Proceedings of The Institute of Acoustics

EFFECTIVENESS OF PARTY-WALL SOUND INSULATION AGAINST AIRBORNE AND IMPACT NOISE FROM STAIRWELLS AND CORRIDORS IN NEWLY CONVERTED DWELLINGS

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INTRODUCTION

Much investigation has been carried out on the acoustic properties of partitions and conversions in Victorian Buildings, particularly by the Building Research station (United Kingdom).

The most suitable and effective manner of limiting noise nuisance between two separate self-contained flats is to provide like rooms over/below and/or adjacent to each other with adequate sound insulation between them. Unfortunately, this is not always the case.

The above conditions are important in maintaining harmony between neighbours, and are encouraged by most London Boroughs or local authorities through enforcement of the provisions of sound insulation in new conversions through application of the planning laws.

The Acoustic Group, of the South Bank Polytechnic, is presently undertaking a systematic survey and appraisal of noise insulation techniques and methods in such conversions (1, 8, 9). The project has found that in most conversions the party walls and floors directly separating the living accommodations are given proper consideration, but minimal or no treatment is being applied to party walls and floors of stairwells separating, for example, two individual self-contained flats.

In many converted properties, complaints about noise may originate or be exacerbated by noise generation and transmission in corridors and stairwells. This is particularly true where doors are sited on the corridor or stairwell, effectively weakening the acoustic insulation properties of the party walls. This paper is concerned with intrusive noise generated within the stairwells and corridors of buildings and reports surveys carried out.

REGULATIONS

The new Building Regulations 1985: Approved Document: E1/2/3: 'Airborne and Impact Sound', refers to BS 5821: Parts 1 and 2: 1984 which recommends that for an individual wall/floor to be deemed to satisfy a rating (standard) the unfavourable deviation (AAD) should not be more than 32 dB for either airborne or impact sound insulation. But the Building Regulations 1976 which refers to CP3: Chapter III: Part 2: 1972, British Standard Code of Practice: 'Sound Insulation and Noise Reduction' recommends that the unfavourable deviation (AAD) should not be more than 23 dB when compared to its own standard and is more stringent than the present Building Regulations.

The Building Regulations 1985 also specify that the criterion for satisfactory performance changes when the number of pairs of rooms tested equal to, or exceed, four. The criterion becomes more stringent and thus provides a higher standard of noise insulation. However, the tested party walls-floors of Stairwells and corridors in this paper will be referred to the criteria for 'a pair of rooms' only.

Also, the measurements will be interpreted according to CP3: Chapter III: Part 2: 1972: 'Sound Insulation and Noise Reduction' and BS 5821: British Standard Methods for Rating the Sound Insulation in Buildings and of Building elements (Parts 1 and 2).

In the United Kingdom the actual degree of sound insulation of party walls and floors were, before the introductions of BS5821 (4); classified in accordance with a simple Aggregate Adverse deviation (AAD) rating Grading Systems (2, 5). Unfortunately the Code of Practice (2) classifies the standard of structural insulation between a flat or maisonette and a main stairs or corridor in terms of Airborne Sound Insulation only. Impact Sound Insulation is considered solely for those floors of common approach, balconies or corridors which are directly OVER living accommodation. Furthermore, there is as yet no grading system (as other countries in Europe) for Impact Sound Insulation relative to Party walls.

Also, although it is well established that stairwells and corridors provide easy paths for sound propagation there are neither standard test procedures nor agreed criteria presently available for both airborne and impact noise generated within them; this is an important omission where bed and living rooms are adjacent to common pathways.

Method of Measurements

The usual basic techniques for the measurement of Airborne and Impact Sound Insulation are those described in BS2750(3). These have been found to give the acoustic consultant considerable flexibility in his measurement techniques and may lead to systematic differences in results obtained by individuals(7). To reduce these differences an agreed technique has been adopted (in the United Kingdom) by those concerned, but unfortunately this technique does not cater for airborne and impact sound transmission in corridors and stairwells. In this paper the following has been used as an initial method of assessment.

