

A20298

Structural Report

on

Former Agricultural Buildings

at

The Drury, Drury Lane, Tybroughton, Whitchurch, SY13 3BD

Carroll & Williams LLP

Consulting Structural Engineers

25 Sandford Avenue,

Shrewsbury, Shropshire. SY1 3BE.

Tel. 01743 368006, Fax 01743 245475 e-mail: office@carrollandwilliams.co.uk

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1.0. Introduction

1.1. On the instructions of the owners Mr & Mrs Probin, a surface inspection was made on the above property on 21st October 2020. No investigations were carried out, for example the excavation of trial pits or removal of finishes.

1.2. This report deals only with the structural matters discussed and does not cover items normally contained in a Chartered Surveyors report or reports by specialists such as those dealing with timber infestation. It is assumed that such reports will be obtained by the client. Lack of comment on structural elements does not imply that they comply with current standards, but only that we could not detect any obvious signs of distress in these members. The past history of the site has not been established from records, maps, etc. as a part of this investigation nor the effects of past or future mining activities.

1.3. For reference purposes only, the elevations to the range of buildings facing the public highway are considered to be facing south with the farm house to the east, although this orientation has not been checked accurately.

1.4. The main features of the three buildings are:-

a) **General Layout:** Three existing buildings A, B & C to be converted to form 5N° residential dwellings. Building 'A' (proposed unit 1): Single storey former Shippon building. Building 'B' (proposed units 2, 3 & 4): Single storey former cowshed with a flat roofed side wing to southern end of west elevation. Building 'C' (proposed unit 5): Former stable block and hay loft, partly two storey to western half with a lean-to single storey rear (north) wing.

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- b) **Roof Covering:** Natural slate to all roofs, except lean-to rear wing to Building 'C' which has modern trapezoidal plastic coated profiled steel roof sheet. Corrugated metal roof sheeting to single storey side wing to Building 'B' and polycarbonate/glass roof lights to Building 'B & C'
- c) **Roof Support System:** Common timber rafters and canted purlins to all pitched roofs, except lean-to roof to rear wing of Building 'C' which has purlins but no common rafters. Flat roof to side wing of Building 'B' has timber purlins supported on rafters. Canted purlins span between 3Nº traditional kingpost roof trusses to Building 'A' and lightweight steel angle iron raised collar trusses at approximately 3.5m centres to Building 'B' and internal cross walls to Building 'C'.
- d) **Elevations:** Solid facing brickwork walls to all buildings, shallow self supporting brick arches typically to external openings to Buildings A & C. Exposed concrete lintels to Building 'B'.
- e) **First Floor Construction:** Suspended timber floor (hay loft) to western half of Building 'C'.
- f) **Ground Floor Construction:** Solid ground floors throughout, typically concrete slab forming livestock stalls to Buildings A & B, brickwork paviors to Building 'C'.
- g) **Slope of Site:** Reasonably level, slight fall in north westerly direction.
- h) **Trees and Other Vegetation:** Wall climbing plant conceal bottom half of south elevation and 3No. bushes to north elevation of Building 'A'. Wall climbing rose centrally to south elevation of western half of Building 'C' and plant to eastern end elevation. Mixed hedge adjacent southern elevations to Buildings A & B, minimum 10m away. Conifer hedge to eastern boundary, 2.6m high and 5.4m minimum from south west corner of single storey wing to Building 'B'.

2.0. **Observations**

2.1. This list is not necessarily comprehensive, but is intended as a guide to the stability and general structural condition of the building.

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2.2. Building 'A'

2.2.1. Front Elevation – (South)

- a) Roof plane and eaves line are true, no evidence of significant roof spread.
- b) Shallow self supporting brick arches over windows are sound.
- c) Gutter is leaking some standing water adjacent wall and base of wall is damp/discoloured.
- d) Weathered mortar joints to low level blue brickwork wall.
- e) Three or four loose, laterally displaced bricks locally at base of wall to rainwater/yard gulley.

2.2.2. Side Elevation – (East)

- a) Gable is fairly plumb, feature corbelled brick verge details is slightly uneven laterally.
- b) Eroded brick faces to majority of header brick course at base of wall.
- c) Deep weathering of mortar joints to band of brickwork mid-height.

2.2.3. Rear Elevation – (North)

- a) Roof plane and eaves line are generally true. Slight outward bow in eaves line locally at western end where corner pier has displaced horizontally.
- b) Brickwork arch over left hand window is sound, minor old cracking over right hand window, right hand end of which is concealed by ivy. Similarly bottom half of majority of elevation is masked by wall climbers, some spalled/eroded brick faces.
- c) A loose brick & deep weathering mid-height at south east corner - impact damage due to gate.
- d) Bottom few courses of south east corner slope down to east, two displaced bricks. Likewise to bottom south west corner which slopes to west, 3Nº displaced/loose bricks behind rainwater downpipe and some deep weathering of mortar joints.

