STRUCTURAL ENGINEER'S REPORT ON

THE FITZWILLIAM ARMS
42 HILL STREET
ELSECAR
S74 8EL

for

Mr M Monfredi

Report number 2251

Buckingham Associates
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Brief

To carry out a structural inspection of the property in order to determine the present state of stability and assess the likelihood of future instability.

To comment on the seriousness of any defects. To determine the causes of the defects and whether they are dormant or progressive.

The investigation is limited to the above-mentioned structural aspects of the property and does not include items not specifically mentioned in this report, such as wiring and plumbing, for which specialist advice should be sought. No investigation of any other aspects of the property was made.

The inspection was carried out on 20 January 2022.

General Description

The Fitzwilliam Arms is situated at 42 Hill Street, Elsecar. It was built in the last third of the nineteenth century as a public house and has remained so ever since. It originally had adjoining properties, numbers 38 and 40 to the left side. These properties were demolished between 1956 and 1976. A rear extension was constructed in 2013.

The site on which the property stands is a fairly steeply sloping road rising at about 1 in 9 to the north. The property faces N 70° E, but for the purposes of identification, the front will be referred to as the east elevation, the right and left sides referred to as north and south elevations respectively and the rear as the west elevation. The site is at approximately 74 metres OAD.

The building has external walls in solid brickwork, with the side and rear walls painted white and the front unpainted. The brickwork on the front east elevation has every course with alternate headers and stretchers, known as Flemish bond. The bonding on the other elevations is less elaborate.

At the top of each of the gable walls (north and south elevations) there are large chimney stacks projecting approximately 2.5 metres above the roof line.

The upper internal floors consist of timber joists spanning between loadbearing walls. The ground floor is solid and can be seen from within the cellar to consist of a series of brick arches forming a vaulted ceiling.

North Elevation

It is clear from a visual inspection that the north elevation, next to the car park, is considerably out of plumb. At low level the wall leans inward by approximately 1 in 35. Above this level the wall appears to straighten, but then leans inwards to a much greater extent at high level.

From measurements taken by a previous survey (Haycock & Todd – July 2012) the chimney stack leans inwards to such an extent that the top of the chimney is around 550 mm out of plumb from the bottom of the wall. Not only does the wall lean inwards, it also slopes down

towards the front corner. The two windows on this elevation that would originally have been at the same level are now approximately 40 mm different.

There are two pattress plates at first floor level on the north elevation, one of which is 4 metres from the front corner and the second is near to the rear corner. These are repeated on the south elevation and will be connected by tie rods running through the building. It is not known when these were installed, but clearly there has been a significant stability problem for many years.

There is evidence of previous cracking in the wall that has been repaired and is disguised by the presence of the painted finish. However, the cracks have reappeared, indicating that there is ongoing movement.

East Elevation

The front elevation consists of Flemish bond brickwork that has not been painted. The entire elevation is sloping down towards the left side by approximately 1 in 30. Measurements from the previous survey indicate an overall difference in level from the right corner to the left in excess of 200 mm.

The doorframe and window frames are severely distorted and the chimney stacks can be seen to lean to the left.

There is a pattress plate at first floor level, 1 metre from the left corner, with a corresponding plate on the west (rear) elevation.

South Elevation

This is the left side which was originally connected to the adjoining property, number 40 Hill Street. It is cement rendered and painted white.

Due to the general slope of Hill Street, external ground level along this elevation is lower than others, making the gable wall higher by up to 1.8 metres.

At the rear corner, and continuing along the southern boundary, there is a retaining wall of relatively recent construction. This additional wall is built plumb and can be clearly seen to be flush with the main wall at the bottom and over a height of 3.8 metres the main wall slopes away by about 150 mm, indicating an overall lean of 1 in 25.

From the previous survey, the top of the chimney stack was measured to be leaning outwards and overhanging the boundary by 550 mm.

