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Report

On

Structural Inspection

At

Flat A

6 Bath Road

Reading

RG1 6NB

Prepared For:

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6 Bath Road
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On behalf of Structis Design Ltd

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Project Number: 1060

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1.0 INTRODUCTION

- 1.1 In accordance with the instructions from Mr J Lee a Structural Inspection at the property known as Flat A, 6 Bath Road, Reading was carried out.
- 1.2 The inspection was undertaken on the morning of Friday 4th March 2016.
- 1.3 The purpose of the inspection was to inspect the external balcony, stone staircase and brick retaining wall at the rear of the property.
- 1.4 The weather at the time of the inspection was bright, dry and cold.
- 1.5 A visual inspection only was carried out.
- 1.6 The inspection was limited to this brief only. We did not inspect any part of the structure which was covered, unexposed or inaccessible and we are therefore unable to report that any such part of the property is free from defect.
- 1.7 This report is the copyright of Structis Design Ltd and was written for and on behalf of Mr J Lee for his sole benefit and use. No responsibility is accepted where other parties have acted upon its contents.
- 1.8 This report is not for transmission in whole or in part to any third party and we bear no obligation to any such third party for its content without our express permission in writing. Such permission will not be unnecessarily withheld.

2.0 INSPECTION

- 2.1 The property is a ground floor flat located within a 4 storey semi-detached and converted Georgian town house. The property is situated on Bath Road close to Reading town centre.
- 2.2 The property appears to be of loadbearing masonry construction, with a pitched, tiled, cut timber roof and suspended timber floors. The flats are formed through conversion of a Georgian town house and we understand that the property is grade II listed.
- 2.3 We did not inspect the interior, front or gable elevations of the property.
- 2.4 The area inspected was the steel balcony, stone landing and stairs and brick retaining wall at the rear of the property.
- 2.5 The rear garden is accessed via Flat A and is understood to be within the domain of Flat A.
- 2.6 Access through the French doors at the rear of the flat is to a narrow steel cantilever balcony. The floor to the balcony consists of durbar plate, seated on a framework of rolled steel angles. The balcony cantilevers from the rear elevation and is supported on two galleys bracket details consisting of rolled steel angles that are built into the rear wall. The horizontal framing is also built into the external wall. The right hand edge (when viewed from rear garden) is seated on two small support stubs welded to the underside of the frame and bearing on an adjacent stone landing.
- 2.7 The balustrade to the balcony consists of small square hollow sections (approx. 25mm x 25mm) welded together and to the balcony frame. The balustrade consists of a handrail and a rail at mid-height only. There is no kick plate.
- 2.8 The balcony has been painted in black paint – probably a hammerite type or bituminous paint – and it appears that it has been repainted on several occasions in the past, evidenced by noticeable build-up in several areas. We were anecdotally advised that the flooring had been painted to such an extent that the pattern of the durbar paint was not visible until recent cleaning and repainting.
- 2.9 There are a number of areas on the balustrade and balcony frame where the paint finish has effectively failed and peeled away and where evidence of corrosion is clear. Viewed from the rear garden there is noticeable significant corrosion of the durbar plate with increased thickness and possible lamination evident.
- 2.10 Under foot loading, the balcony felt sound and there was no noticeably significant bounce or deflection. It was noted however, that the handrail and balustrade deflected when pushed or leant against.
- 2.11 Beneath the balcony there is evidence of significant corrosion and it appears that there has not been any maintenance of the protective paint finish for some time. The Rolled Steel Angle (RSA) to the framing have corroded and this appears potentially significant although the build up of damage meant that it was not possible to accurately determine this.

