

## **NV6 – Relevant Standards, Policy and Guidance**

### **British Standard 5228 - Noise Control on Construction and Open Sites (BS 5228) <sup>1</sup>**

The principal guidance for assessing noise from construction activities is BS 5228. This Standard draws short of defining acceptable limits and comments that criteria should be defined on a site specific basis.

### **British Standard 6472 - Evaluation of Exposure to Vibration in Buildings (BS 6472) <sup>2</sup>**

British Standard BS6472 provides guidance upon acceptable levels of vibration exposure to humans. The human body is most sensitive to vibration in the vertical direction (foot to head) during the daytime. Base curves for vertical Peak Particle Velocities (PPVs) are presented which can be multiplied by factors to give satisfactory magnitudes of building vibration with respect to human response.

In principal Peak Particle Velocity (PPV) vibration levels of the order of 1.12 mm/s at residential premises are generally considered to be satisfactory within dwellings during the daytime for construction activities, with a first Action Level of 0.56mm/s often defined to provide Contractors with an indication when disturbance may occur to neighbours. A second Action Level of 1.12 mm/s is normally defined, above which alternative techniques would be considered and adopted where appropriate.

### **British Standard 7385 - Evaluation and Measurement for Vibration in Buildings (BS 7385) <sup>3</sup>**

in British Standard BS7385 considers the potential effects of vibration upon buildings. This standard defines criteria for two different types of building structure, brick-built residential and more heavily-built industrial. The standard advises that there is a minimal risk of cosmetic damage (i.e. the formation of hairline cracks on drywalls, plaster or in mortar joints) at the specific guidance levels.

For residential buildings the limit for cosmetic damage varies with frequency: 14mms<sup>-1</sup> at 4Hz rising to 20mms<sup>-1</sup> at 15Hz and to 50mms<sup>-1</sup> above 40Hz. These limits apply to all three orthogonal directions individually. It is highly likely that occupants would complain long before vibration levels reached this order of magnitude. It is common for a conservative approach to be taken when setting criteria for cosmetic damage and a lower overall level of 12.5 mm/s PPV is often specified.

### **Planning Policy Guidance 24 – Planning and Noise (PPG 24) <sup>4</sup>**

PPG24 provides guidance for new dwellings. It outlines four Exposure Categories which correspond to bands of noise levels from various sources. The advice corresponding to the four Noise Exposure Categories is summarised in Table 1.

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<sup>1</sup> British Standards Institute. Noise Control on Construction and Open Sites. Part 1. Code of Practice for Basic Information and Procedures for Noise and Vibration Control. BS 5228: 1997.

<sup>2</sup> British Standards Institute. British Standard Guide to Evaluation of Exposure to Vibration in Buildings (1Hz - 80Hz). BS 6472. 1992.

<sup>3</sup> British Standards Institute. Evaluation and Measurement for Vibration in Buildings. Part 2. Guide to Damage Levels from Groundborne Vibration. BS 7385: Part 2. 1993.

<sup>4</sup> Department of the Environment. Planning Policy Guidance PPG 24, Planning and Noise. 1994. HMSO.

**Table 1: Planning Policy Guidance for Proposed Residential Developments from PPG 24**

Noise Exposure Category	Planning Policy Guidance
A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.
B	Noise should be taken into account when determining planning applications, and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.
C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should normally be refused.

The noise levels relating to the Exposure Categories are source-specific and are shown in Table 5.2. The levels are:

- i) 'free-field', that is away from reflective surfaces other than the ground; and
- ii)  $L_{Aeq}$  evaluated over 07:00 - 23:00 for daytime and 23:00 - 07:00 for night-time.

The noise levels should be representative of typical conditions. Measurements to determine these values should be carried out at a measurement height of 1.2 - 1.5 metres.

