

Appendix G: Noise and Vibration



Appendix G.1: Policy Context, Legislation, Guidance and Standards

Appendix G.1 Noise and Vibration

Policy Context, Legislation, Guidance and Standards

Legislative

Control of Pollution Act

- 1.1.1 The Control of Pollution Act (CoPA) (Control of Pollution Act, 1974) covers a wide range of environmental pollution including noise. Parts of the Act have been superseded by the Environmental Protection Act (EPA) (Environmental Protection Act, 1990).
- 1.1.2 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.
- 1.1.3 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 (Control of Pollution Act, 1974) or Section 80 of the EPA (Environmental Protection Act, 1990).

Environmental Protection Act

- 1.1.4 The Environmental Protection Act (EPA) (Environmental Protection Act, 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.
- 1.1.5 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 Policy

The National Planning Policy Framework (NPPF)

- 1.1.6 The revised National Planning Policy Framework (NPPF) (DLUHC, 2023) was published in December 2023. In respect of noise, paragraph 180 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..."

- 1.1.7 In relation to ground conditions and pollution, paragraph 191 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:

- 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 quality of life;*
- 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...”*

- 1.1.8 In relation to the integration of new development with existing premises and community facilities, paragraph 193 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.”

- 1.1.9 The NPPF indicates that the Noise Policy Statement for England (NPSE) should be used to define the “significant adverse impacts”.

Planning Practice Guidance: Noise

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

- 1.1.11 Paragraph: 001 Reference ID: 30-001-20190722, “When is noise relevant to planning?” states:

“Noise needs to be considered when development may create additional noise, or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced). When preparing plans, or taking decisions about new development, there may also be opportunities to make improvements to the acoustic environment. Good acoustic design needs to be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the outset.”

- 1.1.12 The PPG provides advice on how noise impacts should be determined. Paragraph: 003 Reference ID: 30-003-20190722 states the plan-making and decision makes processes should 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.

- 1.1.13 The paragraph highlighted above also refers to the Noise Policy Statement for England (NPSE) (Defra, 2010), in stating that the overall effect of the noise exposure (including the

impact during the construction phase where applicable) should be identified against the significant observed adverse effect level (SOAEL) and the lowest observed adverse effect level (LOAL) for the given situation.

- 1.1.14 The same paragraph provides more descriptive detail for the definitions of NOEL, LOAEL and SOAEL but refrains from using numerical values. A summary of the advice is provided within the noise exposure hierarchy table in Paragraph: 005 Reference ID: 30-005-20190722 and reproduced in **Table A1:1**.

Table A1:1: Noise Exposure Hierarchy Table

Response	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level (NOEL)			
Not present	No effect	No observed effect	No specific measures required
No Observed Adverse Effect Level (NOAEL)			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No observed adverse effect	No specific measures required
Lowest Observed Adverse Effect Level (LOAEL)			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to 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 small actual or perceived change in the quality of life.	Observed adverse effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, 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
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable adverse effect	Prevent

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- 1.1.15 Paragraph: 006 Reference ID: 30-006-20190722 provides guidance factors which influence whether noise could be a concern. It states that *“The subjective nature of noise means there is not a simple relationship between noise levels and the impact on those affected.”*
- 1.1.16 The same paragraph goes on to state that the impact will depend on how various factors combine in any particular situation. These factors include:
- Source and absolute level of the noise together with the time of day it occurs.
 - How new noise making source relates to the existing sound environment.
 - Number and pattern of noise events (for non-continuous sound).
 - Frequency content (i.e. whether the noise contains particular high or low frequency content) and general character of the noise (i.e. whether or not the noise contains particular tonal characteristics or other particular features).
 - The extent to which the local arrangement of buildings, surfaces and green infrastructure reflects or absorbs noise.
- 1.1.17 The PPG provides more specific factors to consider, when relevant, including:
- The cumulative impact of multiple sources of noise.
 - The provision of alternative ventilation if proposed mitigation relies on closed windows most of the time.
 - In situations where noise sensitive locations are already subject to high noise levels, a development which is expected to cause even a small increase in the overall noise level may result in a significant adverse effect, even though little to no change in behaviour would be likely to occur.
 - Noise Action Plans and Important Areas (as defined in the Environmental Noise Directive) should be taken into account.
 - The effect of noise on wildlife. Consideration should be given to the potential effects of noisy development on international, national and locally designated Sites of importance for biodiversity.
 - Some commercial developments can have particular impacts in the evening and at night, when they are trading at their peak (e.g. restaurants, hot food takeaways, night clubs and public houses). This includes noise generated within the premises as well as noise that may be made by customers within the vicinity.
- 1.1.18 Paragraph: 009 Reference ID: 30-009-20190722, which advises on how the risk of conflict between new development and existing businesses or facilities can be addressed, states that:
- “Development proposed in the vicinity of existing businesses, community facilities or other activities may need to put suitable mitigation measures in place to avoid those activities having a significant adverse effect on residents or users of the proposed scheme.*
- In these circumstances the applicant (or ‘agent of change’) will need to clearly identify the effects of existing businesses that may cause a nuisance (including noise, but also dust, odours, vibration and other sources of pollution) and the likelihood that they could have a*

significant adverse effect on new residents/users. In doing so, the agent of change will need to take into account not only the current activities that may cause a nuisance, but also those activities that businesses or other facilities are permitted to carry out, even if they are not occurring at the time of the application being made.

The agent of change will also need to define clearly the mitigation being proposed to address any potential significant adverse effects that are identified. Adopting this approach may not prevent all complaints from the new residents/users about noise or other effects, but can help to achieve a satisfactory living or working environment, and help to mitigate the risk of a statutory nuisance being found if the new development is used as designed (for example, keeping windows closed and using alternative ventilation systems when the noise or other effects are occurring).

