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REPORT ON

STRUCTURAL APPRAISAL

OF

THE OLD SCHOOL

PARK LANE

RICHMOND

TW9 2RA

INTRODUCTION

This report has been commissioned by Renworth Homes (Windsor) Ltd to provide a structural engineer's report on the above property to advise on the structural integrity of the main building and to recommend any remedial measures or further investigations considered necessary.

GENERAL DESCRIPTION

The property is a detached purpose built school built circa 1894. At the front right-hand corner of the property is the Headmaster's house. The original school is integrally constructed with this but a number of extensions have taken place over the years.

The building is generally constructed with slate tiled roofs on traditional timber rafters and purlins which are supported on solid brick external walls. The roof to the original school however has a canted roof with the ceiling joists positioned well above wall plate level. The Headmaster's house also has timber first and second floors.

The property is constructed on a fairly level site and the geological survey map for the area indicates sands and gravel, locally with lenses of silt, clay or peat overlying London clay. No site investigations have been carried out to check the subsoil.

EXTERNAL OBSERVATIONS

Front Elevation Headmaster's House (see photograph 1)

1. At the top of the entrance door there is an old crack which continues up to the underside of the first floor window and the mortar has washed out of the joints in the brick arch.

2. The crack continues through the stone windowsill as a 3.0mm wide vertical crack (see photographs 2 and 3).

3. The left-hand side of this windowsill has dropped approximately 10mm relative to the right-hand side.

4. Over the top of this first floor window the stone lintel has cracked at the middle to left-hand side, this crack then extends across and up through the lintel (see photographs 4 and 5).

5. Just to the right-hand side of the window there is also a 1mm wide vertical crack through the stone lintel itself. Water has penetrated at both of these crack locations as can be seen on photographs 5 and 6 and the lintel will need to be replaced.

6. At the front right-hand corner of the building the stone corbelling has deteriorated quite significantly (see photograph 7).

7. The coping stones both sides of the main roof are all damaged by frost action and the top coping stone has a 50mm wide gap on the underside (see photographs 8 and 9).

8. At the top of the gable the brickwork face on some of the bricks has been damaged by frost action (see photograph 10).

9. On the larger roof at the left-hand side of this section of the building there is similar damage to the coping stones to both the left-hand and right-hand roof slopes (see photograph 11). The mortar joints have also been washed out due to frost action below the coping stones.

10. The stone corbelling at the front left-hand corner of this section of the building is also crumbling as can be seen on photograph 12.

11. The gable wall and chimney to the rear (as shown on photograph 12) has coping stones on the top and these are bowing quite significantly. The cause of this is not known but they will need to be replaced.

12. The mortar flashings at the junction of the roofs with the gable walls (see photograph 12 as an example) need to be replaced with lead flashings.

13. The stone corbelling or stone capping on the chimney is also deteriorating due to frost action (see photograph 13).

Front Elevation Main Building (see photographs 14 and 15)

1. The timberwork around the dormer windows in the main roof is all deteriorating. See photographs 16, 17 and 18 as examples.

2. Over the right-hand ground floor window the stone arch is crumbling due to frost action and has been poorly repaired with mortar (see photograph 19).

3. The second stone arch from the right-hand side is deteriorating badly due frost action (see photograph 20).

4. The stone work between these two windows is also deteriorating (see photograph 21).

5. Over the central window the stone arch is starting to deteriorate in a similar manner (see photograph 22).

6. The stone corbelling between the middle and middle left-hand window is badly damaged by frost action (see photograph 23).

7. In the middle to left-hand window the deterioration due to frost action is starting to occur at the left-hand side towards the top of the arch as shown in photograph 24 and at the bottom but this cannot be seen on the photographs because of a bush growing in front of it.

8. Over the left-hand window the bottom right-hand corner of the stone arch has snapped off completely (see photographs 25 and 26).

9. In the stone corbelling between the left-hand and middle left-hand windows the stone corbelling is deteriorating but this cannot be picked out on the photograph due to the vegetation.

10. At the top right-hand side of the middle to right-hand window there is a 1mm wide stepped crack which extends up through the stone corbelling (see photograph 27). This is indicative of slight subsidence movement along the front elevation. This is probably due to the large Cotoneaster shrub below the window. Below windowsill level nearly all of the brickwork is hidden behind vegetation. However, the brickwork where it can be inspected is in reasonable condition but it does need re-pointing (see photograph 28 as an example).

