FORWARD THINKING ENGINEERING

26 Fitzroy Square

Visual Structural Inspection Report

for

Avery Real Estate Limited

20th May 2022

Project No. 99657

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Revision History

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1 Introduction

This report describes the visual structural inspection of a cantilever stone staircase at 26 Fitzroy Square, Fitzrovia following a visual structural inspection that was undertaken by Frank Bates, Alex Ozegovic and Bradley Cahalin of DCL Consulting Engineers Ltd on 19th May 2022.

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No opening up works were carried out before or during the inspection, and it was just a visual structural inspection of the staircase and landings.

The main purpose of the site inspection was to assess an area of the staircase that showed movement when walked upon and had some cracking along the construction joint line. Upon inspection, the three treads above the first-floor landing were the main concerns.

The property is a Grade II* listed building of stone construction that was built in the later Georgian era. The cantilever stone staircase is presumed to be constructed from limestone.

2 Discussion

Cantilever stone staircases such as the one at 26 Fitzroy Square largely gain their strength and stability due to the rebate at the base of each tread. The rebate allows for an interlocking effect between the treads which allows for the transfer of both horizontal and vertical compressive forces, thus resulting in increased stability and reduced torsional stresses in the treads. The interlocking effect between the treads ultimately means that the treads all rely on each other for support, thus meaning that the failure of a single tread can result in a disproportionate collapse if the embedment into the supporting wall is insufficient for providing a full cantilever.

The stairs also gain some strength due to the embedment of the treads into the supporting wall, however, it is typical to find small embedment depths of only 100mm and so this cannot be fully relied upon.

Photos of cracking at the construction joint that had occurred around the first tread above the first-floor landing are shown in Figures 1 & 2. Upon inspection it was evident that the cracking had been caused by a lack of contact between the tread and the landing, thus resulting in a reduction of the transfer of compressive forces between the two. Overall, this means that more reliance is placed upon the embedment of the tread into the wall.

When the landing was jumped upon from above, noticeable movement of the stonework could be seen. The movement that occurred in the landing was most noticeable near to the supporting wall as shown by the cracking in Figure 2. This indicated that there could have been insufficient embedment of the landing into the wall as a result of small movements over time.

As can be seen in Figure 3, the first floor landing comprised of several stone slabs which had been joined together.

Figures 4 & 5 show some cracking of the stone at the rebate joints of the second and third treads respectively. Both these treads as well as the first tread showed some movements when jumped on from above. The most noticeable movement occurred in the first tread and decreased with each tread. The fourth tread and the treads above did not show any signs of movement.

Overall, the fact that the landing and the first tread had the most significant movement suggests that the slab had dropped slightly over time, thus resulting in a lack of contact between the two elements and a subsequent reduction in the transfer of forces as originally intended. If the stairs are left unrepaired then further movements are likely to occur with time, thus resulting in greater bending and torsional stresses within the treads and a subsequent failure.

Figure 1: Cracking between first floor landing and first tread above.

