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STRUCTURAL ENGINEERS REPORT

ON

REDUNDANT FARM BUILDINGS

MILL FARM

SKERNE ROAD

WANSFORD

EAST YORKSHIRE

YO25 8NQ

August 2023
Job No. 23-9795

STRUCTURAL REPORT ON REDUNDANT FARM BUILDINGS, MILL FARM, SKERNE ROAD, WANSFORD, EAST YORKSHIRE, YO25 8NQ

1.0 INTRODUCTION

- 1.1 On the instructions of Edwardson Associates, we visited the site known as Mill Farm, Skerne Road, Wansford on 26th July 2023.
- 1.2 We were commissioned to carry out a visual inspection of the redundant buildings in order to confirm their current structural condition as part of their proposed conversion into alternative residential accommodation. As such we have not had sight of any details relating to the original construction nor the proposed conversion works.
- 1.3 This report has therefore been prepared for inclusion within the Planning Application based solely upon the visual evidence available at the time of our inspection.
- 1.4 The buildings form three sides of an open courtyard with the main farmhouse along the Southern side. Construction is generally of load-bearing brickwork supporting a pitched roof covered in a pantile finish. Some of these roofs have been recovered, and the roof to the two storey building replaced in full.
- 1.5 The buildings occupy a relatively level plot to reflect the general ground profile within this area of Cliff Road. They are bounded by the river to the northern face of the two storey building and various lawned gardens with a gravelled access to the adjoining properties to the east.
- 1.6 There are various trees and vegetation in proximity to the buildings, including a hedge and larger trees to the west. To the north and eastern side there are a series of trees along the riverbank with wild sown vegetation between the bank and the buildings making access difficult. We would also note a substantial stump directly against the northern elevation of the single storey section, with further trees on the bank near to the two storey structure.

1.7 This report is confined to the structural aspects as detailed above. This report does not constitute a full building survey and excludes certain items such as those listed below:

- The decorative condition of the property
- The condition of the property with respect to dampness, dry rot, timber infestation and the like
- The condition of services
- The condition of roof, floor, wall and ceiling coverings
- The location of the property, its value and other aspects such as searches and boundaries, etc.

1.8 At this stage we have not undertaken any testing of materials, monitoring, breaking out or long term investigation. No inspection has been made of timber or other parts which were covered, unexposed or inaccessible, and no comment can be made on the condition or quality of such materials.

2.0 EXTERNAL OBSERVATIONS

2.1 NORTHERN ELEVATION OF TWO STOREY BUILDING

As indicated in the introduction access to this elevation is not possible due to the lack of any bank to the adjoining river.

2.2 EASTERN GABLE ELEVATION OF TWO STOREY BUILDING

We were unable to gain close access to the northern return, but we would note severe weathering to individual bricks and erosion to mortar joints. The main brickwork does not appear to lean out to any significant degree and where the upper Gable could be viewed from low-level there was no major cracking damage within what appears to have been a fully repointed elevation.

Where the southern return of the elevation could be viewed from ground level within the courtyard the coursing appears reasonably true and there is no major bowing of the upper apex. The repointing referred to previously extends across the majority of the elevation and although there is some variation in mortar weights there is little signs of recent cracking damage where it could be viewed from ground level.

2.3 NORTHERN ELEVATION OF SINGLE STOREY STORE BUILDING

We were not able to gain close access to the junction with the two storey building but the coursing to the main wall exhibits a limited degree of rotational movement probably in the region of 5-7 mm in a 600 mm spirit level. This is consistent across the majority of the elevation with the coursing otherwise reasonably level. There is damage associated with weathering and previous climbing plants, but no major stepped cracking or fractures to the brickwork at the western end.

Towards the centre the brickwork continues to rotate relative to ground level, but again there is little other than associated with weathering and discolouration. Near to the eastern end, however, we would note that the upper brickwork has been rebuilt over the

top seven courses in a near vertical plane. This means that this upper brickwork coursing steps out relative to the lower brickwork by more than 15 mm. There is a tapered mortar fillet associated with the step within which there is little evidence of cracking damage.

The upper coursing is otherwise reasonably true and the degree of rotation through the lower brickwork is slightly more onerous than that noted previously. Again no major cracking damage was noted near to the return with the Eastern elevation although there is damage to individual bricks caused by weathering and previous climbing plants.