It can be helpful for developers to provide information to prospective purchasers or occupants about mitigation measures that have been put in place, to raise awareness and reduce the risk of post-purchase/occupancy complaints.”

1.1.19 Paragraph: 010 Reference ID: 30-010-20190722 provides advice on how the adverse effects of noise can be mitigated which are dependent on the type of development being considered and the character of the proposed location. Four broad classifications of mitigation are defined as follows:

- Engineering: reducing the noise generated at source and/or containing the noise generated;
- Layout: where possible, optimising the distance between the source and noise-sensitive receptors and/or incorporating good design to minimise noise transmission through the use of screening by natural or purpose built barriers, or other buildings;
- using planning conditions/obligations to restrict activities allowed on the Site at certain times and/or specifying permissible noise levels differentiating as appropriate between different times of day, such as evenings and late at night, and
- mitigating the impact on areas likely to be affected by noise including through noise insulation when the impact is on a building.

1.1.20 Paragraph: 011 Reference ID: 30-011-20190722 advises that the impact of noise may be partially offset if the residents of those dwellings have access to one or more of the following:

- A relatively quiet façade (containing windows to habitable rooms) as part of their dwelling.
- A relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced if this area is exposed to noise levels that result in significant adverse effects.
- 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.
- A relative quiet, protected, external publicly accessible 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).

Noise Policy Statement for England

- 1.1.21 The NPSE (Defra, 2010) 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”.
- 1.1.22 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.
- 1.1.23 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.”

- 1.1.24 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.”

- 1.1.25 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.”

- 1.1.26 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.

Guidance

Professional Practice Guidance on Planning and Noise

- 1.1.27 The Professional Practice Guidance on Planning and Noise (ProPG) (IOA, CIEH & ANC, 2017) was jointly published 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.
- 1.1.28 The scope of the ProPG is limited to new residential development that will be predominantly exposed to airborne noise from transport sources. The guidance is mostly focused on new flats and houses, although there is some relevant content in regard to other types of residential units, such as care homes and residential institutions.
- 1.1.29 Noise sources other than airborne transport (i.e. industrial, commercial, entertainment, etc.) and ground-borne noise and vibration fall outside of the scope of the ProPG.
- 1.1.30 The 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.
 - Stage 2 – a systematic consideration of four key elements.
- 1.1.31 **Table A1.2** is a reproduction of Figure 1 within the ProPG which summarises the noise risk categories for Stage 1 of the assessment process.

Table A1.2: Stage 1 ProPG Risk Categories

Noise Risk Assessment	Potential Effect Without Noise Mitigation	Pre-Planning Application Advice
Indicative Daytime Noise Levels $L_{Aeq,16hr}$ Indicative Night-time Noise Levels $L_{Aeq,8hr}$ 70 dB 65 dB 60 dB 55 dB 50 dB High Medium Low Negligible 60 dB 55 dB 50 dB 45 dB 40 dB	Increasing risk of adverse effect No adverse effect	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. 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. 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. 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.
Figure Notes: - Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures. - 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” . $L_{Aeq,16hr}$ is for daytime 0700 - 2300, $L_{Aeq,8hr}$ is for night-time 2300 - 0700. - An indication that there may be more than 10 noise events at night (2300 - 0700) with $L_{Amax,F} > 60$ dB means the site should not be regarded as negligible risk.		

1.1.32 Stage 2 comprises four 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’.

1.1.33 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.

1.1.34 Demonstration of good acoustic design should 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.
- Assess external amenity areas noise.

1.1.35 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.”

1.1.36 With respect to external noise levels, the ProPG again makes reference to the guideline levels detailed in BS8233 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 $L_{Aeq, 16hr}$.”

1.1.37 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 the ProPG.

- Likely occupants of the development.
- Acoustic design verses unintended adverse consequences.
- Acoustic design verses wider planning objectives.

Calculation for Road Traffic Noise

- 1.1.38 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.
- 1.1.39 Noise levels are measured or predicted in terms of the $L_{A10,1\text{hour}}$ or $L_{A10,18\text{hour}}$. The $L_{A10,18\text{hour}}$ is the arithmetic average of the measured or calculated $L_{A10,1\text{hour}}$ levels for each one-hour period between 06:00 hours and 00:00 hours.

Environmental Noise Guidelines for the European Region

- 1.1.40 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.
- 1.1.41 The guidelines refer to L_{den} and L_{night} 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 ($L_{\text{Aeq},16\text{hours}}$) and night-time average ($L_{\text{Aeq},8\text{hours}}$) levels.
- 14.1 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."
- 1.1.42 As such reference is made to the World Health Organization, Guidelines for Community Noise, 1999 (WHO, 1999).

Guidelines for Community Noise

- 1.1.43 The WHO 'Guidelines for Community Noise' (WHO, 1999) provides 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 $L_{\text{Aeq},16\text{hours}}$ in living rooms during the daytime (07:00 to 23:00 hours); and
 - 30 dB $L_{\text{Aeq},8\text{hours}}$ in bedrooms during the night-time (23:00 to 07:00 hours).
- 1.1.44 With respect to maximum sound levels during the night-time, the 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."*
- 1.1.45 In addition to the above, the guidelines suggest that daytime sound levels of above 50 dB $L_{\text{Aeq},16\text{hours}}$ are of 'moderate annoyance' in the community with daytime sound levels above 55 dB $L_{\text{Aeq},16\text{hours}}$ of 'serious annoyance'.

- 1.1.46 The above levels are in-line with guidance detailed in BS 8233:2014 (BSI, 2014) and ProPG Planning and Noise (IOA, CIEH & ANC, 2017).

