Appendix F.1 Noise Policy Context

A.1 Policy Context, Legislation, Guidance and Standards

National Legislation

A.1.1 National legislation that is relevant to the noise and vibration assessment is as follows:

Control of Pollution Act (1974)

A.1.2 The Control of Pollution Act (CoPA) (HMSO, 1974) published in 1974 covers a wide range of environmental pollution including noise. Parts of the Act have been superseded by the Environmental Protection Act (EPA) (HMSO, 1990) published in 1990.

A.1.3 Section 60 of the Act relates to the 'Control of Noise on Construction Sites' and Section 61 relates to obtaining 'Prior Consent for Work on Construction Sites'. These parts of the Act are often used in conjunction with other standards to determine acceptable noise levels in relation to construction, hours of operation and specific working methods or mitigation.

A.1.4 A Section 61 application outlines the proposed construction works, hours of operation and a mitigation plan to reduce noise and vibration impact through the use of best practicable means. It allows prior consent to be agreed between the contractor and the council and assists with protecting the contractor from legal action being taken under Section 60 of CoPA (HMSO, 1974) or Section 80 of the EPA (HMSO, 1990).

Environmental Protection Act (1990)

A.1.5 The Environmental Protection Act (EPA) (HMSO, 1990) published in 1990 requires local authorities to investigate noise complaints from premises (land and buildings) and vehicles, machinery or equipment in the street. This includes noise arising from construction sites.

A.1.6 If the local authority is satisfied that noise from a development 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 may require that the noise or nuisance is completely stopped or limited to certain times of the day.

National Planning Policy

A.1.7 National planning policy that is relevant to the noise and vibration assessment is as follows:

National Planning Policy Framework (NPPF) (2023)

A.1.8 The revised National Planning Policy Framework (NPPF) (MHCLG, 2021) was published in July 2021. In respect of noise, paragraph 174 states that in relation to conserving and enhancing the natural environment:

> *"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 … noise pollution..."*

A.1.9 In relation to ground conditions and pollution, paragraph 185 states that:

> *"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:

- *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 quality of life;*

- *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason…"*

A.1.10 In relation to the integration of new development with existing premises and community facilities, paragraph 187 states that:

> *"Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."*

A.1.11 The NPPF indicates that the Noise Policy Statement for England (NPSE) should be used to define the "*significant adverse impacts*".

Noise Policy Statement England (NPSE) (2010)

A.1.12 The Noise Policy Statement for England (NPSE) (Defra, 2010) was published in March 2010 and clarifies the underlying principles and aims of existing policy documents that relate to noise. It also sets out the long-term vision of Government noise policy which is: "*to promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development*".

A.1.13 The NPSE states that noise should not be considered in isolation of the wider benefits of a scheme or development, and that the intention is to minimise noise and its effects as far as is reasonably practicable having regard to the underlying principles of sustainable development.

A.1.14 Paragraphs 2.20 and 2.21 define 'significant adverse' and 'adverse' impacts as applied to noise as follows:

> *"There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:*
>
> *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 the noise.*
>
> *LOAEL – Lowest Observed Adverse Effect Level*
>
> *This is the level above which adverse effects on health and quality of life can be detected.*
>
> *Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.*

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur."

A.1.15 Paragraph 2.22 clarifies that:

> *"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."*

A.1.16 The three aims of the NPSE are defined as follows:

> *"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."* (Note: Applies when the impact lies somewhere between the LOAEL and SOAEL and does not mean that adverse effects cannot occur).
>
> *"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."*

A.1.17 It is necessary to define the LOAEL and SOAEL for the potential source of noise to relate the potential impact to the aims and requirements of the NPSE.

Planning Practice Guidance (2019)

A.1.18 The Planning Practice Guide (PPG) was launched in 2014 (with the latest update being in 2019) (DLUHC & MHCLG, 2019) and provides additional guidance and interpretation to the Government's strategic policies outlined within the NPPF in a regularly updated, web-based resource.