The roof structure appears to have been more recently recovered and exhibits a small degree of rippling consistent with the likely strong points of the main construction. Generally this appears to have been taken account of within the covering as there are no major areas of ill-fitting or dislodged Pantiles.

2.4 EASTERN ELEVATION OF SINGLE STOREY STORE BUILDING

The weathering and damage to the brickwork is reflected about the return with the northern elevation with rotational movement of the wall relative to ground level probably in excess of 20 mm in a 600 mm spirit level. There is significant cracking damage through the brickwork along the return with open jointing and some displaced bricks. This is likely to be associated with the movement prior to the previous repairs noted elsewhere.

This rotation continues across the majority of the northern section of the elevation varying to around 75 mm across the height of the wall. There is a tie bar towards the centre of the elevation after which the wall appears to be more true at lower level. There is movement out towards the eaves, but this is significantly less pronounced than that noted elsewhere. The remaining central section of the single storey building remains otherwise relatively true.

There is a vertical butt joint coinciding with the junction between the differing structures with some displacement of the brickwork consistent with this joint. This suggests slight

movement of the southern end although the weathering and discolouration indicates that this is clearly long-standing.

Through the southern section there is rotation relative to the eaves in the region of 5-7 mm in the 600 mm spirit level, but this is not reflected by significant recent stepped cracking or fractures. There are open joints and some weathering, with slightly more onerous rotation near to the trees at the southern end. The rotation extends through to the feature brickwork to the underside of the roof but again through the main body of the brickwork the limited cracking damage is clearly long-standing from the weathering and discolouration.

Where the roof could be inspected there is slight deviation towards the northern hip return with some rippling of the ridge tiles. Generally the deflection towards the centre of the roof is in the region of 50-75 mm at its maximum and has not been reflected by significant ill-fitting or displaced tiles. Generally the roof finish appears to have taken account of the roof movement.

2.5 SOUTHERN ELEVATION OF SINGLE STOREY STORE BUILDING

There is slight damage to the brickwork along the return with the Eastern elevation but where repointing has been carried out there is little suggest an active problem. Where the feature brickwork arch between the house and the building meet there is separation cracking consistent with the differing age of the first construction.

The coursing to the main Gable exhibits a limited degree of rotation relative to ground level and is otherwise relatively level. No significant stepped cracking or fractures were noted through the brickwork at low level suggestive of foundation problem.

Where the upper apex could be viewed from ground level there is a limited degree of undulation, but this has not been reflected by significant cracking, although there has been repointing in part. At the interface between the repointing and the older mortar there is little of significance. Where a central window has been infilled in a relatively

untidy manner there is variation within the mortar but no significant separation cracking between the two materials.

2.6 WESTERN GABLE ELEVATION TO TWO STOREY BUILDING

The Gable has a setback central section under ornate brick arch with access through to an outside store and the main building. Where the upper apex could be viewed from ground level there is little signs of major movement over the arch, and we would note that the set back elevation also continues up to the underside of the roof. The arch itself shows little signs of recent deformation where it could be viewed from ground level.

The return with the northern elevation exhibits a small degree of rotational movement outwards although this is not reflected by major settlement of the general brick coursing. The opening into the main structural remains relatively level and there is no recent cracking damage through the brickwork directly above the featured arch. Slight separation has occurred between the arch and the brick panels on either side, but this is subject to notable weathering.

The left-hand return of the recess does not exhibit significant rotational or out of level movement relative to ground level. There is a first-floor access in the recess but the original timber decking has been removed and the steel support to the leading edge of the floor is suffering from significant rusting and delamination. The timber work associated with the openings does not exhibit significant rotational or out of level movement. Where there has been slight rotation this is limited by comparison to the width of the wall and not reflected by recent cracking damage.

The timber support over the opening into the right-hand store exhibits a slight degree of settlement towards the main building line and there is rotation of the panel leading up to the single storey section. This is minimal and again not reflected by recent cracking damage. Extensive repointing has been undertaken in parts without any significant reopening. Where the older mortar is retained there is little to suggest an active problem.

2.7 RECESS STORE TO TWO STOREY BUILDING

The brick coursing has suffered from notable erosion and there are small areas of missing bricks consistent with previous fixings. Through the main body of the brickwork however we did not identify major structural movement with little separation between the internal walls and the main structure. There is minor opening up of the joint along the return with single storey section, but the weathering and discolouration indicates this is probably long-standing.