- 2.12 Away from the connection to the main frame, the RSA gallows bracket members appear in better condition although there is evidence of some corrosion where the angles are bent and built into the external wall.
- 2.13 Local to the built in angles, movement and hairline to 0.5mm wide cracking is present. The angles are above and adjacent to the rear window of the basement flat and the bulk of the cracking has occurred on the window side of the angles.
- 2.14 The stone landing slab spans the lightwell below and bears on the rear wall of the property and on the external retaining wall.
- 2.15 The stone landing appears in reasonable condition although a crack is noted originating from the hole through which the drainage pipe passes. Beneath the landing however, there is flaking evident. It was noted also that the bearing of the landing on the external retaining wall is in poor condition.
- 2.16 The stone steps consist of individual stone slabs, each bearing on the step below and have suffered vertical and lateral movement, particularly the bottom two steps. It was also noted that the masonry edging below the stairs and the fill material beneath the steps has moved and eroded away.
- 2.17 A detailed cast iron balustrade borders both sides of the stairs. This appears to have been repainted on numerous occasions and the uprights are set in pockets in the stone slabs. There does appear to be some local corrosion at the interface between the balustrade and slabs and two of the uprights have snapped at this point.
- 2.18 We noted that the drainage pipe is plastic and runs beneath the landing and alongside the stone steps. It then turns down and appears to discharge to ground immediately adjacent the stairs and retaining wall. We were advised that there is a soakaway constructed in this location although we were unable to confirm this during our inspection. We were also anecdotally advised that the joint in the pipe may have failed as during periods of heavy or prolonged rainfall, water is noted to spout from the joint.
- 2.19 The external retaining wall is approximately 1.50m high and separates the rear garden from the lightwell at the rear of the property. The wall appears to be of masonry construction.
- 2.20 The wall appears to have recently been repointed however, there is a significant and noticeable bulge and rotation in the wall. This movement has occurred at a point close to where the soakaway is understood to be situated.
- 2.21 Beneath the stone stairs there is a masonry arch that leads to a "room" with vaulted ceiling beneath the stairs. The rotation and movement of the retaining wall has caused cracking and deformation of the end of the arch. As highlighted above, the bearing of the stone slab is in poor condition.

3.0 DISCUSSION

- 3.1 There appear to be a number of issues concerning the balcony. Clearly, it is of narrow width (approximately 600mm) and certainly the balustrade detailing would not be adequate to satisfy current Building Regulations where a 100mm sphere should not be able to pass through the system.
- 3.2 The corrosion of the steelwork appears relatively significant and in areas there would be concern as to how much effective steelwork remains.
- 3.3 The cause of the corrosion principally appears to be through a lack of maintenance where the protective paint finish has peeled away exposing the underlying steelwork. Through moisture and air ingress, corrosion of the underlying steelwork has occurred.
- 3.4 It is difficult to accurately assess the degree of corrosion due to the build up of residue. The amount of residue/damage particularly to the edge of the durbar plate and the gallows connections does however, suggest that significant corrosion has occurred.
- 3.5 There is no noticeable deflection or distortion in the balcony itself which suggests that the corrosion has not yet caused any instability. Left unchecked however, the corrosion will cause issues and ultimately failure, in the future.
- 3.6 The movement of the balustrade when pushed is relatively significant and under more significant loading – i.e. several people pushing against the handrail – it is likely that movement beyond reasonable expectations and design codes would occur.
- 3.7 It appears that the cause of the movement is due to the small members that form the balustrade system. We are confident that it would not be possible to “prove” the stability of the system by design calculation for recommended design loadings. The connections between the balustrade members are welded and rusting is evident.
- 3.8 The cracking adjacent to the brackets in the external wall appears to have occurred due to the corrosion of the angle members where they are built into the wall. The steelwork will be more susceptible to corrosion in this location due to moisture build up on top of the member where it is bent and meets the wall. In addition, there is an increased risk of corrosion as within the wall moisture will build up due to it soaking through the brickwork and will also take much longer to dry/evaporate.
- 3.9 At this point in time the damage to the brickwork appears relatively minor. We consider however, that it is likely to increase in severity over time as corrosion will continue and the member cross section will expand as a result, causing further local damage to the masonry.
- 3.10 Meaningful repair in this location will be very difficult as locally removing the bricks to allow access to repair the steel would likely result in some instability. It will be difficult to restore this stability as the rebidged bricks will always be slightly weaker than bricks in their original setting. As such, corrosion would need to be given to either replacing the balcony or forming an alternative support.
- 3.11 The supports off the stone landing were noticeably corroded, which is unsurprising given their location.