A.1.19 The PPG provides guidance on the effects of noise exposure, relating these to people's perception of noise, and linking them to the no observed effect level (NOEL) and, as exposure increases, the lowest observed adverse effect level (LOAEL) and significant observed adverse effect level (SOAEL).

A.1.20 As exposure increases above the LOAEL, the noise begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise. As the noise exposure increases, it will then at some point cross the SOAEL boundary.

A.1.21 Exposure to noise above the LOAEL is described in PPG (Paragraph: 005 Reference ID: 30-005-20190722) as:

> *"…noise starts to cause small changes in behaviour and/or attitude, for example, having to turn up the volume on the television or needing to speak more loudly to be heard. The noise therefore starts to have an adverse effect and consideration needs*

to be given to mitigating and minimising those effects (taking account of the economic and social benefits being derived from the activity causing the noise)."

A.1.22 Exposure to noise above SOAEL is described as:

> *"…noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is predicted to be above this level the planning process should be used to avoid this effect occurring, for example through the choice of sites at the plan-making stage, or by use of appropriate mitigation such as by altering the design and layout. While such decisions must be made taking account of the economic and social benefit of the activity causing or affected by the noise, it is undesirable for such exposure to be caused."*

Local Planning Policy

A.1.23 Local Planning policy that is relevant to the noise and vibration assessment is as follows:

Local Plan First Review (1995-2011) – Policy EN5

A.1.24 The Local Plan First Review (1995-2001) Policy EN5 states the following regarding noise:

> *EN5: Noise-generating development will not be permitted if it would be liable to increase adversely the noise experienced by the users of existing or proposed noise-sensitive development nearby. Noise-sensitive development will not be permitted if its users would be affected by noise from existing or proposed noise-generating uses unless adequate mitigation works can be implemented to achieve an acceptable environment.*

Core Strategy (2006-2026) – Policy CP11

A.1.25 The adopted Core Strategy (2006-2026) Policy CP11 states the following regarding noise:

> *CP11: Development should be located and designed so as to minimise and if necessary, mitigate against environmental impacts. Within the Air Quality Management Area shown on the following map, measures to reduce pollution and meet air quality objectives, that are proposed by the Local Transport Plan and the Air Quality Action Plan, will be brought forward.*

Other Relevant Policy, Standards and Guidance

A.1.26 Other policy, standards and guidance that are relevant to the noise and vibration assessment are as follows.

British Standard 8233: 2014 'Guidance on Sound Insulation and Noise Reduction for Buildings'

A.1.27 BS 8233:2014 (BSI, 2014), in relation to this development, sets out desirable guideline values in habitable rooms, such as living rooms and bedrooms.

A.1.28 The guideline values relate to steady external noise without a specific character, previously termed 'anonymous noise'. According to the standard, noise has a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case lower noise limits might be appropriate. Examples of noise with a character may include tonal/intermittent plant noise emissions, music playback, and workshop noise. Examples of external steady noise sources may include environmental noise sources such as busy road traffic.

A.1.29 The desirable internal ambient noise levels for dwellings are presented in **Table A.1.1**

Table A.1.1: BS 8233 Desirable Internal Ambient Noise Levels for Dwellings

Activity	Location	Desirable Internal Ambient Noise Level	
		07:00 to 23:00 hours	23:00 to 07:00 hours
Resting	Living room	35 dB $L_{Aeq,16h}$	No level stated.
Dining	Dining room/area	40 dB $L_{Aeq,16h}$	No level stated.
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$
*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 $L_{Amax,f}$, depending on the character and number of events per night. Sporadic noise events could require separate values.			
*Note 5 If relying on closed windows to meet the guide values, there needs to be an appropriate alternative source of ventilation that does not compromise the façade insulation or the resulting noise levels.			
*Note 7 Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.			
*A selection of the available notes			

A.1.30 The standard also provides advice in relation to desirable levels for external noise. It 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 is also recognized that these guideline values are not achievable in all circumstances where development might be desirable.*
>
> *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."*

A.1.31 With respect to industrial noise, Paragraph 6.5.2 states:

