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THE BUILDING REGULATIONS REASONABLE PERFORMANCE, PRACTICE AND THEORY

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1. INTRODUCTION

This paper discusses the concept of 'reasonable' sound insulation in the context of Building Regulations requirements, when carrying out post-construction testing in accordance with BS 2750:1980 [1]. It is based upon a recent dispute that went to Arbitration, concerning a Type 1B separating wall.

2. APPROVED DOCUMENT E

The requirements of Part E are that a wall which separates a dwelling from another dwelling 'shall have reasonable resistance to airborne sound'. The Approved Document also gives practical guidance on how to comply with the Regulations by suggesting certain 'deemed to satisfy' constructions that have in the past been shown to comply. It also describes in Section 3 a way of meeting the requirements by repeating a construction which has already been built, tested in accordance with BS 2750:1980 and shown to meet the sound insulation performance criteria given in Table 1 Section 3 (a precis of which is reproduced below). In practice this also provides a means of assessing whether reasonable sound insulation has been achieved in cases of dispute.

Table 1 - Sound Insulation Values

		Mean value (≥8 tests)	Mean value (≤4 tests)	Individual value
Walls	$*D_{nT,w}$	52	53	49
Floors (Airborne)	$*D_{nT,w}$	51	52	48
Floors (Impact)	$\bullet L'_{nT,w}$	62	61	65

* Weighted Standardized Level Difference [3]

• Weighted Standardized Impact Sound Pressure Level [3]

3. SEPARATING WALL CONSTRUCTION

The development comprised 10 three storey town houses completed in 1993 and built to The Building Regulations 1985. The separating wall construction used was Type 1B which comprised a 215 mm solid brickwork wall dry-lined either side with 12.5 mm plasterboard on plaster dabs. When the properties were occupied, one of the householders raised concerns about the sound insulation with the builder and later with the National House Building Council (NHBC).

From site investigations of the separating wall between the pair of dwellings tested by AIRO it was determined that the construction deviated from the recommendations contained within the Approved Document in that the bricks had been laid frogs down, joints were not fully filled with mortar and the timber joists, rather than being mounted on joist hangers were built in, and poorly sealed to, the separating wall.

Based upon this evidence and the stalemate between the householder and the builder, the NHBC (with the agreement of both parties) referred the matter to arbitration.

4. DISCUSSION

Two consultancies had carried out sound insulation tests (AIRO represented the householder and another acoustic consultancy 'B' represented the builder) the results of which are given in Table 2. Both consultancies carried out 4 insulation tests between one pair of properties. These tests were not carried out between the same pairs of properties.

Table 2 - Results of sound insulation tests

Tests	$D_{nT,w}$ in dB	Mean of Four $D_{nT,w}$ in dB	Mean of Eight $D_{nT,w}$ in dB
A1	49	49.0	49.6
A2	50		
A3	49		
A4	48		
B5	52	50.25	
B6	49		
B7	49		
B8	51		

(tests A1-A4 were conducted by AIRO and tests B5-B8 were conducted by 'B').

Both consultancies showed in their test reports that the separating wall did not comply with the sound insulation performance requirements of the Approved Document and stated that appropriate remedial works would have to be specified. The evidence submitted to the Arbitrator revolved around the issue as to what should be considered to be 'reasonable' sound insulation for an individual property.

Consultancy 'B' contended that if remedial works were carried out to the pair of rooms that achieved 48 dB (test A4), so that when retested they would achieve a minimum of 49 dB, the requirements of Approved Document E would have been met. Consultancy 'B' asserted that 49 dB was 'reasonable' because the Regulations would not allow an individual value of 49 dB if it represented unreasonable sound insulation.

AIRO argued that, on the basis of the test results, reasonable sound insulation would be achieved if remedial work was carried out to all pairs of rooms tested so that the mean requirement of Approved Document E could be met. AIRO also proposed that the individual requirement represented the onset of 'poor' sound insulation and in support of this submitted an excerpt from Dr Fothergill's paper 'New Building Regulations for Sound Insulation' [4]:

> *The original standard for party walls was based on the performance of traditional solid brick walls, and the intention was not to change this standard. We established the equivalence between AAD and $D_{nT,w}$ by determining the proportion of solid brick walls in our data bank which satisfied the requirement of not exceeding 23 AAD and then determined the $D_{nT,w}$ corresponding to the same pass rate. This was $D_{nT,w}$ = 53. An additional requirement was also added that no example in a group of four should have performance below $D_{nT,w}$ = 49. This was to prevent rooms with poor insulation being accepted because other rooms in the group tested had insulation good enough to compensate for them when the mean was calculated.*

In response consultancy 'B' stated that, because prior to the 1985 Regulations a very poor result could be offset by a very good result, a minimum value of 49 dB was chosen to avoid accepting rooms with poor sound insulation, therefore a value of 49 dB was not poor but reasonable. Further, the mean requirement is greater than the individual requirement as the test results are meant to be used as a basis for building many dwellings of a similar construction and that as surveys have shown that the sound insulation of nominally identical constructions can vary, and that variations of 3 or 4 dB are not unknown, the higher value is required.