11. Between each window there is a brick buttress presumably to resist the horizontal thrust on top of the wall from the roof construction (see photograph 29 as an example). In the middle brick buttress there is a 1.0mm wide vertical crack through the bed joints (see photograph 30).

12. At high level along this elevation there are large areas of brickwork which require re-pointing (see photograph 31 as an example).

13. Approximately 4.0m from the front elevation there are 3 large conifer trees (see photograph 32). These are all capable of rooting below the foundations of the front elevation of this property. This property probably has shallow foundations and they will cause subsidence damage to the property unless action is taken to strengthen the foundation or the trees are removed.

14. Along the front elevation there are a number of shrubs which are growing close to the walls and these need to be carefully maintained or they could cause subsidence. In amongst this there are numerous sycamore saplings and other self-seeded trees which need to be removed otherwise they will grow to their full height and could cause significant subsidence to the building.

Right-hand Elevation Headmasters House (see photograph 33)

1. Below the front side of the ground floor window there is a 1.0mm to 2.0mm wide predominantly vertical crack which extends down to ground level where it reduces to hairline crack width (see photograph 34). The crack also continues up the front side of the window as shown on photograph 35. The crack is old.

2. At the rear right-hand corner of the building a number of bricks have been damaged by frost action. The red bricks appear to be a replacement from previous frost damage but even one of these is damaged by the frost (see photograph 36).

3. Over the rear side of the first floor window there is a 1mm wide crack (see photograph 37) and this has been repaired in the past and re-opened. The crack however is old.

4. Photograph 38 shows the rear side of the stone coving on top of the parapet walls. This is the right-hand parapet wall to the right-hand section of the Headmasters building. These all need to be replaced.

Rear Elevation of Headmaster's house (see photograph 39)

1. In the rear left-hand corner of this part of the building, at gutter level a number of bricks have fallen out of the wall and the mortar pointing at the underside of the tiling at the top of the wall is falling out (see photograph 40 as an example).

2. The mortar has fallen out over most of the height of the roof. This also occurs on the other side of this main roof and both sides of the smaller pitched roof to the Headmaster's house.

Left-hand Elevation Main Building (see photograph 41)

1. Only a limited inspection of this elevation is possible due to vegetation and the close proximity of the neighbouring property.

2. The coping stones on this elevation are suffering badly from frost action as shown in photograph 42. This is similar to the Headmaster's house. These will need to be replaced.

3. There is a row of brickwork projecting out of the wall at high level. This can be seen on photograph 42. This is the top of the wall moving away from the roof construction. The top section of the wall needs to be rebuilt.

4. The stonework around the arch window is separating as shown in the middle of photograph 43. It is not possible to get a clear photograph of this but the central section has dropped approximately 10mm relative to the remainder of this arch.

5. The decorative stone corbelling is corroding quite badly on the front left-hand corner of the building (see photograph 44). There is similar damage but not as marked at the rear.

Rear Elevation rear left-hand addition (see photographs 45 and 46)

1. The left-hand side of the stone windowsill has dropped approximately 15mm relative to the centre (see photograph 47).

2. The right-hand side has dropped approximately 50mm relative to the centre (see photograph 48).

3. Below the centre of the window there is a 2.5mm wide vertical crack which extends down to ground level (see photograph 49). This crack is very dirty internally as

can be seen from the dirt within the crack indicating it is old but it is consistent with subsidence to this part of the building.

4. At the top right-hand side of the large window there is an old crack which is approximately 20mm wide. The mortar in the joint of the crack appears wider than this but we believe this is where it has been raked out prior to re-pointing. The movement at the top right-hand side of the stone lintel would appear to be 20mm (see photograph 50).

5. At the top left-hand side of the small window to the left-hand side of the main window there is a 10mm wide vertical crack at the end of the lintel (see photograph 51). Again this crack is old but as stated previously the movement is probably continuing and active.

6. There is an Elderberry tree approximately 3.0m from the rear left-hand corner of this rear addition and a Sycamore tree approximately 5.0m from the rear left-hand corner of the rear addition and therefore the subsidence here is probably still active.