> *"Where industrial noise affects residential or mixed residential areas, the methods for rating the noise in BS 4142 should be applied. BS 4142 describes methods for determining, at the outside of a building:*
>
> *a) noise levels from factories, industrial premises or fixed installations, or sources of an industrial nature in commercial premises; and*
>
> *b) background noise level."*

British Standard 4142:2014 +A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

A.1.32 BS 4142:2014 +A1:2019 (BSI, 2019) describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in the standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

A.1.33 The standard is used to determine the rating levels for sources of sound of an industrial and/or commercial nature and the ambient, background and residual sound levels at outdoor locations. These levels could be used for the purposes of investigating complaints; assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and assessing sound at proposed new dwellings or premises used for residential purposes. However, the determination of noise amounting to a nuisance is beyond the scope of the standard.

A.1.34 The standard should not be used to assess sound from the passage of vehicles on public roads and railway systems; recreational activities; music and other entertainment; shooting grounds; construction and demolition; domestic animals; people; public address systems for speech and other sources falling within the scopes of other standards or guidance. The standard cannot be applied to the derivation of indoor sound levels arising from sound levels outside, or the assessment of indoor sound levels.

A.1.35 The procedure contained in BS 4142 assesses the significance of sound which depends upon the margin by which the rating level of the specific sound sources exceeds the background sound level and the context in which the sound occurs/will occur. It is noted that a BS 4142 assessment is reliant on measuring relevant background sound levels.

A.1.36 An initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating level and considering the following:

- Typically, the greater this difference, the greater the magnitude of the impact;
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the 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. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

A.1.37 When considering the introduction of a new noise sensitive receptor Section 8.5 states:

> *"Measure the background sound at the intended location of any new noise-sensitive receptor(s) in the absence of any specific sound.*
>
> *NOTE Where a new noise-sensitive receptor is introduced and there is extant industrial and/or commercial sound, it should be recognized that the industrial and/or commercial sound forms a component of the acoustic environment. In such circumstances other guidance and criteria in addition to or alternative to this standard can also inform the appropriateness of both introducing a new noise-sensitive receptor and the extent of required noise mitigation."*

A.1.38 In order to consider the context, BS 4142 advises that the following factors should be considered:

- The absolute level of sound;
- The character and level of the residual sound compared to the character and level of the specific sound; and
- The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions such as:

- Façade insulation treatment;
- Ventilation and/or cooling that will reduce the need to have windows open to provide rapid or purge ventilation; and
- Acoustic screening.

British Standard 7445:2003 'Description and Measurement of Environmental Noise – Part 1: Guide to Quantities and Procedures'

A.1.39 BS 7445-1:2003 (BSI, 2003) describes methods and procedures for measuring noise from all sources which contribute to the total noise climate of a community environment, individually and in combination. The results are expressed as equivalent continuous A-weighted sound pressure levels, $L_{Aeq,T}$.

A.1.40 BS 7445-1:2003 states that sound level meters that are used should conform to Class 1 (or Class 2 as a minimum) as described in BS EN 61672-1:2013 (BSI, 2013) and should be calibrated according to the instructions of the manufacturer and field calibration should be undertaken at least before and after each series of measurements.

British Standard 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 1 Noise

A.1.41 BS 5228-1:2009+A1:2014 (BSI, 2014a) gives 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 industry-specific guidance.

British Standard 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 2 Vibration

A.1.42 BS 5228-2 (BSI, 2014b) provides advice on the human response to demolition and construction vibration. BS 5228-2 suggests that, for demolition and construction activities, it is considered appropriate to provide guidance in terms of the peak particle velocity (PPV) as measured outside the building.

Professional Practice Guidance on Planning and Noise, 2017

A.1.43 The Professional Practice Guidance on Planning and Noise (ProPG) (IOA, CIEH & ANC, 2017) was jointly published in 2017 by the Institute of Acoustics, the Chartered Institute of Environmental Health and the Association of Noise Consultants, and provides guidance on a recommended approach to the management of noise within the planning system in England.

