# Appendix 13.1 Noise and Vibration Legislation, Policy and Technical Guidance

## Legislation

The legislative framework specific to noise and vibration is summarised as follows:

### The Control of Pollution Act 1974

The Control of Pollution Act 1974 (Ref.13.2) Section 61 sets out procedures for those undertaking works to obtain 'Prior Consent' for construction works within agreed noise limits.

Applications for such consent are made to the relevant local authority and contain a method statement of the works and the steps to be taken to minimise noise. Under Section 60 of the Act, the local authority has powers to attach conditions to, limit or qualify any consent to allow for changes; and to limit the duration of any consents.

It is noted that although it is generally for those undertaking the works to decide whether or not to seek such consent under S61, this is also dependent on the custom and practice of the local authority. Some local authorities request demonstration of best practicable means rather than formal 'Prior Consent' applications.

### The Environmental Protection Act 1990

Under Part III of the Environmental Protection Act 1990 (Ref.13.3) local authorities have a duty to investigate noise complaints from premises (land and buildings) and vehicles, machinery or equipment in the street. It does not apply to road traffic noise but may be applicable to some construction activities. The Noise and Statutory Nuisance Act 1993 amended Part III of the Environmental Protection Act 1990 by placing additional definitions in the caused by vehicles, machinery and equipment in the road.

If a local authority's Environmental Health Officer is satisfied that a complaint amounts to a statutory nuisance, then the authority must serve an abatement notice on the person responsible or in certain cases the owner or occupier of the property. The notice could require that the noise or nuisance must be stopped altogether or limited to certain times of the day.

### Noise Insulation Regulations 1975

The Noise Insulation Regulations (NIR) 1975 (as amended 1988) (Ref.13.4) set out the requirements under which residential buildings may qualify for both statutory and discretionary noise insulation. The Regs apply to a highway or altered carriageway which is or will be first open to public traffic after 16th October 1972.

The specific definitions from the NIR relevant to the assessment of the altered A20 alignment are as follows.

- Altered highway - a highway of which the location, width or level of the carriageway has been or is to be altered (otherwise than by resurfacing) after 16th October 1969;

Subject to the provisions of the NIR, the classes of buildings in respect of which a duty or power is to arise under these Regs are:

- Dwellings, and Other buildings used for residential purposes, which will be not more than 300 metres from the nearest point on the carriageway of the highway after the construction of that highway or of an additional carriageway.

Regulation 3 of the NIR imposes a duty on the highway authority to offer insulation or provide grants in respect of a new road, or a road for which a new carriageway has been constructed, if the following three requirements are fulfilled:

- The relevant noise level is greater than or equal to the specified level (68 dB $L_{A10\ 18\text{-}hour}$);
- The relevant noise level is greater by at least 1dB(A) than the prevailing noise level; and,
- Noise caused or expected to be caused by traffic using or expected to use that highway makes an effective contribution to the relevant noise level of at least 1dB(A).

### The Building Regulations 2010

The Building Regulations (BR) (Ref.13.5) cover the minimum standards for the design, construction and alteration of buildings, covering virtually all types of building. The BR are supported by a suite of Approved Documents which set out detailed, practical guidance on compliance.

The Approved Documents supporting the BR cover issues such as:

- Part A - Structure
- Part B - Fire Safety
- Part C - Site preparation and resistance to contaminates and moisture
- Part D - Toxic Substances
- Part E - Resistance to the passage of sound
- Part F - Ventilation
- Part G - Sanitation, hot water safety and water efficiency
- Part H - Drainage and Waste Disposal
- Part J - Combustion appliances and fuel storage systems
- Part K - Protection from falling, collision and impact
- Part L - Conservation of fuel and power
- Part M - Access to and use of buildings
- Part N - Glazing Safety (Withdrawn)
- Part P - Electrical Safety
- Part Q – Security
- Part R - Physical infrastructure for high speed electronic communications networks.

# National Policy

### National Policy National Planning Policy Framework NPPF, Department for Communities and Local Government 2012, revised 2021

The National Planning Policy Framework (NPPF), (Ref.13.6) first published in 2012 was revised on 20th July 2021. The NPPF sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced.

Planning law requires that applications for planning permission must be determined in accordance with the development plan, unless material considerations indicate otherwise. The NPPF must be taken into account in preparing the development plan, and is a material consideration in planning decisions. Planning policies and decisions must also reflect relevant international obligations and statutory requirements.