In support of this consultancy 'B' quoted the results of sound insulation tests carried out on separating walls and published in BRE Digest 333 'Sound insulation of separating walls and floors, Part 1:walls' [5]. This survey showed that for a Type 1B wall the average sound insulation achieved was a $D_{nT,w}$ of 53 dB, 95% of the results were 49 dB or better and 31% were less than 52 dB. Consultancy 'B' suggested that the results in Table 2 were consistent with this statistical spread.

In fact the eight results in Table 2, which are deemed representative of this ten house development, are not consistent with these statistics - the average was a $D_{nT,w}$ of 49.6 dB, and 87.5% were less than 52 dB.

Noting that had either sets of results, or indeed all eight tests together, been submitted as pre-construction evidence, the development would not have been approved, AIRO questioned whether it was somehow supposed to be the responsibility of another building company (using an identical construction) to produce dwellings that would be capable of achieving $D_{nT,w}$'s of the order of 56/57 dB so that the mean requirement could be achieved!

Further evidence that it is the mean requirement that is 'reasonable' was cited by AIRO from BRE Information Paper 18/92 'Sound insulation and the 1992 edition of Approved Document E' [6] where, in discussing the requirements for conversions, it states:

> *An important decision was what level of sound insulation to aim at as being 'reasonable' in this situation. Ideally it would be the same as that for new build. However, with new work, flanking transmission can be taken into account, whereas with conversion work, as much of the existing structure as possible must be used for the job to be economically attractive.*
>
> *The actual values chosen for insulation against airborne sound are... 49 dB for walls and 48 dB for floors, and the value for insulation against impact sound.... is 65 dB for floors.*

The implication of this is that as the flanking construction can be taken into account with new-build dwellings it is the mean requirement that offers 'reasonable' sound insulation.

Based on the evidence presented to him, the Arbitrator ruled that it should be the mean sound insulation performance requirement rather than the individual requirement, as given in Section 3 of Approved Document E to The Building Regulations 1985, that should be considered as giving "reasonable" sound insulation.

Finally, a BRE survey [7], for which AIRO carried out the field measurements and interviews, specifically investigated complaints about poor sound insulation between dwellings. It found that:

> *The study has shown that in the main complainants do live in dwellings having sound insulation below the standard generally regarded as reasonable for Building Regulations purposes.*
>
> *It is interesting to compare some of the findings of this study with the actual standards that are inherent in Approved Document E. In general terms the findings are supportive of the current inherent 'mean value' for the airborne sound insulation of walls and floors because few people complain when these values are met. However, there is some evidence that the current minimum standard, the 'individual value', may be set at too low a level.*

5. CONCLUSION

Approved Document E allows for type approval of 'novel' forms of construction by testing a set of separating walls or floors in buildings of similar construction to those under consideration. It does not deal with disputes arising following completion of a building project.

Post-construction measurements of sound insulation can be of value in determining disputes arising from complaints of poor sound insulation between new or refurbished properties. However, without a responsible authority providing an unambiguous definition of a 'reasonable' insulation value to be used in determining the level of remedial treatment required, arbitration or litigation is almost inevitable.

REFERENCES

1. British Standard BS 2750
Measurement of sound insulation in buildings and of building elements

Part 4:1980
Field measurements of airborne sound insulation between rooms

Part 7:1980
Field measurements of impact sound insulation of floors

2. The Building Regulations 1985
Approved Document E:Sound E1/2/3
HMSO, 1985

3. British Standard BS 5821
Rating the sound insulation in buildings and of building elements

Part 1:1984
Method for rating the airborne sound insulation in buildings and of interior building elements

Part 2:1984
Method for rating the impact sound insulation

4. L C Fothergill, 'New Building Regulations for Sound Insulation',
Proc IOA Vol. 8 Part 3 (1986) pp 441 to 447

5. BRE Digest 333, 'Sound insulation of separating walls and floors,
Part 1: walls' June 1988

6. L C Fothergill, 'Sound Insulation and the 1992 Edition of Approved
Document E', BRE Information Paper IP18/92, (1992)

7. Grimwood C, 'Complaints about poor sound insulation between dwellings',
IOA Acoustics Bulletin Vol. 20 No. 4 pp 11 - 16 (1995)