



Consulting Civil,  
Structural, Highway and  
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**Structural Appraisal  
of  
Shackerstone Fields Farm,  
Snarestone, Swadlincote, DE12  
7DE**

**for**

**P A Wright and Sons**

**Ref:**

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## 1.0 INTRODUCTION

### Brief

- 101 We have been instructed by P A Wright to undertake the following scope of works.
- 102 Our brief was to undertake an initial structural appraisal of the Barns at Shackerstone Farm, providing an opinion on the suitability of the structures for conversion to residential usage, commenting on the overall structural condition of the properties and any significant structural defects.

### Notes and Comments

- 103 This report is an initial structural appraisal only, and whilst commentary on the capacity of structure is offered in the context of conversion to residential usage, appropriate detailed design checks will be required in due course following confirmation of architectural finishes.
- 104 We have not investigated the presence of asbestos and all other non-structural elements or biohazards, including the presence of invasive non-native plants, nor have we inspected the electrical and mechanical installations, and our inspection of the property will only check for visual evidence of damp.
- 105 The external inspection of the building has been carried out from ground level by visual and optical sighting and without special access arrangements we cannot confirm that obscured parts are free from defect.
- 106 The internal inspection has been made within the limits of ready accessibility and it is not normal practice to lift floor coverings or floorboards, remove panels or plaster, or move heavier items of furniture. Consequently, we have not been able to inspect woodwork or any other parts of the structure which are covered, unexposed or inaccessible and it is neither implied nor should it be construed that other parts are free from defect or that they have not suffered from insect or chemical attack.
- 107 Whilst we have used all reasonable skill and care in preparing this report, it should be appreciated that we cannot offer any guarantee that the property will be free from future defects or that existing ones will not suffer from further deterioration.
- 108 All observations are referenced as left or right hand as though observed from outside the front of the property viewing towards the front elevation, and all internal observations in the unlit or dark spaces were made with the aid of a handheld torch light.

## 2.0 **RISK ASSESSMENT**

### Structural risks in present condition:

201 The following structural risks were noted during our inspection:

- (a) Barn 5 & 7 – Instability caused by corroded column bases
  - (i) Whilst Barns 5 & 7 are not within the scope of the survey it was noted during the course of the survey to be in particularly poor condition with significantly corroded column bases which may become unstable in high wind cases. The webs of the stanchions range from reasonable condition to completely absent (with only flanges remaining) due to corrosion.
  - (ii) Particular care should be taken around the structures in high wind conditions, and it is recommended access is restricted to the building in such times until column bases are repaired.