Left-hand Elevation rear addition (see photographs 52 and 53)

1. This section of the building does not appear to have any significant cracking in the external walls.

2. The property needs re-roofing and the gutters are a mixture of plastic and the original cast iron. The original cast iron gutters are in very poor condition (see photograph 54 as an example).

3. At the top rear corner of the rear dormer window there is cracking at the front and rear side of the stone lintel (see photograph 55). This is consistent with the subsidence damage at the rear left-hand corner of the rear addition.

Right-hand Elevation of building to rear of Headmaster's house (see photograph 56)

Approximately in the centre of the front section of this wall (at the front side of the chimney) there is a 1mm wide stepped crack (see photograph 57) which extends down from roof level through the brick courses before turning vertically down, initially as a 1mm wide crack but reducing to hairline crack width at dpc level (see photograph 58). This is consistent with subsidence at the front right-hand corner of this part of the property. The front elevation of this section of the building is shown on photograph 59 and as can be seen where the front wall meets the right-hand wall of the Headmaster's house a substantial crack has been filled in (see photograph 60).

Right-hand section of Rear Elevation of the Main Building (see photograph 61)

1. No structurally significant defects were noted in this area but the area does require re-pointing.

2. Over the top right-hand side of the left-hand door an area of brickwork has been re-pointed (see photograph 62) and mid height there is further re-pointing (see

photograph 63). This may have been due to subsidence caused by water leaking from the drains serving the gulley shown in photograph 64.

Middle Section Rear Elevation of Main Building (see photograph 65)

1. No structurally significant movement appears to have occurred in this elevation (see photographs 66 and 67) below the windows.

2. There does appear to have been movement to the brick arch lintels over the windows (see photographs 68 and 69). This is probably due to frost action and rainwater washing out of the joints and the bricks slipping rather than any significant movement to the foundations.

3. There is a manhole less than 1m from this elevation (see photograph 70) and there is a surface water gulley adjacent to the rear left-hand corner of this part of the building (see photograph 71). If these drains were leaking they could cause subsidence.

4. Below the left-hand window there is slight cracking (see photograph 72) which is indicative of subsidence adjacent to this surface water gulley and these will need to be excavated out and checked. In a property of this age all of the surface water drains should be exposed close to the building and checked and new soakaways constructed as necessary. The foul drainage system should be subject to a CCTV survey.

5. The area shown on photograph 73 we have been advised is to be demolished and we have not carried out any inspection of this area of the building.

INTERNAL OBSERVATIONS (see Existing Plan).

Headmaster's House

Office Front left-hand Room

1. There is tearing and wrinkling in the wallpaper above picture rail level (see photograph 74).

2. There is also tearing of the ceiling paper across the width of the bay window (see photograph 75).

3. In the ceiling there are a number of diagonal cracks across the ceiling (see photographs 76 and 77).

4. In the left-hand wall there is a large area of damp (see photograph 78).

5. There is cracking in the ceiling at the front side of the chimney breast (see photograph 79).

6. In the front right-hand corner of the room the picture rail has separated (see photograph 80).

7. The cracking in this room is all consistent with subsidence at the front right-hand corner of the property.

Kitchen

No structurally significant damage was noted.

Rear Right-hand Ground Floor Room

No access available.

Entrance Hall (see photographs 81 and 82)

At the right-hand side of the entrance door there is a bulge in the plaster at the bottom side of the arch to the door (see photograph 83). This is indicative of cracking behind and the cracking would appear to be substantial. This is consistent with subsidence to the front right-hand corner of the building.

Staircase to first floor Level and Landing

1. At the top of the stairs in the rear wall there is a substantial bulge in the plaster (see photographs 84 and 85). This would indicate significant cracking behind which has been repaired but the movement is so severe that there must be movement to the brickwork causing this step in the wall.

2. In the rear wall of the landing approximately 2m from the top of the stairs there is a further significant bulge in the wall (see photograph 86).

Front Right-hand Bedroom (see photograph 87)

1. In the ceiling from the top left-hand side of the front window to beyond the middle of the right-hand wall there is a 1mm wide crack across the room. This is not picked up on the photograph 87 of the ceiling.

