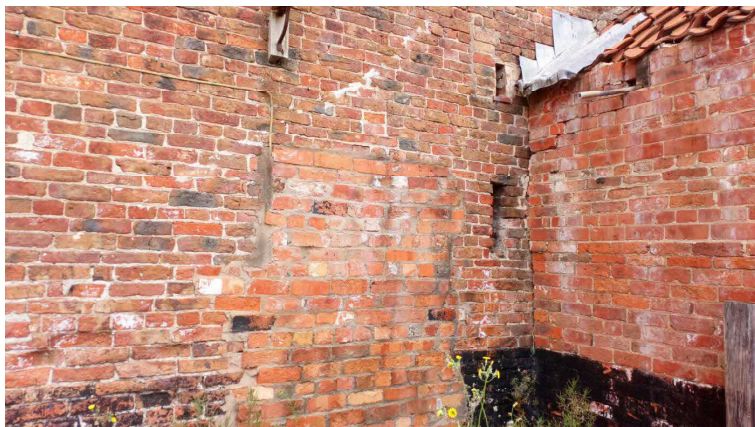
Temporary shoring has been erected against the north elevation and gable wall to prevent further movement of the walls.

The movement of this section of the building is extensive and appears to be due to a combination of inadequate buttressing, lack of roof bracing, position of openings reducing the strength of the walls and increasing foundation bearing pressures, foundation movement and undersized timber lintels. The movement has been ongoing for a considerable time and appears to be progressive. The gable wall is in very poor condition and would require a replacement galvanised steel lintel over the main doors and rebuilding of the worst cracks incorporating Helifix bars for additional strength. In view of the current stability of this wall it would be safer and more practical to take it down completely except where attached to the outbuilding and rebuild it. The new brickwork can be bonded into the infill brickwork of the north elevation in order to enhance the stability of this area. The north wall does not require rebuilding provided further

Grange Farm Barns, Wiseton

movement is prevented by installing roof bracing, tying it back to a new first floor and introducing buttressing in the form of either internal walls or steel portal frames. The temporary shoring will have to be retained until the wall is stabilised.

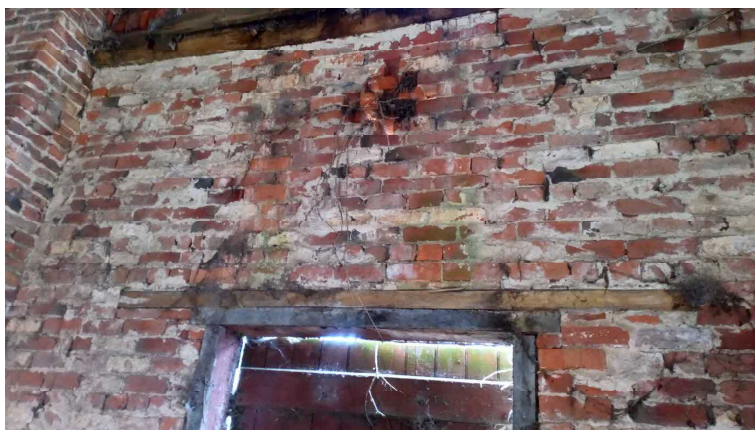
The remainder of the external walls are in relatively good condition although some openings have been infilled with brick in an unsympathetic manner and may require rebuilding for appearance [Photograph 11]. Some localised repointing of eroded joints



Photograph 11

and some localised replacement of frost damaged or missing and loose bricks will be required. All repointing should be in a suitable lime mortar. The crack in the party wall with unit A will require repair.

The timber lintels over the original large openings on the north and south elevations have been rendered over although sections of this have fallen off. It will be necessary to remove all the render to check the condition of the lintels and cut out and replace any sections of rotten timber. The remainder of the timber lintels are inadequate in size [Photograph 12]. New galvanised steel or concrete lintels should be installed.