**Design Manual for Road and Bridges Design Manual for Road and Bridges LA 111
Traffic Noise and Vibration**

- 1.1.47 The Design Manual for Roads and Bridges (DMRB) is considered to be the regulatory standard for the design of a new, or improvements to, a trunk road or motorway. In particular, LA 111 (Standards for Highways, 2020) was published in 2020 by National Highways and provides guidance on the assessment and the reporting of noise and vibration impacts relating to roads (including the change in traffic flows and construction).
- 1.1.48 Typically, the impact of the proposed development on the noise climate in the surrounding areas is based on the change in noise levels at noise sensitive receptors due to the changes in the volume of road traffic generated by the proposed development.
- 1.1.49 The DMRB provides two magnitude scales of impact for the change in noise levels in the 'short-term' (opening year) and in the 'long-term' (future year). The choice of impact scale depends on whether the assessment is comparing the opening year with and without the development, or the opening year without development and the future year with development.
- 1.1.50 The assessment has been informed by the criteria stated in DMRB.

Building Regulations

Approved Document O Overheating

- 1.1.51 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 prior to 15 June 2022, and to schemes which start on site after 15 June 2023.
- 1.1.52 Approved Document O gives guidance on how to comply with Part O of the Building Regulations and applies to residential buildings (excluding hotels) only.
- 1.1.53 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 –

Limit unwanted solar gains in summer;

Provide an adequate means to remove heat from the indoor environment.”

- 1.1.54 Requirement O1(2) states that:

“In meeting the obligations in paragraph (1) –

Account must be taken of the safety of any occupant, and their reasonable enjoyment of the residence; and

Mechanical cooling may only be used where insufficient heat is capable of being removed from the indoor environment without it.”

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

1.1.56 In relation to 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 (11pm to 7am).

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

a. 40dB LAeq,T, averaged over 8 hours (between 11pm and 7am).

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

1.1.57 Based on the above, the 'simplified method' cannot be relied upon if either of the internal noise criteria are exceeded.

Standards

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

1.1.58 BS 4142:2014+A1:2019 (The British Standards Institution, 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.

1.1.59 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.

1.1.60 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.

1.1.61 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.

1.1.62 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.

1.1.63 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.”

1.1.64 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.

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

- 1.1.65 BS 5228-1:2009+A1:2014 (The British Standards Institution, 2014) 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.
- 1.1.66 Annexes C and D detail current and historical sound level data associated with different construction and demolition operations that can be used to calculate the impact of noise from construction sites.

- 1.1.67 Annex E outlines example criteria for the assessment of the potential significance of noise effects and describes methods to identify the likely significance of noise levels from surface construction activity.
- 1.1.68 Annex F provides a calculation method for estimating noise from construction sites. Source sound levels for stationary and quasi-stationary activities, obtained either from sound level data contained in Annexes C and D or from measurements, are corrected for source-received distance, reflections and screening or soft ground attenuation. For continuous plant, the source level should be adjusted to account for the proportion of the assessment period during which the plant is operating. For cyclic or intermittent plant, the source level should be adjusted for the number of complete sequences that will occur within the assessment period.
- 1.1.69 Annex E outlines example criteria for the assessment of the potential significance of noise effects and describes methods to identify the likely significance of noise levels from surface construction activity.
- 1.1.70 The ABC method provides the threshold of potential significant effect at dwellings when the site noise level, rounded to the nearest decibel, exceeds the threshold value. For the appropriate period (night, evening/weekends or day), the ambient noise level is determined and rounded to the nearest 5 dB. This is then compared with the site noise level. If the site noise level exceeds the appropriate category value, then a potential significant effect is indicated. The assessor then needs to consider other project-specific factors, such as the number of receptors affected and the duration and character of the impact, to determine if there is a significant effect.
- 1.1.71 **Table A1.3** describes the example threshold of potential significant effects of noise from construction and open sites at dwellings.

Table A1.3: Example Threshold of Potential Significant Effect at Dwellings

Assessment Category and Threshold Value Period	Threshold Value, in decibels (dB)		
	Category A ^{A)}	Category B ^{B)}	Category C ^{C)}
Night-time (23:00 – 07:00)	45	50	55
Evenings and weekends ^{D)}	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
NOTE 1 A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level. NOTE 2 If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise. NOTE 3 Applied to residential receptors only.			
^{A)} Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.			

- B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.
- C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.
- D) 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.

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

- 1.1.72 BS 5228-2:2009+A1:2014 (The British Standards Institution, 2014) gives 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.
- 1.1.73 Annex B outlines criteria for the assessment of the significance of vibration effects. Furthermore, Table B.1 provides guidance that compares the predicted Peak Particle Velocity (PPV) and the consequences in terms of human perception and disturbance.
- 1.1.74 **Table A1.4** outlines the guidance on effects of vibration levels.

Table A1.4: Guidance on Effects of Vibration Levels

Vibration Level ^{A), B), C)}	Effect
0.14 mm·s ⁻¹	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mm·s ⁻¹	Vibration might be just perceptible in residential environments.
1.0 mm·s ⁻¹	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10 mm·s ⁻¹	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.
^{A)} The magnitudes of the values presented apply to a measurement position that is representative of the point of entry into the recipient. ^{B)} A transfer function (which relates an external level to an internal level) needs to be applied if only external measurements are available. ^{C)} Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects, and where these values are routinely measured or expected then an assessment in accordance with BS 6472-1 or -2, and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.	

- 1.1.75 Table B.2 of BS 5228-2:2009+A1:2014 (The British Standards Institution, 2014) provides guidance on PPV vibration limits for transient excitation for different building types. **Table A1.5** outlines the transient vibration guide values for cosmetic damage to buildings.

Table A1.5: Transient Vibration Guide Values for Cosmetic Damage

Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or Framed Structures. Industrial and heavy commercial buildings.	50 mm/s at 4 Hz and above	
Un-reinforced or light framed structures. Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
NOTE 1 Values referred to are at the base of the building.		
NOTE 2 At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not be exceeded.		