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2.2.4. Side Elevation – (West)

- a) Gable wall is reasonably plumb, slight bulge centrally below circular window and gable peak leans in slightly to east. Eroded faces along brick header course at ground level.
- b) Vertical crack/gap centrally to brickwork arch over right hand door.
- c) Similar crack and minor disturbance to brick arch over left hand door and old repaired cracking to brickwork over which remains sound.
- d) Right hand corner pier bows out towards south at mid-height, there is crude cement rich pointing/repair of stepped crack to corner stone quoins and brickwork above upper quoin.
- e) Similar bulge/bow to left hand corner pier out towards north at mid-height, opening up perpend joists due to horizontal thrust from arched brickwork over door.
- f) Distortions to corner piers are exacerbated by apparent expansion forces due to corrosion of embedded steel door latches which has cracked the feature stone quoins to door jambs.
- g) Right hand springing point to left hand door appears to be marginally lower than left hand one which appears to have lifted/pushed outward.
- h) Some deep weathering and loose bricks to right hand jamb of bricked up central opening.

2.3. Building 'B'

2.3.1. Front Elevation – (East)

- a) Minor dishing/undulations in roof plane between roof truss support lines, more pronounced distortions to both end bays, which repeats to rear (western) roof slope, and to a lesser degree the second bay from southern end of front slope.
- b) Eaves line appears to be true with no significant roof spread, roof dishing between trusses is due to slender canted purlins, again this repeats to rear (western) roof slope.

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- c) Three slipped slates (asbestos/cement?) at southern end, areas of replacement slates and extensive moss covering which repeats to west slope.
- d) Area of missing and slipped slates to right hand (north) end verge line.
- e) Elevation is true/vertical, perhaps slight inward bow to brick wall panels between the windows, repeats to rear (western) elevation.
- f) Exposed concrete lintels over openings are generally sound, except for horizontal crack at left hand end of extreme left hand window - replace lintel or repair.
- g) A number of bricks with eroded faces and some areas of deep weathering to mortar joints.

2.3.2. Side Elevation – (North)

- a) Gable elevation is true/vertical, a few bricks with eroded/spalled faces.
- b) Old diagonal crack over right hand door, wall face below crack is slightly proud by 10mm.
- c) Fair faced concrete lintels over personnel doors appear to be sound, minor cracking to lintel over large central sliding door cast in fixings, although majority of lintel is concealed by door.
- d) Minor displacement of brickwork at base of north east corner and between left & central doors.
- e) Loose bricks locally at base of north west corner pier due to impact damage – rebuild/repaint.

2.3.3. Rear Elevation – (West)

- a) Roof dishing/distortions repeat as front slope, missing glass to rooflights.
- b) Exposed short lengths of corroded reinforcement to lintel over third window from north end.
- c) Crack/bulge in face of concrete door lintel each end due to corroded rebar, right end is worst.
- d) Some eroded brick faces at base of broken rainwater downpipe and along wall at north end.
- e) Single storey side wing appears to be built off concrete floor slab, but elevation appears sound.

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2.3.4. Side Elevation – (South)

- a) Gable elevation is true/vertical, except apparent slight lateral displacement of wall for short length between central door and right corner just above damp proof course (dpc).
- b) A number of eroded brick faces to gable, more so to left hand side of central door.
- c) Mortar pointing to old stepped crack to left hand wall panel/side of door. Similar stepped crack to right hand side of door, again some loss of mortar to crack line and couple of loose bricks at eaves level at top of crack. Top of gable corner has displaced laterally by 5 - 8mm.

2.4. Building ‘C’

2.4.1. Front Elevation – (South)

- a) Minor undulations to roof plane and some missing/broken slates to roof over two storey area, roof plane to single storey wing appears to be reasonably true.
- b) Moderate outward bow in eaves line centrally to two storey wing and top of wall leans outward towards south either side of hayloft hatch, otherwise front wall is reasonably true.
- c) Old minor repointing over left hand door arch and right hand springing point has settled slightly.
- d) Deep weathering of mortar joints locally to right hand corner of two storey wing due to rainwater downpipe and to central band at low level.
- e) Vertical crack at left hand end of right hand door, some repointing over right hand window.
- f) Length of front wall eaves to single storey western wing bows inward, some disturbance to band of brickwork over door and right hand window.
- g) Top of pier between right hand end door and window leans outward and brick face is stepped.
- h) Some repointing to brickwork above right hand window - rebuild brick course above door arch, adjacent western window and possibly the pier between both openings.

