

Flat 2, 51 Lambs Conduit Street

Structural Engineering Notes on the existing floor construction

1.0 Introduction

- 1.1 Alan Baxter Ltd (ABA) are appointed to the Governing Body of Rugby School to visit 51 Lambs Conduit Street to record the details of the floor construction. Following the visit, we prepared a drawing showing our findings, and this note summarises our assessment of the floor capacity and stiffness, with recommendations for works to improve the stiffness and ties to the front wall.
- 1.2 We visited the property initially on 21st November and then again on 9th December, when we looked in more detail at the floor construction. Areas of the chipboard fixed to the top of the floor joists had been lifted in the living room and bedroom, and we were able to look at the construction and measure the floor joists and beams.

2.0 Description

- 2.1 The property is on the second floor of this five storey, including basement, mid-19th-century, grade II listed building on the west side of Lambs Conduit Street. It is a mid-terrace property with a restaurant at ground and basement levels, with separate flats on the upper three levels, accessed off a communal stair. Flat 2 on the second-floor level comprises a bedroom and bathroom to the front, with a living room and kitchen to the rear, all off a small entrance lobby, accessed off the stairs, also to the rear.
- 2.2 The building has a cellular loadbearing masonry structure with brick front, rear and party walls and a half-brick wide central spine wall. The floors and roof are of timber construction, with the floor joists spanning parallel to the front wall. Generally, it appears from the front elevations to be similar to the other properties in the terrace which appear to be in reasonable condition for their age and type. There is a single, circular pattrass plate located centrally on the front elevation at second floor level.
- 2.3 The floor construction has been inspected by BM Trada, who carried out some sampling and testing of the timbers and produced a report on the condition and grading of the timber joists and beams.

3.0 Observations

- 3.1 Generally, the building appeared to be in reasonable condition externally for its age, and although it has been empty for a while, flat 2 appeared to be in reasonable condition internally, with few signs of movement and cracking. We noted some minor cracking to the ceiling and cornice in the corner of the living room, close to the entrance from the hall.

The half landings to the communal stairs were sloping down from the party wall towards the internal stairwell partition wall at each level, but there was no sign of any recent movement, cracking or distress to the walls or stairs.

- 3.2 The timber floor joists are approximately 200mm deep x 50mm wide and span parallel to the front wall. In the living room, they span from the party wall to a timber bressummer beam, which is located below the stairwell partition wall. This beam spans from the rear wall onto the spine wall. In the bedroom, the joists span from the party walls onto a central 290mm wide by 200mm deep timber beam, spanning from the front wall to the spine wall. The arrangement is summarised on the attached sketch.
- 3.3 Generally, the timber joists and beams are in reasonable condition. The BM Trada report notes excess wane in a few joists, but this is not unusual in timbers of this age, which were not regularised. They visually graded the joists as C16 and the bressummer beam as C24. The beam to the bedroom was not exposed during their visit, so it was not graded.
- 3.4 The floors had deflected up to a maximum of 40mm and had been levelled previously using timber firings. Some holes had been drilled in the joists for electric cables, and heating pipes run on top of the joists and the beam in the bedroom in gaps in the firings.
- 3.5 We carried out heel drops on the floors to the front and the rear, which felt reasonably stiff.

4.0 Discussion

- 4.1 Previously the client has been advised that the bressummer beam in the living room needed to be strengthened to meet current codes of practice and standards. However, the structural works proposed to do this were damaging and detrimental to the historic fabric and were rejected by the planners. Following our initial visit in November, we advised that whilst there has been some deflection of the living room floor and stairs, much of this is likely to have occurred fairly early in the life of the building and had been addressed by adding firings on top of the joists. With no change of use proposed and visual evidence of the satisfactory performance of the floor structure, we did not consider the proposals were appropriate.
- 4.2 We have now carried out an appraisal of the living room floor construction, and as anticipated, the existing floor joists and beams are adequate in bending for the theoretical loads. Using the timber grades assessed by BM Trada, the calculated deflection of the beam exceeds the normally accepted modern criteria, but as previously noted, the floor feels stiff, and there are no signs of distress to the finishes in the property or the ceiling to the flat below. It is also quite possible, with timbers this age, that the strength class could be higher, which would increase the floor strength and stiffness.
- 4.3 It was previously proposed to add blocking between the floor joists at mid-span and both ends and to replace the chipboard with 18mm ply nailed to the top of the joists. We also recommend these works be carried out, as this will help to share loads and generally make the floor stiffer. Given the position of the bressummer beam directly below the stairwell wall, there is no straightforward way to stiffen this beam. As there is no change in use proposed and therefore no need to justify the existing construction, which has performed perfectly adequately for over 150 years, we do not consider it necessary to carry out any works to the beam simply to meet current codes. We understand that the client appreciates the situation and potential disruption to the historic fabric inherent in carrying out works to the beam and is prepared to accept that the floor may be slightly less stiff than the current codes recommend.
- 4.4 We have also carried out an appraisal of the bedroom floor where the timber floor beam supports a larger floor area and spans further from the front wall to the spine wall. Here, using BM Trada gradings, the beam is slightly overstressed, and the theoretical deflections exceed the criteria given in current codes and standards.

- 4.5 The situation is different here in that the top of the beam is accessible along the full length, and the cables and heating pipes which run over the top of the beam are to be removed and replaced. In these circumstances, we would recommend adding a 12mm thick steel plate to the top of the beam. This will strengthen the beam and make it appreciably stiffer. The plate would be fixed to the top of the timber beam with resin, coach screws and shear plate connectors. The disruption in fitting the plate would be limited, and the detail is, in conservation terms, reversible, so it should be acceptable to the Conservation Officer.
- 4.6 We also recommend that blocking is added between the floor joists at mid-span and both ends and ply is nailed to the top of the joists, in a similar manner to the living room.
- 4.7 There are four galvanised steel straps fixed into the front wall and nailed to the top of the existing joists adjacent to the wall. We recommend adding blocking between the joists and wedges against the wall to improve the tying action of the existing detail.
- 4.8 It is currently unclear how the tie rod from the patten plate on the front elevation is fixed to the floor. Some works may be needed to improve the fixing detail when the other floor works are carried out.

5.0 Summary and Conclusions

- 5.1 Generally, the flat is in a reasonable condition, and the floors appear to have performed adequately in the past.
- 5.2 We recommend that blocking and ply are fixed between and on top of the joists in the living room and bedroom to improve the general stiffness of the floors. Timber blocking and wedges should also be added on the line of the galvanised steel ties into the front elevation.
- 5.3 An appraisal of the timber bressummer beam below the partition between the living room and the staircase indicates that theoretical deflections could exceed modern code recommendations. The floor has performed adequately for over 150 years and feels stiff. It is, therefore, reasonable to assume that the beam can continue to perform the same function without carrying out any work to it, provided the Client accepts that the floor may be less stiff than modern codes recommend.
- 5.4 The appraisal of the longer-span timber beam in the bedroom indicates that this is theoretically overstressed and deflections exceed the criteria recommended in modern standards. In these circumstances, we recommend resin fixing and bolting a 12mm thick steel plate on top of the beam, which is accessible along its full length. If this is agreed by the Client then we will develop the details for submission to the local authority, who have approved similar details in the past.