2. In the front left-hand corner of the room there is severe wrinkling and tearing of the wallpaper (see photograph 88). This is at the junction of a lathe and plaster stud wall with the front wall of the house. The lathe and plaster stud wall is probably supported on the floor joists.

3. The ceiling has reached the end of its working life but it is an old lathe and plaster ceiling and is to be expected.

Left-hand Bedroom (see photograph 89)

1. No structurally significant cracking was noted in the external walls of this room.

2. The wallpaper is very old but the only sign of any damage is in the front right-hand corner of the room (see photograph 90). This is probably due to the parapet wall being in such poor condition, which is allowing water to penetrate into the building.

3. The ceiling has reached the end of its working life but it is an old lathe and plaster ceiling and is to be expected.

Staircase to Second Floor Level

1. Where the rear wall meets the sloping ceiling (see photographs 91 and 92) there is cracking over the full height.

2. There is also cracking in the lathe and plaster ceiling but this may be due to wind loading on the structure and the defective coping stones.

3. The ceiling has reached the end of its working life but it is an old lathe and plaster ceiling and is to be expected.

Second Floor Bedroom (see photograph 93)

1. In the front wall of this room there are plaster repairs to the front wall and we believe this is due to water penetration through the stone copings externally (see photograph 94).

2. The walls and ceiling are old lathe and plaster construction and need to be replaced.

Workshop (see photographs 95 and 96)

1. No structurally significant cracking was noted in the front wall where it could be inspected.

2. We have not commented on the left-hand and rear wall, these are stud walls which are to be removed.

3. The roof construction we understand is all to be replaced (see photograph 97 as an example) and therefore we have not commented on the roof construction.

4. In the front right-hand corner of the room there is a 1mm wide stepped crack which extends down behind the fuse box (see photograph 98).

5. Below this crack in the front right-hand corner there is further minor cracking (see photograph 99).

6. In the front right-hand corner of the room there is a 1mm to 2mm wide crack at high level which shows separation between the right-hand front wall (see photograph 100).

7. In the front left-hand corner of the room there is a previously repaired crack where hairline cracking has re-occurred (see photographs 101 and 102).

Front left-hand Room (storage) (see photographs 103 and 104)

1. Between the two front windows in this office there is significant damp penetration (see photograph 105) and to a lesser extent there is also damp penetration to the right-hand side and left-hand side of the main windows as well.

2. In the rear wall there is a brick arch over a large opening formed with either a steel beam or timber Bressumer below the arch and there is cracking around the top of this arch (see photographs 106 and 107).

Rear Workshop Rear Addition (see photographs 108 and 109)

1. At the top left-hand side of the lintel over the tall window there is a 1mm wide horizontal crack along the bottom of the lintel at its bearing (see photograph 110) which turns up the end of the lintel as a 2mm wide vertical crack and then continues along the junction of the wall and ceiling. The crack continues in the ceiling at the junction of the sloping ceiling and flat ceiling (see photograph 110).

2. The right-hand side of the rear windowsill has dropped quite substantially but this can't be seen on the photographs.

Rear Hall Rear Addition (see photograph 111)

1. No structurally significant cracking was noted.

2. At the front section of this part of the building however at the front side of the double doors there is a substantial bulge in the right-hand wall as shown on photographs 112 and 113. This indicates that there has been significant movement to this part of the property in the past and the cause of this is not known. It could be the surface water drains leaking externally at this location which was mentioned earlier in this report. This bulge in the wall is consistent with the bulge in the Headmaster's house leading up to first floor level and it is probable that there is similar damage there behind the plaster and paper.

3. The rear door head in the rear hall has dropped approximately 20mm at the right-hand side and the floor slopes from the left to right-hand side in the rear right-hand corner of this area.

Middle Office Rear Addition (see photographs 114 and 115)

Photograph 116 shows the double doors where the bulge in the brick wall is to the front side of it and this shows the surface water drain outside (see item 2 above).

Front Garden Wall

The front garden wall is in poor condition as can be seen on photographs 117, 118 and 119. These are only examples of the wall but the condition is consistent throughout the full length of the wall. At the left-hand side some re-pointing has taken place but it

has not dealt with the problem which is probably the bushes growing immediately behind the wall and causing subsidence.

