

# Anderson Mechanical Services

## Acoustic Testing

In Association with

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By

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## My background

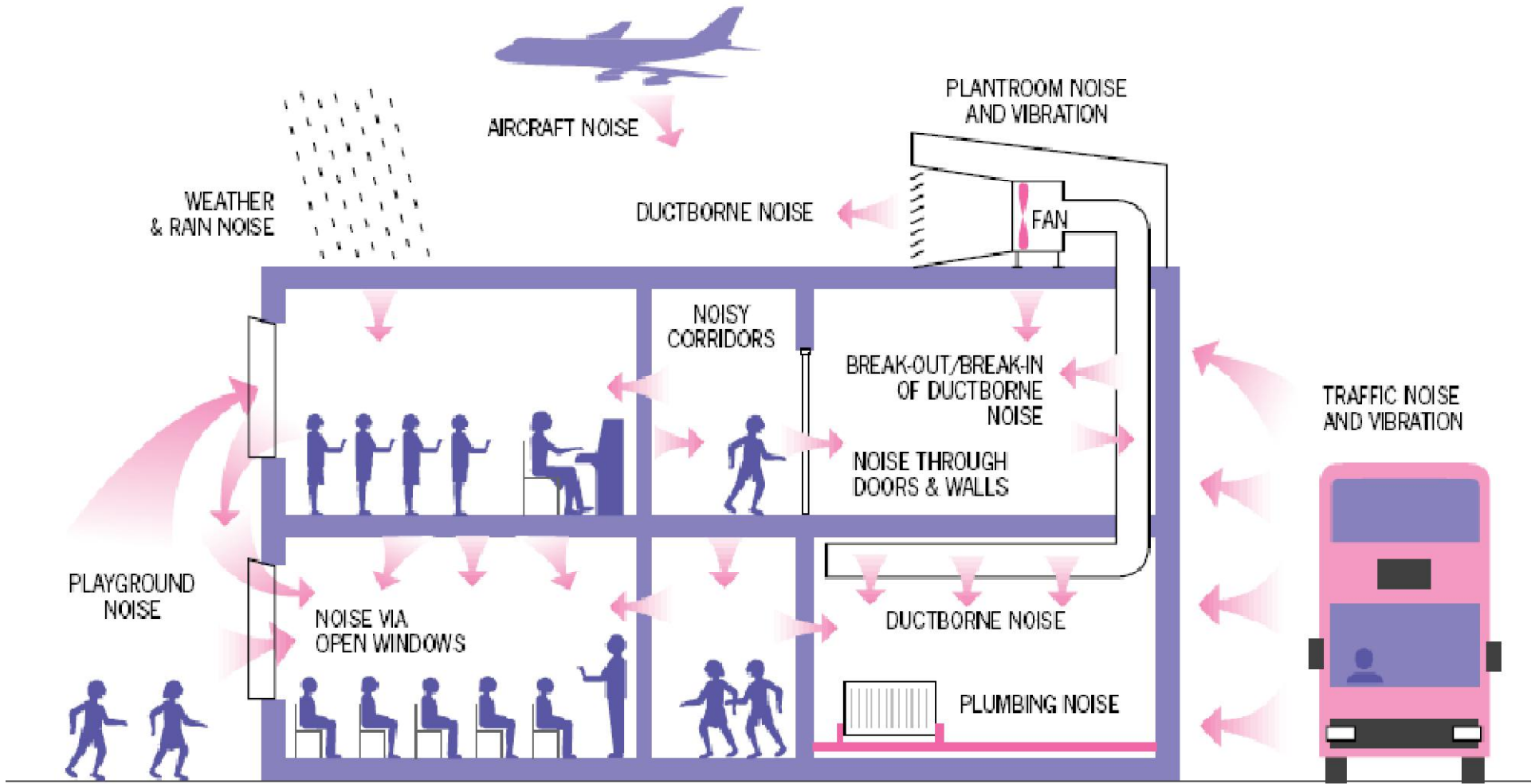
- Head of Condition Monitoring at Research and Specialist Consultants, BSRIA.
- PCN Level III thermographer
- Chairman of the UK Thermography Association
- Fellow of BINDT
- Member of CIBSE
- Associate Member Institute of Acoustics
- 14 years experience in building thermography
- 5 years experience in acoustic testing
- Chairman Thermography Training and Certification Working Group
- BSI and ISO CM & NDT committees.
- 10 years in research & consultancy for farm buildings
- BSc Environmental Engineering
- 5 years with mechanical and electrical contractor
- 4 years with lighting manufacturer