A.1.44 The scope of ProPG is limited to new residential development that will be predominantly exposed to airborne noise from transport sources.

A.1.45 Noise sources other than airborne transport (i.e. industrial, commercial, entertainment, etc.) and ground-borne noise and vibration fall outside of the scope of ProPG.

A.1.46 ProPG details a two-stage approach to the consideration of noise issues including:

- Stage 1 – an initial noise risk assessment of the proposed development site; and
- Stage 2 – a systematic consideration of four key elements.

A.1.47 **Table A.1.2** summarises the noise risk categories as defined in ProPG for Stage 1 of the assessment process.

Table A.1.2: Stage 1 ProPG Risk Categories

Site Noise Risk Level	Indicative Noise Levels excluding Mitigation (dB $L_{Aeq,T}$)		Pre-Planning Application Advice
	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)	
High	> 70	> 60	Increased risk that development may be refused on noise grounds. The risk may be reduced by following a good acoustic design process
Medium	60 – 70	50 - 60	The site is likely to be less suitable from a noise perspective and an application may be refused unless a good acoustic design process is followed
Low	50 – 60	40 – 50	The site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed
Negligible	< 50	< 40*	The site is likely to be acceptable from a noise perspective
* Site Noise Risk Level should not be considered negligible where there could be more than 10 noise events with $L_{Amax,f}$ > 60 dB			

A.1.48 Stage 2 comprises 4 key elements which are undertaken in parallel:

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

A.1.49 Following a good acoustic design process involves considering acoustics at an early stage in the design process; avoid 'unreasonable' acoustic conditions and prevent 'unacceptable' acoustic conditions; and achieve an integrated, optimum solution without overdesign.

A.1.50 Demonstration of good acoustic design must include:

- Checking the feasibility of relocating or reducing noise levels from relevant sources;
- Consider options for planning the site or building layout;
- Consider the orientation of proposed building(s);
- Select construction types and methods for meeting building performance requirements;
- Consider the effects of noise control measures on ventilation, fire regulation, health and safety, CDM, etc.;
- Assess the viability of alternative solutions; and
- Assess external amenity areas noise.

A.1.51 With respect to internal noise levels, ProPG recommends that noise levels set out in BS 8233 are used for residential development. However, an additional criterion is proposed by ProPG for night-time L_{Amax} levels as follows:

"[…] 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 45 dB $L_{Amax,\ F}$ 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."

A.1.52 With respect to external noise levels, ProPG again makes reference to the guideline levels detailed in BS 8233 stating that:

"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 $L_{Aeq,16hr}$."

A.1.53 The final element indicates that the assessment should consider 'Other Relevant Issues' which may include:

- Compliance with relevant national and local policy;
- Magnitude and extent of compliance with ProPG;
- Likely occupants of the development;
- Acoustic design verses unintended adverse consequences;
- Acoustic design verse wider planning objectives.

Calculation of Road Traffic Noise 1988 (CRTN)

A.1.54 The Calculation of Road Traffic Noise (CRTN) (Department for Transport Welsh Office, 1988) describes the standard procedures for the measurement and calculation of traffic noise. It includes consideration of a number of factors including vehicle class, speed, road surface, distance attenuation and barrier attenuation.

A.1.55 Noise levels are measured or predicted in terms of the LA10,1hour or LA10,18hour. The LA10,18hour is the arithmetic average of the measured or calculated LA10,1hour levels for each one-hour period between 06:00 hours and 00:00 hours.

DEFRA 'Method for Converting the UK Traffic Noise Index LA10,18 hr to EU Noise Indices for Noise Mapping'

A.1.56 The 'Method for Converting the UK Road Traffic Index LA10,18h to the EU Noise Indices For Road Noise Mapping' (Defra,TRL and Casella Strange, 2006) was published by Defra, TRL and Casella Stanger in 2006 and can be used to convert LA10,18hour (06:00 – 00:00 hours) sound levels from vehicular movements on a road to daytime, evening and night-time sound levels (LAeq,T) from vehicular movements on a road.