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

- 1.1.76 BS 8233:2014 (The British Standards Institution, 2014), in relation to this development, sets out guideline values in habitable rooms, such as living rooms and bedrooms which should not be exceeded.
- 1.1.77 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.
- 1.1.78 The guideline internal ambient noise levels for dwellings are presented in **Table A1.6**.

TableA1.6: BS 8233 Guideline Internal Ambient Noise Levels for Dwellings

Activity	Location	Internal Ambient Noise Level	
		07:00 to 23:00 hours	23:00 to 07:00 hours
Resting	Living room	35 dB $L_{Aeq,16h}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16h}$	-

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 5dB and reasonable internal conditions still achieved.			
*A selection of the available notes			

1.1.79 The standard also provides advice in relation to sound 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.

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate.

Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation.

In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB $L_{Aeq,T}$ or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space.”

Appendix G.2: Measurement Locations and Noise Sensitive Receptors Figures

Appendix G.2 Figures

Figure 1.1: Measurement Locations



Figure 1.2: Noise Sensitive Receptors at the Site



Appendix G.3: Construction Data Tables

Appendix G.3 Construction Data Tables

Tables A1.7: Construction tables - Site Preparation

Source Data					Calculation Assumptions			Corrections (dB)				Total (free- field) (dB L _{Aeq,T})
Equipment	Power Rating kW	Other notes	5228 Ref/Source	L _{Aeq} at 10m	No. Units	Distance (m)	On time %	Screening	No. Units	Distance	On- time	
Dozer	142	20 t	BS 5228- 1:2009+A1:2014 Table C.2:1	75	1	40	60%	0	0	-12	-2	61
Tracked excavator	102	22 t	BS 5228- 1:2009+A1:2014 Table C.2:3	78	1	40	55%	0	0	-12	-3	63
Tracked excavator (idling)	102	22 t	BS 5228- 1:2009+A1:2014 Table C.2:4	52	1	40	25%	0	0	-12	-6	34
Wheeled loader	209	—	BS 5228- 1:2009+A1:2014 Table C.2:26	79	1	40	50%	0	0	-12	-3	64
Dump truck (tipping fill)	306	29 t	BS 5228- 1:2009+A1:2014 Table C.2:30	79	1	40	40%	0	0	-12	-4	63
Dump truck	306	29 t	BS 5228- 1:2009+A1:2014 Table C.2:31	87	1	40	40%	0	0	-12	-4	71
Roller (rolling fill)	145	18 t	BS 5228- 1:2009+A1:2014 Table C.2:37	79	1	40	40%	0	0	-12	-4	63
Roller	145	18 t	BS 5228- 1:2009+A1:2014 Table C.2:38	73	1	40	40%	0	0	-12	-4	57

Grader	205	25 t	BS 5228-1:2009+A1:2014 Table C.6:31	86	1	40	30%	0	0	-12	-5	69
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Tables A1.8: Construction tables - Demolition and Foundation Works

Source Data					Calculation Assumptions			Corrections (dB)				Total (free-field) (dB L _{Aeq,T})
Equipment	Power Rating kW	Other notes	5228 Ref/Source	L _{Aeq} at 10m	No. Units	Distance (m)	On time %	Screening	No. Units	Distance	On-time	
Dozer	239	41 t	BS 5228-1:2009+A1:2014 Table C.2:10	80	1	40	60%	0	0	-12	-2	66
Tracked excavator	226	40 t	BS 5228-1:2009+A1:2014 Table C.2:14	79	1	40	55%	0	0	-12	-3	64
Tracked excavator (idling)	125	25 t	BS 5228-1:2009+A1:2014 Table C.2:20	68	1	40	25%	0	0	-12	-6	50
Wheeled loader	209	—	BS 5228-1:2009+A1:2014 Table C.2:26	79	1	40	50%	0	0	-12	-3	64
Cement mixer truck (discharging)	—	—	BS 5228-1:2009+A1:2014 Table C.4:18	75	1	40	20%	0	0	-12	-7	56
Cement mixer truck (idling)	—	—	BS 5228-1:2009+A1:2014 Table C.4:19	71	1	40	40%	0	0	-12	-4	55
Poker vibrator	—	—	BS 5228-1:2009+A1:2014 Table C.4:33	78	1	40	40%	0	0	-12	-4	62

Tables A1.9: Construction tables – Building Erection

Source Data					Calculation Assumptions			Corrections (dB)				Total (free-field) (dB L _{Aeq,T})
Equipment	Power Rating kW	Other notes	5228 Ref/Source	L _{Aeq} at 10m	No. Units	Distance (m)	On time %	Screening	No. Units	Distance	On-time	
Dumper	81	7 t	BS 5228-1:2009+A1:2014 Table C.4:3	76	1	40	60%	0	0	-12	-2	62
Large concrete mixer	167	26 t	BS 5228-1:2009+A1:2014 Table C.4:22	76	1	40	40%	0	0	-12	-4	60
Wheeled mobile telescopic crane	610	400 t	BS 5228-1:2009+A1:2014 Table C.4:38	78	1	40	60%	0	0	-12	-2	64
Lorry with lifting boom	50	6 t	BS 5228-1:2009+A1:2014 Table C.4:53	77	1	40	40%	0	0	-12	-4	61
Tracked excavator	223	40 t	BS 5228-1:2009+A1:2014 Table C.4:63	77	1	40	20%	0	0	-12	-7	58
Mini tracked excavator	—	5 t	BS 5228-1:2009+A1:2014 Table C.4:67	74	1	40	50%	0	0	-12	-3	59
Circular bench saw (petrol-cutting concrete blocks)	—	—	BS 5228-1:2009+A1:2014 Table C.4:71	85	1	40	30%	0	0	-12	-5	68
Hand-held circular saw (petrol-cutting concrete blocks)	3	9 kg	BS 5228-1:2009+A1:2014 Table C.4:72	79	1	40	60%	0	0	-12	-2	65
Diesel generator	6.5	—	BS 5228-1:2009+A1:2014 Table C.4:76	61	1	40	90%	0	0	-12	0	49