The NPPF focuses on the need for developments to be sustainable and underpinned by the following three overarching objectives which the document expands upon more fully:

- Economic
- Social
- Environmental

Issues pertinent to noise are specifically dealt with in Chapter 15. Conserving and enhancing the natural environment. In paragraph 174 it states *"Planning policies and decisions should contribute to and enhance the natural and local environment by:……..*

(e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or **noise pollution** or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and"…….

Also relevant is paragraph 185 which states **"**Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

(a) mitigate and reduce to a minimum potential adverse impacts resulting from **noise** from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life 65 ;

(b) identify and protect tranquil areas which have remained relatively undisturbed by **noise** and are prized for their recreational and amenity value for this reason; and"……

## Noise Policy Statement for England, 2010

The Noise Policy Statement for England (NPSE) (Ref.13.7) was published in March 2010 and covers all forms of noise other than occupational noise. The document serves to provide policy on the need to avoid and mitigate adverse noise effects on health arising from and impacting on new development.

The NPSE attends to three types of noise;

- 'Environmental noise' which includes noise from transportation sources;
- 'Neighbour noise' which includes noise from inside and outside people's homes; and,
- 'Neighbourhood noise' which includes noise arising from within the community such as industrial and entertainment premises, trade and business premises, construction sites and noise in the street.

In line with the aims determined in the NPPF, the NPSE determines three aims;

- Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development;
- Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development; and,

- Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

The explanatory note to the NPSE introduces three concepts relating to the adverse impacts of noise. The following three statements have been reproduced from the explanatory note:

- 'NOEL – No Observed Effect Level: This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to noise.'
- 'LOAEL – Lowest Observed Adverse Effect Level: This is the level above which adverse effects on health and quality of life can be detected.'
- 'SOAEL – Significant Observed Adverse Effect Level: This is the level above which significant adverse effects on health and quality of life occur.'

The NPSE acknowledges that the values for NOEL, LOAEL and SOAEL are likely to vary depending on the noise source and environment and at present there are no defined numerical values to allow flexibility within the policy until further evidence and guidance is presented.

## Planning Practice Guidance: Noise 2014

Technical Guidance (Planning Practice Guidance) (Ref.13.8) to the Implementation of the National Planning Policy Framework was published in December 2014. The information detailed within the Planning Practice Guidance indicates that noise should be considered when:

- New developments may create additional noise; and/or,
- New developments would be sensitive to the prevailing acoustic environment.
- The guidance indicates that Local Planning Authorities should take account of the acoustic environment and in doing so consider:
- Whether or not a significant adverse effect is occurring or likely to occur;
- Whether or not an adverse effect is occurring or likely to occur; and,
- Whether or not a good standard of amenity can be achieved.

The Planning Practice Guidance summarised the noise exposure hierarchy, based on the likely average response to noise, as set out in below:

Hierarchy of Noise Exposure Responses

| Perception | Examples of Outcomes | Effect Level | Action |
|---|---|---|---|
| Not noticeable | No effect | No Observed Effect | No specific measures required |
| Noticeable and not intrusive | Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life. | No Observed Adverse Effect | No specific measures required |
| Lowest Observed Adverse Effect Level | | | |
| Noticeable and intrusive | Noise can be heard and causes small changed in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to | Observed Adverse Effect | Mitigate and reduce to a minimum |

| Perception | Examples of Outcomes | Effect Level | Action |
|---|---|---|---|
| | close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life. | | |
| Significant Observed Adverse Effect Level | | | |
| Noticeable and disruptive | The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area. | Significant Observed Adverse Effect | Avoid |
| Noticeable and very disruptive | Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory | Unacceptable Adverse Effect | Prevent |

# Technical Guidance

The following section presents the relevant technical guidance which has been used in the assessment of noise and vibration for the proposed Development.

## BS 7445-1:2003 Description and measurement of environmental noise. Guide to quantities and procedures

This British Standard (BS) (Ref.13.14) defines the basic quantities to be used for the description of noise in community environments and describes basic procedures for the determination of these quantities.

The methods and procedures described in BS 7385 are intended to be applicable to sounds from all sources, individually and in combination, which contribute to the total noise level. This standard recommends that the requirement for the description of environmental noise is best met by adopting the equivalent continuous A-weighted sound pressure level as a basic quantity.