## Noise

- Most of the 180,000 complaints about noise in England and Wales involve low frequency noise from domestic music systems
- Changes in 2004 Regulations introduced Pre-completion testing and more emphasis on low frequency noise
- All new and refurbished dwellings and schools are now tested on a sample basis or use Robust Details

# Noise



## Part E Requirements, Ireland

E1 (1) **A wall** which -.

(a) separates a dwelling from another dwelling or from another building, or

(b) separates a habitable room within a dwelling from another part of the same building which is not used exclusively with the dwelling, **shall have reasonable resistance to airborne sound.**

## Part E Requirements, Ireland

<i>Table 1</i> <b>Sound transmission values</b>			
Type of performance	Individual values	Mean values	
		Test in at least 4 pairs of rooms	Test in at least 8 pairs of rooms
Airborne sound (minimum values)*	49 (walls) 48 (floors)	53 (walls) 52 (floors)	52 (walls) 51 (floors)
Impact sound (maximum values)**	65	61	62
<i>Notes:</i>			
* Airborne sound - Weighted Standardised Level Difference ( $D_{nT,w}$ )			
** Impact sound - Weighted Standardised Sound Pressure Level ( $L'_{nT,w}$ )			

## Part E Requirements, Ireland

- No technical specification for walls or floors
- Examples of good construction practice
- Recommendations of what to do and what not to do
- Only new walls of same build as old walls are covered by tech. Spec.

## Get-out clause, Ireland

- **4.11 Limits on the use of test evidence...** A failure of new construction to achieve the values in the Table is not in itself evidence of a failure to comply with the requirements of the Regulations.
- And new construction need only follow the specified examples, it doesn't need testing

## Part E - Sound Insulation testing, E&W

- Dwellings
  - Robust details – pre-tested to high performance
  - Sample testing of special partitions recommended by Approved Document E to comply with Part E of the Building Regulations
- Schools
  - Section 1 of Building Bulletin 93 is now the constructional standard for acoustics for new school buildings.
  - Part E of the Building Regulations includes schools

## Part E Requirements, E&W

Table 0.1a Dwelling-houses and flats – performance standards for separating walls, separating floors, and stairs that have a separating function

	Airborne sound insulation sound insulation $D_{nT,w} + C_{tr}$ dB (Minimum values)	Impact sound insulation $L'_{nT,w}$ dB (Maximum values)
<b>Purpose built dwelling-houses and flats</b>		
Walls	45	-
Floors and stairs	45	62
<b>Dwelling-houses and flats formed by material change of use</b>		
Walls	43	-
Floors and stairs	43	64

Slightly lower requirements for 'Rooms for residential purposes'

## Testing required

- Dwellings where robust details have not been used
- Walls between adjacent dwellings
  - Lounge, bedroom, living room, dining room
  - At least one set of tests for every ten dwellings
  - Set of tests = 2 walls & 2 floors airborne & impact
  - At least one in ten to be tested
- Schools – to meet requirements of BB93
  - At least one in four to be tested
- Buildings such as health premises to other standards

