



APPENDIX 4: Noise Exposure Categories for Residential Development

1 When assessing a proposal for residential development near a source of noise, the Council will determine into which of the four noise exposure categories (NECs) the proposed site falls, taking account of both day and night-time noise levels. The Council will then have regard to the advice in the appropriate NEC, as below:

NEC	
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

2 A recommended range of noise levels is given below for each of the NECs for dwellings exposed to noise from road, rail, air, and "mixed sources". Paragraph 10 onwards provides a detailed explanation of how the boundaries of each of the NECs have been derived.

Other noise-sensitive development

3 Developments such as offices, hospitals and schools will contain buildings and activities which are noise-sensitive. But these developments are likely to occupy sizeable sites and to contain a proportion of buildings and activities which are less noise-sensitive. The NEC principle cannot therefore be sensibly applied to such developments and it will be more appropriate to refer to specific guidance on internal noise standards in respect of each activity. General information can be found in BS 8233 1987. Information about guidance for health and hospital buildings is available from NHS Information Centre for Health and Social Care (www.ic.nhs.uk). The Department for Education publishes guidance for schools (Building Bulletin 87 Guidelines for Environmental Design in Schools).

Noise index and measurement positions

4 For the purposes of consistency all noise indices are expressed in terms of LAeq,T and the time periods of day and night time of between 07.00-23.00 and 23.00-07.00.

5 Values in the table below refer to noise levels measured on an open site at the position of the proposed dwellings, well away from any existing buildings, and 1.2m to 1.5m above the ground. The arithmetic average of recorded readings should be rounded up. Where that average falls on the boundary between NECs B and C the Council will determine which is the more appropriate NEC for the proposal, taking into account the need for the development.

6 Levels of noise from road and rail traffic are often specified at one metre from a facade, and these facade levels should be assumed to be 3 dB(A) higher than levels measured away from any buildings, unless a more accurate figure is available. For road traffic noise in NECs C and D, LAeq,16h ~ LA10,18h -2 dB.

7 For aircraft, the noise levels refer to aircraft noise exposure contour values which are specified at 1.2m above the ground and published at 3 dB(A) intervals (each 3 dB(A) increment represents a doubling of noise energy). Because most aircraft noise originates from above, contours include the effects of ground reflection (see Note 2 below).

Recommended Noise Exposure Categories For New Dwellings Near Existing Noise Sources

	Noise Exposure Category			
Noise Source	A	B	C	D
Road Traffic				
07.00 - 23.00	<55	55 - 63	63 - 72	>72
23.00 - 07.00	<45	45 - 57	57 - 66	>66

Rail Traffic				
07.00 - 23.00	<55	55 - 66	66 - 74	>74
23.00 - 07.00 (a)	<45	45 - 59	59 - 66	>66
Air Traffic (b)				
07.00 - 23.00	<57	57 - 66	66 - 72	>72
23.00 - 07.00 (c)	<48	48 - 57	57 - 66	>66
Mixed Sources(d)				
07.00 - 23.00	<55	55 - 63	63 - 72	>72
23.00 - 07.00 (e)	<45	45 - 57	57 - 66	>66

- a. **Night-time noise levels (23.00 - 07.00):** sites where individual noise events regularly exceed 82 dB LAmax (S time weighting) several times in any hour should be treated as being in NEC C, regardless of the LAeq,8h (except where the LAeq,8h already puts the site in NEC D).
- b. **Aircraft noise:** daytime values accord with the contour values adopted by the Department for Transport which relate to levels measured 1.2m above open ground. For the same amount of noise energy, contour values can be up to 2 dB(A) higher than those of other sources because of ground reflection effects.
- c. **Night-time noise levels (23.00 - 07.00):** sites where individual noise events regularly exceed 82 dB LAmax (S time weighting) several times in any hour should be treated as being in NEC C, regardless of the LAeq,8h (except where the LAeq,8h already puts the site in NEC D).
- d. **Mixed sources:** this refers to any combination of road, rail, air and industrial noise sources. The "mixed source" values are based on the lowest numerical values of the single source limits in the table. The "mixed source" NECs should only be used where no individual noise source is dominant.
- e. **Night-time noise levels (23.00 - 07.00):** sites where individual noise events regularly exceed 82 dB LAmax (S time weighting) several times in any hour should be treated as being in NEC C, regardless of the LAeq,8h (except where the LAeq,8h already puts the site in NEC D).