2.8 WESTERN ELEVATION OF SINGLE STOREY BLOCK

The roof structure exhibits a limited degree of movement but no major rippling of the ridge line. There is deflection through the Pantiles towards the centre and away from the presumed strong points associated with internal walls and trusses. From the moss growth and weathering of the tiles this movement does not appear to be that recent, although probably exceeds 50 mm in places.

At the junction of the single storey wall with the two storey building there is a butt joint which has been partially repointed. There is no major stepping along this joint or significant opening up to suggest differential settlement. The brickwork of the single storey section is relatively true, using a 600 mm spirit level, with the limited rotation relative to ground level not reflected by significant cracking damage. There is little signs of significant movement around the eaves with the brickwork and sills to the openings not exhibiting signs of recent movement.

Towards the northern end there is minor rotation of around 3-5 mm in the 600 mm spirit level, but this has not been reflected as significant movement around the eaves or as separation cracking where the wall has been repointed at the southern end. Here the junction with the open two storey building is obscured by a climbing plant although where joint is visible there is no major separation cracking through the pointed butt joint.

2.9 NORTHERN GABLE OF OPEN BARN

No major bowing was noted through the Gable where it could be viewed above the single storey section. There is a vertical butt joint presumably associated with an infilled opening and from ground level there is little to suggest opening up of the interface between the infill and the main brick panels. Generally through the elevation, where it could be viewed from ground level, we did not identify significant signs of recent movement.

2.10 WESTERN ELEVATION OF OPEN BARN

The roof exhibits a degree rippling within the ridgeline presumably relating to the internal truss positions. Relative to the Gables there is slight deflection to the roof structure but overall no major areas of ill-fitting or displaced tiles. There is deflection to the rafters, but this is probably in the region of 50-75 mm maximum. From the moss growth and weathering this movement is clearly long-standing.

As indicated previously the northern section is obscured by a climbing plant. Within the brick panel up to the more recent central opening the coursing does not exhibit significant out of level movement and the rotation relative to foundation level is limited. The returns associated with the opening remain level and true with little indication of distress where the steel support beam is built into the brickwork at each end. At the interface between the pointing and rebuilt sections of the original wall there is no signs of significant separation.

At the southern end there is minor undulation through the coursing and rotation relative to ground level, but this is probably only in the region of 3-5 mm in the 600 mm spirit level. Again it has not been reflected by significant stepped cracking or fractures, with little through the elevation as a whole suggestive of an active problem. There is little signs of significant roof spread, with the minor rippling of the eaves feature brickwork well within acceptable levels.

2.11 SOUTHERN ELEVATION OF OPEN BARN.

The upper apex is partially obscured by the remains of a climbing plant that has previously been cut back. Where the wall could be viewed from ground level there was no major signs of cracking damage through the upper apex or across the repointed section to just below eaves level. There is deterioration within the timber work associated with the first floor opening but little suggestive of more recent distress through the brickwork on either side. A plaque below the opening indicates a date of 1774.

The lower coursing suggest rotational movement of around 3-5 mm in a 600 mm spirit level at its maximum. There is slight twisting associated with this movement, but the wall becomes more vertical where it could be viewed at the higher level. There is no significant rotational movement relative to the returns at either end with the coursing otherwise relatively true. Individual bricks suffer from some weather damage, as do the older mortar joint but this is primarily cosmetic.

2.12 EASTERN ELEVATION OF OPEN BARN

Minor rotation was noted through the brickwork at low level relative to ground level and this appears to continue over the majority of the height of the wall. It is not reflected by recent cracking damage however with little around the interface of the rebuilt brickwork associated with the central opening. Here the steel beam is built into the wall at either end without recent damage and the returns appear to have taken account of the limited movement. Across the more northern section there is no major rotational movement with little signs of recent damage.

2.13 COURTYARD ELEVATION OF SINGLE STOREY BLOCK

Where the wall projects beyond the junction with the Open Barn there are no signs of significant separation with the coursing reasonably true. The general elevation does not exhibit major movement or rotation relative to ground level. There is slight bowing towards the central, but this is limited by comparison to the overall width of the wall. It is

not reflected by significant rippling of the eaves line or spread at the eaves. Through the repointing across the majority of the elevation there is no signs of significant recent cracking damage. Deterioration was noted within the timbers built within the openings, but the main sills remain relatively level.