## Acoustic performance of schools

Many factors to consider and show compliance

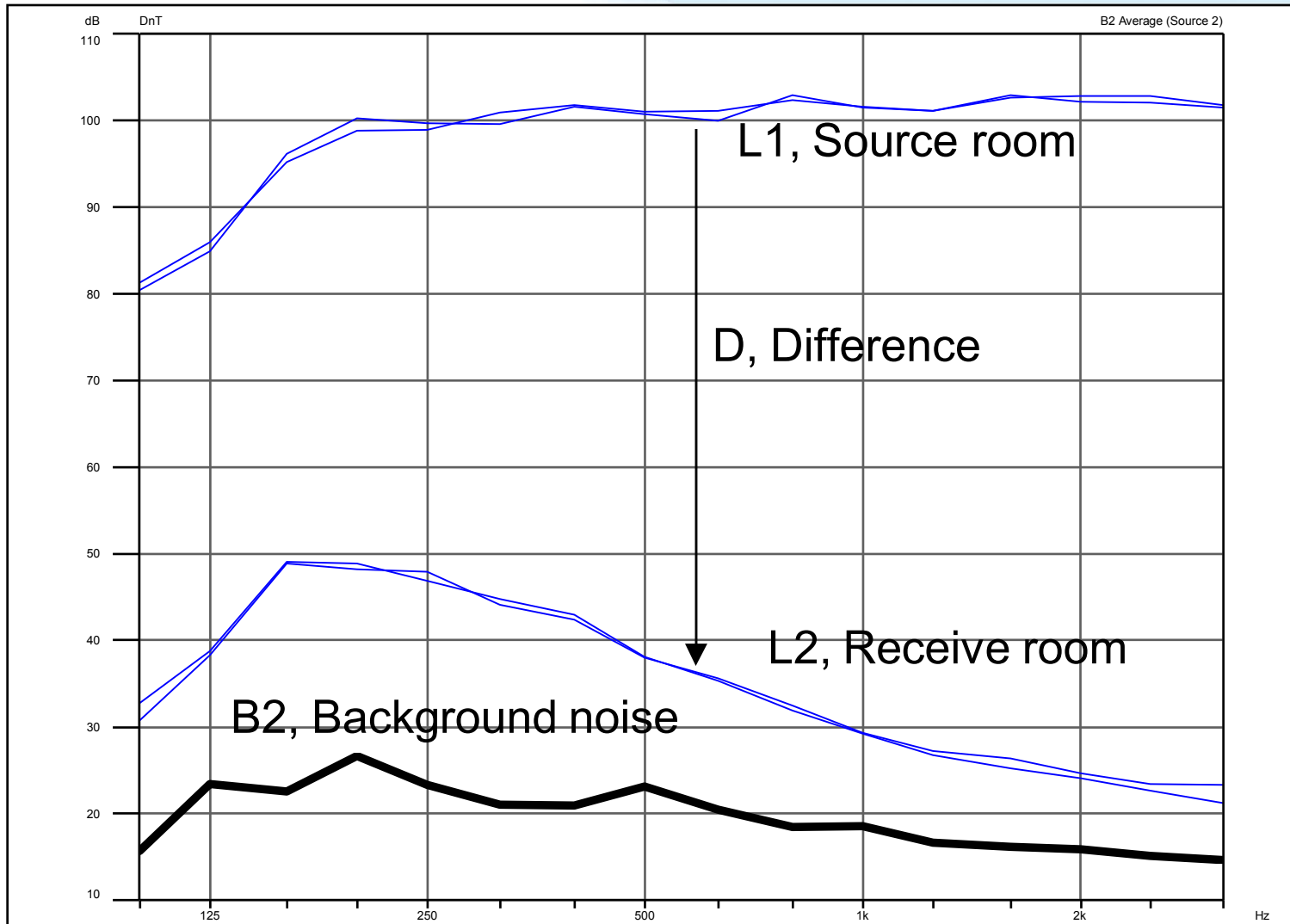
- Attenuation between rooms - depends on room uses  
- Table 1.2 in BB93 gives 30dB to 60dB
- Attenuation between corridors and rooms – Table 1.3
- Impact noise through floors – Table 1.4
- Reverberation times important for clear understanding of speech and for music – Table 1.5
- External noise ingress
- Rain impact noise