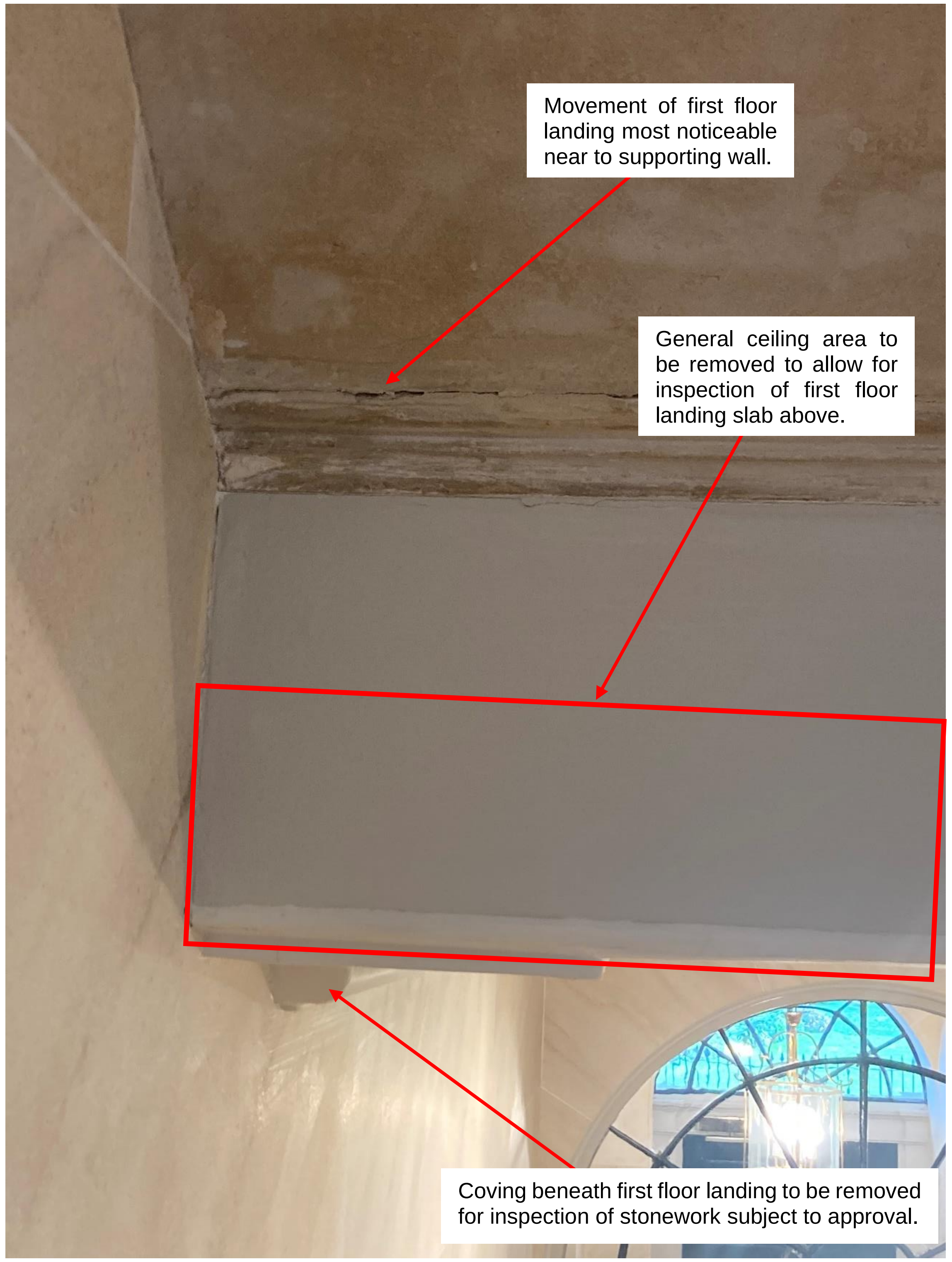

Figure 2: Cracking around rebate between first floor landing and first tread above.

Figure 3: View of first floor landing.

Figure 4: Cracking of stone at rebate construction joint of second tread.