202 Further risks may be present, and all due precautions should be taken.

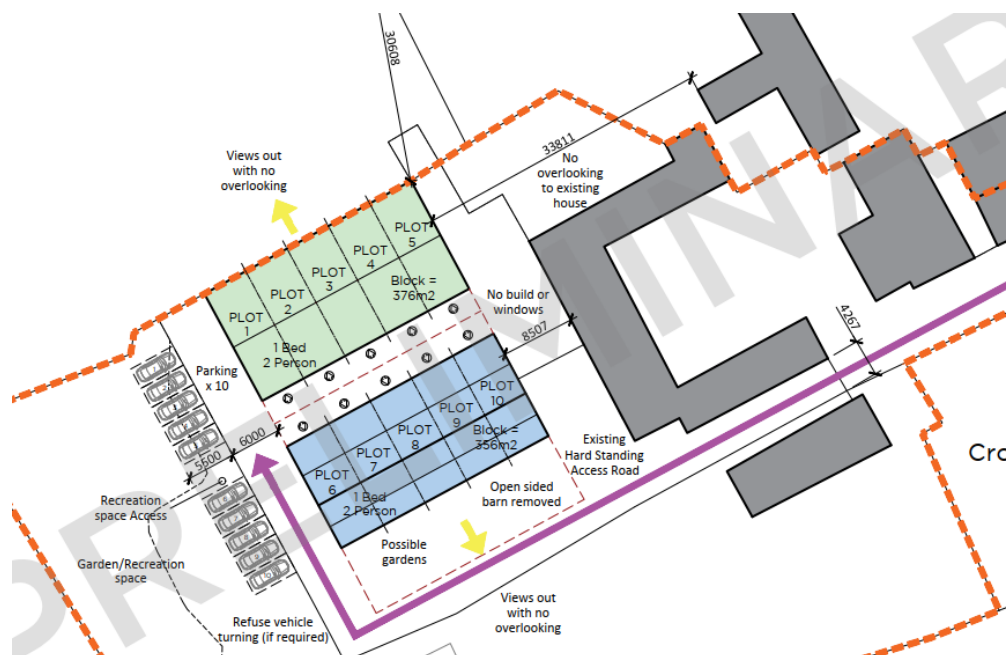
### 3.0 **GENERAL OBSERVATIONS**

- 301 Shackerstone field farm is located off Derby Lane, south-east of Snarestone.
- 302 The farm comprises a range of agricultural barns of various ages and constructions, which include:
- (a) Historic traditional brick structures
  - (b) Modern steel portal frames
  - (c) Mid-20<sup>th</sup> century steel framed barns with steel trussed roofs
  - (d) Mid-20<sup>th</sup> century steel Dutch barns
- 303 The surrounding topography is relatively flat, with the Ashby de la Zouch canal located to the south and west of the site.
- 304 The adjacent farm house and Crown cottage are under separate ownership and not within the site boundary.
- 305 An existing gated access is present off Derby Lane.
- 306 The barns are currently generally used for a range of agricultural purposes including livery and storage of goods and equipment.
- 307 This structural survey is concerned with the condition of the barns to the rear of the site. A reference plan for the barns is provided below.



**Figure 1 – Satellite view with Barn references**

308



### Figure 2 - Architectural Proposals

## **4.0 Barn 1**

### **4.1 General Observations**

- 401 Barn 1 comprises a modern steel portal frame with a low pitched duo pitched roof and gables to the North-East and South-West elevations. The roof is clad in light weight cementitious panels.
- 402 The elevations are masonry to the lower half, and cladding panels to the top half of the elevations. The masonry to the north-east of the barn is brick, indicating an older construction and that the barn has been extended historically to the south-west.
- 403 The masonry is generally in reasonable conditions for its age, with no signs of any significant structural cracking suggesting the current foundations for the wall are suitable. The blockwork is in good condition with good pointing and only occasional localised defects. The brickwork is in a slightly more weathered condition and would benefit from some repointing but the brick units are otherwise in reasonable condition for their age.
- 404 The roof line is even with no significant deformation or distortion, demonstrating that the underlying steel frame has been suitable to support the weight of the roof and imposed wind and snow loads without excessive deformation or sway damaging the masonry walls.
- 405 Lateral stability is achieved through stiffness (portal action) of the steel frame in the North-west to South-east direction, and by the masonry infill panels acting as shear walls in the perpendicular direction.

### **4.2 Residential Conversion**

- 406 Notwithstanding areas requiring minor localised remedial works, the primary steel frame and masonry panels were noted to be in relatively good structural condition for their age and the structure is considered suitable for residential conversion without fundamental works, with a sympathetic architectural scheme.
- 407 It is envisaged that a new insulated light weight roof of similar weight could be installed in lieu of the current cementitious panels.
- 408 Portalised steel frames often experience higher deflections than braced frames although are stiffened significantly by cladding/sheeting panels. Refurbishment proposals should therefore replicate the stiffness provided by the current sheeting and low height masonry walls in any replacement wall constructions. Adoption of flexible finishes may also be prudent subject to a review of the theoretical deflections of the frame.



Front elevation



Brickwork side elevations



Rear elevation



Full side elevation with brick and block

## **5.0 Barn 2**

### **5.1 General Observations**

- 501 Barn 2 is an infill building between barns 1 & 3. The structure comprises a monopitched lean-to roof to the North-East side of the barn, and a pitched roof to the South-West.
- 502 The lean-to roof is a light weight cementitious boarded roof finish, supported on angled steel purlins and steel beam rafters.
- 503 The duo-pitched roof is formed from cranked steel beams supporting timber purlins and further cementitious sheeting.
- 504 The walls are a mixture of precast panels, and brickwork at low level with sheeting supported by timber rails at higher level.
- 505 The structure was generally in good condition for its age, with no significant deformation or corrosion to the structure, and no signs of significant settlement which would indicate any issues with undersized foundations.
- 506 Lateral stability is provided in part by the infill masonry panels and precast planks in the longitudinal direction, and by the adjacent barns in the minor direction.