The roof over reflects previous observations with slight deviation towards the centre in what appear to be the original Pantiles. In this instance however there are a small number of shattered individual Pantiles along with further notable weathering of the finish directly against the gutter line. Generally however the movement is consistent with that observed previously and against appears to be long-standing.

2.14 COURTYARD ELEVATION OF TWO STOREY BUILDING

The roof finish appear to be relatively recent and appears reasonably true. Within the finish we did not identify significant deviation or missing pantiles.

Along the interface with the roof with a single storey building there is little around the flashing, but we would note some erosion and damage to individual brick faces. The Vertical joint between the buildings does not exhibit significant opening up although there is minor separation cracking in the region about 1 mm at high level.

The frame to the ground floor door, and the sill to the window do not exhibit significant settlement and the wall as a whole appears relatively true. Tie bars probably coincide with the first floor beams and there has been minor rotation of the brickwork around the first floor. This continues to the high-level but is relatively limited. It is not reflected by significant stepped cracking or fractures. We also highlight slight variations within the brickwork to the upper section possibly indicative of historic raising of the wall, although this cannot be confirmed.

2.15 COURTYARD ELEVATION OF NORTHERN SINGLE STOREY STORE BUILDING

The roofline is slightly raised consistent with the line of the central truss with deflection through the main body the Pantiles in the region of 50-75 mm at its maximum. This is

not reflected by areas of ill-fitting Pantiles although we would point out that the finish is clearly more recent than some of the other buildings.

At the interface with the two storey section there is a tapered butt joint which has opened as a result of spalling of the mortar packer to a limited degree. The cracking is less than 1 mm with no major deviation through the coursing relative to this joint.

The brickwork leading from the two storey section towards the centre exhibits a small degree of differential settlement but there is no major rotation or bowing of the wall. The central pier does exhibit slight displacement but as with the return against the eastern section the degree of movement is negligible by comparison to the width of the wall. Relative to the arches over the openings there is no major displacement or deflection. Through the repointing there is little to suggest recent movement through the arches. There are small sections of missing mortar consistent with spalling but little else of recent significance.

2.16 COURTYARD ELEVATION OF EASTERN SINGLE STOREY STORE BUILDING

At the valley with the northern structure there is vegetation growing within the feature and along the gutters. There is rippling of the ridgeline similar to that noted previously along with deflection of the Pantiles towards the centre, and presumably away from the strong points associated with the internal walls and trusses. Generally through the Pantiles, however, there are no major areas of ill-fitting or displaced tiles, with the moss and weathering suggesting the movement predates this covering.

Along the arch at the northern end there is little of significance with no major opening up of the joint along the profiled return with the northern section. Here the building has clearly been altered by infilling of previous openings below the arches, but through the interface between this infill and the original brickwork there is no evidence of significant recent movement. The coursing does exhibit a small degree of settlement, but this is not reflected by stepped cracking or fractures. Where there is minor displacement of the arch over the more central opening this is not reflected by opening up of the joints within the timber frame

The sills to the openings at the southern end do not exhibit significant out of level movement. There is minor rotation relative to ground level, but this is probably less than 5 mm in the 600 mm spirit level. It has generally not been reflected by stepped cracking or fractures within the brickwork, or displacement of the brick soldier arch over the openings. The eaves feature does exhibit a small degree of rippling, but this is limited by comparison to the overall construction width. In the case of the more southern opening, however, this has resulted in displacement of the brickwork over the doorway consistent with slight dropping of the arch. It is localised and can be repaired during the conversion works.

3.0 INTERNAL OBSERVATIONS

3.1 EASTERN SINGLE STOREY BUILDING

3.1.1 SOUTHERN STORE

The significant degree of stored materials within this room makes access to the main structural fabric impractical. We would note staining of the paint finish along the southern Gable and a step out in the brickwork at the reduced width at the high-level. Here a brick pier has been built up to support the purlin to the main roof.

This roof consists of rafters supported on purlins with the rear purlin coinciding with an internal partition. It appears the partition only extended to around ceiling level before being raised in timber panelling up to the underside of the purlin. Through the exposed felt finish there is minor tearing and some staining of the rafters when viewed from ground level. This includes staining around the eaves although the extent appears to be limited.

