STRUCTURAL ENGINEERS APPRAISAL

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STRUCTURAL ENGINEERS APPRAISAL

ON

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FOR

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1.0 INTRODUCTION

We have been requested by the current owner to provide a Structural Engineer's Appraisal following cracks and distortions that were noted to the property. A Chartered Structural Engineer with experience of this type of building and age of property and of the area has completed an initial structural inspection of the property.

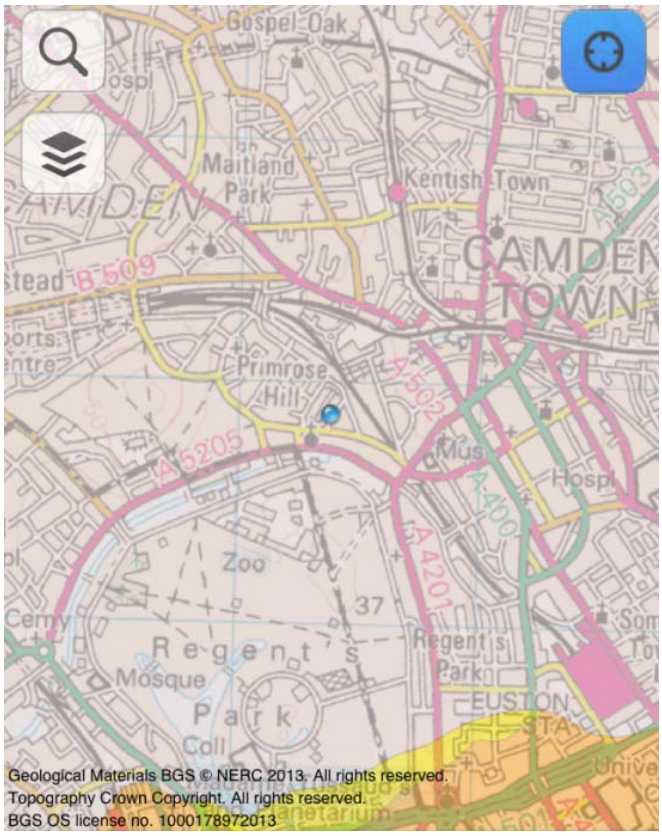
No opening up works have been completed, but the property did have a majority of the finishes removed which allowed good inspection of most of the areas.

The appraisal was completed over one site visit and is visual in nature. This report has been completed from the defects seen during that inspection. This report should not be considered an exhaustive list of all defects.

The purpose of this report is to provide our comment and opinion on why the movement or cracking may have occurred and whether the level of movement is significant, and recommend repairs where necessary.

2.0 GENERAL SITE DESCRIPTION

2.01 Local Geology



The site is flat front to back with no significant falls or major undulations. We do not consider that landslip is a problem.

From the North London Geological Drift Sheet (extract opposite) it can be seen that the site is underlain by London clay. In this area we often find part of the Claygate Bed Members are also present. This type of soil is susceptible to subsidence and volume change due to water ingress and egress. Items that will cause problems with subsidence are trees locally and drainage.

2.02 Local Vegetation and Trees

To the front of the property two lime trees are present, one on the front left hand side and one on the right, these have been significantly pollarded and are only 5 to 6 metres high. They are however mature trees that have been removed so the root ball base will be larger and more likely to affect the building.

3.0 GENERAL DESCRIPTION OF THE PROPERTY

The building is finished in exposed London stocks on first and second floor; at ground floor level rendered brickwork is present. A lower ground floor is present.

SITE OBSERVATIONS

EXTERNAL

The front garden has a garden wall against the pavement area; it can be seen that the front left hand tree is causing damage to the garden wall. The proximity of the tree and the boundary would require that any wall built in this location will be damaged by the tree; it is not possible to build a brickwork wall and prevent the tree from damaging it. Should the boundary wall need to be maintained due to planning then the tree should be removed.

Figure 1 Front Wall Damage by Tree

FRONT ELEVATION

Minor hairline cracking can be seen through the first floor stone sills. No significant signs of major cracking were noted to the main front elevation.

The front porch does have a significant fall to the right hand side and a crack through the middle of it, there is obviously some movement of the front porch and under croft area.

Where the front coal cellar and stairs meet the main building there is a 4mm crack running around through the render, this indicates that the rear coal cellar has dropped away differentially to the main building. Either side of the coal cellar is where the two trees are noted externally, it is believed that these are the cause of the differential movement.

Within the under croft a significant crack was noted through the roof. There is a horizontal crack through the roof of around 3mm. It appears that either side of the arch has shifted causing the crack in the crown.

Figure 2 Cracking to Front Vault

The trees have caused the soil around the arch to swell and shrink which has removed the buttressing effect of the soil for the arch. As the soil shrinks away from the arch the buttressing action is removed and the crown is placed into tension. To relief the stresses built up the crown deflects and cracks. This is a dangerous scenario as the crack can suffer from a scenario know as "snap through". This is a sudden failure of the roof.