## Testing process

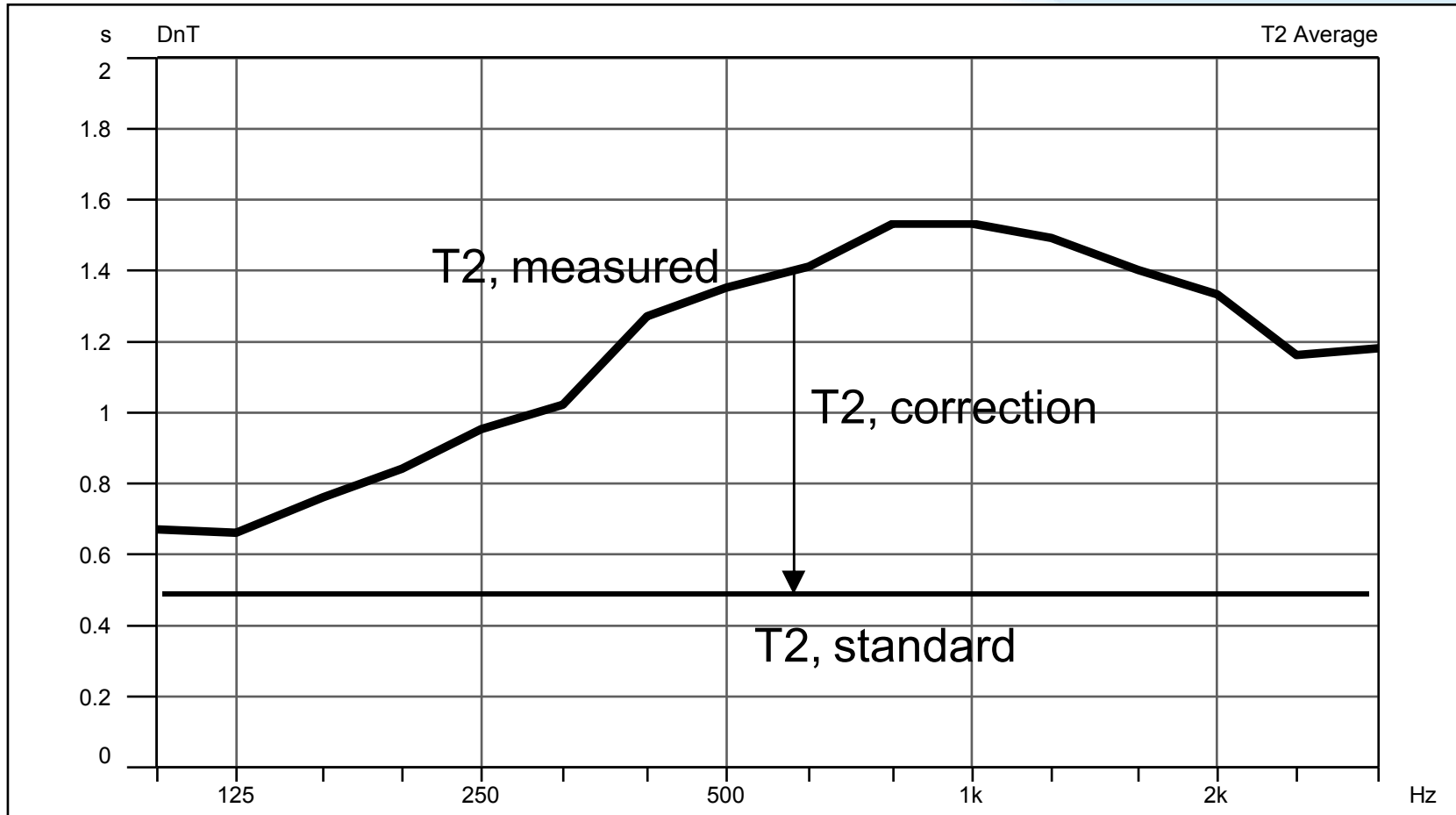
- 100dB white noise in one room
- Measure transmission to next
- Measure reverberation time
- Measure background noise
- Apply correction factors for reverberation time and low frequency noise
- Results computed on the spot