## BS 7445-2:1991 Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use

This BS (Ref.13.15) presents a guide to the acquisition of data pertinent to land use, and provides guidance on the acquisition of data for measuring and describing environmental noise relevant to general land use, such that:

- A description of the environmental noise in a specified area of land can be made in a uniform way;
- The compatibility of any land use activity of projected activity can be assessed with respect to existing or predicted noise.

Using the data as a basis, it is possible to establish a system for selecting the appropriate land use, as far as levels of noise are concerned, for a specified area, or the sources of noise which are acceptable with respect to land use, existing or planned.

### Guideline for Environmental Noise Impact Assessment, Institute of Environmental Management and Assessment

These guidelines (ref.13.10) address the key principles of noise impact assessments and are applicable to all development proposals where noise effects are likely to occur. The guidelines provide specific support on how noise impact assessment fits within the Environmental Impact Assessment (EIA) process. They cover:

- How to scope a noise assessment;
- Issues to be considered when defining the baseline noise environment;
- Prediction of changes in noise levels as a result of implementing development proposals; and,
- Definition and evaluation of the significance of the effect of changes in noise levels (for use only where the assessment is undertaken within EIA).

### World Health Organisation (WHO): Guidelines for Community Noise

The World Health Organisation's (WHO) 'Guidelines for Community Noise' (Ref.13.11) report for external environmental noise levels states that;

'Annoyance responses

During the daytime, few people are seriously annoyed by activities with $L_{Aeq}$ levels below 55dB; or moderately annoyed with $L_{Aeq}$ levels below 50dB. Sound pressure levels during the evening and night should be 5 - 10dB lower than during the day….'

A summary of the guideline internal noise levels for both the daytime and overnight periods as taken from Table 1 of the WHO guidelines is presented below.

WHO Guidelines Values

| Specific Environment | Critical Health Effects(s) | $L_{Aeq}$ (dB) | Time Base (Hours) | $L_{Amax, fast}$ (dB) |
|---|---|---|---|---|
| Dwelling, Indoors | Speech Intelligibility & Moderate annoyance daytime and evening | 35 | 16 | - |
| Inside Bedrooms | Sleep disturbance, night-time | 30 | 35 | 45 |

## World Health Organisation (WHO) Night Noise Guidelines for Europe 2009

The WHO Night Noise Guidelines for Europe 2009 (Ref.13.12) states:

'Considering the scientific evidence on the thresholds of night noise exposure indicated by $L_{night, outside}$ as defined in the Environmental Noise Directive (2002/49/EC), an $L_{night, outside}$ of 40dB should be the target of the night noise guidelines (NNG) to protect the public, including the most vulnerable groups such as children, the chronically ill and the elderly.'

However, the document further states that '$L_{night,outside}$ value of 55dB is recommended as an interim target for the countries where the NNG cannot be achieved in the short term for various reasons'

The NNG values from within the document accords well with the internal design criteria as defined within BS8233:2014 when windows are open for ventilation.

## British Standards 8233:2014: Guidance on sound insulation and noise reduction for buildings

This BS (Ref.13.16) is mainly concerned with building design from an acoustic standpoint. It does however contain information relevant to environmental noise, more specifically by stating guidance for desirable internal noise levels for dwellings and other buildings.

Extracts from BS8233:2014 detailing the recommended levels are included below.

Indoor ambient noise levels in spaces when they are unoccupied, and privacy is also important (extract from Table 2 of BS8233:2014)

| Objective | Typical Situations | Design Range $L_{Aeq, T}$ dB |
|---|---|---|
| Typical noise levels for acoustic privacy in shared spaces | Restaurant | 40-55 |
| | Open-plan office | 45-50 |
| | Night club, public house | 40-45 |
| | Ballroom, banqueting hall | 35-40 |
| | Living room | 35-40 |

Typical noise levels in non-domestic buildings (extract from Table 6 of BS 8233:2014)

| Activity | Location | Design Range $L_{Aeq, T}$ dB |
|---|---|---|
| Speech or telephone communications | Department store Cafeteria, canteen, kitchen | 50-55 |
| | Concourse Corridor, circulation space | 45-55 |
| Study and work requiring concentration | Library, gallery, museum | 40-50 |
| | Staff/meeting room, training room | 35-45 |
| | Executive office | 35-40 |
| Listening | Places of worship, counselling, meditation, relaxation | 30-35 |

