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Notes for Highgate Cemetery Colonnade and Stair.

Observations

Uneven steps. The rise height is generally in the region of 155mm but there are locations where they are as little as 124mm and as much as 178mm.

The maximum variation in level along the treads is 81mm but that is from one end to the other.

The nosing's are moderately (but not severely) worn, this is common for a staircase of this age and style.

The steps are built and supported in a somewhat unusual structural manner, with a sloping soffit to the steps resting on the top of a sloping ground bearing support strip.

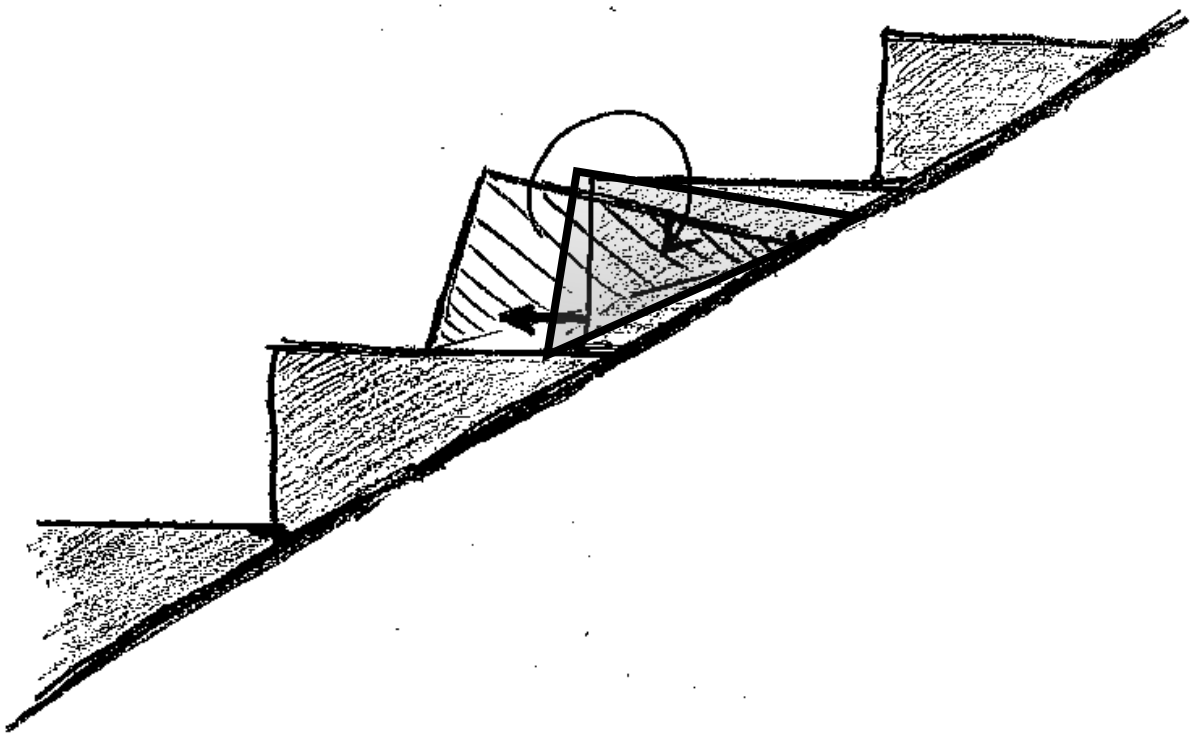
Joints are randomly located. There are 21 treads; 2 have no intermediate joints, 14 have one joint and 5 have 2 joints.

Structural condition:

From the images taken during the site investigation, it can be seen that the treads register within the brickwork of the side walls but have no positive horizontal restraint at their intermediate joints.

Image taken during opening up works showing the treads have an inclined soffit bearing on a strip foundation support of unknown depth and quality. Treads are built into the side walls.

The lack of positive fixing at the intermediate supports is a defect that we advise should be addressed during the consolidation works. The sketch below indicates a potential failure mechanism.



Analysis of the accurate level survey suggests this is not occurring throughout the entire flight of steps but there are locations where displacement has led to uneven rise and going. The most notable movement has occurred to steps 10 and 11 (flight numbered from the bottom up). The average rise of the flight is 155mm becomes 124mm at the rise of step 10 and 178mm at the rise of step 11. This coincides with a tapered open joint at the junction between the two stones forming step 11.

