

19-21 Castle Street

College of Integrated Chinese Medicine

226223

**Structural Inspection of
mathematical Tiles**

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Contents

1.0	Summary	1
2.0	Introduction	2
2.1	Scope	2
2.2	Building Details	2
3.0	Observations	3
3.1	External	3
3.2	Beam over Passageway	5
4.0	Conclusion	6
4.1	Condition Summary	6
4.2	Recommendations	7

1.0 Summary

This report sets out the findings of a structural inspection to the rear flank elevation of No 21 Castle Street, Reading.

- 1) The mathematical tiles are generally fixed to solid boarding, with a masonry backing. We did not see evidence of a timber structural frame, with the possible exception of a sole plate adjacent to the ground floor door.
- 2) Where we investigated, the boards were in variable condition, with some appearing solid and dry, while others were damp and decayed, leaving the tiles un-fixed and relying on the interlock with surrounding elements.
- 3) Pointing varied over the elevation and was often poor.
- 4) At the junction with the front range of the building, at the location of a RWP the tiles had been replaced over much of the height of the façade.
- 5) The timber lintel supporting the upper part of the main rear façade over the passageway was in poor (possibly very poor) condition, timber was damp and the surface friable.

Our recommendations are:

- 1) Repoint whole tiled elevation. A relatively soft lime based mortar should be used. This will help prevent the boards behind becoming saturated.
- 2) Areas of distorted or damaged tiles should be removed and refixed, with the boarding behind checked and replaced as necessary – the extent this will only become apparent as the pointing is cut out and repairs are made. While some tiles that are not damaged, but are not securely fixed, may be salvaged and reused a significant number of new units will be required.
- 3) The bottom 1.5m (approx.) of the wall will require the full removal and refixing of the tiles over the length of the elevation.
- 4) A timber specialist should be engaged to test drill the timber lintel to determine the extent of the decay, if it is more than superficial a new lintel is required. The type of replacement will require discussion with the conservation officer. Although the lintel supports the rear of Number 21, it bears onto the wall of Number 19, which is listed at the higher level of Grade II*.

2.0 Introduction

2.1 Scope

Following a condition survey undertaken by Trident Building Consultancy in March 2026 Mason Navarro Pledge were instructed to undertake a survey of the flank wall to the rear addition of No 21 Castle Street, Reading. The original condition survey identified distortions in the face of the wall and very poor condition of timber elements observed behind the facing tiles at low level.

MNP attended site on the morning of 19th May 2026. A full height scaffold had been erected over the elevation and a builder was on hand to undertake small areas of opening up works externally.

2.2 Building Details

Numbers 19 and 21 are a linked pair of buildings, fronting onto Castle Street to the north. The wall under investigation forms the east side of the rear projection to Number 21. Number 19 is Listed Grade II*, while Number 21 is Grade II. The two buildings have been linked over much of their history.



Figure 1. Key Plan – Wall Highlighted Red

Number 21 is understood to date from the early 19th Century, with the rear projection added later that century. The rear portion was further extended in the 20th Century. A covered passage way leading south from Castle Street is present at ground floor, with the upper floors joined above. The passageway forms part of the primary access to the properties and the wall under investigation is adjacent too/above this route.

3.0 Observations

3.1 External

The wall is clad with Mathematical Tiles, these are thin clay tiles, with the outward appearance of bricks. The tiles were often used over timber framed buildings and were considered cheaper and easier to fit than a real masonry façade as a skilled bricklayer was not required.

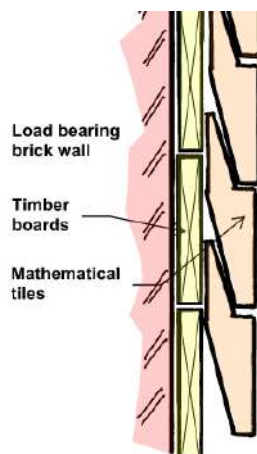


Figure 2. Indicative Section

The investigations found that in this case the tiles are fixed back to wide timber boards, which are in turn attached to an internal loadbearing masonry wall. Other than at ground floor level, adjacent to the doorway, there was no indication of a structural timber within the wall. At the south end of the wall (where it meets a later addition) there was no indication of a timber post. These observations suggest that the wall is entirely masonry and not a timber frame with brick infill.

A series of targeted investigations were undertaken at various locations over the elevation. Locations were chosen to represent areas of apparent distress or distortion. In addition, some areas of apparently sound construction were investigated.

In all locations the buildup was found to be consistent and as indicated in figure 2. In several locations the timber boards onto which the tiles are fixed, were found to be in poor or very poor condition. This generally correlated with areas of visible distortion or damage.



Figure 3. Top of wall – note previous rebuild on right



Figure 4. Detail at position in figure 3



Figure 5. Top of wall – over window



Figure 6. At south end junction with later solid wall. Timber poor



Figure 7. Ground floor – timber board very poor

In general, the pointing to the whole elevation was poor, with various phases of repair and making good. At ground floor level, below the window the timber boards were in very poor conditions, leaving many of the tiles insecure.

3.2 Beam over Passageway

An existing timber lintel at high level over the passageway was visually inspected. The face of the timber appears to be in poor condition, with the paint peeling away and numerous flight holes from insect infestation. It is not possible to confirm an active beetle infestation, but the exposed nature of the timber suggests that the moisture levels will be sufficiently high to allow insects to burrow in the timber.



Figure 8. Timber Lintel

A separate section of timber below the main lintel is significantly distorted and not robustly fixed (as seen in figure 9). Despite the apparently poor condition of the timber, no significant distress or distortion was noted in the wall above.

4.0 Conclusion

4.1 Condition Summary

The condition of the timber boards behind the mathematical tiles is of concern as the fixing of the clay units is compromised. Particular areas of concern are above windows and at the base of the wall where significant distortion was observed.



Figure 9. Distortion over window



Figure 10. Ground floor – significant distortion

The variable (and often poor) condition of the pointing is allowing water to penetrate the wall, allowing the timber boards to decay locally. Where distortion occurs the mortar joints are opened up, allowing more water to penetrate and cause damage.

The timber lintel condition is of concern, if the whole cross section of the timber is decayed the structure will be unstable and the support to the wall and floor above compromised.

4.2 Recommendations

In order to safe guard the fabric of the building and mitigate against the risk of mathematical tiles falling into the passageway the following action is recommended in the short term:

- The whole of the tiled elevation should be repointed with all cementitious material removed. A relatively soft lime based mortar should be used. This will help prevent the boards behind becoming saturated. It should be noted that the work to cut out the old mortar may cause some damage to the tiles requiring local replacement, this is particularly the case in areas of cement based pointing.
- The areas of distorted or damaged tiles should be removed and refixed, with the boarding behind checked and replaced as necessary – the extent of this will only become apparent as the pointing is cut out and repairs are made. While some tiles that are not damaged may be salvaged and reused; a significant number of new units will be required. In particular it is recommended that the bottom 1.5m of the façade is fully removed and refixed over the full length of the elevation.

Due to the overlapping nature of the tiles, it is difficult to remove isolated sections without damage. A suitably experienced contractor should be appointed. Ideally, they should have experience with Mathematical Tiles, but a roofer with experience of conservation work may also be suitable.

With regard to the timber lintel a timber specialist should be engaged to test drill the timber lintel to determine the extent of the decay, if it is more than superficial a new lintel is required. The type of replacement will require discussion with the conservation officer. In this situation a new concrete lintel may be more appropriate than timber. It should be noted that although the lintel supports the rear of Number 21 (Listed Grade II), it bears onto the wall of Number 19, which is listed at the higher level of Grade II*.

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