Corridors

For the airborne measurement, the sound source was placed at one end midway between the walls of the corridor and simultaneous measurements of sound level differences across facades of rooms adjacent to the corridor were made. The above technique was repeated using the standard tapping machine at suitable positions along the length of the corridor.

Stairwells

For the airborne sound insulation of the walls adjacent to the stairwell the sound source was placed in a suitable corner of the stairwell landing to give a diffuse field throughout the stairwell, and for the impact insulation the standard tapping machine was placed in a number of positions on the landing directly adjacent to the common wall. Both room/corridor and stairwell sound levels were recorded simultaneously.

Discussion of results

The results of the airborne and impact sound insulation measurement, of the partywalls, were compared to the Building Regulations 1976 and 1985 respectively and the aggregate Adverse Deviations (AADs) of respective areas are listed in Table 1.

There are no standard nor criteria at present for determining the effect across a wall of impact sound on floors. The impact grading standard for floors is used in this report solely to differentiate the impact sound levels in respective rooms. For bare floors the normalised impact level differences from the results of the measurements vary between as low as 7dB to 27 dB or as high as 29dB to 42dB for the preferred one-third octave frequencies of 100 Hz to 3150Hz.

Generally one is interested in the direct impact sound in the receiving room. The normalised impact level differences can, therefore be classified as the degree of impact isolation necessary to limit the amount of impact sound in the source room.

It will be appreciated from figures 1 to 5 and Table 1 that effective noise isolation cannot be achieved with inadequate sound insulation of party walls.

Conclusion

As may be seen from the results in Table 1, those who live in large houses converted into flats with common stairwells and corridors, are likely to experience substantial instrusive noise due to the inadequate sound insualtion being provided.

There would thus appear a real need to develop relevant standards and procedures for such situations.

REFERENCES

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3. BSI: BS2750: 1980; Methods of Measurement of Sound Insulation in Buidlings and Building Elements. Parts 4 and 7.

4. BSI: BS 5821: 1984; British Standard Methods for Rating the Sound insulation in Buildings and Building Elements. Parts 1 and 2.

5. HMSO: The Building Regulations 1976, 1976 No. 1676:

"Airborne and Impact Noise from Stairwells and Corridors".

Table I : Aggregate Adverse Deviation (AADs)as determined using Building Regulations I976 and I985.

Room Classification * -tested with carpet.	Building Regulations			
	I976		I985	
	Airborne	Impact	Airborne	Impact
Figure I				
Stairwell to Bedroom	9.6	59.4	2.5	I7.2
Stairwell to Lounge	I4.4	33.7	5.6	0
Figure 2				
Entrance Hall to Livingroom	I89.3	I23.4	I37.3	70.0
Stairwell to Corridor	29I.7	8I.4	239.7	33.6
Stairwell to Bedroom	40.4	53.7	II.3	20.4
Figure 3				
Entrance Hall to Livingroom	II7.4	8I.4	82.4	3I.3
Ditto.-with airgap under door temporary sealed.	66.0	* 37.6	25.2	* 9.I
Stairwell to Livingroom -with door sealed.	I4I.0	* 5.2	92.3	* 0
Stairwell to Bedroom	6.7	* I.0	0	* 0
Figure 4				
Stairwell I to Corridor I	II0.4	6I.5	82.0	33.I
Stairwell I to Livingroom I	0	0	0	0
Stairwell 2 to Corridor 2	395.0	I05.5	332.8	54.5
Stairwell 2 to Livingroom 2	34.5	7.5	23.5	0
Note: Floors are carpeted.				
Figure 5				
Entrance Hall to Livingroom	75.3	0	42.7	0