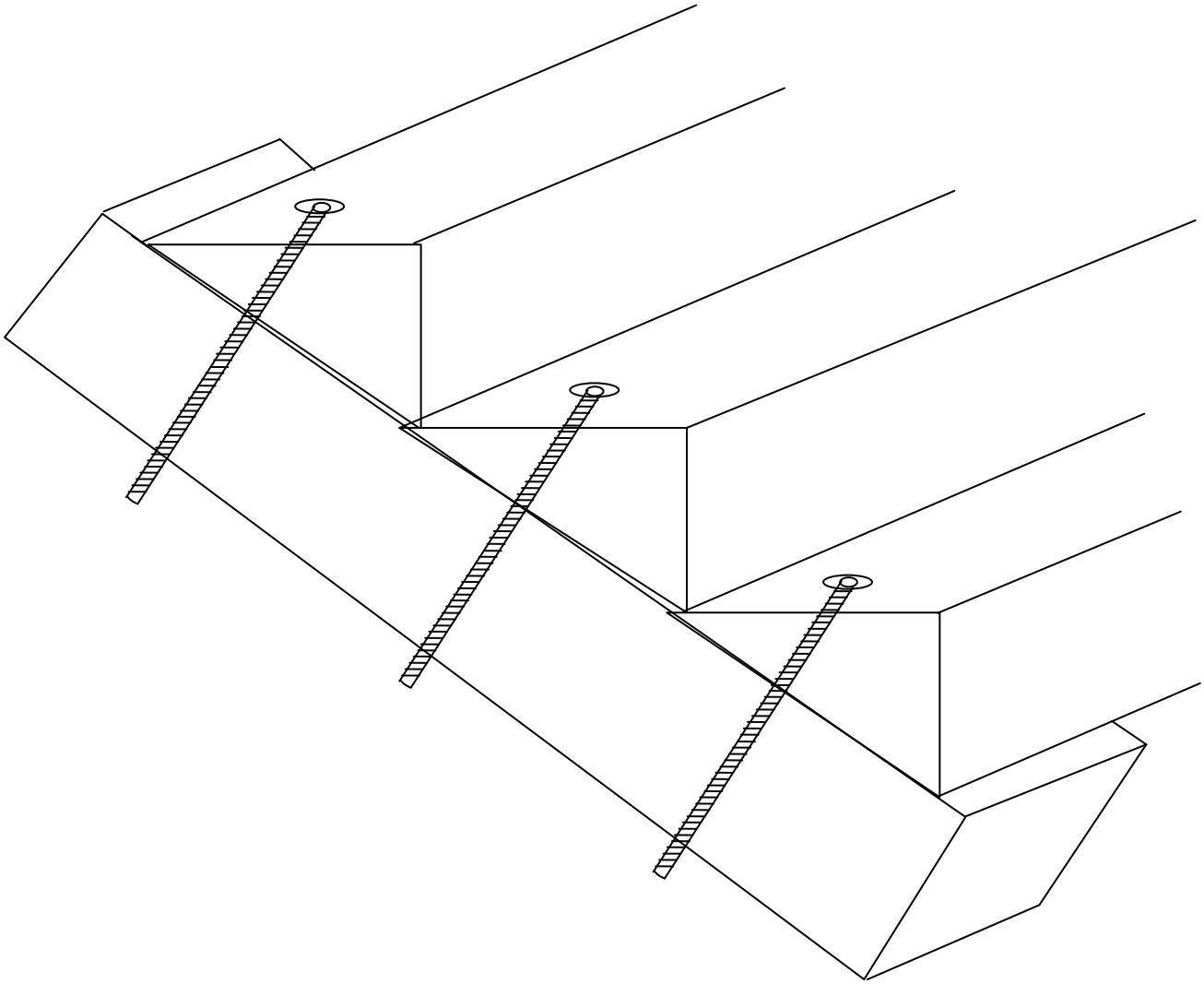
The difference in level between adjacent stones comprising each step has been measured and is commonly in the range 0 to 8mm, this is considered to be acceptable for this staircase. There are some exceptions such as that on step 15 (28mm) and step 16 right hand joint (15mm). These would benefit from adjustment.

Structural Restraint

The uncertain foundation support to the flight has been considered and a view taken that it has successfully served its purpose for more than 150 years. If the current maintenance and consolidation work ensures the structure is conserved in situ there will be no justification for structural intervention. One of the important elements to this will be the effective drainage of the uphill surface. We noted a well maintained “cut-off / trench” drain at the top of the flight. This will intercept ground water from the land above the staircase and

prevent it percolating through the steps and their foundations, causing washout.

The potential slip of the treads down the slope can be restrained by the insertion of stainless steel grouted dowel bars. The holes should be formed using non-percussive diamond core drilling to minimise the risk of breaking the treads. It is suggested that a medium strength injectable bonding mortar such as Hilti HIT HY 70 is used to fix the dowel bars in position.