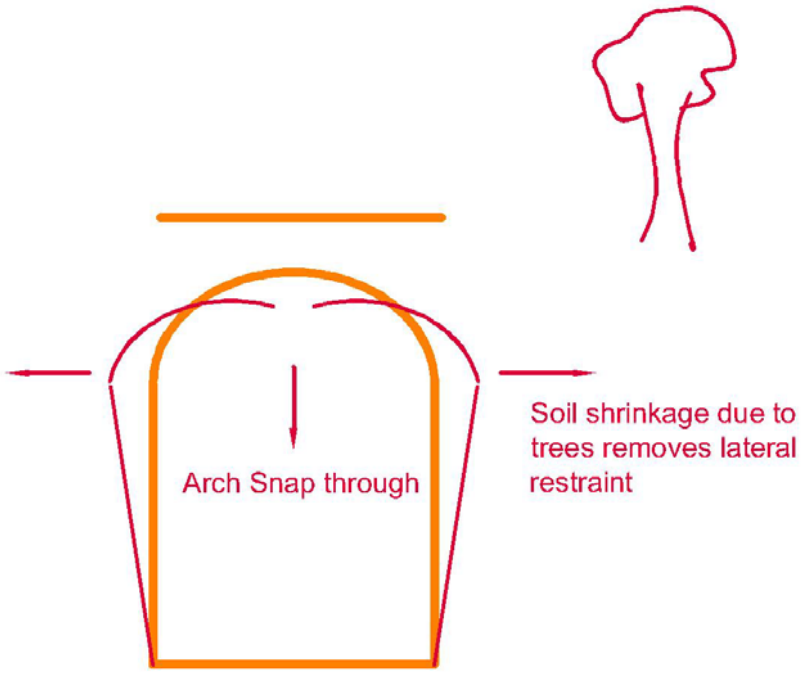


Figure 3 Mechanism for Arch Snap through

REAR ELEVATION

The rear elevation is finished with exposed brickwork above ground floor level with the ground and lower ground being finished in rendered brickwork. On the left side of the property there is a significant and major crack present, this runs from lower ground floor level up to the window sill level and further diagonal cracking has been noted above the WC window frame, this indicates that the rear left hand corner has dropped. The level of cracking is significant at around about 15mm.

Figure 4 Cracking to Rear Side Corner

On the right side of the property further diagonal cracking is present. From the lower ground floor window diagonal cracking propagates from the lower ground floor window lintel up to the ground floor window sill, and further cracking is present from the ground floor window lintel diagonally up to the Roman arch central window; this indicates that the rear left hand side of the property has dropped.

INTERNAL OBSERVATIONS

GROUND FLOOR LANDING

Around the ground floor landing diagonal cracking is present around the rear window and the left side WC window; this mirrors the cracking that was noted externally.

SECOND FLOOR REAR WALL

On the rear wall diagonal cracking was noted from the left hand flank wall diagonally up to the centre of the wall, this indicates there has been some movement.

LOWER GROUND FLOOR

On the rear left hand side where the crack was noted externally, internally further cracking was noted of around about 15-20mm; this is a significant crack.

Figure 5 Cracked rear Wall

This cracking is to the rear wall towards the lime tree at the back of the property.

4.0 CONCLUSIONS AND RECOMMENDATIONS

All buildings tend to develop minor cracks and distortions over the life of a property; these buildings are constructed with lime mortar and can accommodate a certain amount of differential movement around the building, once a certain level has been reached cracking can occur. The level of cracking is all subjective and it is recommended that the chart below is used to help quantify the level of movement.

Cracking can always be subjective and to place a more object position to cracking the Institute of Structural Engineers has published the table below.

Extract from The Institution of Structural Engineers "Subsidence of Low-Rise Buildings"
Table 6.2 Classification of visible damage to walls with particular reference to type of repair, and rectification consideration with inclusion of notes from Table 6.3

Approximate crack width	Definitions of cracks and repair types/considerations
Up to 0.1mm	HAIRLINE – Non Structural Internally cracks can be filled or covered by wall covering, and redecorated. Externally, cracks rarely visible and remedial works rarely justified.
0.2mm to 2mm	FINE – Non Structural Internally cracks can be filled or covered by wall covering, and redecorated. Externally, cracks may be visible, sometimes repairs required for weather tightness or aesthetics. NOTE: Plaster cracks may, in time, become visible again if not covered by a wall covering.
2mm to 5mm	MODERATE – Internal cracks are likely to need raking out and repairing to a recognised specification. May need to be chopped back, and repaired with expanded metal/plaster, then redecorated. The crack will inevitably become visible again in time if these measures are not carried out. External cracks will require raking out and repointing, cracked bricks may require replacement._Cracks not necessarily visible externally, some external repointing may be required to ensure weathertightness. Doors and windows may stick slightly.

5mm to 15mm	SERIOUS – Internal cracks repaired as for MODERATE, plus perhaps reconstruction if seriously cracked. The cracks 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. Rebonding will be required. External cracks may require reconstruction perhaps of panels of brickwork. Alternatively, specialist resin bonding techniques may need to be employed and/or joint reinforcement. Doors and windows sticking. Weathertightness often impaired.
15mm to 25mm	SEVERE Major reconstruction works to both internal and external wall skins are likely to be required. Realignment of windows and doors may be necessary. Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows. Window and door frames distorted, floors sloping noticeably (1). Walls leaning (1) or bulging noticeably some loss of bearing in beams. Service pipes disrupted.
Greater than 25mm	VERY SEVERE –Major reconstruction works, plus possibly structural lifting or sectional demolition and rebuild may need to be considered. Replacement of windows and doors, plus other structural elements, possibly necessary. NOTE – Building & CDM Regulations will probably apply to this category of work, see sections 10.4, 10.6 and Appendix F.

To the rear left hand corner a SEVERE crack was noted.

When looking at the causes of the movement the soil needs to be inspected. This is known to be clay, to confirm this a soil investigation is undertaken. The items that cause significantly movement to clays are trees and drainage.

To the front of the property there is damage to the below ground vault. The cracking evident indicates that the arch is suffering from remove of the buttressing force of the soil. Either side of the arch two trees are present. These will have caused shrinkage of the clay soil. As the soil shrinks around from the arch any buttressing effects are removed and the arch can move.

This is a dangerous scenario as it can lead to snap through; i.e. sudden failure of the arch. Due to this we believe the trees should be removed to prevent any further removal of buttressing of the arch.

Please remember that trees should not be removed if they have TPO upon them.