Within the internal wall there is damage as the result of dampness affecting individual bricks but where the wall has been rendered at low level we did not identify significant recent cracking damage.

3.1.2 SOUTHERN CENTRAL STORE

There is again significant staining of individual bricks through the internal walls with blistering of the paint finish and crumbling of some brick faces. Across the rear wall there is dampness through the paint finish but no significant signs of recent cracking damage. Where an opening has been infilled to the internal partition there is little at the interface between the two structures and again no major cracking through the lower rendered plinth where it could be accessed around the stored materials.

3.1.3 NORTHERN CENTRAL STORE

There are openings through the internal partitions against the courtyard elevation with slight displacement of the brickwork and cracking damage around the bearing of the timber supports up to high level. This remains relatively limited and made more onerous by the timber plates built within the walls. The principal damage relates to weathering of individual brick faces, similar to that noted previously, and staining on the paint.

No major cracking damage has occurred through the rendered finish although there is slight separation near to the junction of the rear wall with the internal wall. This rear wall has rotated outwards but only in the region of 5-7 mm in a 600 mm spirit level. Separation cracking is reflected on the right-hand side where it has reopened following repairs to a width in excess of 5 mm. Through the render the cracking is more hairline.

The purlins are built within the internal walls and through the felt finish there is no major tearing. There is some weathering of the timbers but only limited staining.

3.1.4 NORTHERN STORE

Staining of the rafters feet were noted, particularly across the rear wall and there is some tearing of the felt covering. The main purlins are supported on an internal truss within which there are indications of infestation where it could be viewed from ground level.

The separation of the internal walls with the rear wall has been reflected through the brickwork primarily along the northern side. Here there is an oversized mortar packer within which there is no major signs of recent cracking damage. Some cracking has occurred through the rendered plinth at low level, but the principal damage again relates to weathering through the upper brickwork. Untidy detailing was noted around timbers built within the walls and directly to the underside of the roof to the apex with the northern section of the single storey building.

Vertical cracking appears to coincide with likely infilled openings but has a width of 2-3 mm. It does not extend to any major degree at lower level. Within the infill to the arches there is untidy detailing but little to suggest an active problem.

3.2 NORTHERN OPEN SINGLE STOREY SECTION

Trusses coincide with the piers and the hip return with repairs to some of the trusses via splice plates bolted through the bottom boom at the bearings. Within the roof finish there is no major tearing, but we would highlight damage through the wallplate as a result of climbing plants growing through the structure. Associated staining was noted through the timbers and wallplate at the lower level particularly along the Northern and eastern walls.

Within the internal brickwork associated with the southern section there has clearly been infilling of the structure. This includes what appears to have been infill up to timber piers that originally supported the purlins. There is a vertical butt joint between the infill and these piers which probably explains the cracking damage noted on the opposite side. Through the coursing there is minor out of level movement but no major rotational relative to ground level. The Eastern elevation was partially obscured by limited access around the stored materials, but we would again note the tapered separation joint between the internal wall and the external elevation. Here there is a strap built into the wall and bolted to the brickwork, with the separation comparable to that noted previously.

At the change in profile of the North and eastern elevations there is cracking damage running through to lower level probably coinciding with the cracking noted externally. The cracking follows a previous diagonal line where it has reopened following repointing by around 3-5 mm. It does not continue to any major degree through the main body of the wall where previous repointing has not reopened. This cracking is all indicative of slight dropping of the wall towards this return where the northern elevation has rotated outwards by a similar amount to that noted externally.

This rotation continues across the full length of the northern wall where there are troughs built against it at lower level. The rotation is around 5-7 mm in a 600 mm spirit level and reflected where an opening has been infilled. There is deterioration and infestation within the retained timber lintel over this opening but no significant separation at the interface between the varying materials.

Where the northern elevation abuts the return with the two storey structure there is a tapered mortar joint within which there is little of significance. We were noted a pipe that has been fixed to the wall extending from the courtyard elevation through to the rear, presumably as rainwater discharge. Repaired cracking has occurred through the central section and around what is presumably an original infilled opening. This has not reopened following the repointing which is generally reasonably true.