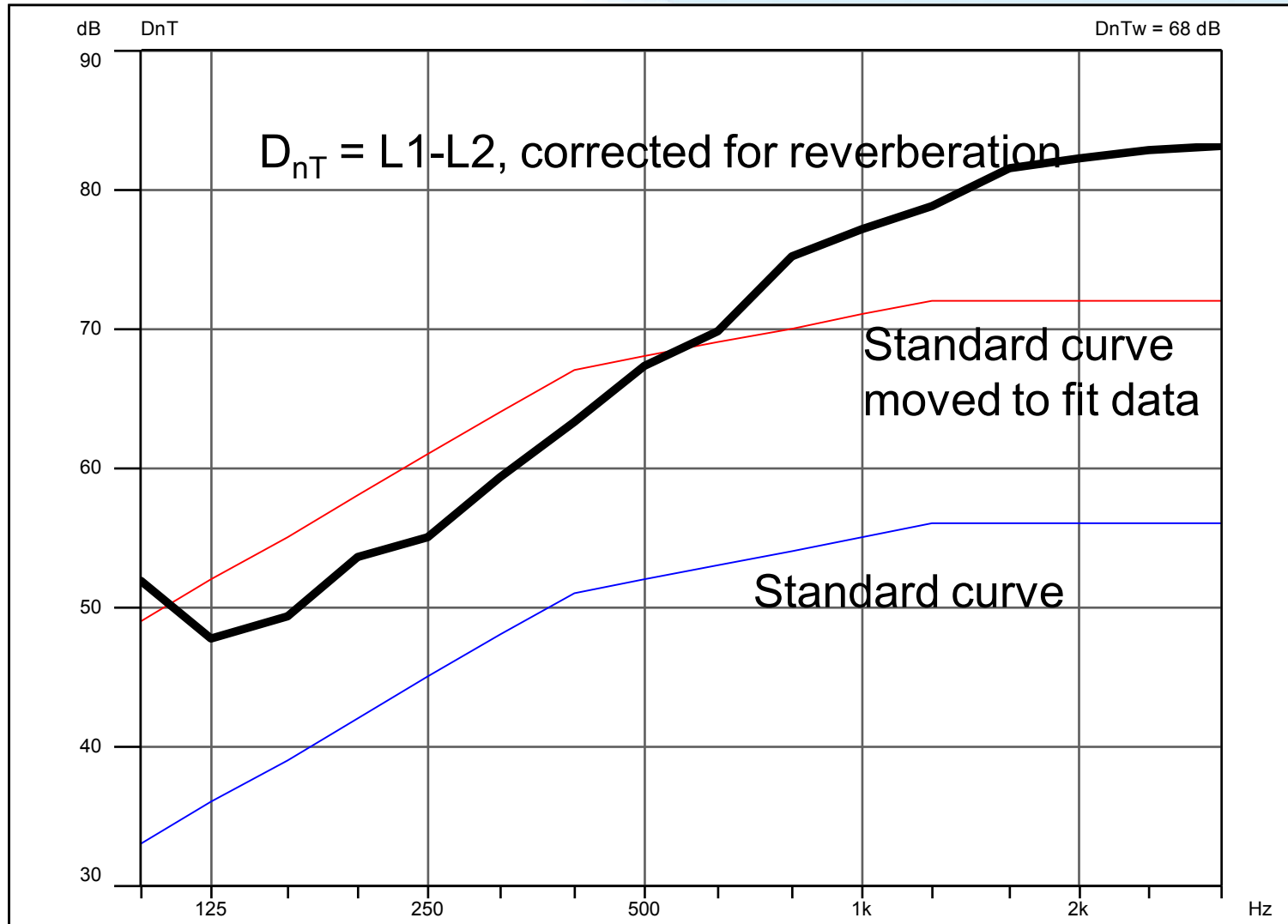
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# Reverberation time



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**Standardized Level Difference according to Part E of Building Regulations 2000**  
**Field measurements of airborne sound insulation between rooms**