**Table 2: Source-Specific Noise Levels Relating to Noise Exposure Categories for Proposed Residential Developments**

Noise Source	Noise Exposure Category			
	A	B	C	D
<b>Road Traffic</b>				
07:00 - 23:00	<55	55 - 63	63 - 72	>72
23:00 - 07:00*	<45	45 - 57	57 - 66	>66
<b>Rail Traffic</b>				
07:00 - 23:00	<55	55 - 66	66 - 74	>74
23:00 - 07:00*	<45	45 - 59	59 - 66	>66
<b>Air Traffic</b>				
07:00 - 23:00	<57	57 - 66	66 - 72	>72
23:00 - 07:00*	<48	48 - 57	57 - 66	>66
<b>Mixed Sources</b>				
07:00 - 23:00	<55	55 - 63	63 - 72	>72
23:00 - 07:00*	<45	45 - 57	57 - 66	>66

\*Sites where night-time noise events regularly exceed 82 dB  $L_{Amax,S}$  several times in one hour should be placed in Noise Exposure Category C unless already in Noise Exposure Category D.

**British Standard 4142 - Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas (BS 4142)<sup>5</sup>**

PPG24 recommends the use of BS4142 for assessing new commercial operations and building services plant noise. The document provides an objective method for rating the likelihood of complaint from industrial and commercial operations as described below.

Background noise levels ( $L_{A90}$ ) should be measured without the noise source in operation. Building services plant noise levels (Rating Level) can be obtained from manufacturer's data or measured in situ. These two determined quantities can then be used to calculate the likelihood of complaint by subtracting the background noise level from the Rating Level. If there is likely to be a tonal content or specific character to the building services plant noise then a +5dB(A) correction is applied to the Rating

<sup>5</sup> British Standards Institute. Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas. BS 4142. 1997.

Level prior to calculation. The excess value given after the calculation is compared to the following criteria for assessment.

- A difference of around +10 dB(A) or more indicates that complaints are likely.
- A difference of around +5 dB(A) indicates a marginal significance of complaint.
- A difference of -10 dB(A) or less is a positive indication that complaints are unlikely.

The assessment method is only applicable to external areas.

### **British Standard 8233 – Sound Insulation and Noise Reduction for Buildings (BS 8233)<sup>6</sup>**

BS8233 is a Code of Practice providing guidelines for the control of noise in and around various types of buildings. The document recommends internal and external noise levels to provide both a 'Good' and 'Reasonable' acoustic environment for residential properties and offices, which are summarised below:

- 30 – 40 dB  $L_{Aeq,T}$  for living area (daytime)
- 30 – 35 dB  $L_{Aeq,T}$  for bedrooms (night-time)
- 45 dB  $L_{Amax}$  should not normally be exceeded in bedrooms at night.
  
- 40 – 50 dB  $L_{Aeq,T}$  for cellular offices
- 35 – 40 dB  $L_{Aeq,T}$  for meeting rooms

The guidance indicates that hotel bedrooms should be treated as residential. The criteria provided above should be considered unless there are specific criteria to be adopted by the developer of the proposed hotel.

### **World Health Organisation (WHO) – Guidelines for Community Noise<sup>7</sup>**

The WHO document provides guidance of a similar nature to BS8233, although the emphasis is more on health effects associated with noise. The document recommends internal and external noise levels to provide an acoustic environment conducive to un-interrupted speech and sleep. The WHO guidance is summarised below for information purposes.

- Recommended internal noise levels in bedrooms are given as 30 dB  $L_{Aeq,T}$  for continuous noise and 45 dB  $L_{Amax,F}$  for single events, during the night-time period.
- Recommended external noise levels to bedrooms are given as 45 dB  $L_{Aeq,T}$  for continuous noise and 60 dB  $L_{Amax,F}$  for single events, assuming partially open windows.
- The recommended internal noise level for rooms used for conversation during the daytime is given as 35 dB  $L_{Aeq,T}$  for continuous noise.