The main damage is consistent with weather penetration through the roof and we would note deterioration of the timbers against the two storey elevation, particularly on the courtyard side. Here there is algae growth on the brickwork along with staining and erosion of the mortar joints. The junction between the courtyard elevation and the Gable does not exhibit significant movement and the principal damage through the internal face of the arches is of salt effervescence within the brickwork. We will also highlight deterioration of timber work and significant moss staining of the brickwork associated with the troughs referred to previously.

3.3 TWO STOREY BUILDING

3.3.1 FIRST FLOOR LEVEL

The roof has been completely replaced with a raised tie gangnail truss system spanning the full width. This is suitably braced and within the finish we did not identify significant recent movement.

The courtyard elevation has been raised with block and brickwork to reflect the slight variation in the coursing noted externally. This raised section wall does lean outwards slightly by around 3-5 mm in a 600 mm spirit level. Where it meets the eastern Gable

there is no major separation and through that Gable the main damage relates to weathering and erosion of mortar joints. There has clearly been infilling of an opening at first-floor level with the original timber support retained. Through the upper section of the Gable however there is little significance.

The lintels over the openings through the northern elevation have been replaced with Catnic type lintels which presumably have taken account of the rotational movement noted through the elevation. This is relatively limited and has not been reflected by major cracking damage. Where an opening has been infill there is little at the interface between the infill and the original brickwork or where eaves level was raised in blockwork.

Across the recessed section of the Western elevation there are climbing plants extending through the roof finish and a limited degree of separation cracking where alterations have taken place. The majority of the upper elevation remains vertical however with no significant stepped cracking or fractures. As with the return at the southern end there is little through the painted finish of the brick to suggest an active problem.

Cracking is however evident along a vertical line through the courtyard elevation extending from the wallplate down towards the head of the stairs. This cracking is tapered to a width around 3 mm although the coursing on either side remains reasonably vertical and true. It may be associated with previous alterations, and the recovering of the roof, but through the wall panels on either side there is no major cracking damage. Weathering and erosion of brick and mortar joints is evident across the main elevations as well as the Gable referred to previously. This includes crumbling to individual brick faces and loss of mortar. The scale of the damage is limited and can be treated during the conversion works.

3.3.2 GROUND FLOOR LEVEL

The first floor consists of joists supported on 3No substantial timber beams spanning across the width of the building with restraint provided by ornate probably cast-iron

columns towards the centre. Through the timbers there is no major deformation but there is clear evidence of infestation of the beams and some joists. Against the accessible sections of the Western elevation there is some staining and a limited degree of spalling to both the paint finish and mortar joints.

Hairline damage runs through the mortar and there is slight separation of the ground floor opening and the main wall. Across the northern elevation there are infilled openings with timber support to the brickwork above. These timbers are reasonably level and the degree of rotational movement of the northern elevation is limited. There is weathering and erosion to both bricks and mortar joints within the exposed brickwork, where access was possible, and this extends around the internal Gable. Again an opening has been infilled to reflect that noted externally, but through the visible render there was little of recent significance.

At the bearing of the beams within the main walls there are timber plates and a limited degree of deformation through the brickwork around the courtyard door opening. This is due to the proximity of the beam to that opening and can be rectified. The main wall has suffered from salt effervescence and spalling of brick and mortar, but through the main body of the accessible elevations we did not identify significant recent cracking damage.

3.4 WESTERN SINGLE STOREY BLOCK

3.4.1 NORTHERN STORE

There are extensive stored materials within this area making full inspection impractical.

We would note that the first floor beam to the two storey section extends through the wall and again supported on a limited timber plate. There is significant staining associated with dampness of this wall as well as minor cracking to reflect that noted internally. Where the main elevations could be inspected there is slight separation where the elevations abut the two storey building but no major rotational movement or cracking damage. We must emphasise that a full inspection of the structure was not

practical. At the internal wall there is only nominal separation along the joints and little through the upper Gable.

The roof consists of purlins supported on 3No trusses with no major damage through the felt finish of the courtyard elevation. We would note that the Western elevation has not been felted and is still of the original battens below the Pantiles. Some of these battens are missing and there are indications of staining and infestation where the timbers could be viewed. This includes timbers built within the main walls.