Indoor Ambient Noise Levels for Dwellings (Source: Table 4: BS8233-2014)

| Activity | Location | 07:00 to 23:00 | 23:00 to 07:00 |
|---|---|---|---|
| Resting | Living room | 35dB $L_{Aeq,(16hour)}$ | - |
| Dining | Dining room / area | 40dB $L_{Aeq,(16hour)}$ | - |
| Sleeping (daytime resting) | Bedroom | 35dB $L_{Aeq,(16hour)}$ | 30dB $L_{Aeq,(8hour)}$ |
| Note - within BS8233 details that "Where development is considered necessary or desirable, despite external noise levels above World Health Organisation guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved" | | | |

With regard to external noise levels, BS8233: 2014 states that

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq\,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments".

However, it also recognises that these levels are not achievable in all situations and further states that "In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited".

The internal values detailed within the scope of BS8233: 2014 generally accord well with the recommendations of the World Health Organisation.

British Standard 5228-1:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites; Part 1 Noise

Part 1 of BS 5228 (Ref.13.17) provides recommendations for basic methods of noise control relating to construction sites, including sites where demolition, remediation, ground treatment or related civil engineering works are being carried out; and open sites, where work activities/operations generate significant noise levels, including some industry-specific guidance.

Recommendations are given regarding procedures for the establishment of effective liaison between developers, site operators and local authorities along with guidance concerning methods for predicting and measuring construction noise and assessing its impact on those exposed to it.

Annex E provides examples of a number of methods for establishing a significance criteria of construction noise effects. Of these methods, a precedent has been set through numerous significant infrastructure projects, taken through both Public Inquiry and Development Consent Order examination, for the use of the 'ABC method' as the most appropriate way to establish construction noise limits for large infrastructure projects. Within the 'ABC method' the change in the ambient noise level with construction noise is assessed against defined threshold values. Example threshold values from within BS 5228 are reproduced below.

Threshold of Significant Effect at Dwellings from Construction Noise

| Assessment Category and Threshold Value Period | Threshold Value, in decibels (dB) | | |
|---|---|---|---|
| | Category A* | Category B* | Category C* |
| Night-time (23:00-07:00) | 45 | 50 | 55 |
| Evenings and weekends | 55 | 60 | 65 |
| Daytime (07:00-19:00) and Saturdays (07:00 – 13:00) | 65 | 70 | 75 |
| *Category A is the threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values<br>Category B is the threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as Category A values<br>Category C is the threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than Category A value | | | |

If the existing ambient noise levels are higher than the threshold values presented above then a significant effect is deemed to have occurred if the total $L_{Aeq}$ noise level1 for the period increases by more than 3dB due to construction activity. The ABC method should only apply to residential receptors.

A significant effect is deemed to occur if the construction activity $L_{Aeq}$ noise level exceeds the threshold level for the category appropriate to the ambient noise level.

British Standard 5228-1:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites; Part 2 Vibration

Part 2 of BS 5228 (Ref.13.18) provides recommendations for basic methods of vibration control relating to construction and open sites where work activities/operations generate significant vibration levels, including industry-specific guidance.

Guidance is provided concerning methods of measuring and predicting construction vibration and assessing its effects on the environment and those exposed to it.

## Calculation of Road Traffic Noise (CRTN) 1988

The procedure (Ref.13.19) for predicting the noise level from a road is described in the Department for Transport and Welsh Office technical memorandum Calculation of Road Traffic Noise (CRTN). The prediction method takes into account factors such as the traffic flow, composition and speed, the alignment and distance of the road relative to receiving property, the road surface type, the nature of the intervening ground cover between the road and receptors, and reflections from building facades in order to calculate the dB $L_{A10\ 18\text{-hour}}$ or dB $L_{A10\ 1\text{-hour}}$ noise level.

The calculation methodology described in CRTN is the required method for the assessment of road traffic noise stated within DMRB and NN NPS.

## Design Manual for Roads and Bridges (DMRB) LA111 Noise and Vibration – Version 2 May 2020

The DMRB LA111(Ref.13.20) provides classification for the magnitude of change in road traffic noise in terms of both long-term and short-term changes in road traffic noise with the smallest perceptible changes (Threshold Values) defined as 3dB(A) in the long term and 1dB(A) in the short-term comparisons. Changes in road traffic noise are referenced to a semantic rating

scale within the DMRB to conclude the potential for resulting impacts. These semantic rating scales provided in the DMRB LA111 (Ref.13.20) document have been amended to show both adverse and beneficial changes with the beneficial categories based upon the same differential groupings. They are presented in Table 13.45 and Table 13.46 for both short and long-term comparisons respectively.