- 3.12 Given the above, we consider that the balcony and balustrade appears to be performing adequately at the moment and clearly has done so in the past. Left unrepaired however, we are confident that the condition of the balcony and balustrade will continue to deteriorate and ultimately failure will occur.
- 3.13 The difficulty of access to and risks associated with some of the repairs are such that we do not believe that fully effective repairs can be carried out.
- 3.14 It may however, be possible, to carry out some repair work that will at least help to extend the lifespan of the balcony in the short term.
- 3.15 In the first instance, all exposed surfaces should be cleaned of corrosion and paint finish via wire brushing and/or other abrasive measures, as much as possible. A suitable protective finish, or finishes, should then be applied to stop or at least reduce the rate of corrosion occurring.
- 3.16 There are a number of options for the application of finishes. A proprietary finish such as Fosroc galvaform would offer most protection but, as this likely requires the application of bonding agents and such like, we believe that a specialist would be needed to apply it. Alternatively, a more practical (albeit less long term) solution such as the application of two coats of a heavy duty bituminous paint would offer some improved protection and would be relatively straightforward.
- 3.17 Given that corrosion in concealed and inaccessible areas will continue, our view would be that the application of protective finishes is only a short term measure and as such, the application of a heavy duty bituminous paint finish would be adequate.
- 3.18 Our considered view is that this structure will require replacement within the short term – say 1 to 5 years – due to the likelihood that corrosion will continue and certainly the noted damage to the brickwork will increase, together with an associated deterioration in performance.
- 3.19 There is a risk that removal and cleaning of the corrosion will expose details, particularly at the junction between the gallows bracket angles where corrosion and damage may be more significant than anticipated. If this is the case then it will be necessary to consider removing and replacing the structure in the very short term.
- 3.20 The crack in the stone landing does not appear to be a significant concern at this point in time and does not appear to be affecting its stability. It is however, likely that over time, moisture will penetrate the crack and the freeze/thaw cycle in cold weather may cause the damage to increase in severity. There is no indication that this has occurred or is occurring at this point in time so it would appear reasonable to adopt a watching brief. Ultimately, the injection of an epoxy repair grout may be necessary, or this work could be carried out now to reduce the risk of damage occurring.
- 3.21 There is noticeable flaking material beneath the stone slab. The cause of this is not clear but, it is consistent with the damage that is often seen to occur in many types of stone due to salt weathering. This occurs where salt or salt water (which can arise when salt grit is used on the surface in icy weather) penetrates behind the outer layer of stone and crystallises. Repeated wetting and drying causes expansion of these crystallised salts and causes the outside layer of stone to peel and flake.

- 3.22 There is no similar defect on the upper surface of the landing slab which suggests that grit salts may not be the cause. We do however, consider it likely that the location of the landing is the major contributory factor in this instance. The underside of the slab will become wet through capillary action in wet weather but, the wet/dry cycle is likely extended due to the sheltered and shaded location of the slab. This will undoubtedly be exacerbating the weathering effects and noted damage.
- 3.23 This cycle is likely to continue and will exacerbate over time. Effective repairs will likely be difficult and specialist advice would be needed. Left to continue to deteriorate, it is likely that in the longer term the damage will continue and that ultimately a replacement will be required. At this point in time however, there appears to be no obvious or imminent risk to the stability of the slab.
- 3.24 The stone steps themselves generally appeared to be in reasonable condition although a horizontal crack is evident in the bottom step just beneath the surface. Similar comments and measures as per paragraph 3.20 would apply.
- 3.25 The corrosion of the cast iron balustrade has occurred at the weak point where moisture is likely to gather where the balustrade meets the slab. Replacement/repair of the balustrade is necessary but, it would in the short term be prudent to remove the corroded steel from within the slab to remove the risk of corrosion continuing and causing damage to the stonework.
- 3.26 Movement of the stone steps has clearly occurred and this appears to be as a result of localised settlement of the ground/fill beneath the steps. The brickwork beneath the stairs is loose and the mortar and backfill material beyond has almost entirely eroded. This lack of or change in support has caused vertical and lateral movement of the steps away from the landing and gaps to occur.
- 3.27 The noted bulging of the masonry retaining wall is significant. The wall has moved by a significant amount and we estimate that its centroid lies outside the mid-third of its base, which is beyond the point at which it would normally be considered stable. We understand that the wall has been repointed recently and there are no signs of cracking or progressive movement.
- 3.28 The movement of the wall has caused damage to the arch beneath the stone staircase. At this point in time, there does not appear to have been any movement of the arch. Local masonry repairs would be prudent to safeguard the integrity of the wall in this location.
- 3.29 The masonry at the head of the wall appears loose and should be rebbed to maintain adequate support for the landing and steps over.
- 3.30 The location of the soakaway is a concern and appears to be the likely cause of the noted movement to both the retaining wall and the stone steps. This is due to two things, the first being the build up of moisture behind the retaining wall causing an increase in pressure behind the wall and thus the noted movement. It is likely that the ground beneath the stairs has locally settled. Secondly, the apparent leak from the above ground drainage pipe appears to have caused deterioration and erosion of the masonry and the fill material beneath the stairs.