3.4.2 CENTRAL STORE

The purlins are supported on the internal walls within which there are openings with timber lintel support. Slight separation has occurred through the southern wall with the timber frame extending as cracking damage through the brickwork up to high level. This cracking is tapered to a width in excess of 15 mm although the courtyard elevation does not exhibit significant rotational movement. Through the remaining walls the damage relates to weathering rather than ongoing structural movement, with no major areas of cracking damage through the paint finish of the brickwork.

3.4.3 SOUTHERN STORE

The purlins are supported on 2No trusses but otherwise built within the internal wall and the wall with the Open Barn. At the interface between the return with the courtyard wall and the Open Barn there is a profiled butt joint which has opened up to a width in excess of 7-10 mm at higher level. There is no major displacement along the joint and the return brick coursing is reasonably level.

The courtyard elevation has again been refelted whereas the western face is of the exposed lathes. There is staining of the timbers around the roof light and across the eaves. Infestation was noted within some timbers where they could be inspected from ground level. Generally however the deformation within the roof remains relatively limited.

No major separation cracking has occurred between the internal wall and the Western elevation and there is little through the visible junction between the Western elevation and the Open Barn. Here a section wall has been rebuilt, without any cracking reopening through the repointing or at the interface with the original wall. The supports over the window have been replaced with timbers and we note the proximity of the support plate to the central truss. This also has resulted in slight deflection of the timber support over the courtyard door opening, although there is no major cracking through the brickwork. The principal damage relates to dampness and subsequent weathering of the joints.

The opening through to the Open Barn is formed via a steel 'goalpost' arrangement and through the rebuilt brickwork directly above the beam there is little of significance. No major rotational movement was noted relative to ground level nor significant cracking damage along the return.

3.5 OPEN BARN

Through the pointing over the 'goalpost' frame there is little to suggest subsequent movement although we would note a change in width of the wall to the upper Gable from approximately eaves level. An opening has been infilled at first-floor level with the timber support lintel retained. Although this can only be viewed from ground level there was some apparent staining of the timbers.

The purlins are supported on 3No trusses with substantial section bottom booms. The purlin in the North West corner has been repaired in an adhoc manner with a prop down to the change of brick width. From ground level there appears to be significant deterioration within these timbers. Deflection was also noted through purlins some of which are bowing to the plane of the roof consistent with the undulation noted externally.

Through the courtyard brickwork there are areas of infilled openings which it do not exhibit significant structural movement. No major cracking damage is evident above the steel beam support to the main opening, and the return with the southern Gable does

not exhibit significant separation. There is minor damage through the bricks and mortar joints, with some rotation of the lower wall by around 7-10 mm in a 600 mm spirit level, but we must point out that this wall is 450 mm thick at lower level.

The southern Gable does not change in width, but the timbers are retained above the first floor opening. Again some staining of the timbers were noted with deterioration of the frame to the door. Across the western return there is no major separation with the southern Gable, although we again note rotational movement outwards around 3-5 mm in the 600 mm spirit level. This is more onerous along the return with the Western elevation where it probably exceeds 7 mm. Again it is not reflected by major cracking damage and is limited by comparison to the overall wall width.

At the repairs to the brickwork over the main opening with the original mortar there is little to suggest separation and no major cracking around the return with the internal wall at the northern end. Slight opening up has occurred through the joints, but this remains minimal other than a limited number of snapped bricks.

4.0 COMMENTS, RECOMMENDATIONS AND CONCLUSIONS

- 4.1 It is evident from our inspection of the various buildings that they have been subject to various maintenance and repairs during their lifetime. This is indicated by the gangnail truss roof to the two storey building as well as the refelting of other roofs. Repairs have been carried out through the brickwork in a number of instances and these have generally been adequate.
- 4.2 Other alterations include the new openings through the Open Barn and between the Open Barn and the single storey stable block. No details are available for the works undertaken although there are clearly galvanised steel beams over both openings through the external walls. In the case of the opening into the single storey building the 'goalpost' frame does not exhibit significant misalignment or deformation, and there is little evidence of any cracking damage through the brickwork above. The columns are anchored into the brick walls on either end. A rough concrete floor finish may suggest a spreader beam to form a full 'box' frame. There is nothing through the structure to indicate that these alterations are not structurally adequate.
- 4.3 Access to the northern elevation of the two storey building, and the associated single storey section, was not possible due to the riverbank being tight up against the elevation. Where these could be viewed internally however there was no major rotational movement to suggest inadequacy of the support. Minor Bowing and rotation has occurred, but this is limited by comparison to the overall wall and has not resulted in eccentricity relative to the foundations. Although we were unable to carry out external inspection of the elevations from the internal evidence there is little to suggest structural inadequacy.
- 4.4 Along the northern elevation of the single storey section few have highlighted the upper brickwork having been locally rebuilt to take account of the rotational movement noted at low level. This has meant a tapered mortar packer between the rebuilt section and the original wall but this is not reflected by significant deviation internally. There has, however, been separation along the profile joint between the North and Eastern elevations both internally and externally. Some of this may be result of inadequacy of