8 To check if any individual noise source is dominant (for the purposes of this assessment) the noise level from the individual sources should be determined and then combined by decibel addition (remembering first to subtract 2 dB (A) from any aircraft noise contour values). If the level of any one source then lies within 2 dB(A) of the calculated combined value, that source should be taken as the dominant one and the site assessed against the appropriate NEC for that source, rather than using the "mixed source" NECs.

9 If the contribution of the individual noise sources to the overall noise level cannot be determined by measurement and/or calculation, then the overall measured level should be used and the site assessed against the NECs for "mixed sources".

Noise Exposure Categories: Explanation of Noise Levels

10 The following is an explanation of how the boundaries of each of the noise exposure categories (NECs) in the table at Paragraph 1 above have been calculated or derived. Wherever possible figures have been based on research findings or figures contained in statutory regulations. However, the NEC table attempts to give guidance across a broad spectrum of situations and not all of these are covered by existing research work or regulations. In these instances assessments and interpolations have had to be made and these are also explained below.

11 The explanations under each heading make specific reference to each of the transport modes: road, rail, and air. However, separate explanations of "mixed sources" are not given. The "mixed source" values are based on the lowest numerical values of the single source limits in the table.

12 The values given in the NEC table are free-field levels, together with an addition of 2 dB(A) for ground reflection of air traffic noise. Details of correction factors to convert between façade levels and free-field where appropriate are given below. For night-time levels typical insulation values for window installations that are likely to be used in each NEC have been assumed. Because the insulation performance of different window installations is likely to vary, these values are nominal.

Noise levels at the boundary of NEC A and NEC B

Daytime

13 The level at the boundary of NEC A and NEC B for road and rail traffic is based on guidance provided by the World Health Organisation (B.2) that "general daytime outdoor noise levels of less than 55 dB (A) Leq are desirable to prevent any significant community annoyance". The figure of 55 dB(A) has been taken to be free-field and therefore no adjustments have been necessary for road and rail traffic noise levels before inserting them in the table. In respect of air traffic noise a considerable amount of research has been carried out. (B.3) 57 dB(A) Leq (previously 35 NNI) relates to the onset of annoyance as established by noise measurements and social surveys

Night-Time

14 The night time noise level at the boundary of NEC A and NEC B is based on the WHO guideline previously referred to which states that for night time: "based on limited data available, a level of less than 35 dB(A) is recommended to preserve the restorative process of sleep" and this is considered more relevant when seeking to achieve the best practicable conditions for rest and sleep.

15 The sound insulation qualities of a partially open window are taken to be 10 - 15 dB(A) (B.4) and for the purposes of the NEC table a reduction of 13 dB(A) from the façade level has been assumed. This would give a recommended maximum figure of 48 dB(A) at the façade. However, as the NEC figures are free-field a correction of -3 dB(A) is necessary giving 45 dB(A) in the table for road and rail noise. For air traffic noise 2 dB(A) has been added to 45 dB(A) to allow for ground reflection, making 47 dB(A). The level in the table of 48 dB(A) is the nearest aircraft dB(A) Leq contour value.

Noise levels at the boundary of NEC B and NEC C

Daytime

16 The daytime noise levels for all three transport modes at the boundary of NEC B and NEC C are based on the levels that trigger official grant schemes. For road traffic noise the trigger level is 68 dB LA10,18h (B.5) at a facade. This has been converted to an LAeq,18h level by subtracting 3 dB, and to an LAeq,16h value by adding 1 dB, giving 66 dB LAeq,16h at a facade. Finally, this figure has been converted to a free-field level by subtracting 3 dB, thus arriving at 63 dB LAeq,16h in the table.

17 For railway noise the proposed trigger level (B.6) is 68 dB LAeq,18h at a facade. This has been converted to 66 dB LAeq,16h free-field.

18 For air traffic noise, 66 dB(A) LAeq,16h, previously 50 NNI, was the daytime criterion for noise insulation schemes at Heathrow, Gatwick and Stansted.

