

ACOUSTIC DESIGN NOTE

Ref : 17073/002/js

Date : 7th April 2017



PROJECT : 6 Coptic Street, London, WC1A

TOPIC : Separating Floor Assessment

1.0 Brief

- 1.1 To provide an acoustic assessment of the proposed floor construction between a ground floor restaurant area and first floor office accommodation.
- 1.2 To publish a summary acoustic design note including the predicted sound insulation performances for the proposed separating floor with suggested alternative construction specifications to provide an adequate level of acoustic performance.

2.0 Site Description

- 2.1 6 Coptic Street is a mid-terraced four storey building which currently has office accommodation on all floors. The intention is to convert the basement and ground floor to a restaurant. The area is generally commercial in nature although there are residential properties to the north of the site and to the east on the opposite side of Coptic Street.
- 2.2 The adjacent building, to the north, already has a restaurant on the ground floor with the premises to the south being commercial properties. Coptic Street is lightly trafficked.

3.0 Suggested Acoustic Performance

- 3.1 Although there is no Building Regulation minimum required acoustic performance for a separating floor structure between two non-domestic uses, guidance is given in the British Council for Offices (BCO) Guide to Specifications as to maximum levels of noise intrusion and minimum levels of airborne sound insulation for offices.
- 3.2 The BCO guidance is that, for cellular offices, noise intrusion from sources external to the office should not give rise to noise levels in excess of NR35 ($L_{eq, t}$). The BCO guidance continues with consideration of the minimum level of vertical airborne sound separation (floor airborne sound insulation) between offices and advises on a minimum acoustic performance of $D_{nT,w}$ 45 dB.
- 3.3 A restaurant, typically, is a noisier environment than most other commercial uses which would indicate that consideration should be given to providing an enhanced level of airborne sound insulation.

- 3.4 To calculate a minimum level of airborne sound insulation between the proposed restaurant and the office above it is necessary to consider the likely levels of noise within the restaurant area. Restaurant noise levels can vary considerably depending upon the type of restaurant, whether or not there is “*piped*” music or if there is “*live*” music.
- 3.5 A typical acoustic environment of a restaurant, with piped music, has been used to determine minimum levels of airborne sound insulation required between the proposed restaurant and the office accommodation such that the NR35 criterion should not be exceeded. The reverberant noise levels are as shown below;

Table 1: Assumed restaurant reverberant noise levels

	octave band centre frequency (Hz)								dBA
	63	125	250	500	1k	2k	4k	8k	
	sound pressure level, dB re 2x10 ⁻⁵ Pa								
Restaurant	76	73	72	76	73	70	65	60	78

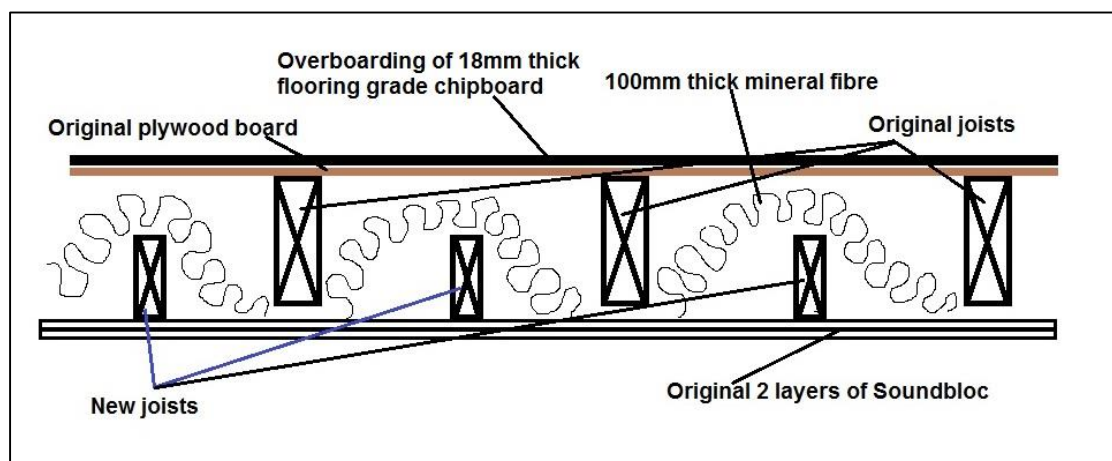
- 3.6 Given the above mentioned reverberant noise level in the restaurant it is calculated that the acoustic criterion for the separating floor should be a minimum airborne sound insulation performance of level of airborne of $D_{nT,w}$ 58 dB.
- 3.7 This level of acoustic performance takes account of the likely flanking transmission of sound up the walls from ground to first floor which degrades the apparent onsite acoustic performance of separating floors. A worst case has been assumed where the flanking sound transmission along the walls is equal to the sound transmission through the floor.
- 3.8 In line with BCO no minimum level of impact sound insulation performance is suggested for the separating floor.

4.0 Assessment of Proposed Floor Construction

- 4.1 It is understood that the proposed floor construction is as set out below;
- 18mm thick plywood flooring with floor finish over
225mm deep timber joists
Resilient bar
2 off layers of 15mm thick Sounbloc
- 4.2 Calculations using the Insul V8.0 software package indicate that the likely airborne sound insulation of the proposed floor construction is around $D_{nT,w}$ 39 dB. This is 19 dB lower in acoustic performance than the suggested criterion.
- 4.3 As the proposed floor specification has been shown to provide a lower level of airborne sound insulation than the suggested criterion, consideration has been given to alternative floor specifications.

5.0 Alternative Floor Specifications

- 5.1 Initially consideration was given to revisions of the existing floor proposal by increasing the number of boards above and below the joists, fitting interstitial boards in the floor void and filling the floor void with mineral fibre of varying densities.
- 5.2 The calculated level of airborne sound insulation increased over that of the original floor specification, but only to around $D_{nT,w}$ 42 dB.
- 5.3 Consideration was subsequently given to a floor construction where the ceiling to the restaurant was supported on different joists to those supporting the floor above. In this construction new joists would be installed between the floor joists and these new joists, as they would only be supporting the ceiling, could be smaller than the floor joists.
- 5.4 A sketch of the suggested floor specification is shown below;



- 5.5 As can be seen, the bottom of the new joists must be lower than the bottom of the original joists to create a gap between the top of the ceiling and the bottom of the joists. The specification would also include the fitting of a 100mm thick layer of mineral fibre in the floor void with a minimum mass of 33 kg/m^3 .
- 5.6 It is calculated that this suggested alternative construction should give an acoustic performance of around $D_{nT,w}$ 61 dB. This level of acoustic performance meets the suggested airborne sound insulation criterion.

6.0 Summary

- 6.1 The ground floor of 6 Coptic Street is to be converted from office accommodation to a restaurant and consideration has been given to the acoustic performance of the separating floor.
- 6.2 There is no Building Regulation minimum level of acoustic performance for floors between commercial uses however, it is suggested that the separating floor should provide a minimum airborne sound insulation performance of $D_{nT,w}$ 58 dB.
- 6.3 No minimum level of impact sound insulation is proposed.

- 6.4 The currently proposed separating floor is calculated to provide an airborne sound insulating performance of $D_{nT,w}$ 39 dB which does not meet the suggested level of acoustic performance.
- 6.5 Calculations have been undertaken for a number of revisions to the suggested floor specification and none met the suggested level of airborne sound insulation.
- 6.6 A new floor specification is suggested using separate ceiling and floor joists which it is calculated should provide an airborne sound insulation of around $D_{nT,w}$ 61 dB which would meet the suggested airborne sound insulation criterion.

End of Note