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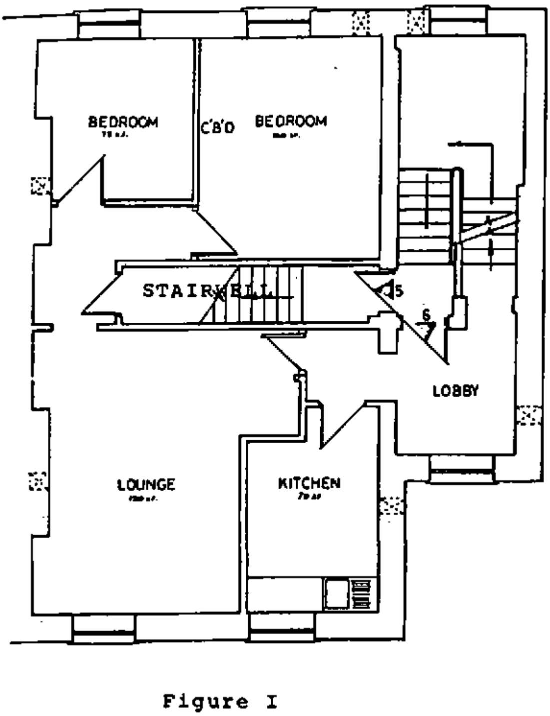

Figure I

"Airborne and Impact Noise from Stairwells and Corridors".