Night-time

19 The night-time level at the boundary of NEC B and NEC C for road traffic is, like that at the boundary of NEC A and NEC A, based on the WHO figure of 35 dB(A). Because noise should be taken into account when determining planning applications in NEC B, it has been assumed that the minimum amelioration measure available to an occupant at night will be to close bedroom windows. Single glazed windows provide insulation of about 25 dB(A) (B.7). Therefore, in order to achieve 35 dB(A) inside a bedroom, the facade level should not exceed 60 dB(A). This facade level requires a further 3 dB(A) adjustment to convert it to the free-field level of 57 dB(A) for road traffic at the boundary of NEC B and NEC C. For rail traffic, the level proposed to trigger the official grant scheme has been adopted. This level is 63 dB LAeq,6h and it has been converted to 59 dB LAeq,8h free-field. For air traffic, the level proposed to trigger the grant scheme at Stansted airport (B.8) has been adopted. This level is the 57 dB(A) Leq contour value.

Noise levels at the boundary of NEC C and NEC D

Daytime

20 The noise level at the boundary of NEC C and NEC D for road traffic is based on a Building Research Establishment (BRE) survey(B.9) which has shown that the insulation package supplied under the Noise Insulation Regulations is inadequate for road traffic noise levels of 78 dB LA10,18h and above at a facade. This figure is equivalent to a free-field level of 75 dB LA10,18h; which in turn is equivalent to 73 dB LAeq,16h. The 73 dB LAeq,16h has been reduced by 1 dB to 72 dB LAeq,16h in the table at the boundary of NEC C and NEC D, which is the maximum external level that the standard noise insulation package will reduce to an acceptable internal level.

21 There is some evidence (B.10) that noise from rail traffic causes less disturbance than noise from road traffic at the same level. Therefore, the level at the boundary of NEC C and NEC D has been set 2 dB higher than the free-field level for road traffic noise.

22 For air traffic noise the value put forward in Circular 10/73, has been used. This is 60 NNI or 72 dB LAeq,16h, including a 2 dB allowance for ground reflection.

Night-time

23 The night-time levels at the boundary of NEC C and NEC D are, like those at the boundary of NEC A and NEC B, based on the WHO figure of 35 dB(A). The standard noise insulation package provides insulation of about 35 dB(A). Therefore at a facade level of 70 dB(A) or above the internal limit for a bedroom of 35 dB(A) may not be achieved. The level of 70 dB(A) has therefore been reduced by 1 dB(A) and a correction factor of 3 dB(A) applied to derive the free-field level of 66 dB(A) in the table at the boundary of NEC C and NEC D for road and rail noise. For air traffic noise the level of 66 dB(A) is the nearest aircraft dB(A) Leq contour value to provide equivalent protection.

End Notes

1. **Noise levels:** the noise level(s) (LAeq,T) used when deciding the NEC of a site should be representative of typical conditions
2. Environmental Health Criteria 12 - Noise. World Health Organisation, 1980.
3. Directorate of Operational Research and Analysis "The Noise and Number Index" DORA Communication 7907, Second Edition, September 1981 Brooker, P et al "United Kingdom Aircraft Noise Index Study: Final Report" Civil Aviation Authority DR Report 8402, January 1985, Critchley, JB and Ollerhead, JB "The Use of Leq as an Aircraft Noise Index" Civil Aviation Authority DORA Report 9023, September 1990
4. Transportation Noise Reference Book: Edited by Paul Nelson, published by Butterworths, 1987.
5. Noise Insulation Regulations, 1975: SI 1975:1763
6. The Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996. SI 1996 No 428.
7. Transportation Noise Reference Book: Edited by Paul Nelson, published by Butterworths, 1987 and Sound Control For Homes, published by the Building Research Establishment and CIRIA, 1993 [BRE report 238, CIRIA report 127]
8. Department for Transport Consultation Paper: Proposed Stansted Noise Insulation Grants Scheme, September 1990.
9. Utlely W. et al "The effectiveness and acceptability of measures for insulating dwellings against tragic noise" (Journal of Sound and Vibration (1986) Vol 109(1), pages 1-18).
10. "Railway Noise and the Insulation of Dwellings" Mitchell Committee Report, published February 1991