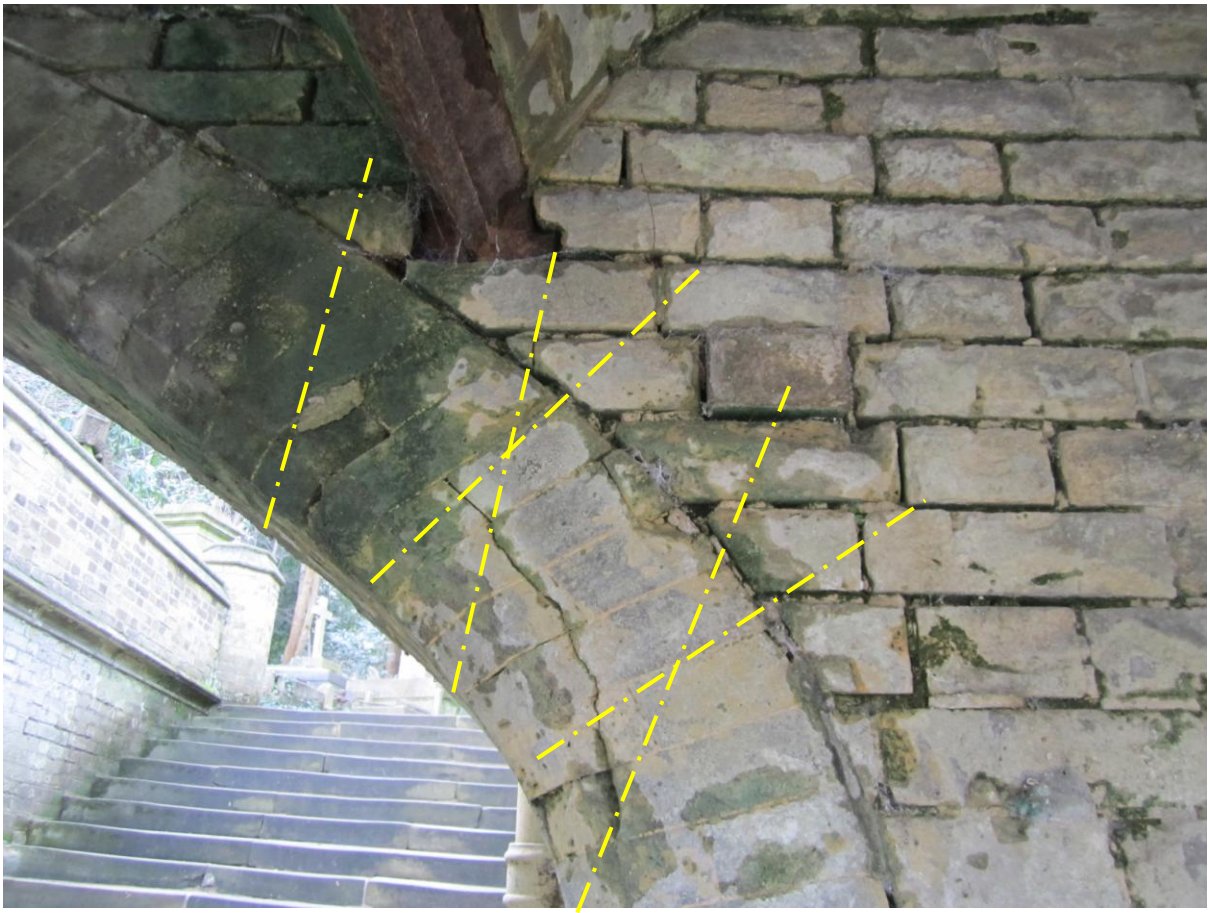
Dowel bars at each end of each separate stone forming the steps will provide valuable stability to the stairs. If it is considered beneficial to adjust the line or level of and steps, this should be completed before the dowel pinning.

Arch voussoirs.

Cracking in the brick arch voussoir at each side of the entrance to the stair has been identified.

In situ pinning with 6mm diameter stainless steel helical reinforcement (approx 500mm in length) is required. This will conserve the original load path (line of thrust) and historic fabric. The method of installation should use non-percussive drilling.

The locations of the pins should be identified on site – but for initial costings we suggest alternate courses, and incline in opposite directions



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Barrel Arch Support Beams (cast iron)

The built in bearings of the support beams should be cleaned (as best they can) and treated with high grade glass flake paint.

eg. Sherwin – Williams (ex Leighs Paints) 2 pack epoxy system.

The following paint specification is suitable for both brush and roller application.
• Epigrip M902 Epoxy Aluminium Primer (stippled by brush) @ 125 microns dft
• Epigrip M905 Epoxy Intermediate Coat (brush / roller) @ 100 microns dft
• Resistex K651 Polyurethane Finish * (brush / roller) @ 30 microns dft
The finish colour may need more than one coat for the exposed lengths of the beams.

After painting, the bearing should be packed with a proprietary micro grout that has a corrosion inhibitor included in the mix (eg Sika InjectoCem – 190 or similar).

The suggested system will not prevent future corrosion but will reduce damage to the historic beams.

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