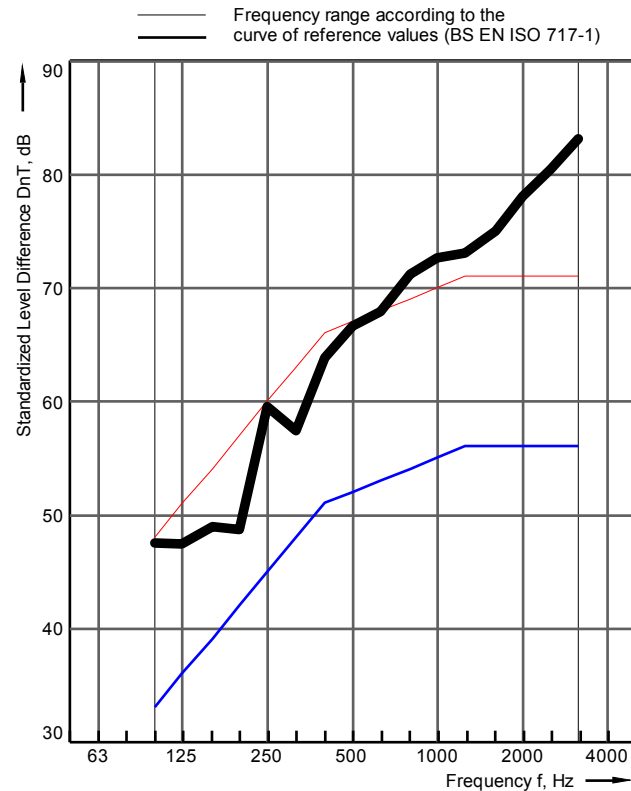
Client: Test Homes: The Birches, Walton

Date of test: 18/06/2009

Description and identification of the building construction and test arrangement, direction of measurement:  
 Wall from plot 108 kitchen/dining room to 109 kitchen dining room

Source room volume: 43 m<sup>3</sup>  
 Receiving room volume V: 43.00 m<sup>3</sup>

Frequency f Hz	DnT 1/3 Octave dB
50	
63	
80	
100	47.5
125	47.4
160	48.9
200	48.7
250	59.5
315	57.4
400	63.8
500	66.6
630	67.9
800	71.2
1000	72.6
1250	73.0
1600	75.0
2000	78.0
2500	80.4
3150	83.1
4000	
5000	



Rating according to BS EN ISO 717-1

$D_{nT,w}(C;C_{tr}) = 67 (-2; -7) \text{ dB}$        $C_{50-3150} = \text{N/AdB}; C_{50-5000} = \text{N/AdB}; C_{100-5000} = \text{N/AdB};$

Evaluation based on field measurement results obtained in one-third-octave bands by an engineering method       $C_{tr,50-3150} = \text{N/AdB}; C_{tr,50-5000} = \text{N/AdB}; C_{tr,100-5000} = \text{N/AdB};$



No. of test report: 53103AB

Name of test institute: BSRIA

Date: 22/06/2009

Signature:



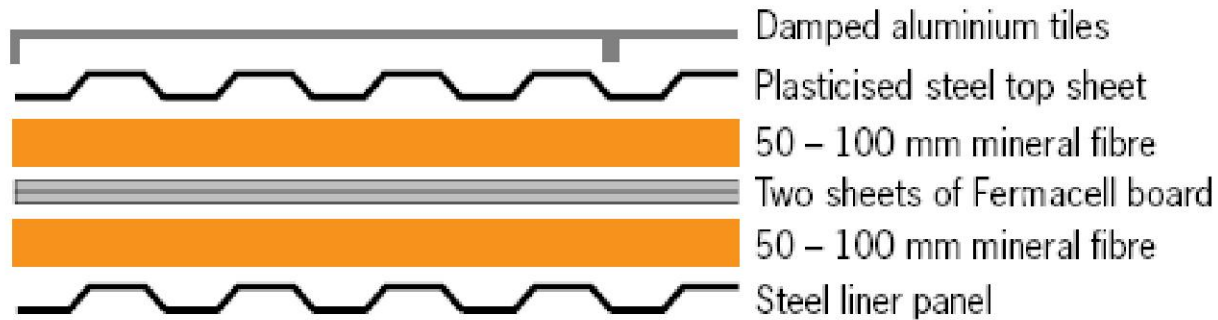
## Presentation of results

	<b>Airborne sound insulation test:</b>	$D_{nTw}$	-Ctr	$D_{nTw} + C_{tr}$ dB	Pass / fail
A	Wall from plot 108 GF Living room to 107 living room	61	9	<b>52</b>	Pass
B	Wall from plot 108 kitchen/dining room to 109 kitchen dining room	67	7	<b>60</b>	Pass