Table 13.45 DMRB Short-term Magnitude Thresholds

| Change, road traffic noise level | Short term impact classification |
|---|---|
| Decrease ≥ 10dB | Major Beneficial (Significant) |
| Decrease ≥ 5dB and < 10dB | |
| Decrease ≥ 3dB and < 5dB | Moderate Beneficial (Significant) |
| Decrease ≥ 1dB and < 3dB | Minor Beneficial |
| Decrease > 0dB and < 1dB | Negligible Beneficial |
| 0dB | No Change |
| Increase > 0dB and < 1dB | Negligible Increase |
| Increase ≥ 1dB and < 3dB | Minor Increase |
| Increase ≥ 3dB and < 5dB | Moderate Increase (Significant) |
| Increase ≥ 5dB and < 10dB | Major Increase (Significant) |
| Increase ≥ 10dB | |

Table 13-46 DMRB Long-term Magnitude Thresholds

| Change, road traffic noise level | Short term impact classification |
|---|---|
| Decrease ≥ 10dB | Major Beneficial (Significant) |
| Decrease ≥ 5dB and < 10dB | Moderate Beneficial (Significant) |
| Decrease ≥ 3dB and < 5dB | Minor Beneficial |
| Decrease ≥ 1dB and < 3dB | Negligible Beneficial |
| Decrease > 0dB and < 1dB | |
| 0dB | No Change |
| Increase > 0dB and < 1dB | Negligible Adverse |
| Increase ≥ 1dB and < 3dB | |
| Increase ≥ 3dB and < 5dB | Minor Adverse (Significant) |
| Increase ≥ 5dB and < 10dB | Moderate Adverse (Significant) |
| Increase ≥ 10dB | Major Adverse (Significant) |

British Standard 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from ground borne vibration

This standard (Ref.13.21) sets guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. It provides standard procedures for measuring, recording and analysing building vibration.

The Standard identifies the factors which influence the vibration response of buildings, with vibrations of both transient and continuous character considered.

British Standard 6472-1:2008: Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting

This standard (Ref.13.22) provides guidance on predicting human response to vibration in buildings over the frequency range 0.5Hz to 80Hz. Frequency weighting curves for human beings exposed to whole-body vibration are included, together with advice on measurement

methods to be employed. Methods of assessing continuous, intermittent and impulsive vibrations are presented.

The guidance describes how to estimate the probability of adverse comment which might be expected from human beings experiencing vibration in buildings. The guidance takes into account the time of day and the use made of the occupied space in buildings, whether the building use is residential, office or workshop.

British Standard 4142:2014 Methods for rating and assessing industrial and commercial sound

This BS (Ref.13.23) provides a methodology for the rating and assessing of sound associated with both industrial and commercial premises. The purpose of the Standard is clearly outlined in the opening section where it states the method is appropriate for the consideration of:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and,
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

The Standard is based around the premise that the significance of the impact of an industrial/commercial facility can be derived from the numerical subtraction of the background noise climate level (not necessarily the lowest background level measured, but the typical background of the receptor) from the measured/calculated rating level of the specific sound under consideration. This comparison will enable the impact of said sound to be concluded based upon the premise that typically “the greater this difference, the greater the magnitude of the impact”. This difference is then considered as follows:

- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5dB is likely to be an indication of an adverse impact, depending upon context; and,
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact.

BS4142 further states that “where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact” again depending upon the specific context of the site. The Standard further qualifies the assessment protocol by outlining conditions to the comparative assessment and stating that “not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact”, thus implying that all sites should be assessed on their own merits and specifics.

The Standard quantifies the typical reference periods (for the purposes of the standard) to be used in the assessment of noise:

- Typical Daytime 07:00 – 23:00 1hr assessment period
- Typical Night-time 23:00 – 07:00 15min assessment period

The Standard outlines a number of methods for defining appropriate "character corrections" within the Rating Levels to account for tonal qualities, impulsive qualities, other sound characteristics and/or intermittency. These are a) the Subjective Method, b) the Objective Methods for tonality, and c) the Reference Method. It is noted by the Standard that where multiple features are present the corrections should be added in a linear fashion to the Specific level.