Tables A1.10: Construction tables – Road Works

Source Data					Calculation Assumptions			Corrections (dB)				Total (free-field) (dB L _{Aeq,T})
Equipment	Power Rating kW	Other notes	5228 Ref/Source	L _{Aeq} at 10m	No. Units	Distance (m)	On time %	Screening	No. Units	Distance	On-time	
Road planer	185	17 t	BS 5228-1:2009+A1:2014 Table C.5:7	82	1	40	30%	0	0	-12	-5	65
Road planer (idling)	185	17 t	BS 5228-1:2009+A1:2014 Table C.5:8	62	1	40	30%	0	0	-12	-5	45
Bulldozer	250	35 t	BS 5228-1:2009+A1:2014 Table C.5:14	86	1	40	50%	0	0	-12	-3	71
Articulated dump truck	194	25 t	BS 5228-1:2009+A1:2014 Table C.5:16	81	1	40	50%	0	0	-12	-3	66
Road roller	95	22 t	BS 5228-1:2009+A1:2014 Table C.5:19	80	1	40	75%	0	0	-12	-1	67
Asphalt paver (+ tipper lorry)	112	12 t hopper	BS 5228-1:2009+A1:2014 Table C.5:30	75	1	40	50%	0	0	-12	-3	60
Vibratory roller	95	12 t	BS 5228-1:2009+A1:2014 Table C.5:21	80	1	40	50%	0	0	-12	-3	65
Vibratory roller	98	8.9 t	BS 5228-1:2009+A1:2014 Table C.5:20	75	1	40	50%	0	0	-12	-3	60
Grader	205	25 t	BS 5228-1:2009+A1:2014 Table C.6:31	86	1	40	30%	0	0	-12	-5	69

Appendix G.4: Time History Graphs

Appendix G.4 Time History Graphs

Figure 1.5: Measurement Position LT1

Hollingworth Road, Littleborough
 L_{Aeq} , $L_{Amax,f}$ and L_{A90} Time History
LT1 - Monday 11 September to Tuesday 12 September 2023

