

STRUCTURAL APPRAISAL OF
MILL HOUSE
OAK STREET
CHEADLE
STAFFORDSHIRE
ST10 1NX

DATE: SEPTEMBER 2020

OUR REF: A4940



1.0 INTRODUCTION

We have been instructed by Alistair Goodwin to carry out an inspection and structural appraisal of the building on the corner of Oak Street and the A521 Bank Street. We are to assess the structural condition and identify any defects, and recommend any remedial works which may be considered necessary to return the structure to a sound, stable condition.

The property is within the Cheadle Conservation Area.

The property is earmarked for conversion into 2no separate domestic units.

Unless specifically mentioned, the survey excludes an inspection of the electrical, mechanical, heating and drainage installations and associated wiring, and all other non-structural items.

External inspection of the building has been carried out from ground level and within the limits of ready and safe accessibility. We cannot confirm that obscured parts are free from defect.

The internal inspection has been made within the limits of ready and safe accessibility.

The lack of specific reference to any structural element or form of construction does not signify compliance with current codes of practice, building regulations or British Standards.

An engineer from this office attended site on 20 August 2020 and the weather was sunny and warm

Categorised descriptors of cracking severity are in accordance to Building Research Establishment Digest 251 - Assessment of Damage in Low-Rise Buildings (Figure 1).

We have no records of any of the incoming services to the buildings.

2.0 GENERAL DESCRIPTION

The property is a former industrial building, dating from the mid-to-late 19th century, currently being used for storage, in the centre of the town of Cheadle. It is located on the corner of the two one-way streets, with its front elevation facing approximately west onto Oak Street. The building is rectangular on plan, measuring approximately 6m from front to back, and 15m long in total, and approximately 5.75m to eaves. To its northern boundary, the property adjoins a further property, the ridge of which is slightly higher.

The construction is of solid 225mm-thick loadbearing brickwork. The roofs are traditional cut-timber constructions, consisting of rafters on timber purlins. The purlins bear onto the trusses and the property's gable walls. The roof is finished with Staffordshire blue tiles.

The site falls within the planning jurisdiction of Staffordshire Moorlands District Council. The site is a considerable distance from designated Main River watercourse Cecilly Brook, and is not within Flood Zones 2 or 3 according to the Environment Agency's mapping. The plot slopes along Oak Street, downwards from the northern end of the building to the southern end.

3.0 EXTERNAL INVESTIGATION

The building is located extremely close to the edge of the carriageways to its front and gable elevations; there is a footway of 600-800mm width to the front elevation (Figure 2), and the gable is immediately adjacent to Bank Street. To the rear of the property there is a small yard which falls within the curtilage of the nearby garage (Figure 3).

The masonry on the front elevation, facing onto Oak Street, is laid in 225mm brickwork of an indeterminate bond pattern which features header bricks on roughly every fifth course. The mortar beds are thin, in lime mortar. There are 3no windows and 1no doorway at ground floor level, and 4no windows at first floor level. The openings are surmounted by brick arches, some of which are shallow.

There is a slight inward lean to the front elevation brickwork along the whole elevation, most pronounced at the southern end of the building. There is evidence that Mill House pre-dates the adjacent (plumb) building (Figure 4), and that the lean had already taken place at the time when the neighbouring building was constructed (although both were built in the 1800s). This supports the assertion that the movement in the building is historic and not ongoing. The buildings do not appear to be toothed into each other.

In spite of the historic movement in the property, there is little cracking in the front elevation brickwork. There is some evidence of past movement in the southernmost ground-floor window arch; the brickwork over it has been repointed (Figure 5). There is a patch on the southwestern corner of the building where several bricks have been replaced, clearly because of vehicular damage (Figure 5). At low level, some of the brickwork is somewhat weathered and the mortar eroded.

The gable elevation, directly on Bank Street, features 2no large doorway openings – one each at ground floor and first-floor level. The openings are surmounted by timber lintels which have evidently deflected and are giving rise to cracking above (particularly the left-hand end of the lower lintel), and there is vehicular damage to both corners (Figure 6). There is a noticeable belly in the shape of the wall.