West Elevation

From the west (rear) elevation an extension has been added. A previous extension was added to in 2013 and at the junction of the different phases of the building the non-uniformity of the original structure can clearly be seen. It had proved impossible to neatly bond the new brickwork into the old because of the large degree of movement that has taken place.

Cellar

The cellar ceiling and ground floor construction comprised a series of brick arches spanning side to side, forming a vaulted ceiling. These arches are of different spans, with the two outer arches being the longer spans and the centre arch being shorter and therefore the outer arches are of a greater radius than the centre one. Towards the rear, the arches run front to rear.

With any true arch structure, the loads are transmitted down to the supporting walls at the ends not only vertically, but horizontally in the form of a lateral thrust. This thrust is greater the shallower the rise of the arch. Thus the outer two arches will be exerting a considerable lateral thrust on the external supporting walls.

This has caused the arches to fail, which has been partially addressed in the past by the installation of additional support beams across the arches. The underside of the brickwork arches has collapsed in several locations and the integrity of the structure now relies on the remedial beams that are in place.

Due to the nature of arches, it only takes a small amount of lateral movement to cause the arches to fail and this increases the lateral thrust on the supports, resulting in the movement and failure becoming progressive and catastrophic.

Internal Walls and Piers

Most of the internal fittings and ceilings above first floor have been removed. Plaster has been removed from the internal brick piers in the bar area.

The stripping out has revealed that the internal walls at first floor level are leaning towards the south by about 1 in 15 and are in a precarious condition. The internal piers in the bar area carry heavy loads from a series of beams and are also leaning dangerously to the south. One of the piers has a vertical crack, which is symptomatic of compression failure.

The roof is visible where the ceilings have been removed and this reveals that the original roof timbers have lost their bearing where they would have been supported on the external north wall. Remedial work has been carried out in the past, but the roof timbers are currently in danger of further movement causing complete loss of bearing.

General Condition and Conclusions

The building has suffered from severe movement in the past to the extent that the building leans towards the south (left) by an amount which gives serious cause for concern. Any wall that leans by an amount that places the top of the wall beyond the outer face of the base of the wall is considered to be on the point of instability and this is the case with the south wall.

The previously installed tie rods and pattress plates can only provide limited restraint under these circumstances and will not prevent the wall from failing if there is ongoing movement.

Any additional movement of the arched ground floor will result in large lateral forces on the outside walls, with the south wall being the more vulnerable as the ground level is lower at this side.

The present condition of the building indicates significant overall movement as evidenced by the overall tilting of the building downhill to the south and spreading of the arched ground floor.

The building is in a coal mining area and from the geological map for Barnsley (sheet 87) and the accompanying BGS memoir *Geology of the Country around Barnsley* it can be seen that there are several coal seams that are relevant in the area. The Kent's Thick seam outcrops just to the north of the site and dips away to the north. Beneath the site the Barnsley seam is located at relatively shallow depth, estimated to be around 30 to 40 metres. As this is the most important seam in the Yorkshire Coalfield, and at an average thickness of 2.4 metres, it will have been extensively worked in the past. The method of mining adopted would have been the old "pillar and stall" method.

It is likely that this has occurred to some degree in the past, probably affecting the adjoining buildings that were subsequently demolished, as well as The Fitzwilliam Arms. The movement should now have ceased.

The building has suffered from serious movement in the past which has compromised its stability in the future.

In its present state the side walls of the building, in particular the south elevation, are on the point of becoming unstable.

Historical mining subsidence, the removal of the adjoining buildings, and the lateral thrust from the ground floor arched construction are all contributory factors in concluding that the building may become unsafe in the foreseeable future.

Restoring the building is considered next to impossible given the extent of the movement and the dangerous instability of most of the internal piers, walls and the external walls.

The recommended course of action is to demolish the upper and ground floors of the building and to infill the basement.

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for *Buckingham Associates*
31 January 2022