Photograph 12

The foundations consist of a brick footing projecting 150mm from the face of the wall and founded on natural sand at a depth of 450mm below ground level. Generally there is no evidence of foundation movement of the building and therefore this footing is considered to be structurally adequate for the refurbishment and strengthening is not required. However there is evidence of ongoing foundation movement to the eastern end of the north elevation and the gable wall. No trial pits were excavated in this area due to the stability of the walls. At this stage it is considered probable that underpinning of at least a six metre length of the north wall will be required to prevent further movement. In addition if the gable wall is retained it will require full underpinning. If it is rebuilt a new concrete foundation will be required.

Grange Farm Barns, Wiseton

Single Storey Outbuilding

The roof of the single storey outbuilding consists of timber rafters and purlins supported by timber trusses [Photograph 13-view in unit C]. Although the purlins and elements of the trusses appear to be undersized there is no evidence of any significant distortion or distress. Strengthening work to these elements is not considered to be necessary.



Photograph 13

The ground floor consists of concrete laid to suit the previous agricultural use. The floor does not have adequate insulation or dampproofing and requires full replacement.

The external walls consist of solid brickwork, are relatively plumb and are in good condition. Some localised repointing of eroded joints and some localised replacement of frost damaged or missing and loose bricks will be required particularly at ground level on the north elevation where a small area of the brickwork is extensively damaged. All repointing should be in a suitable lime mortar.

The brick arch lintels and the timber lintels are in good condition and can be retained. However there is evidence of sagging to the timber lintel to the doorway on the east elevation [Photograph 14]. A new galvanised steel lintel should be installed.



Photograph 14

The foundations consist of a brick footing projecting 120mm from the face of the wall and founded on natural clayey sand at a depth of 600mm below ground level. This footing is considered to be structurally adequate for the refurbishment and strengthening is not required.

Small Store

The roof of the small store has collapsed and will require full replacement

Grange Farm Barns, Wiseton

The ground floor could not be inspected but probably does not have adequate insulation or dampproofing and will require full replacement.

The external walls consist of solid brickwork and are in poor condition with cracked and displaced brickwork and brickwork sagging where it is built off door frames [Photograph 15]. Extensive rebuilding of brickwork and installation of lintels will be required and it will be more practical to demolish and rebuild the store.



Photograph 15

The foundations consist of a concrete footing projecting 120mm from the face of the wall and founded on natural sand at a depth of 450mm below ground level. This footing is considered to be structurally adequate for the refurbishment and strengthening is not required although if the store is rebuilt it may be necessary to install a new footing to suit the new wall construction.

UNIT C

This unit consists of the remainder of the single storey outbuilding.

Single Storey Outbuilding

The roof of the single storey outbuilding consists of timber rafters and purlins supported by timber trusses. Although the purlins and elements of the trusses appear to be undersized there is no evidence of any significant distortion or distress. Strengthening work to these elements is not considered to be necessary.

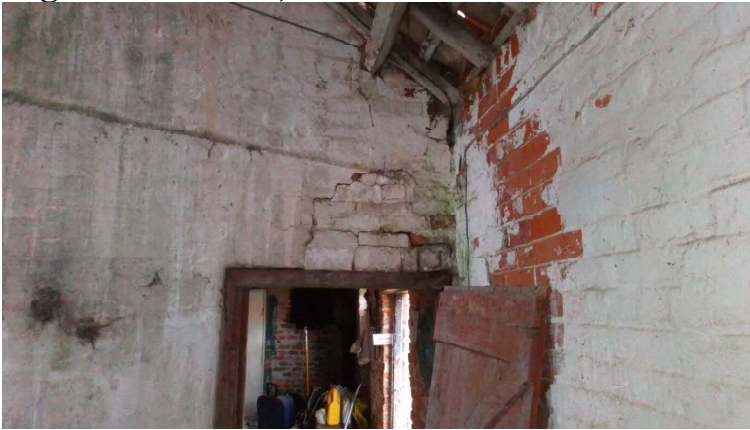
The ground floor consists of concrete laid to suit the previous agricultural use. The floor does not have adequate insulation or dampproofing and requires full replacement.