Department of Transport 1995: Calculation of Railway Noise

A.1.57 The Calculation of Railway Noise (CRN) (Department for Transport, 1995) describes procedures for calculating noise from moving railway vehicles and other types of vehicles which run on rails. It includes consideration of a number of factors including vehicle class, speed, distance attenuation and barrier attenuation.

World Health Organization, Guidelines for Community Noise, 1999, W.H.O.

A.1.58 The World Health Organization (WHO) 'Environmental Noise Guidelines for the European Region' (WHO, 2018) sets out guidance on suitable external noise levels from specific noise

sources including road traffic railway, aircraft, wind turbine and leisure noise to inform policy makers.

A.1.59 The guidelines refer to Lden and Lnight dB values for road traffic, railway, aircraft and railway noise. These are sound descriptors not commonly used within the UK. More commonly utilised descriptors are the daytime average (LAeq,16hours) and night-time average (LAeq,8 hours) levels.

A.1.60 With respect to indoor noise levels, the guideline document states that "the GDG recommends that all CNG indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) should remain valid."

A.1.61 As such reference is made to the World Health Organization, Guidelines for Community Noise, 1999 (WHO, 1999).

World Health Organization, Guidelines for Community Noise, 1999, W.H.O.

A.1.62 The World Health Organization (WHO) 'Guidelines for Community Noise' (WHO, 1999) details guidance on suitable internal and external sound levels in and around residential properties. The following internal sound levels are recommended by the WHO:

- 35 dB $L_{Aeq,16hours}$ in living rooms during the daytime (07:00 to 23:00 hours); and
- 30 dB $L_{Aeq,8hours}$ in bedrooms during the night-time (23:00 to 07:00 hours).

A.1.63 With respect to the night-time maximum noise levels, the WHO guidelines state:

> *"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night."*

A.1.64 In addition to the above, the guidelines suggest that daytime sound levels of above 50 dB $L_{Aeq,16h}$ are of 'moderate annoyance' in the community with daytime sound levels above 55 dB $L_{Aeq,16h}$ of 'serious annoyance'.

A.1.65 The above levels are in-line with guidance detailed in BS8233:2014 (BSI, 2014) and ProPG Planning and Noise (IOA, CIEH & ANC, 2017).

Design Manual for Road and Bridges (2020) – Design Manual for Road and Bridges LA 111 Traffic Noise and Vibration

A.1.66 The Design Manual for Roads and Bridges (DMRB) (Standards for Highways, 2020) is considered to be the regulatory standard for the design of a new road or improvements to an existing road. LA 111 provides guidance on the environmental assessment of noise and vibration emissions and includes likely significant effects from:

- Construction noise;
- Construction vibration; and
- Operational noise.

A.1.67 Paragraph 1.5 of the DMRB states:

> *"Operational vibration is scoped out of the assessment methodology as a maintained road surface will be free of irregularities as part of project design and under general maintenance, so operational vibration will not have the potential to lead to significant adverse effects."*

Construction Noise

A.1.68 The calculation of construction noise levels should follow the methodology outlined in BS 5228-1:2009+A1:2014 and should include:

- Construction plant in use on the project;
- Construction compounds; and
- Traffic on haul roads not part of the public highway.

Construction Vibration

A.1.69 The calculation of construction vibration levels should follow the methodology outlined in BS 5228-2:2009+A1:2014 for all activities with the potential to adversely affect vibration sensitive receptors.

Operational Road Traffic Noise

A.1.70 DMRB states that an operational road traffic noise study area should be defined where the need for further assessment has been established and should include all noise sensitive receptors that are potentially affected by operational noise changes generated by the project, either on the route of the project or other roads not physically changed by the project. The document notes that a study area of 600 m from new road links or link physically changed or bypassed by the project is normally sufficient for most projects.

A.1.71 DMRB states that the operational noise baseline shall be determined from Do Minimum noise levels in the assessment year.