## Likely causes of failure

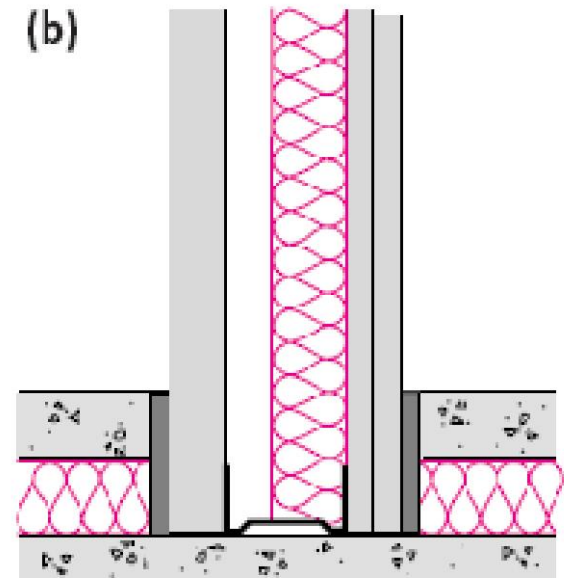
- Inadequate mass in structure
- Gaps at interface between wall and soffit
- Interface between partition and external wall
- Unfilled perpend between concrete blocks
- Penetrating ducts
- Flanking transmission through slab
- Unbacked socket outlets or light-switches
- Penetrating beams or joists