The external walls consist of solid brickwork, are relatively plumb and are in good condition. Some localised repointing of eroded joints and some localised replacement of frost damaged or missing and loose bricks and window cills will be required. There was a 5mm wide diagonal crack in the west elevation but this appeared to be old and not structurally significant. The crack can be repointed. All repointing should be in a suitable lime mortar.

The brick arch lintels and the timber lintels are in good condition and can be retained. However there is evidence of unsupported brickwork over internal doors [Photograph 16]. New galvanised steel or concrete lintels should be installed.

The foundations consist of a brick footing projecting 120mm from the face of the wall and founded on natural clayey sand at a depth of 600mm below ground level. This footing is considered to be structurally adequate for the refurbishment and strengthening is not required.

Grange Farm Barns, Wiseton



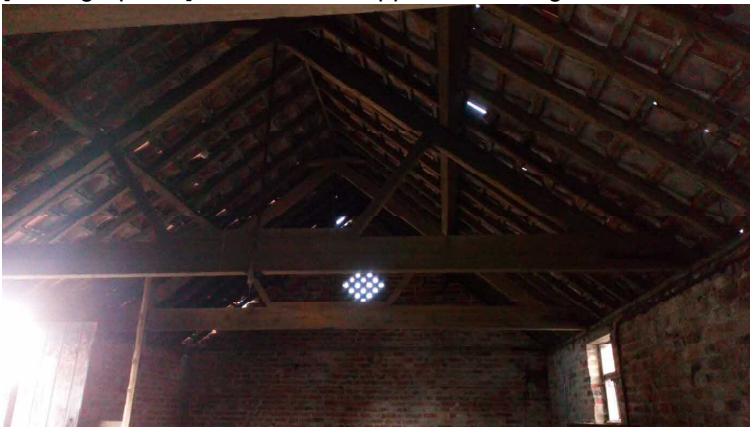
Photograph 16

UNIT D

This unit consists of a two storey barn.

Two Storey Barn

The roof consists of tiling supported by timber rafters, purlins and timber/steel trusses [Photograph 17]. The timbers appear to be in good structural condition and, although the



Photograph 17

purlins appear to be undersized, there is no evidence of any significant distortion or distress. Strengthening work is not considered to be necessary.

Once the tiles are removed the timbers can be checked for any deterioration and localised repairs undertaken as necessary.

The first floor consists of 220x75mm floor joists at 400mm centres spanning between walls. The joists are of adequate size for domestic loading and can be retained. However there has been some excessive notching of four joists and one joist has split [Photograph 18]. These joists will require replacement or repair with additional timbers



Photograph 18

Grange Farm Barns, Wiseton

bolted to the side.

The ground floor consists of brick laid directly onto soil and poor quality concrete. The floor does not have adequate insulation or dampproofing and requires full replacement.

The external walls consist of solid brickwork. Some localised repointing of eroded joints and some localised replacement of frost damaged or missing and loose bricks will be required. All repointing should be in a suitable lime mortar.

The walls bulge out slightly at first floor level and steel pattress plates with ties back to the first floor have been installed in the past. It appears that this remedial work has prevented any further movement but it would be prudent to install additional steel restraint straps between the floor and wall to ensure that no further movement occurs.

The brick arch lintels are in good condition and can be retained although the arch over the door on the west elevation has eroded and will require localised rebuilding. The timber lintels over the first floor windows directly support the roof trusses and have sagged. Replacement with steel lintels will be required. The timber lintel over the main door in the south gable is inadequate in size and has sagged causing diagonal cracking up to 10mm wide above it. A new galvanised steel lintel should be installed.

The foundations consist of a brick footing projecting 120mm from the face of the wall and founded on natural clayey sand at a depth of 500mm below ground level. This footing is considered to be structurally adequate for the refurbishment and strengthening is not required.

Conclusions

The buildings are generally in good condition with the exception of the roof and chimney of the unit A single storey outbuilding, the gable wall of the unit B double storey barn and the small stores. Provided the remedial work described is undertaken the buildings will be structural suitable for conversion to habitable accommodation.

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