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- i) Evidence of old pointing to diagonal cracks lines under window, indicative of minor foundation settlements locally at front south east corner.

2.4.2. Side Elevation – (East)

- a) Gable wall is true, wall partly masked by wall climbing plant.
- b) Some weathering of mortar joints and a few bricks with eroded faces.

2.4.3. Rear Elevation – (North)

- a) Western half of two storey roof is reasonably true, minor dishing/dip to eastern half. No clear view along eaves line, but appears to be minor outward bow towards north.
- b) Shallow roof pitch to single storey wing, quite a few slipped/missing slates forming roof holes.
- c) Minor cracking and crude repointing at end of second internal stall wall from western gable.
- d) Some old cracking and slight displacement laterally to top few courses to end of first internal wall from western gable at high level, repeats to other internal dividing walls between stalls.
- e) Some softening of exposed timber eaves beam/wallplate over first internal wall from eastern gable and straight joint mid span between pair of central piers.
- f) Moderate lateral displacement at base of western end wall, one missing brick - impact damage?

2.4.4. Side Elevation – (West)

- a) Gable wall is true to main building, couple of eroded bricks.
- b) Minor opening up of vertical dog toothed joint at junction of main building and rear wing, but not significantly so, some deep weathering of mortar joints at low level.

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2.5. Internal

2.5.1. Building 'A' - Ground Floor

Extensive storage particularly to the south half of building limited inspection of walls and floor.

- a) Three kingpost trusses are robust size, no sign of any significant distress or opening up of truss joints, minor shakes in kingposts. No excessive deflections to canted timber purlins.
- b) Some old ivy growth/ingress to underside of roof, rotten timber battens, but generally roof timbers appear to be in sound condition, subject to checking ends locally built into external walls.
- c) Central keystone to shallow self supporting over bricked up door in eastern end gable has dropped, there is a raking crack over up to eaves.
- d) Crack opened up by 10 - 15mm in soffit of brick arch over north door in west gable and vertically to inside face of arch but reducing to hairline.
- e) Similar crack in soffit of arch over southern door in west gable, diagonal crack to right hand side of door and minor cracking locally at high level to south wall in corner.
- f) Raking crack in front wall from mid height of door in north west corner up towards eaves.
- g) Corrosion of embedded door hinges/latches has cracked the stone quoins, causing minor lifting of brickwork coursing above the ironmongery to the feature door jambs in west gable.

2.5.2. Building 'B' - Ground Floor

Horizontal tarpoline sheeting between second and fourth roof trusses from western end gable hindered inspection of roof structure and trusses.

- a) Slender raised collar steel angle iron roof trusses exhibit marked corrosion throughout.
- b) Moderate downslope deflections noted to small section canted timber purlins spanning between roof trusses, more pronounced deflections to end bays as noted externally.

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- c) Some rot noted to tiling battens, generally timber wallplate appears to be sound.
- d) Minor stepped cracking over personnel doors in north end gable - check inbuilt timbers in gable over southern door below missing slates and hole in roof.
- e) Minor horizontal cracking to top of north pier/wall supporting second steel roof truss from northern end and between pier and window to left hand side.
- f) Stepped crack between left jamb of third window from north end and adjacent southern pier.
- g) Stepped crack to eastern half of southern end end gable as noted externally.
- h) In single storey side wing, partial collapse of roof timbers in entrance lobby/plant room. Small piece of asbestos/cement (asbestolux) fire lining over plant.
- i) Original chipboard flat roof decking has collapsed onto floor concealing concrete slab, timber planks have been laid over original joists to support remedial corrugated metal roof sheeting.
- j) Minor cracking to western end of lintel over southern external door and horizontal crack in render to east wall of main building.
- k) Minor cracking to walls over northern external door around rafter bearings.

2.5.3. Building 'C' - Ground Floor

- a) Some discolouration to north end of first floor downstand beam, but it appears to be sound, treat as necessary. Likewise timber backing lintels over front door and window appear sound.
- b) Floor boards are rotten and there is some decay/rot noted to first floor joists.
- c) Brick paviors laid to falls to ground floor western two storey area, bedding/debris concealed assumed brick paviors in single storey eastern half.
- d) Roof timbers over eastern single storey half of building generally appear sound, staining and discolouration to rear wallplate and rafter ends - check rafter feet and repair/replace as necessary.