To the eastern elevation, a large amount of brickwork has been replaced, using bricks which are approximately three-quarters as deep as the original units, so that the toothing pattern is somewhat irregular (Figure 7). The corner brickwork appears to be slightly damaged, probably by vehicular impact, and much of the low-level masonry is affected by efflorescence (Figure 8). There does not seem to have been significant cracking or movement on this elevation, with the exception of over the

southernmost ground-floor window arch – Category 1 or 2 cracking (Figure 9). The overall sway in the building is less apparent on this elevation.

The roof, which is earmarked for replacement, bears Staffordshire blue tiles. There is a noticeable dip in the ridgeline away from where it is supported at the gables, and at mid-rafter, close to the chimney (Figure 10).

The property has no effective damp-proof course. There are no significant signs of rising damp within the property. No trial holes have been excavated, but the building's spread stone footings are visible above the level of the footway on the western elevation, and are not likely to extend deep into the ground.

The drainage goods to the front and rear elevations appear to be intact but this could not be verified. The downpipe on the front elevation appears to discharge across the footway, into the road gutter and into a gully grating in the highway. The gutter on the rear elevation appears to discharge into the combined soil stack on the road-facing gable.

There are no trees close to the property which would be deemed to be having an effect on its foundations.

4.0 INTERNAL INVESTIGATION

The property is presently not subdivided into units – there are no permanent internal partitions in the building. There is a lightweight timber staircase in the southeastern corner. There is a timber first floor structure, which spans 5.2m from the front to the rear elevation walls on 225mm x 75mm joists at 400mm centres, which are considered slender for the span that they cover.

The elevation walls are buttressed at approximately 3500mm centres by 225mm wide x 125mm deep (overall 350mm deep) masonry piers (Figure 11). These piers support the 3no timber roof trusses onto which the roof purlins bear. The trusses consist of 240mm x 125mm bottom chords, 175mm x 100mm rafters and kingpost, and 100mm x 100mm counterbrace struts.

The purlins are 200mm x 100mm timbers, spanning 3500mm between supports, and they are aligned perpendicular to the roof slope, and are slender for their span. There is a single purlin per roof pitch and no structural ridge beam. Without a tie member across the roof within the bottom third of the rafter length, there is no effective triangulation to the roof except at the truss locations (Figure 12).

The rafters are mostly inaccessible on account of boarding to their underside. They measure 60mm x 80mm and are slender for the span that they cover. There is evidence of rainwater ingress through the roof, much of the lime torching has come loose, and, although the rafters appear to be in fair condition, the tile laths are approaching the end of their serviceable life.

The window and door openings on the ground floor are surmounted by timber lintels on the inner leaf, and the first-floor openings are surmounted by brick arches through the whole thickness of the wall.

The leaning walls are apparent from inside the property – most obviously when viewed from the first floor (Figure 13).

Largely on account of the flexible lime mortar, there are few cracks to the front and rear elevation walls, the exception being above the ground-floor window at the staircase on the southeastern corner, where the combination of timber lintel and shallow arch has given rise to movement throughout the masonry – Category 2 cracking (Figure 14).

However, there is widespread cracking (Category 3 – Category 1) in the gable wall, particularly above first-floor level, where the sway of the building has caused shearing in the brickwork, already weakened by the large openings (Figure 15 and 16).

5.0 RECOMMENDATIONS AND CONCLUSIONS

The structure has undergone some historic movement but it is our view that this is not ongoing and that the proposed works will strengthen and further stabilise the property.

It is proposed that the property be divided into 2no units by the installation of a full-height 225mm-thick loadbearing wall on a thickened region of floorslab or new trenchfill footing, to one side or other of the central truss position. This would build considerable strength back into the structure and allow reconfiguration of the first-floor layout. Where the walls are perpendicular to the joists, strapping should be applied from the walls across the underside of the joists, in accordance with the requirements of Building Regulations Approved Document A.

Although there is no structural requirement to do so, building a timber stud inside the masonry would add further strength and allow for insulation and vapour membrane to be installed to current standards.

It is proposed that the roof be stripped and refurbished. We would recommend that an additional purlin be installed on each pitch of the roof, close to the apex, to a suitable structural design. It may be possible to use a timber member, but otherwise a flitch beam could be designed for the purpose. This would substantially relieve the load from the existing purlins, and provide triangulation. The trusses are deemed to be in adequate condition to keep.