Rear Garden Wall (see photographs 120, 121 and 122)

1. The rear garden wall is suffering from frost damage to the mortar joints (see photograph 123 as an example). The wall is relatively plumb and it is not in a dangerous condition. However the bricks are deteriorating from frost action and the mortar has worn out of the joints due to frost action.

2. At the rear left-hand corner of the site there are 3no. deciduous tree which we believe are False Acacia. There appear to be 5no. but the 3no. central ones are a single tree with an additional tree on the left-hand and right-hand sides. These trees are obviously causing subsidence damage to the rear garden wall but this is lime mortar wall and it does not appear to have affected the stability of the wall. The wall here however is in need of re-pointing (see photograph 124 as an example). Along the remainder of the wall although the whole wall needs re-pointing, the top of the wall is in a much worse condition (see photograph 125 as an example).

DISCUSSION

The form and location of the cracking which has occurred in this property indicates that there has been subsidence damage to the front right-hand corner of the Headmaster's house, the rear left-hand corner of the rear left-hand addition and the front right-hand corner of the store. When classifying the damage in accordance with BRE Digest 251 this would be considered to be moderate or category 3 in respect of the total movement which has taken place to the property.

From a visual inspection of the property it would appear the subsidence at the front right-hand corner of the property is that related to clay shrinkage by one of the conifer trees at the front of the property. The damage here however is old and it is possible that the source of the damage at this corner of the property has already been removed. If confirmation of this were required trial holes would be required adjacent to the front right-hand corner of the Headmaster's house.

The subsidence which has occurred to the rear left-hand corner of the rear addition has almost certainly been caused by the Elderberry tree approximately 3m from the rear left-hand corner of this addition and the Sycamore tree positioned approximately 5m from the rear left-hand corner. The removal of both of these trees would be required in order to ensure the long term stability of the building.

The subsidence which has occurred to the front right-hand corner of the store, adjacent to the Headmaster's house, is probably related to leaking surface water drains as shown on the photograph 59 but this again would need confirmation by trial hole investigation. It should be noted that no trial hole investigations have been excavated at this property. The geological map for this area generally indicates sand and gravel over London clay and trial hole investigations would be required to confirm whether the building is sitting on shrinkable clay subsoil.

In the front elevation of this building a number of defects have been noted under the heading 'Front Elevation'. It is apparent however from those observations of the front elevation of both the Headmaster's house and the main school that the decorative stone corbelling shown in photograph 7 and a number of lintels (see photograph 4 as an example) and the coping stones along the whole of the front elevation of the Headmaster's house (see photograph 11 as an example) require replacement. Similarly, the stone lintels over the ground floor windows and supporting the first floor projecting dormer windows (see photograph 20) are in very poor condition and replacement will probably be the cheaper option. The timberwork to these dormer windows also requires replacement as shown in the same photograph and a lot of the front elevation requires re-pointing. This building is constructed generally in 225mm thick brickwork with a soft lime mortar and therefore damp penetration into the building is inevitable during heavy rainfall.

Due to the number of defects in the front elevation of the building we would recommend that serious consideration is given to rebuilding this property. The architectural layout and features can be kept by carefully taken down the existing front elevation of the building and rebuilding it in cavity construction. The mortar is a soft lime mortar and it would be relatively easy to take down the walls and salvage the brickwork. The front wall of the building is constructed in 225mm thick brickwork and therefore there will be more than sufficient bricks to rebuild this as a single skin of brickwork externally together with a properly insulated block wall internally. This will greatly reduce any heat loss from a future building and it will also give far greater resistance to rain.

An internal inspection of the building also confirms that there has been subsidence damage to the parts of the property set out above. In addition to this however there are a number of other cracks in the building which cannot be identified purely from a visual inspection of the building. For example the movement which has taken place at first and second floor level in the Headmaster's house. The movement on these walls is substantial and if the external elevations are not demolished and rebuilt then it would be necessary to fully expose the damage in these areas before preparing a scheme of structural strengthening works. It may be possible to repair these walls by a combination of resin injection and the introduction of helibars but these would cause hard spots in a lime building and alternative repairs would be preferable. Until the walls are exposed however it is not possible to make recommendations on these. All of these defects would be corrected by carefully dismantling and rebuilding.