The Subjective Method is based on the following corrections:

BS4142 Subjective method rating corrections

| Level of Perceptibility | Tonal Correction | Impulsivity Correction | Correction for "Other sound characteristics" | Intermittency Correction |
|---|---|---|---|---|
| No Perceptibility | +0 dB | +0 dB | Where neither tonal nor impulsive but identifiable +3 dB | If intermittency is readily identifiable +3 dB |
| Just Perceptible | +2 dB | +3 dB | | |
| Clearly Perceptible | +4 dB | +6 dB | | |
| Highly Perceptible | +6 dB | +9 dB | | |

The Objective Methods are based around the actual quantification of 1/3 octave data for the sound under investigation where possible.

However, the Standard states that the assessment methodology provided is not intended for the derivation of internal noise levels arising from sound levels outside or *"where background sound levels and rating levels are low",* however, with regard to the latter no definition of "low" is provided. Where these situations prevail, it is considered appropriate to reference the absolute guidance levels provided in British Standard BS 8233: 2014 *'Guidance on Sound Insulation and Noise Reduction for Buildings'* and the World Health Organisation *'Guidelines for Community Noise'* and *'Night Noise Guidance for Europe'.*

Professional Practice Guidance on Planning and Noise – New Residential Development (ProPG) 2017

In June 2017, the 'ProPG: Planning & Noise Professional Practice Guidance on Planning & Noise New Residential Development (ProPG)' (Institute of Acoustics et al., 2017) (Ref.13.24) was formally launched. The document was produced through a Working Group consisting of representatives of the Institute of Acoustics (IOA), Association of Noise Consultants (ANC) and Chartered Institute of Environmental Health (CIEH), together with practitioners from a planning and local authority background.

The ProPG document sets out advice on establishing a site risk evaluation for new residential development that will be exposed predominantly to airborne noise from existing transportation sources. The approach is also considered suitable where some industrial or commercial noise contributes to the acoustic environment, provided that it is not the dominant noise source. Where industrial and/or commercial noise is considered to be the dominant source then the ProPG states that the guidance of BS 4142:2014 should be referred to.

The primary goal of the ProPG is to assist the delivery of sustainable development by promoting good health and wellbeing through the effective management of noise. It seeks to do this through encouraging a good acoustic design process in and around proposed new residential development having regard to national policy on planning and noise.

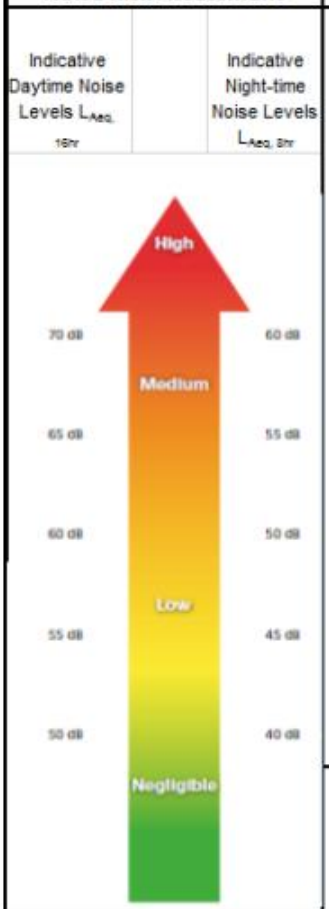
The ProPG advocates a systematic, proportionate, risk based, 2-stage approach that encourages early consideration of noise issues, facilitates straightforward accelerated decision making for lower risk sites, and assists proper consideration of noise issues where the acoustic environment is challenging.

**Stage 1 of the ProPG** methodology is considered to support wider Government planning and noise policy, and guidance at the date of publication of ProPG (2017), including the NPPF, NPSE and PPG-Noise. Stage 1 consists *of "an initial noise risk assessment of the proposed development site"* and aims to conclude whether the proposed site would be classified on grounds of noise as posing a *"negligible, low, medium or high risk from a noise perspective".*

This initial risk assessment should be undertaken in the absence of any new or proposed mitigation measures and should include consideration of the "*acoustic effect of any existing site features that will remain (e.g. retained buildings, changes in ground level) and exclude the acoustic effect of any site features that will not remain (e.g. buildings to be demolished, fences and barriers to be removed)".*