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- e) Slight bulge in internal cross wall dividing two single storey stables below rear purlin line, but not significantly so. Some discolouration noted towards western end of rear purlin in second stable from eastern end and tiling battens are rotten.
- f) Front south eastern corner has pushed out slightly in top, 10 - 15mm step between brickwork gable face and in-built timbers in gable.
- g) In south west corner of rear lean-to wing, minor vertical crack to straight debonded joint where north end wall abuts two storey wall.
- h) Minor cracking locally to top of western end wall over in-built timbers at northern end.
- i) Some rot and old wood boring insect flight holes noted to intermediate canted timber purlin line over most westerly stall.
- j) Minor cracking to top of stall walls locally at junction with two storey rear wall.
- k) Rendered lower section of stall walls, deep weathering of mortar joints where render is missing. Very minor hairline stepped crack in eastern end stall above render.

2.5.4. Building 'C' - Ground Floor

- a) Rear timber wallplate is rotten, some loss of section due to water ingress around rooflight and top brick course to rear wall is loose/rotated and rear wall leans over in top due to roof spread.
- b) Significant quantity/layer of pigeon droppings concealing floor boards.

3.0. Conclusions & Recommendations

3.1. The age and construction of the property is such that it inevitably contains elements which do not comply with current design standards. Such elements must therefore be judged on their condition and apparent adequacy to support the loads imposed upon them.

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3.2. Examples of this are the canted timber purlins and lightweight angle iron steel trusses to Building 'B' (former cowshed), it is assumed that these will be replaced as part of the conversion works to accommodate the increased roof loads. Similarly the rudimentary corrugated metal roof sheeting and flat roof timbers to the side wing of Building 'B' should be replaced.

3.3. Otherwise the roof timbers to all buildings appear to be generally in good order, subject to localised repairs required under small patches of damaged roof coverings. Any soft or rotten timbers should be treated, repaired or replaced as necessary as part of the conversion works.

3.4. Minor distortions to the roofs and walls, where noted, have generally occurred due to a lack of cross tying at eaves level. The lateral restraint may be readily improved by the installation of suitable horizontal ceiling joists/ties at eaves level to triangulate the roof structures. Alternatively installing new ridge purlins would reduce potential problems with roof spread in the future.

3.5. In the conversion scheme, additional restraint will also be provided to external walls by bonding/tying the new or existing internal walls together and strapping at first floor and eaves levels. Particularly to existing internal stall walls to the rear lean-to wing to Building 'C'.

3.6. Majority of the exposed concrete lintels to Building 'B' appear to be sound and performing satisfactorily, although some lintels have suffered damage due reinforcement corrosion. Whilst it may be feasible to repair the existing concrete lintels with epoxy, it would be prudent to allow for installation of new proprietary galvanised steel lintels or similar during the conversion works as a precaution measure to avoid potential future problems with ongoing maintenance.

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3.7. It is considered good building practice to replace any timber lintels and cut out any sections of rotten in-built timbers and replace in short lengths with masonry, albeit that none were evident with possible exception of northern gable to Building 'B' below missing roof slates. All existing timbers to be retained should be treated.

3.8. Excavation of trial pits to assess the ground conditions and check/verify the adequacy of the existing footings was not included in our remit as part of this report. Care should be taken during replacement floor slab excavations to avoid undermining or destabilising existing walls footings.

3.9. As trial pits have not been excavated to allow inspection and assessment of the foundations, it is not possible to state whether the foundations comply with current requirements. However, the apparent lack of significant current damage due to foundation movement in the areas inspected, suggests that the foundations may be considered to be currently stable and are expected to remain so in the foreseeable future provided there is no intervening cause of instability, such as loss of water from underground services or the like.

3.10. Some improvement of the existing footings may prove necessary locally along with minor remodelling/making good the distorted/displaced masonry to the two corner piers to eastern gable of Building 'A' and front south eastern corner of Building 'C'.

3.11. The external brickwork to all buildings is in fair condition, localised repairs of the minor impact damage to the base of the walls, replacing bricks with eroded faces and repointing the areas of deep weathering of mortar joints would be beneficial in restoring the weather resistance.

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3.12. Repaired cracks tend to form lines of relative discontinuity in the walls, so that they might be liable to slight reopening due to temperature and moisture movements, particularly during extremes of climate. Shallow self supporting arches being particularly vulnerable to such thermal movements.

3.13. The existing buildings are generally of robust construction and remain free of significant structural defects. Subject to the foregoing, the buildings are considered suitable for the proposed conversion to residential use without the need for major reconstruction, ensuring the long term viability of the buildings.

18th December 2020

Signed.....
A.W. Morris B.Eng.

for Carroll & Williams LLP Consulting Structural Engineers