## Suggested details



### Roof to avoid rain noise

From Building Bulletin 93



### Partition foot to avoid flanking transmission

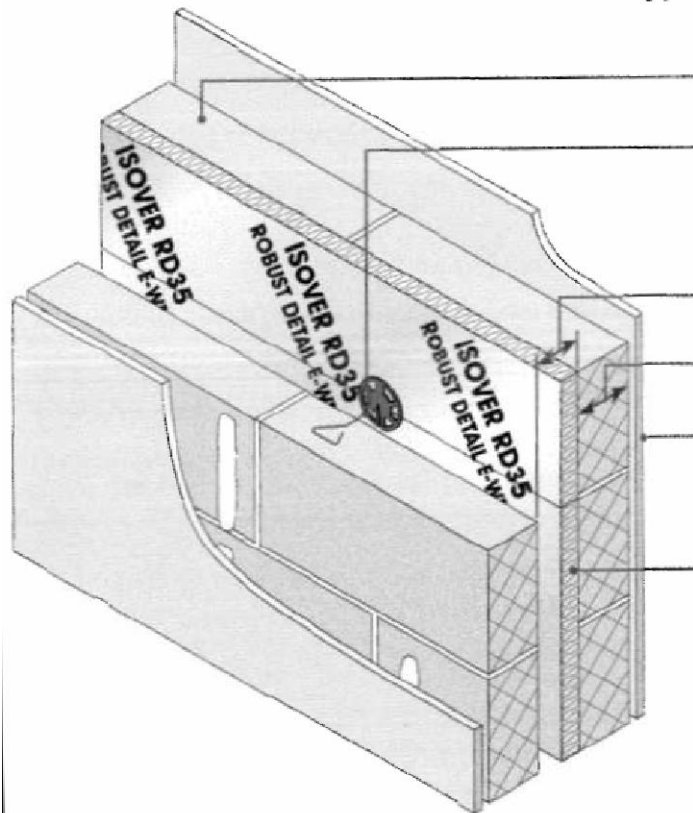
From Building Bulletin 93

## Robust details

### Separating Wall – Cavity Masonry

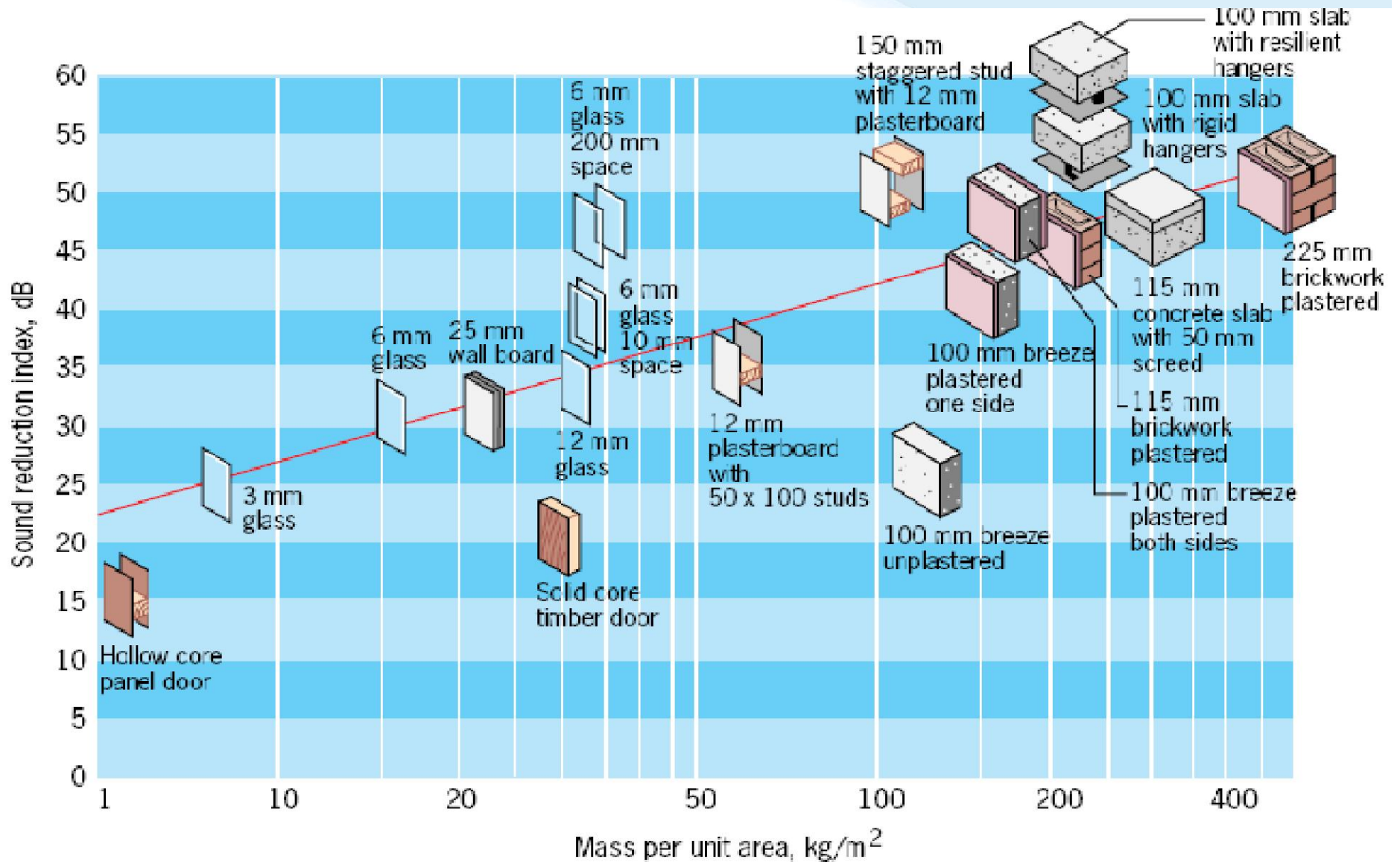
E-WM-8

- Lightweight aggregate blocks
- 35mm (minimum) Saint Gobain-Isover RD35 Acoustic Batt
- Gypsum-based board (nominal 9.8 kg/m<sup>2</sup>) on dabs



Block density	1350 to 1600 kg/m <sup>3</sup>
Wall ties	Insulation retaining wall ties to Approved Document E 'Tie type A' (see Appendix A)
Cavity width	75mm (min) leaf-to-leaf
Block thickness	100mm (min), each leaf
Wall finish	Gypsum-based board (nominal 9.8 kg/m <sup>2</sup> ) mounted on dabs
Insulation	35mm (min) Isover RD35 foil-faced mineral wool acoustic batt
External (flanking) wall	Masonry (both leaves) with 50mm (min) cavity – clear, fully filled or partially filled with insulation

# Generic performance of partitions



## Impact of introducing testing

- Improved average party wall performance
- Extra cost of construction about €1/m<sup>2</sup> about €20/house
- Extra cost of testing or Robust Detail registration €30/house
- About one in five of partitions fail and have to be improved

## Conclusions

- Acoustic testing has improved the quality of building in England and Wales
- The cost is bearable
- There is a trend to go for testing rather than Robust Details because of increased design flexibility

# Anderson Mechanical Services

## Contact

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