The Stage 1 assessment can be based upon either measured or predicted noise levels at the site, typically over a full 24hr day. The risk-based assessment protocol is summarised in Image 1 below

Stage 1: Stage 1 Initial Site Risk Assessment (ProPG: Planning & Noise)

<table>
<tr><th>Noise Risk Assessment</th><th>Potential Effect Without Noise Mitigation</th><th>Pre-Planning Application Advice</th></tr>
<tr><td rowspan="3"> 
</td><td rowspan="3">Increasing Risk of Adverse Effect</td><td>High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice.</td></tr>
<tr><td>As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.</td></tr>
<tr><td>At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development.</td></tr>
<tr><td></td><td>No Adverse Effect</td><td>These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.</td></tr>
<tr><td colspan="3">Notes:<br>a. Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.<br>b. Indicative noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present but is "not dominant".<br>c. LAeq,16hr is for daytime 0700 – 2300, LAeq,8hr is for night-time 2300 – 0700.<br>d. An indication that there may be more than 10 noise events at night (2300 – 0700) with LAmax,F > 60 dB means the site should not be regarded as negligible risk.</td></tr>
</table>

**Stage 2 of the ProPG** guidance process essentially covers "a full assessment" of noise considering the 4 main elements referenced below:

- **Stage 2 Element 1** – demonstrating a "Good Acoustic Design Process";
- **Stage 2 Element 2** – observing internal "Noise Level Guidelines";
- **Stage 2 Element 3** – undertaking an "External Amenity Area Noise Assessment"; and
- **Stage 2 Element 4** – consideration and assessment of "Other Relevant Issues".

The **first element of Stage 2** relates to "Good Acoustic Design". This aspect of the ProPG recommends that *"following a good acoustic design process is an implicit part of achieving good design*" and is required under appropriate Government planning guidance and policy. Element 1 specifies that good acoustic design should:

- Follow a multi-faceted and integrated approach to achieve optimal acoustic conditions both internally and externally;
- Avoid unreasonable, and prevent unacceptable acoustic conditions with the intention of delivering the *"optimum acoustic outcome*" for a given site. This is specifically noted to not mean overdesign or "*gold plating"* of potential design measures; and,
- Avoid design compromises that will adversely affect living conditions and the quality of life of future inhabitants, and sustainable design objectives.

Under this element it is noted that noise assessments should provide evidence that good acoustic design has been included, specifically considering:

- The feasibility of relocating, or reducing noise levels from relevant sources;
- Options for planning the site or building layouts;
- Orientation(s) of proposed buildings;
- Construction types and methods for meeting building performance requirements;
- Viability of alternative solutions; and,
- Assessment of external area noise.

In addition, concurrent consideration should be given, where possible, to the effects of any proposed noise control measures on ventilation, fire regulation, health and safety, cost and CDM requirements of the design.

The second element of **Stage 2 of ProPG** is the consideration of internal noise levels within noise sensitive rooms in accordance with appropriate guidance and limits.

The ProPG has augmented the internal noise guidance provided in BS8233:2014 and advocates the internal noise levels presented below.

ProPG Internal Noise Level Guidelines

| Activity | Location | 07:00-23:00 hrs | 23:00 – 07:00 hrs |
|---|---|---|---|
| Resting | Living room | 35 dB LAeq,16hour | - |
| Dining | Dining room/ area | 40 dB LAeq, 16hour | - |
| Sleeping (daytime resting) | Bedroom | 35 dB LAeq, 16hour | 30 dB LAeq, 8hour<br>45 dB LAmax, F (Note 4) |

NOTE 1 The Table provides recommended internal LAeq target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

NOTE 2 The internal LAeq target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, e.g. 1 hour, may be used, but the level should be selected to ensure consistency with the internal LAeq target levels recommended in the Table.

NOTE 3 These internal LAeq target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

NOTE 4 Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or LAmax,F, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB LAmax,F more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events (see Appendix A).

NOTE 5 Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic design. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the "open" position and, in this scenario, the internal LAeq target levels should not normally be exceeded, subject to the further advice in Note 7.

NOTE 6 Attention is drawn to the requirements of the Building Regulations.

NOTE 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal LAeq target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal LAeq levels start to exceed the internal LAeq target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal LAeq levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form.