the rainwater goods and long-term movement. The cracking damage is relatively limited, but we recommend that it is repaired using a 'helifix' type system cut into the walls, to suit the profile, so that the elevations are rebonded to enhance the lateral restraint provided.

- 4.5 Throughout our observations internally we have made reference to the varying roof constructions and the timber members built within the walls. Some roofs have been altered and strengthened, with the section of the two storey building replaced in full. There is infestation and some staining evident through the timbers although this appears to be limited where it can be viewed from ground level. It should be envisaged, however, that some timber replacement will be required particularly to members built within the walls, or where the deterioration has reduced their strength.
- 4.6 As with our comments regarding weathering of bricks and mortar joints as well as dampness these comments do not constitute a report with regards to such matters. As part of the proposed conversion works we therefore recommend that specialists carry out an independent survey of the buildings with regards to dampness, infestation and rot. Appropriate treatment and replacement can then be incorporated within the conversion works so that the long-term stability of the structures is not compromised. At this time there is little to suggest that significant weakening of the main structural fabric has occurred.
- 4.7 Rotational movement has been observed across the majority of the elevations although this is generally limited to around 5 mm in a 600 mm spirit level, and probably 35 mm across the height of the walls. We have highlighted the 450 mm wide walls to the open two storey building as well as the piers to the open corner store. The degree of rotation movement is limited by comparison to the overall width of the solid brick construction and has not resulted in instability relative to the foundations. As such we are satisfied that the integrity of the principal structural masonry walls has not been adversely reduced.
- 4.8 We have, however, highlighted separation cracking between internal walls and the main external construction. This has weakened the buttressing provided by these internal

walls, and in the case of the two storey building there are no internal partitions. Subject to the proposed conversion scheme we recommend that the internal walls are more adequately tied back to the external elevations using 'helifix' type masonry reinforcement. This can be drilled through the external brickwork and mortar joints or cut horizontally into the jointing internally. This form of repair will enhance the lateral resistance and increase the stability of the external elevation. If any new internal walls are incorporated within the conversion then these should also be fully tied through to the external wall to further enhance the overall stability.

- 4.9 Externally we have highlighted erosion to both bricks and mortar joints and there is some crumbling of the internal bricks as a result of dampness. This dampness can be treated by the specialist as necessary, but it should be envisaged that some individual brick replacement will be required during the conversion works. This can be incorporated within associated repointing of the damaged and weathered mortar joints as part of the aesthetic treatment of the external elevations.
- 4.10 There are an isolated number of cracks within the internal and external walls which will require some repair. Where these cracks are limited, they should be raked out a depth of at least 35 mm prior to repointing with an appropriate sand/cement mortar. For more significant cracking we recommend the introduction of 'helifix' masonry enforcement in a similar manner to that referred to above. This reinforcement will effectively rebond areas weakened by cracking damage and cater for future limited movement.
- 4.11 It should be appreciated that the above comments have all been made following a single visual inspection of the various buildings without the benefit of any long-term assessment, investigations or testing of the materials used in construction. We are therefore unable to categorically state that all movement observed within the individual buildings has ceased. It is our opinion based upon the available visual evidence, however, that each of the buildings remains in a structurally stable condition not subject to significant recent movement.
- 4.12 We have made a number of recommendations with regards to repairs and specialist treatment which will be required during the conversion works. We are, however,

satisfied that the integrity of the main structural fabric remains in an acceptable stable condition. As a consequence is our opinion that the buildings can be incorporated within a sympathetic conversion to alternative residential accommodation without the requirement for extensive reconstruction works, subject to any specialist timber treatment and repair

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For and on behalf of Dudley Consulting (Hull) Ltd