### **5.2 Residential Conversion**

- 507 The structure is not currently proposed for conversion, however, should it be required the primary load bearing structural elements are considered suitable to continue supporting an similar lightweight insulated cladding system which would replicate the weight and aesthetic of the current roofing elements.
- 508 New cladding elements to walls should replicate the stiffness provided by current wall constructions e.g. Structural insulated panel systems or similar would be considered suitable.
- 509 Careful consideration should be given to adding additional weight to the roofs, and detailed analysis would be required to justify any additional loads, or alternatively a secondary support structure or alternate load path could be considered to support new ceilings, for example new ceilings could bear onto SIP walls rather than be suspended from roofs.



View of duo pitched and monopitched roofs



Precast panels at the base of the walls



North-East elevation



Wall cladding panels and timber rails

## **6.0 Barn 3**

### **6.1 General Observations**

- 601 Barn 3 is an ad hoc steel framed construction, comprising steel columns and Portalised steel rafters. The columns extend up beyond the top of the steel rafters and appear to be a slightly older construction.
- 602 Some stiffening members at the eaves in the longitudinal direction are similar to those observed on the Dutch barns elsewhere on the site, and it is considered likely that the original structure was a Dutch barn construction which has had the roof removed and replaced with a more modern cranked beam arrangement.
- 603 Lateral stability is provided by low level blockwork panels in the longitudinal direction, which is assisted by some bracing between columns at the head in places. Cladding sheets will also be providing some diaphragm action and assisting with lateral stability.
- 604 In the minor direction some stiffness is provided by haunches at the eaves and apex of the beams, and some load sharing of lateral wind loads will occur with adjacent barns.
- 605 The block was generally in good condition with no sign of any significant structural cracking or deformation, suggesting that the barn does not sway excessively in high wind load conditions.
- 606 No significant deformation was observed in the roof and steel frame of the barn, suggesting that foundations are currently suitable for the light weight cladding loads currently imposed on the structure.

### **6.2 Residential conversion**

- 607 The primary load bearing masonry elements of the structure are considered suitable for residential conversion without fundamental structural works. The remaining roof structure is also considered suitable for residential conversion using appropriate light weight finishes and structural detailing.
- 608 The structure is lightly braced and is reliant on the stiffness provided by the blockwork at low level and the cladding panels, however, the blockwork and roof sheeting appear to be providing suitable lateral support and provided this is replicated during proposals for residential conversion the structure is considered suitable in principle to continue supporting light weight cladding elements during conversion to residential usage – subject to suitable detailed design checks.
- 609 This stiffness could be replicated in a residential conversion using structural insulated panels between columns, which could also support the additional weight of heavier ceiling constructions and services if required.
- 610 Some localised impact damage is present to columns which will require remedial repairs, but otherwise columns are in reasonable condition and suitable to support the vertical loads of residential loads.



Front opening



Rear inside elevation



Typical long elevation with block wall and Dutch barn eaves bracing



Knee brace at eaves

## **7.0 Barn 4**

### **7.1 General Observations**

- 701 Barn 4 is a similar construction and finish to Barn 3, and shares an internal open space and column support with Barn 3. However, the roof construction is a light weight steel truss construction and the frame generally appears to be a later construction than the original columns of Barn 3, but appears to predate the cranked steel beams of Barn 4. The trussed construction is anticipated to date to the mid 20<sup>th</sup> century.
- 702 Light weight steel trusses are typically able to support reasonable loads without significant deflection owing to their triangulated nature avoiding putting significant bending stresses in the steel members and relying more on the tensile and compressive capacities of the steel.
- 703 Impact damage notwithstanding there was no significant deformation of the structure, and the current columns and rafters appear to be suitable to support the current light weight loads of the structure.