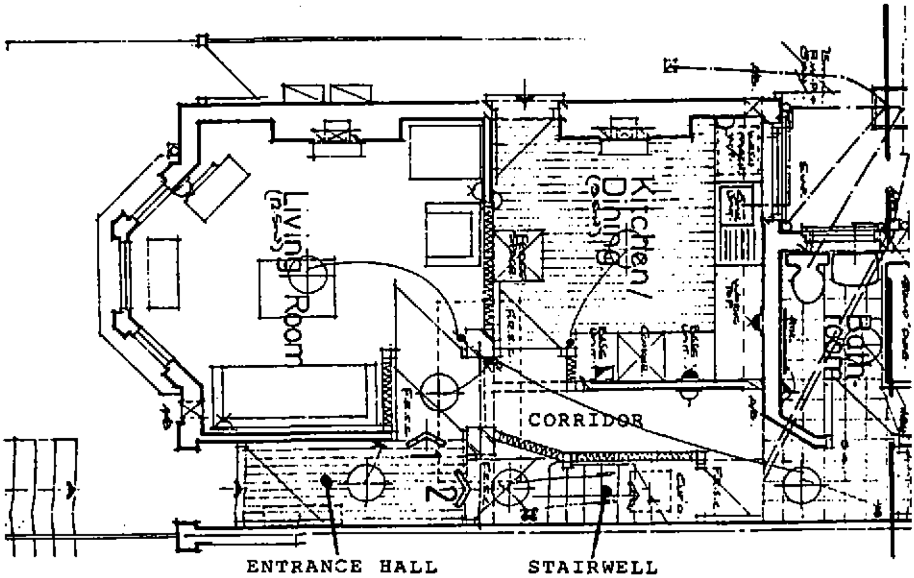

Figure 2

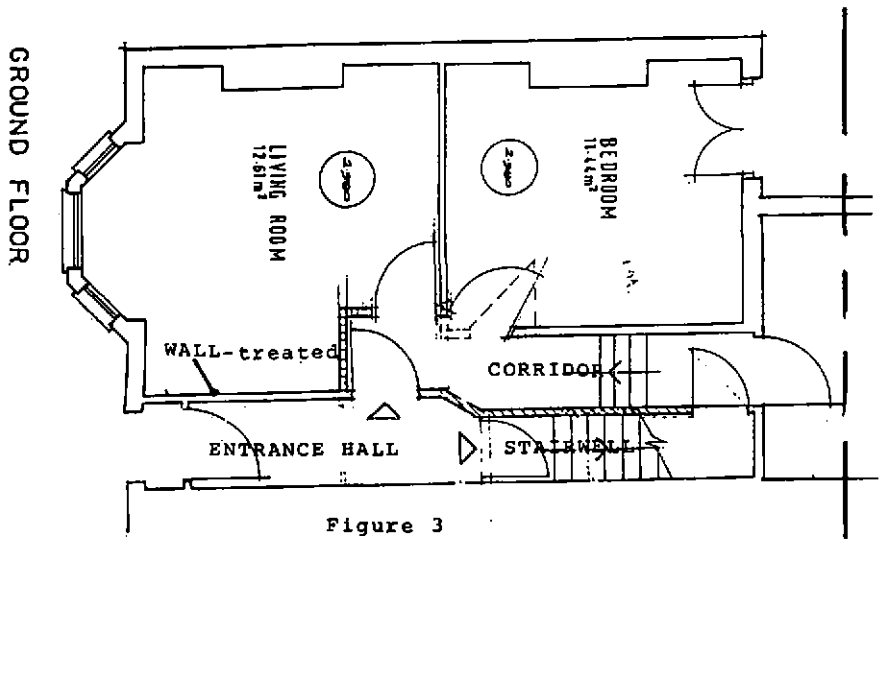

Figure 3

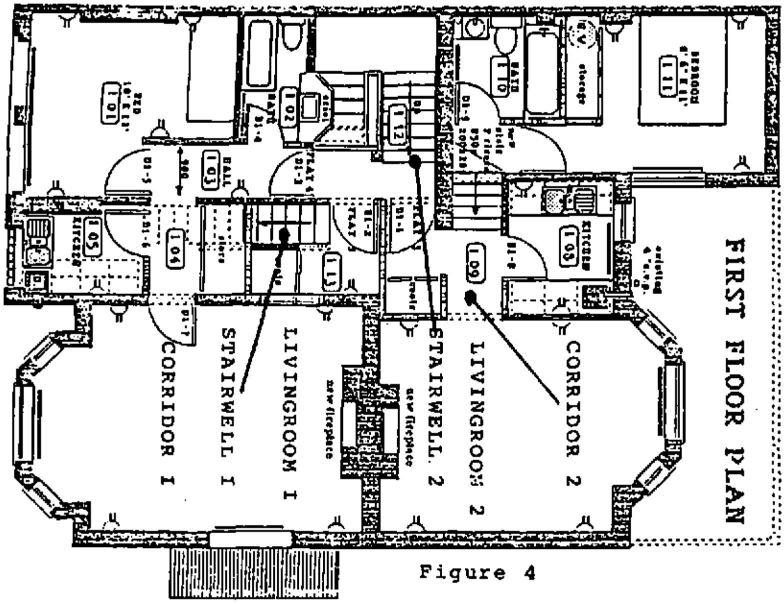

Figure 4

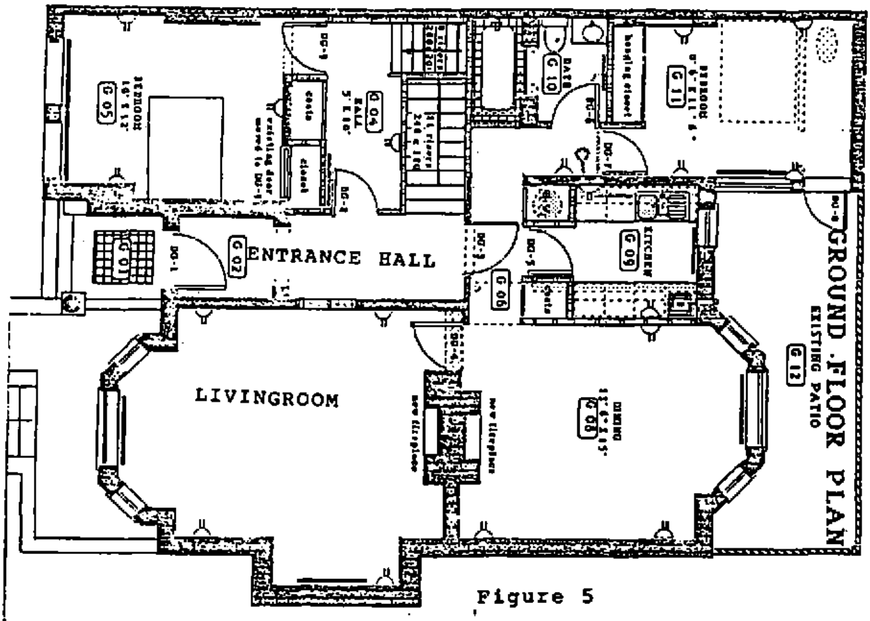

Figure 5

ACKNOWLEDGEMENT

This project is funded by the Science and Engineering Research Council (SERC) with the support of the London Borough of Southwark.