- 3.31 Building regulations require that soakaways be located at least 5m away from buildings. There is no specific requirement for the distance that soakaways should be located from retaining structures however, common sense would dictate that a similar distance of 5m would be prudent.
- 3.32 Specific ground conditions are not known however, reference to published geological drift maps indicate that the ground is likely to consist of the Lynch Hill gravel member overlying the Lambeth group which is predominantly of clays and silts.
- 3.33 In order to reduce the risk of continued movement it would be sensible to construct a new soakaway in the rear garden of the property and located at least 5.0m away from the rear of the retaining wall.
- 3.34 It would be necessary to excavate out and backfill the existing soakaway. The above ground drainage should either be repaired or preferably, replaced with cast iron goods securely bedded or tied to the adjacent structure.
- 3.35 The lower level stone steps should be removed and then rebbed on a nominal concrete bed (over the masonry arch below) with compacted granular fill below and brickwork walls to seal the gap beneath the stairs.
- 3.36 The cast iron balustrades will need to be reattached to the stone steps however, specialist advice will be required in this regard, particularly if the original balustrades are to be re-used.
- 3.37 The movement/stability of the retaining wall is a significant concern and we are not able to offer any kind of reassurance as to whether and for how long it will remain stable. The recent repointing makes it difficult to assess if movement is progressive however, the absence of cracking suggests that very recent movement has not occurred.
- 3.38 Notwithstanding the above, there is clearly a risk that continued movement will occur and collapse is likely – even though the main contributory factor will have been removed.
- 3.39 It would therefore appear prudent, in the short term, to install temporary shoring within the lightwell to provide temporary support to the bulging section of wall.. This is because the consequences of failure and collapse are significant, including damage to the adjacent steps and arch and also damage to the main building and adjacent lower ground floor window.
- 3.40 Beyond this short term measure, it will be necessary to take down and rebuild the affected length of retaining wall.

4.0 CONCLUSIONS AND RECOMMENDATIONS.

- 4.1 The balcony, in its present form, would not comply to current design or building regulations standards. Notwithstanding, at this point in time it appears to be performing adequately.
- 4.2 There is evidence of significant corrosion and also corrosion occurring to the steelwork that is embedded within the rear wall of the property. In our opinion this corrosion is likely to continue and will ultimately cause failure of the balcony.
- 4.3 We recommend that the corrosion and paint finish should be cleaned from the balcony using wire brush or other abrasive methods to expose the bare steelwork. A suitable protective finish, in the form of two coats of heavy duty bituminous paint should be applied. This will help, in the short term, to extend the lifespan of the balcony.
- 4.4 During the above works, it is possible that areas of damage that are more significant than anticipated will be exposed. In such instance, it will be necessary to consider removing and replacing the balcony in the very short term.
- 4.5 Our view is that the balcony will require replacement within the next 1 to 5 years due to the continued corrosion (and associated damage) that will occur within the inaccessible parts of the structure – in particular where the balcony is built into the external wall. The condition of the balcony and supporting structure should be regularly checked during this period.
- 4.6 The stone landing appears in reasonable condition although its bearing on the external retaining wall is in poor condition and the bricks in this location need to be rebbeded.
- 4.7 The soakaway appears to be the likely cause of the noted movement to the external retaining wall and stone steps.
- 4.8 We recommend that the soakaway be excavated out and backfilled (these works will need to proceed with caution due to the risk of additional damage to adjacent structures). A new soakaway should be constructed in the rear garden, at least 5m away from any existing or proposed structures.
- 4.9 Any above ground drainage should be repaired or, preferably, replaced with cast iron goods.
- 4.10 The movement of the retaining wall adjacent to the soakaway has gone beyond the point at which the wall could be considered stable. Notwithstanding, there does not appear to have been any movement since the wall was repointed approximately two months ago.
- 4.11 The consequences of failure/collapse are significant and we therefore recommend that temporary shoring should be installed as soon as possible. This will safeguard, as much as possible, the wall in the short term however, beyond this it will be necessary to take down and rebuild the affected length of wall.
- 4.13 It should be noted that current Building Regs would dictate that a balustrade is required at the top of the wall.