Institute of Environmental Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment (IEMA, 2014)

A.1.72 The Institute of Environmental Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment (IEMA, 2014) detail an assessment process applicable to a wide range of potential environmental noise sources where a specific assessment method either does not exist or is not considered to be appropriate.

A.1.73 The guidelines suggest that by defining the sensitivity of receptors, the change in noise environment as a result of the source under consideration, and considering the type of noise, an assessment of the potential noise impact can be undertaken.

A.1.74 Receptors are those aspects of the environment sensitive to changes in baseline conditions. The sensitivity of a particular receptor depends upon the extent to which it is susceptible to such changes. Residential receptors are typically considered to have a high sensitivity with commercial and industrial receptors considered to have a low or negligible sensitivity.

Building Bulletin 93 Acoustic Design of Schools: Performance Standards, 2015 (BB93)

A.1.75 Acoustic performance standards that apply to schools are set out in Building Bulletin 93 Acoustic Design of Schools: Performance Standards (BB93) (Schools Committee of the Association of Noise Consultants and the Institute of Acoustics, 2015). The performance standards relate to new builds and refurbishments. Compliance with the standards laid out in BB93 is considered to be the usual method of demonstrating compliance with Requirement E4 of Part E of Schedule 1 of the Building Regulations 2010. This assessment does not consider internal noise levels within the school in detail as these are dependent on a number of design factors not available at this stage.

A.1.76 Supporting guidance and recommendations on the acoustic design of new and refurbished schools are provided in the Acoustics of Schools: A Design Guide, produced by the Institute of Acoustics and the Association of Noise Consultants.

A.1.77 Chapter 2 of the document gives guidance on external noise levels. It should be noted that meeting the external levels do not form part of the requirement E4 of the building regulations. It states that:

> *"For new schools, 60 dB $L_{Aeq,30min}$ should be regarded as an upper limit for external noise at the boundary of external areas used for formal and informal outdoor teaching and recreation."*

BS 6472-1:2008 'Guide to Evaluation of Human Exposure to Vibration From Buildings – Part 1: Vibration Sources Other Than Blasting

A.1.78 BS 6742-1:2008 (BSI, 2008) details guidance with respect to the evaluation of human response to vibration sources (other than blasting).

A.1.79 The Standard sets out a methodology to assess the likely subjective response to vibration, based on evaluating the probability of adverse comment against the quantifiable Vibration Dose Value (VDV). The VDV defines a relationship that produces consistent assessment of continuous, intermittent, occasional and impulsive vibration and the subsequent human response.

A.1.80 Human response to vibration is dependent on various factors, including the frequency and direction of vibration. To address this the Standard specifies frequency weightings that are applied to horizontal and vertical vibration measurements. The weighting curves are applied to the raw acceleration time history data, in order to calculate the VDV.

A.1.81 The VDV is expressed as a single value over a stated time period. For assessment purposes these periods are typically taken to be a 16-hour daytime period (07:00 to 23:00 hours) and an 8-hour night-time period (23:00 to 07:00 hours).

A.1.82 The VDV is much more strongly influenced by the vibration magnitude, than the duration of the vibration. A doubling of the vibration magnitude is equivalent to an increase in exposure duration by a factor of 16.

Parallel Effects

A.1.83 The Standard refers to parallel effects which can affect the extent to which people in buildings react to vibration at a given VDV. The following parallel effects are referred to in the standard:

- Structure-borne noise (re-radiated noise): Low frequency noise (<100Hz) can arise from the vibration of building structures, caused by ground-borne vibration or acoustic excitation from external sources and is sometimes heard within a building.
- Airborne noise: Airborne noise can be heard at the same time as the vibration is felt. This can affect a persons' response to the perceived vibration.
- Induced rattling: The occurrence of rattling windows, furniture, fittings or ornaments can emphasise vibration perception.

Measurement

A.1.84 The objective of the measurements is to quantify the VDV for the daytime and/or night-time evaluation periods.

A.1.85 Where the direction of the dominant vibration is unknown, measurements should be recorded in all three orthogonal axes.