In a building of this age and type of construction it is unlikely that the foundations are more than 600mm deep. This would need to be confirmed by trial hole investigations. However the modern building regulations would require 1m deep foundations for any new construction and if the property is found to be constructed on shrinkable clay subsoil these foundations would need to be significantly deepened to take account of vegetation in close proximity. The risk of differential movement between the parts of the property constructed with shallow foundations and those with modern deep foundations is almost inevitable. Whilst movement joints could be introduced to try to accommodate this movement the only long term solution would be to underpin the original walls to the existing building should the property be founded on shrinkable clay subsoil.

It is also probable that some of the subsidence in this building has been caused by leaking foul and surface water drains. If the building is to be retained then the foul drainage system would need to be checked using CCTV cameras and water testing. The surface water drainage system will almost certainly need to be replaced, due to its age.

CONCLUSIONS AND RECOMMENDATIONS

1. It is concluded that there has been subsidence damage to three areas of this property.

2. It is concluded that the most probable cause of subsidence in these areas is clay shrinkage by trees in close proximity but this cannot be confirmed without further investigations in the form of trial holes.

3. It is concluded that if the property is found not to be supported on shrinkable clay subsoil then further investigations will need to be made to determine the original cause of subsidence if any of the existing building were to remain.

4. It is concluded that leaking foul and surface water drains are also contributing to if not causing some of the subsidence.

5. It is therefore recommended that the foul drainage system is properly tested and the surface water drains replaced if the building is to be retained.

6. It is concluded that the stone window frames, decorative masonry corbelling along the front elevation of the whole of this building is in a very poor state of repair and complete replacement would be the best long term solution to this.

7. It is concluded that the stone coping stones on the Headmaster's office in particular but also elsewhere throughout the building have reached the end of their working life. These require complete replacement.

8. It is therefore recommended that serious consideration is given to carefully taking down this building and reconstructing it with modern cavity external walls using the original bricks as the external skin in the new construction. A new fully insulated block inner skin wall would greatly improve the heat loss throughout the building.

9. It is recommended that the front garden wall along the whole of the front elevation is taken down and rebuilt on new foundations due to the close proximity of the conifer trees in close proximity.

10. It is concluded that the rear garden wall is structurally stable but will require constant maintenance.

11. It is concluded that the future growth of the trees in the rear left-hand corner of the property will require careful monitoring in the future.

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GROUND FLOOR PLAN SHOWING PHOTOGRAPH LOCATIONS

REAR

45

46

73

53

39 AT HIGH LEVEL

61

65

MIDDLE OFFICE
REAR ADDITION

NO ACCESS AVAILABLE

FIT MARK C

56

52

41

59

33

32

15

14

1

FRONT

MAIN SCHOOL

HEADMASTER'S HOUSE

Job No.14120
SK1

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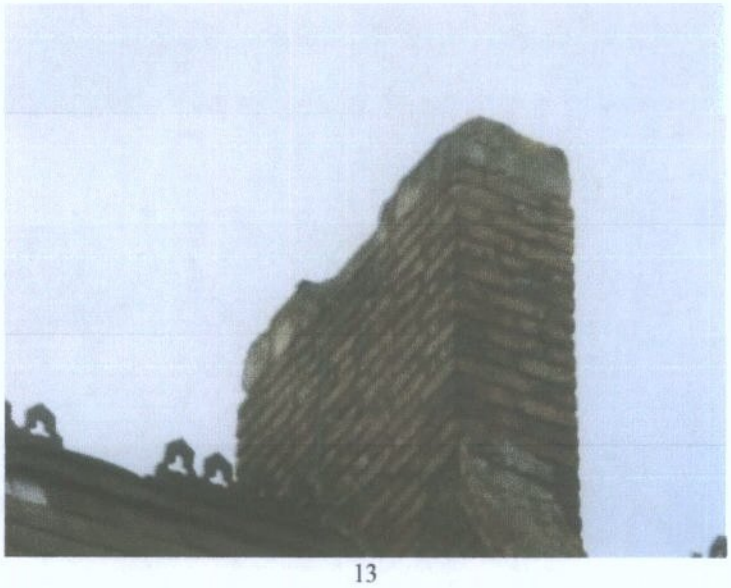

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