### **7.2 Residential conversion**

- 704 The structure has been supporting a light weight roof construction and light weight cladding elements to the walls for a significant period of time without incurring any adverse deflection of the structure. It is therefore considered that the structure would be suitable to continue supporting similar light weight finishes in a conversion to residential usage without fundamental structural alteration.
- 705 A suitably sympathetic scheme should take account of the lightweight nature of the frame by replacing external cladding with similarly lightweight materials, and supporting additional internal finishes and the addition of self supporting/independent structures internally.
- 706 As with Barn 3 some local impact damage was noted in places and some localised repair of the steel framed structure is required.



Typical internal view from Barn 3



View of internal trusses and columns



Rear elevation



Shared column with Barn 3

## **8.0 Barn 5**

### **8.1 General Observations**

- 801 Barn 5 is a Dutch Barn construction comprising steel columns and curved roof trusses, and light weight angled steel purlins.
- 802 Some attempt has been made historically to concrete encase the bases of the columns, however, this has not prevented significant corrosion of column bases which required structural repair.
- 803 The Barn shares column with Barn 4, is clad with cementitious panels.
- 804 The Barn is currently proposed to be demolished as part of the redevelopment proposals.
- 805 Lateral stability of the barn is provided by the stiffening effects of the roof and wall panels with Barn 4, but overall a reasonable level of sway would be expected in the structure given the open sides and lack of bracing and walling elements.

### **8.2 Residential Conversion**

- 806 Whilst the Dutch Barn is not currently propose to be redeveloped similar structures are often converted. Typical challenges with such structures include stiffening the frame to avoid high deflections during wind loads – this is often achieved without fundamental works to the structure by infilling between steel columns with infill SIPS panels or similar. Other typical challenges include avoiding adding significant weight to the roof structure, which whilst able to support light weight roofing panels and often some modest insulation, these structures would typically struggle to support heavy plastered ceiling finishes. Architectural schemes therefore either expose the structure and avoid additional finishes, or support finishes on the infill wall panels.
- 807 In this instance should future development proposals require it, Barn 5 could also be converted in a similar manner following appropriate repairs to the column bases.



View of roof structure and trusses



View from rear



Side elevation



Interface with Barn 4

## **9.0 Barn 6**

### **9.1.1 General Observations**

- 901 Barn 6 is not currently within the scope of the redevelopment proposals but the following commentary is offered for completeness.
- 902 Barn 6 is a traditional brick construction with thick walls and loose timber roof and floor constructions arranged in a “U” shape around an internal courtyard.
- 903 The barn is split into three distinct areas including a single storey stable structure, a double height threshing barn in the centre, and a two storey barn to the North with stables and ground floor and storage at first floor.
- 904 The brickwork of the structures is generally in reasonable condition, but as with structures of this age would benefit from some additional tying between floors, roofs and walls as par of any conversion.
- 905 Detailed design of the roof structures would be required to ascertain their full load capacity, in some instance these structures are able to support additional insulation and plaster with little/no modifications, whilst in others some secondary structure is required.
- 906 Existing rafters are relatively shallow and are therefore either replaced with larger sections to provide suitable depth for insulation, pushing the roof line up slightly, or the insulation is installed within the purlin zone.
- 907 Walls are suitable to support the additional weight of an additional floor where required, and the beneficial effects of floors stiffening walls typically outweigh the additional load. The additional load of a light weight floor on the foundations is typically acceptable given the building has consolidated and the additional load is relatively low.



Trusses to single storey Barn



Typical View from Courtyard



Trusses and internal view in threshing barn



Floor in two storey elements of building

## **10.0 Barn 7**

### **10.1.1 General Observations**

- 1001 Barn 7 is not currently within the scope of the redevelopment proposals, but the following commentary is offered for information purposes.
- 1002 Barn 7 is a Dutch Barn construction of similar construction to that of Barn 5, however, the barn is lower in height.
- 1003 The barn has similar corrosion issues at the bases of the columns which require repair.
- 1004 The barn is clad to the side and rear elevations so is likely to be stiffer than Barn 5 with less sway during high wind loads.
- 1005 As with other similar Dutch Barns the columns are considered suitable to support the weight of a new light weight residential roof, and the roof would be suitable to support a similar weight of insulated cladding to that of the current cementitious roof sheets, however, care should be taken in the architectural scheme not to impart significant additional load from services and finishes to the roof structure.



Front elevation



Rear elevation



Column flange



Column Web

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