A.1.86 The measurement location should be selected to establish the vibration level at the point of entry to the body. Vibration should usually be measured on the floor of the room implicated, within one-third and two-thirds of the width/length.

Assessment

A.1.87 According to the Standard, a judgement is made to determine the probability of adverse comment, based on the VDV falling within a corresponding range as presented in **Table A.1.3**, which has been reproduced from the Standard.

Table A.1.3: Vibration Dose Values corresponding to Probability of Adverse Comment in a Residential Building

Time Period	**Low Probability of Adverse Comment*1 $ms^{-1.75}$**	**Adverse Comment Possible $ms^{-1.75}$**	**Adverse Comment Probable *2 $ms^{-1.75}$**
Daytime (07:00 – 23:00 hours)	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Night-time (23:00 – 07:00 hours)	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8
*1 Below these ranges adverse comment is not expected *2 Above these ranges adverse comment is very likely			

Approved Document O – Overheating

A.1.88 Approved Document O of the Building Regulations 2010 Overheating was published in December 2021 and took effect in England on 15 June 2022. It applies to schemes which have not had a planning application submitted before 15 June 2022, and to schemes which start on-site after 15 June 2023.

A.1.89 Approved Document O gives guidance on how to comply with Part O of the Building Regulations and applies to residential buildings (excluding hotels) only.

A.1.90 Requirement O1(1) states that:

> *"Reasonable provision must be made in respect of a dwelling, institution or any other building containing one or more rooms for residential purposes, other than a room in a hotel ("residences") to –*
>
> *(a) Limit unwanted solar gains in summer;*
>
> *(b) Provide an adequate means to remove heat from the indoor environment."*

A.1.91 Requirement O1(2) states that:

> *"In meeting the obligations in paragraph (1) –*
>
> *(a) Account must be taken of the safety of any occupant, and their reasonable enjoyment of the residence; and*
>
> *(b) Mechanical cooling may only be used where insufficient heat is capable of being removed from the indoor environment without it."*

A.1.92 Compliance with Requirement O1(1) can be demonstrated by using the 'simplified method' or by 'dynamic thermal modelling', as described in Approved Document O.

A.1.93 Concerning noise, Paragraphs 3.2 and 3.3 of Approved Document O state:

"3.2 In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11 pm to 7 am).

3.3 Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

a. 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11 pm and 7 am).

b. 55dB L_{AFmax}, more than 10 times a night (between 11 pm and 7 am)."

NANR45 revision1 December 2011 - Procedure for the Assessment of Low Frequency Noise Complaints

A.1.94 The assessment of the potential impact of the substation on the proposed noise-sensitive receptors has been undertaken with reference to 'NANR45 revision1 December 2011 - Procedure for the Assessment of Low Frequency Noise Complaints'.

A.1.95 The objective of this document is to assist Environmental Health practitioners in handling complaints relating to low-frequency noise (LFN), excluding LFN relating to traffic and entertainment sources.

A.1.96 The document details a methodology for assessing complaints which refers to third-octave band criteria between 10 Hz and 160 Hz. At frequencies below 31.5 Hz, the criteria are based on the average threshold of audibility for steady sounds.

A.1.97 The methodology compares the measured LFN at the location of the complainant with the third-octave band criteria between 10 Hz and 160 Hz. Where the measured LFN exceeds the criteria, then this suggests that there may be an actionable complaint.

A.1.98 The reference values are detailed in Table 2.1.

Table 2.1: LFN Criteria

Low Frequency Noise Reference Criterion (dB $L_{eq,T}$) at 1/3 Octave Band Centre Frequency (Hz)												
10	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
92	87	83	74	64	56	49	43	42	40	38	36	34

A.1.99 The procedure detailed in NANR45 is intended to assist in the evaluation of existing problems and is not intended as a means of predicting when disturbance might occur. However, in the absence of industry-standard guidance with respect to LFN, it is considered that if the assessed sound falls below the criteria curve, this is a positive indication that the assessed sound is unlikely to cause LFN complaints.