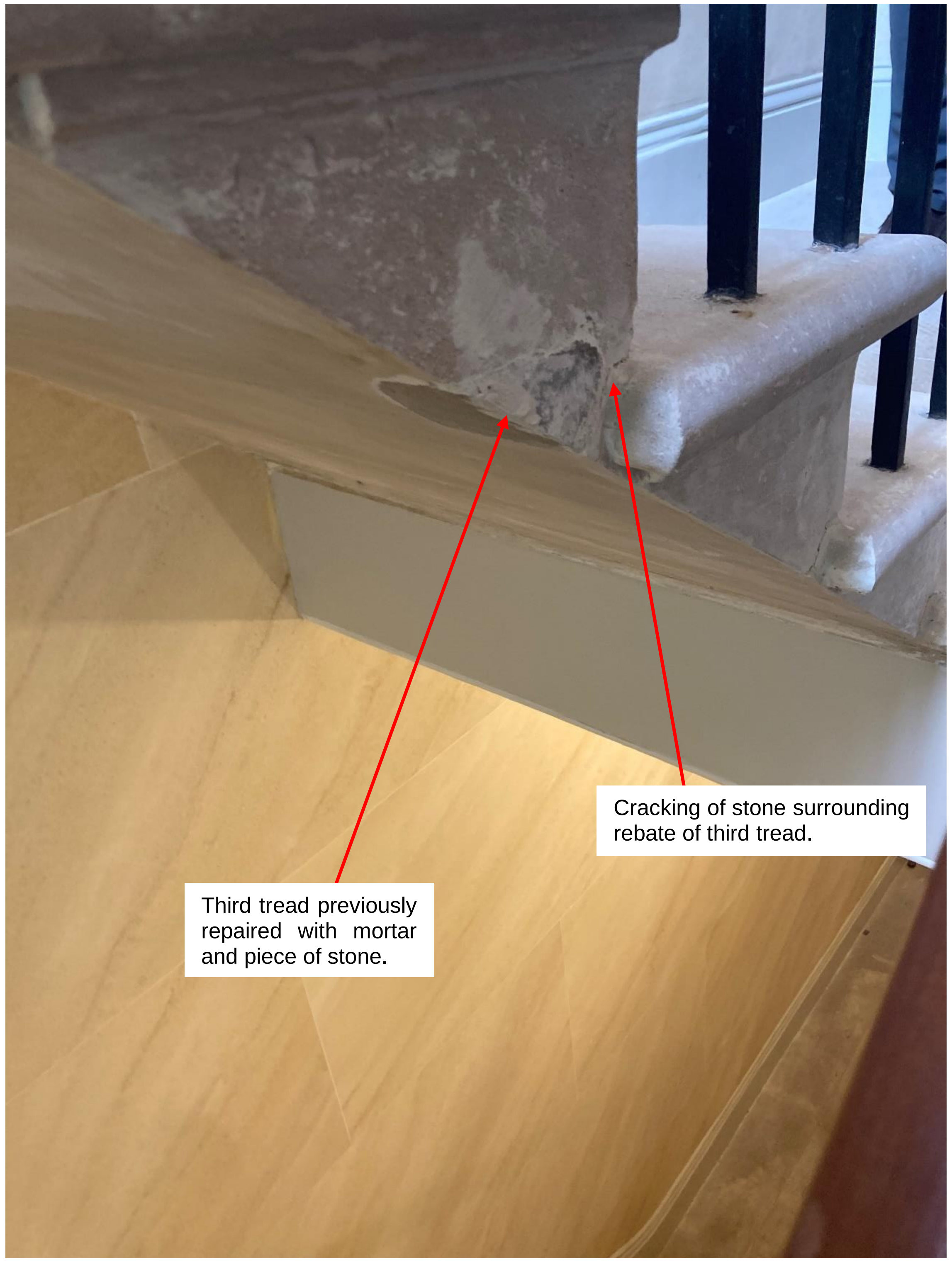

Figure 5: View of third tread above first floor landing showing previous repair and cracking.

3 Conclusions & Recommendations

Following the site inspection, DCL suspects that the looseness and observed movement of the treads was likely caused by the first floor landing dropping slightly, thus resulting in a loss of contact between the landing and the tread above.

Overall, this was due to the fact that the landing showed significant movement close to the supporting wall when jumped on from above and the first tread was looser than the treads above.

In order to confirm that this is the case, DCL advises that the coving and ceiling beneath the first floor landing are opened up locally for the inspection of the bearing/embedment of the landing. Since the building is Grade II* listed, it is possible that approval will be needed from the Westminster Conservation team before the coving is removed.

DCL can confirm that the stairs are not under any immediate risk of collapse since there is still some contact between the treads and they are also able to partially rely on their embedment into the wall to gain strength and stability. However, further movement of the treads over time could result in a potential failure of one or more treads if the stairs are left unrepaired.

DCL forecasts that the repair to the stairs will likely consist of reinstating good contact between the landing and the tread above by jacking up the landing. This can be achieved either by rebricking and repacking the area beneath the slab or by providing a new bracket support to the landing. The required repairs to the landing and treads will be subject to change following the results of the additional opening up works.

Once solid contact is reinstated between the treads, the construction joints in the stairs can be reinstated by raking out the existing resin and injecting new resin at any treads that were previously loose.