The **third element of Stage 2** of ProPG is the consideration of external noise levels within noise sensitive spaces external to the building structure, to ensure that, where possible, the acoustic environment of these spaces is considered appropriately in order to ensure they can be enjoyed as intended in accordance with the requirements of the Planning Practice Guidance – Noise.

The guidance of BS8233: 2014 is specifically referenced within the ProPG, stating *"noise levels should ideally not be above the range 50 – 55dB $L_{Aeq, 16hr}$".* BS8233/ProPG further states that, where the development is desirable but the values cannot be achieved, *"development should be designed to achieve the lowest practicable noise levels in these external amenity spaces"* clarifying that development should not be prohibited on these grounds.

As such, under element 3 of Stage 2 consideration should be given to:

- Where external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended;
- The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$;
- Where these limits cannot be achieved but development is desirable, the development should be designed to achieve the lowest practicable noise levels in these external amenity spaces;
- Consideration of the need to provide access to a quiet or relatively quiet external amenity space should be considered;
- Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:

    - A relatively quiet façade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or,
    - A relatively quiet alternative or additional external amenity space for sole use by a household, (e.g. a garden, roof garden or large open balcony in a different, protected, location); and/or,
    - A relatively quiet, protected, nearby, external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings; and/or,
    - A relatively quiet, protected, publicly accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance). The local planning authority could link such provision to the definition and management of Quiet Areas under the Environmental Noise Regulations.

The **fourth element of Stage 2** of ProPG is the assessment and consideration of "other relevant issues". Within this element of the study the ProPG looks to build on national and local planning and noise policy *"to provide a systematic list of recommendations for the issues that should be considered before making judgement about the noise aspects of a particular planning proposal for new residential development".*

This would require the consideration of:

- Compliance with relevant national and local policy.

Specifically, with regard to the objectives of both the National Planning Policy Framework and the Noise Policy Statement for England. Successful applications will therefore need to demonstrate conformance with appropriate national and local policy.

- Magnitude and extent of compliance with ProPG.

Specifically, consideration should be given to situations where it has not been possible to achieve the recommended standards and limits for both internal and external noise referenced in the ProPG.

- Likely occupants of the development.

Specifically, consideration of the requirements of the proposed future residents, e.g. families with young children, students and the elderly may all have different requirements and sensitivities to noise which needs to be considered.

- Acoustic design v unintended adverse consequences.

Specifically, consideration of adverse consequences of measures proposed to control noise on the building or the nearby environment, which may affect the attractiveness of the living environment of the area. These issues should ideally be controlled through the application of "good acoustic design".

- Acoustic design wider planning objectives.

Specifically, where the achievement of planning objectives such as "safety by design", encouragement of active outdoor lifestyles, creation of vibrant mixed-use spaces results in consequences relating to noise and acoustic design.

### Building Bulletin 93 (BB93) Acoustic Design of Schools – Performance Standards

Section 1 of the BB93 (Ref.13.25) sets out the acoustic performance standards for new and refurbished schools. The usual way of satisfying Requirement E4 of the Building Regulations and the School Premises Regulations is to achieve the performance standards detailed in BB93.

Section 2 of BB93 details the preferred means for demonstrating compliance of the design with the performance standards.

BB93 includes performance standards for the following:

- Indoor ambient noise levels in unoccupied spaces;
- Airborne sound insulation between spaces;
- Airborne sound insulation between circulation spaces and other spaces used by students;
- Impact sound insulation of floors;
- Reverberation in teaching and study spaces;
- Sound absorption in corridors and stairwells; and,
- Open plan teaching and learning.

### Health Technical Memorandum 08-01 (HTM08-01): Acoustics

HTM-01 (Ref.13.26) relates to the acoustic requirements to be considered during the development of healthcare facilities. The document specifies acoustic design criteria for various typical area usages within healthcare buildings.

Alongside internal acoustic design criteria, the document also recommends criteria for noise levels within rooms in order to create an acoustic environmental that allows rooms to be used for resting, sleeping and treatment.

Converting the UK traffic noise index $L_{A10,18hour}$ to EU noise indices for noise mapping, by P G Abbott and P M Nelson (TRL Limited) 2002

This document (Ref.13.27) sets out a procedure for converting $L_{A10,18hour}$ dB noise values commonly associated with the measurement of road traffic noise to $L_{Aeq,T}$ dB noise vales. that are used for more general ambient noise levels.