All timber lintels should be replaced with suitably-designed alternatives. We would recommend that the cracked masonry above the failed arch and lintel in the southeasternmost window should be locally taken down and rebuilt.

It is proposed that the ground-floor opening in the gable be infilled with masonry, which will add considerable strength to that wall panel. The cracked exterior masonry on the first-floor gable wall panel should be locally rebuilt once the existing timber lintel has been removed and infilled; the extensive cracks to the inside of the wall should be strapped over with 3mm x 30mm x 1200mm mild-steel straps, perpendicular to the crack direction and positioned at approximately 600mm centres.

Cracked or excessively frost-damaged bricks on all elevations should be chased out and replaced with suitably matching materials. The property would benefit from repointing to all elevations with a suitable mortar mix and profile.

Depending on the proposed ground floor level and construction, there may be a need to underpin the existing foundations so that they are not undermined by the required excavation.

It should be ensured that rainwater goods on the front and rear elevations are free-flowing, and downpipes are connected to a suitable underground drainage system.

Provided the remedial works are carried out to a good standard using first quality materials and provided regular routine maintenance is undertaken, the property should become eminently suitable for conversion to residential use.

Signed: 

12 September 2020

Tim Melville MA(Cantab), MEng

For and on behalf of AJS Structural Design Ltd

Classification of visible damage to walls with particular reference to ease of repair of plaster and brickwork or masonry

Crack width is one factor in assessing category of damage and should not be used on its own as a direct measure of it.

Category of damage	Description of typical damage <i>Ease of repair in italic type</i>
0	Hairline cracks of less than about 0.1 mm which are classed as negligible. <i>No action required.</i>
1	Fine cracks which can <i>be treated easily using normal decoration</i> . Damage generally restricted to internal wall finishes; cracks rarely visible in external brickwork. Typical crack widths up to 1 mm.
2	<i>Cracks easily filled. Recurrent cracks can be masked by suitable linings.</i> Cracks not necessarily visible externally; <i>some external repointing may be required to ensure weather-tightness.</i> Doors and windows may stick slightly and <i>require easing and adjusting.</i> Typical crack widths up to 5 mm.
3	Cracks which <i>require some opening up and can be patched by a mason. Repointing of external brickwork and possibly a small amount of brickwork to be replaced.</i> Doors and windows sticking. Service pipes may fracture. Weather-tightness often impaired. Typical crack widths are 5 to 15 mm, or several of, say, 3 mm.
4	Extensive damage which <i>requires breaking-out and replacing sections of walls</i> , especially over doors and windows. Windows and door frames distorted, floor sloping noticeably*. Walls leaning or bulging noticeably*, some loss of bearing in beams. Service pipes disrupted. Typical crack widths are 15 to 25 mm, but also depends on number of cracks.
5	Structural damage which <i>requires a major repair job, involving partial or complete rebuilding.</i> Beams lose bearing, walls lean badly and require shoring. Windows broken with distortion. Danger of instability. Typical crack widths are greater than 25 mm, but depends on number of cracks.

* Local deviation of slope, from the horizontal or vertical, of more than 1/100 will normally be clearly visible. Overall deviations in excess of 1/150 are undesirable.

Figure 1 – excerpt from BRE Digest 251 – Assessment of Damage in Low-Rise Buildings



Figure 2 – front (western) elevation.



Figure 3 – gable elevation and rear yard



Figure 4 – deviation of front elevation from adjacent plumb building



Figure 5 – cracked and repointed brickwork over arch, vehicle-damaged brickwork on corner



Figure 6 – gable elevation; cracking caused by deflection of lintels, vehicular damage to corner



Figure 7 – eastern elevation; unsympathetic toothing and pointing of replaced masonry



Figure 8 – efflorescence, poor condition of bricks and weed growth at low level



Figure 9 – cracked brickwork over window arch



Figure 10 – bowling roof structure



Figure 11 – typical masonry pier



Figure 12 – timber major roof trusses (first floor, looking northward)



Figure 13 – leaning elevation walls (extent exaggerated)



Figure 14 – cracking to rear elevation wall over failed lintel



Figure 15 – cracking to gable elevation wall



Figure 16 – large and harline cracking in gable masonry