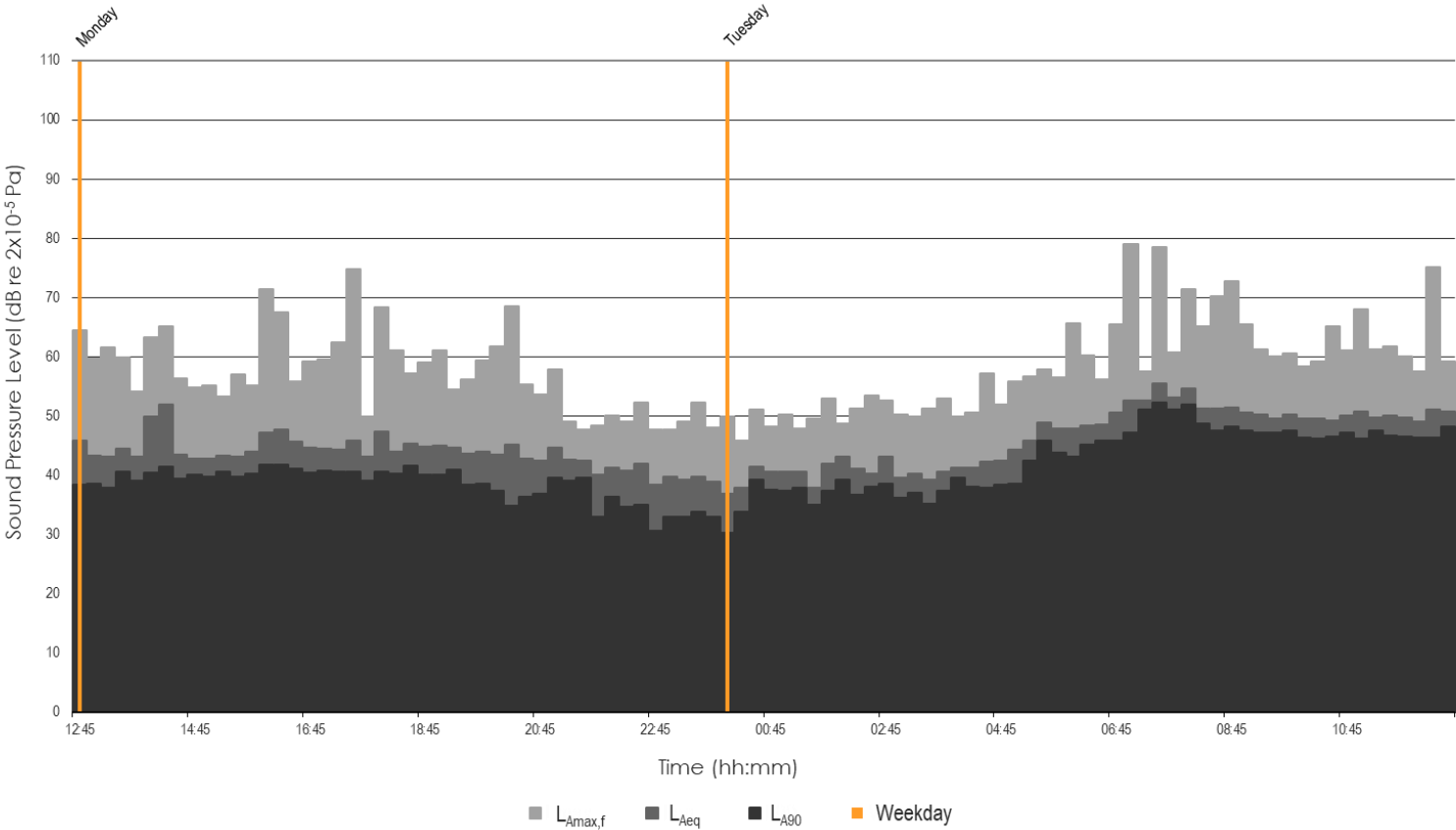


Figure 1.6: Measurement Position LT2

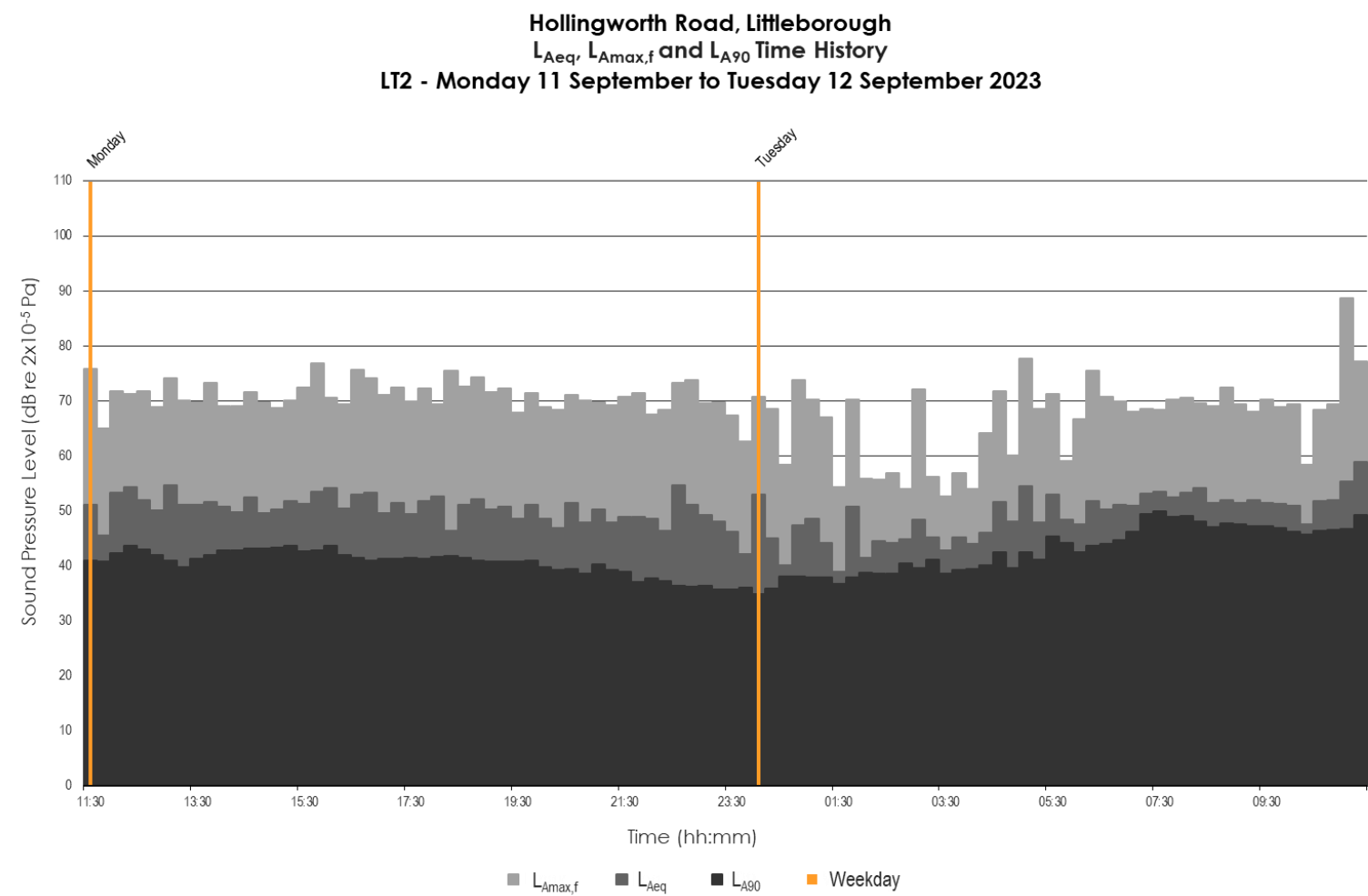


Figure 1.7: Measurement Position LT3

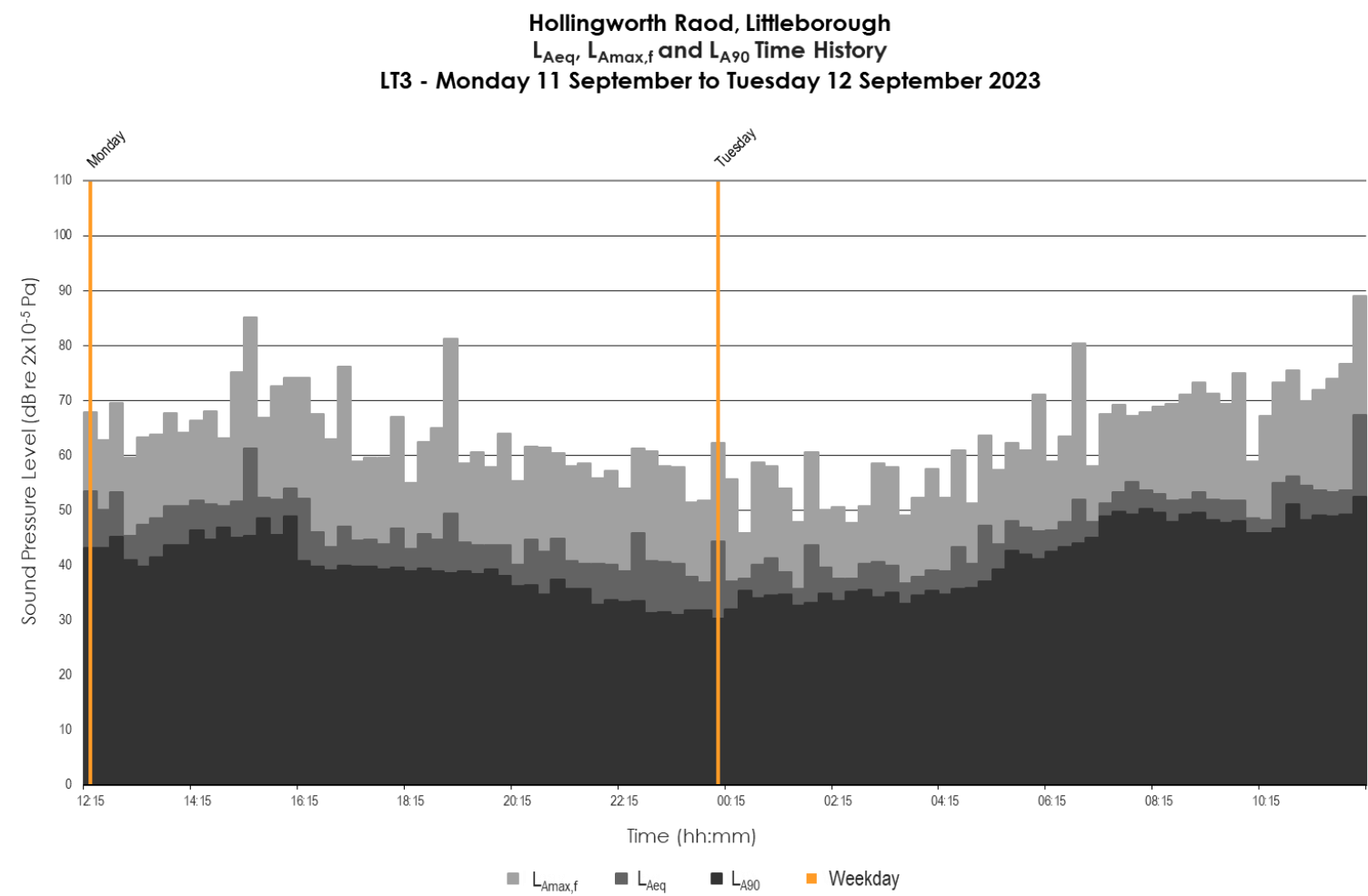


Figure 1.8: Measurement Position LT4

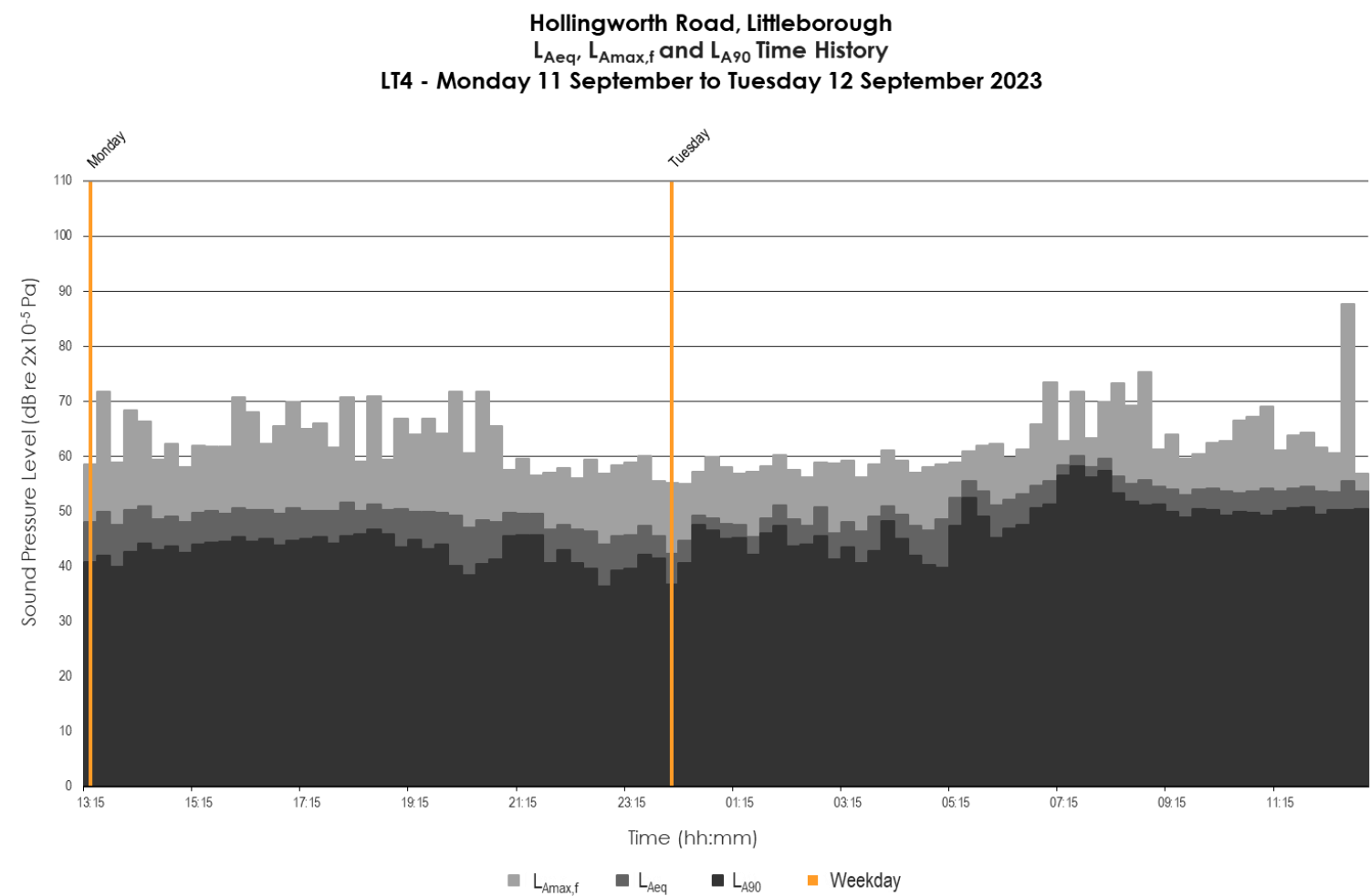
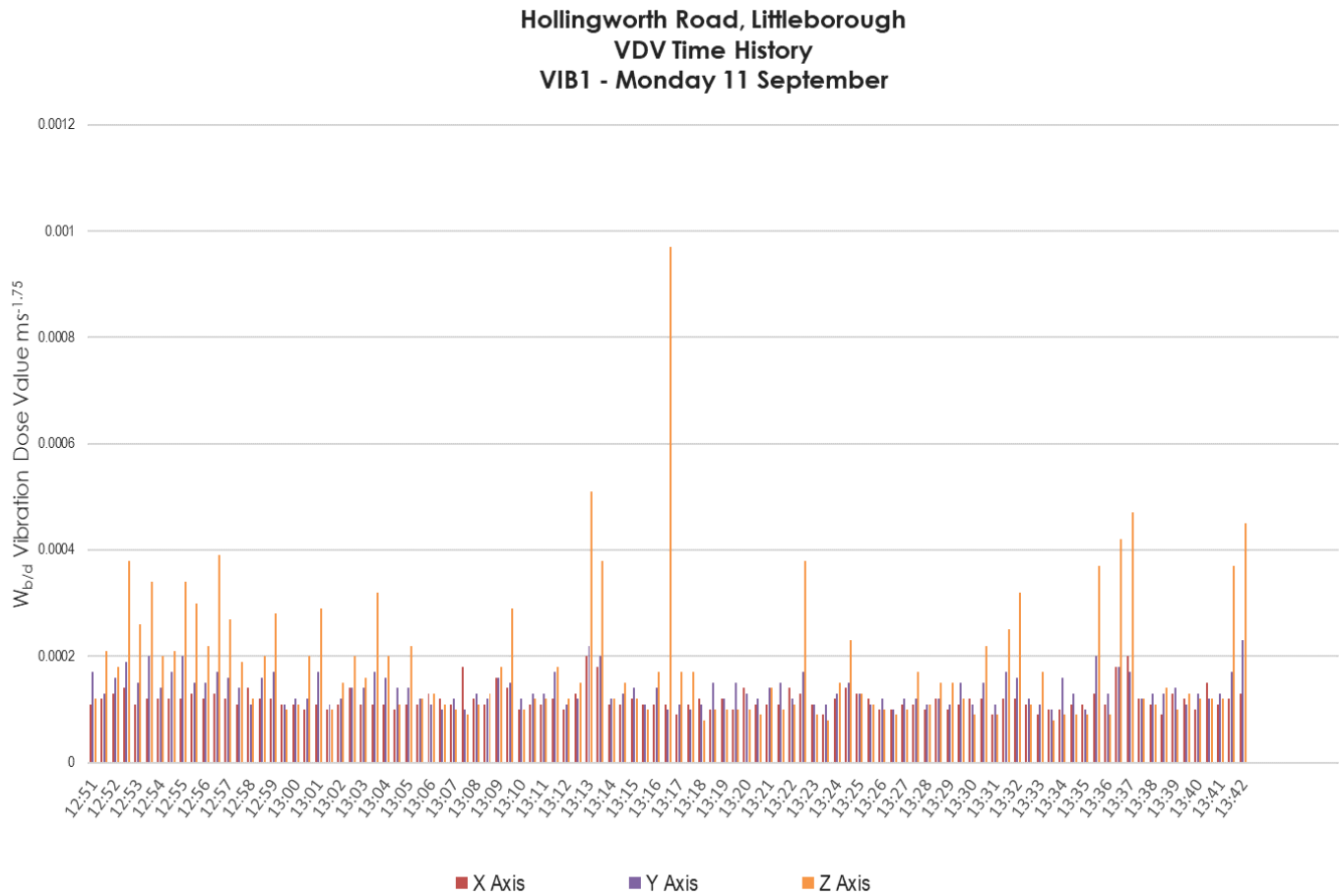


Figure 1.9: Measurement Position VIB





Appendix G.5: Calibration and Measurement Equipment

Appendix G.5 Calibration and Measurement Equipment

Table A1.11: Equipment and Calibration Information

Description	Manufacturer	Type	Serial Number	Laboratory Calibration Date
Sound Level Meter	RION	NL-52	542903	12/01/2023
½" Pre-polarised microphone		UC-59	06480	12/01/2023
Pre-amplifier		NH-25	42931	12/01/2023
Sound Level Meter	RION	NL-52	542901	05/01/2024
½" Pre-polarised microphone		UC-59	06478	05/01/2024
Pre-amplifier		NH-25	42929	05/01/2024
Sound Level Meter	RION	NL-52	1010734	19/06/2023
½" Pre-polarised microphone		UC-59	23232	19/06/2023
Pre-amplifier		NH-25	11381	19/06/2023
Sound Level Meter	RION	NL-52	1043457	12/01/2023
½" Pre-polarised microphone		UC-59	07232	12/01/2023
Pre-amplifier		NH-25	43486	12/01/2023
Sound Level Meter	Brüel & Kjær	2250	3012156	04/11/2022
½" Pre-polarised microphone		4189	3349717	04/11/2022
Pre-amplifier		ZC0032	27836	04/11/2022
Vibration Monitor	RION	VM-56	34920212	10/10/2022