- 4.12 The lower level stone steps should be removed and then reseated on a nominal concrete bed with brickwalls to seal the gaps between and compacted granular fill directly beneath the steps.
- 4.13 Specialist advice should be obtained in respect of the cast iron balustrades and their refixing to the steps.

APPENDIX 1 PHOTOGRAPHS



View on Balcony Structure



View showing damage to brickwork around bearing in wall



View showing balcony bearing on stone landing slab



Drainage pipe



Close up view on bearing in external wall



View showing corrosion



View on bearings in external wall – note damage to brickwork



Cracking in brickwork



View highlighting corrosion of durbar plate in particular



View showing movement of wall and damage to adjacent arch



View showing arch and drainage



View showing movement of retaining wall



View highlighting movement of steps and deterioration/movement of brickwork and fill below.



View on edge of landing slab



View on underside of landing slab



View showing movement of steps and failure of uprights.

APPENDIX 2

Guidance Notes

GUIDANCE NOTES FOR STRUCTURAL ENGINEER'S INSPECTIONS OF DOMESTIC PROPERTIES

These notes are to be read in conjunction with any report to which they are appended.

- I. A Structural Engineer's inspection of a property is intended to provide the information set out in either paragraphs (a) or (b) below. Our reports will indicate the exact nature of our brief.
 - (a) Specific advice on any structural problems which have been brought to the attention of the Engineer and which may be the sole basis for commissioning the report. Examples of this are fractures to walls, previous repairs etc.
 - or
 - (b) To provide a general overview of the condition of the principal structural elements of the property with a view to advising whether the property is suffering from deficiencies such as subsidence, heave, landslip, structural instability or failure of structural components.
2. The inspection is not a full "Building Survey" as defined by the Royal Institution of Chartered Surveyors, this type of survey deals with many of the non-structural aspects of property condition. Other than general comments, the inspection has not included the testing of any services to the property. Neither will it consider the presence of any hazardous or deleterious materials such as asbestos nor any invasive vegetation such as Japanese knotweed etc.
3. Inspections can only be made of those areas which are freely accessible. Unless arrangements have been made beforehand no inspection can be made of foundations or areas buried beneath the structure or behind cladding, neither can any comment be made upon areas that are obscured by fitted carpets or fixed coverings. In the event that such further inspection is advisable then this will be referred to in the report. However, there is always the possibility that there are hidden defects which cannot reasonably be established from a standard Structural Engineer's inspection.
4. The contents and information in the report are for the use of the person in direct contract with Structis Design Ltd. Unless specified to the contrary this is the person who pays our account. Any third party to whom the report is passed should take their own steps to ensure the accuracy of its contents. Acceptance of our report will imply an acceptance and understanding of these notes.
5. The report should not be construed as an implied warranty in relation to the structure. Structis Design Ltd will not be liable to any third parties for any loss, consequential or otherwise, as a result of information given in the report.
6. Clients should always obtain legal advice on matters involving the sale or purchase of property, our reports do not address legal issues.
7. It must be remembered that the condition of any property is a constantly changing variable, with the passage of time new defects can arise and existing ones worsen. The report should only be taken as a record of the condition of the property at the time of the inspection.