### **Approved Document E: 2003 Edition– Resistance to the Passage of Sound (ADE2003)<sup>8</sup>**

Sound separation between and within residential properties and residential forms of accommodation is governed by The Building Regulations 2000. ADE2003 of The Building Regulations 2000 will be applicable to the Development and specifies minimum sound insulation and acoustic absorption limits for design to be approved by the Local Building Control (or other such Approved Inspectors).

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<sup>6</sup> British Standards Institute. Sound Insulation and Noise Reduction in Buildings – Code of Practice. BS 8233. 1999.

<sup>7</sup> World Health Organisation. Guidelines for Community Noise. 1999. WHO Geneva.

<sup>8</sup> The Building Regulations 2000, Approved Document 'E', 'Resistance to the passage of sound', July 2003, As Amended 2004.

The three applicable requirements of ADE2003 for the Development are given below for reference.

Protection against sound from other parts of the building and adjoining buildings

E1. Dwelling-houses, flats and rooms for residential purpose shall be designed and constructed in such a way that they provide reasonable resistance to sound from other parts of the same building and from adjoining buildings.

Protection against sound within a dwelling-house etc.

E2. Dwelling-houses, flats and rooms for residential purpose shall be designed and constructed in such a way that –

- (a) internal walls between a bedroom or a room containing a water closet, and other rooms; and
- (b) internal floors, provide reasonable resistance to sound.

Reverberation in the common internal parts of buildings containing flats or rooms for residential purposes

E3. The common internal parts of buildings which contain flats or rooms for residential purposes shall be designed and constructed in such a way as to prevent more reverberation around the common parts than is reasonable.

The objective performance requirements of ADE2003 are summarised below and in Tables 5.3 and 5.4.

- New internal walls and floors shall provide a minimum  $R_w$  40 dB sound insulation.
- Reverberation time shall be controlled by providing a minimum of 0.20m<sup>2</sup> total absorption area per cubic metre of the volume in entrance halls.
- Reverberation time shall be controlled by providing a minimum of 0.25m<sup>2</sup> total absorption area per cubic metre of the volume in corridors or hallways.

**Table 3: Dwelling-houses and flats – performance separation standards**

Description of Area	Airborne Sound Insulation $D_{nT,w} + C_{tr}$ dB (Minimum Values)	Impact Sound Insulation $L'_{nT,w}$ dB (Maximum Values)
Purpose built dwelling-houses and flats		
Walls	45	-
Floors and stairs	45	62
Dwelling-houses and flats formed by material change of use		
Walls	43	-
Floors and stairs	43	64

**Table 4 : Rooms for residential purposes – performance separation standards**

Description of Area	Airborne Sound Insulation $D_{nT,w} + C_{tr}$ dB (Minimum Values)	Impact Sound Insulation $L'_{nT,w}$ dB (Maximum Values)
Purpose built dwelling-houses and flats		
Walls	43	-
Floors and stairs	45	62
Dwelling-houses and flats formed by material change of use		
Walls	43	-
Floors and stairs	43	64

A summary of the guidance for residential development to maintain a suitable acoustic environment is given below for information.

- Referral to Approved Document 'E' as providing guidance for reasonable standards of sound insulation between dwellings.
- Services should be kept away from bedrooms.
- Footfall noise is disturbing. Avoid locating stairs next to noise sensitive rooms, such as bedrooms in adjacent dwellings.
- In flats avoid locating bedrooms near the lifts and circulation areas.
- Compatibility between rooms of adjacent dwellings can be ensured by handing and stacking identical dwelling plans.
- Recommendation to achieve a  $D_{nT,w}$  38 dB as a minimum between WC's and noise sensitive rooms.
- In flats reduce noise propagation through corridors and stairwells by incorporating absorbent ceiling finishes.
- Use the quietest types of sanitary, heating and plumbing equipment. However, their location is more important than their detailed design.
- Lift doors should operate quietly and acoustic signals to herald lift arrivals should not be audible within dwellings.

