

EXAMINATION OF POSSIBLE APPROACHES FOR ASSESSMENT OF INDUSTRIAL NOISE BY EMPHASIS ON DIFFERENT STANDARDS AND GUIDANCE

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1 INTRODUCTION

This paper describes the applicable guidance and planning policy, and the different approaches which are adopted, when performing noise impact assessments for new residential developments where existing industrial noise is considered significant. A case study is provided in which two separate noise impact assessment methodologies consider the suitability of a site for proposed residential development where neighbouring industry already exists. The assessments demonstrate that different conclusions can be reached by emphasising the applicability of different standards and guidance. The paper discusses the potential conflicts between the different extant British Standards and guidance, and will also aim to demonstrate whether these conflicts would be influenced by new Standards and guidance published during 2014.

2 AVAILABLE APPROACHES

2.1 Applicable Guidance and Planning Policy

As with many noise sources, there are generally two potential approaches for determining the acceptability of existing industrial noise affecting proposed new residential developments:

1. an assessment based on a comparison of the industrial noise with existing noise levels; or
2. an assessment based on a comparison of the industrial noise with absolute noise level criteria.

In England, for industrial noise the first approach normally corresponds to the methodology in BS 4142: 1997 'Method for rating industrial noise affecting mixed residential and industrial areas'¹, which is based solely on external noise levels. The second approach involves comparison with absolute criteria, for example, the internal noise criteria for residential properties in British Standard 8233: 1999 'Sound insulation and noise reduction for buildings – Code of practice'² (recently superseded by the 2014 version³), or the internal and external amenity criteria for residential areas in the World Health Organisation (WHO) 'Guidelines for Community Noise'⁴.

2.1.1 BS 4142

BS 4142 provides a method for determining the likelihood of complaints due to industrial type noise sources. The basis of the Standard is a comparison, at the outside of the building, between the background noise level and the rating level of the industrial noise source under consideration. The scope of the standard is as follows:

"This British Standard describes methods for determining, at the outside of a building:

- a) noise levels from factories, or industrial premises, or fixed installations, or sources of an industrial nature in commercial premises; and*

b) background noise level.

The standard also describes a method for assessing whether the noise referred to in (a) is likely to give rise to complaints from people residing in the building. The method is not suitable for assessing the noise measured inside buildings or when the background and rating noise levels are both very low.

The foreword to BS 4142 acknowledges that the standard *“may be helpful in certain aspects of environmental planning and may be used in conjunction with recommendations on noise levels ... used elsewhere”*.

It can be concluded that the application of BS 4142 to determine the likelihood of complaints from future residents of a proposed development affected by existing industrial noise is appropriate. The standard makes very clear that the methodology only considers external noise levels, and acknowledges that it can be used in conjunction with other guidance.

2.1.2 BS 8233

The 1999 version of BS 8233 stated in section 6.5.2 that *“Where industrial noise affects residential areas, the method for rating the noise in BS 4142 should be applied”*. Section 7.3 and Table 5 provided guidance on internal noise limits for various types of function including ‘reasonable resting/sleeping conditions’ in living rooms and bedrooms. The explanation accompanying the limits in Table 5: *“Unless otherwise stated, the noise should be assumed to be steady, such as that due to road traffic, mechanical services, or continuously running plant”*. This seemed to suggest the limits could be applied to industrial noise as long as it is steady in nature. Further advice on residential properties was provided in section 7.6.1.2 which stated *“Occupants will usually tolerate higher levels of anonymous noise, such as that from road traffic, than noise from neighbours which may trigger complex emotional reactions which are disproportionate to the noise level. For simplicity, only anonymous noise is considered in Table 5”*. It is not clear if ‘noise from neighbours’ applied to residential neighbours only or extended to cover all types of neighbours, including industrial premises. Guideline levels for ‘steady’ external noise were also provided.

The 2014 version of BS 8233 contains the same text in section 6.5.2 as the 1999 version, which states the methods in BS 4142 should be applied for industrial noise affecting residential areas. The statement on ‘steady noise’ including ‘continuously running plant’ is also retained. Further explanation of ‘anonymous noise’ is provided in section 7.7.1 by changing this term to *“sources without a specific character”*; sources of a ‘specific character’ being defined as possessing *“features such as a distinguishable, discrete and continuous tone”* being *“irregular enough to attract attention”* or having *“a strong low-frequency content”*. For such noise BS 8233:2014 states *“lower noise limits might be appropriate”*. The 1999 text on neighbours is retained. The guidance on external noise limits is expanded to give greater flexibility, though the reference to ‘steady’ noise is removed.

From the 1999 version of BS 8233 it is a little unclear whether the suggested internal and external guideline limits were intended to apply to industrial noise, though the implication was that they could be applied if the noise was ‘steady’ in nature such as that from *“mechanical services or continuously running plant”*. This is made more explicit for internal noise in the 2014 version through the use of the term noise ‘without a specific character’. However, neither version acknowledges the potential mismatch between the conclusion of an assessment of industrial noise which is steady/without a specific character based on external levels in accordance with BS 4142, and an assessment based on the guideline internal/external levels in BS 8233, and where a mismatch exists, which result takes precedence.

2.1.3 WHO

The 1999 WHO ‘Guidelines for Community Noise’ provide guideline levels for inside bedrooms in terms of continuous noise and single sound events. The levels are set to avoid sleep disturbance,

although it is acknowledged that *“lower levels may be annoying, depending on the nature of the noise source.”* Corresponding external levels at the façade are also provided assuming a partly open window, so that residents may sleep with the windows open.

External guideline levels *“on balconies, terraces and outdoor living areas”* are provided in terms of protecting the majority of people from being seriously annoyed or moderately annoyed during the daytime. The guideline levels relate to *“a steady, continuous noise”*.

Industrial noise is not explicitly included or excluded from the WHO 1999 guideline values though the implication is that the guidelines provided in terms of a L_{Aeq} are only applicable to steady continuous noise. Individual noise events such as due to an intermittent industrial activity are only covered by the $L_{Amax,fast}$ criteria.

The 2009 WHO ‘Night Noise Guidelines for Europe’⁵ provides additional guideline limit values and acknowledge that for sleep disturbance impacts due to industrial noise there is *“an almost complete lack of information, although there are some indications that impulse noise may cause considerable disturbance at night.”* Nevertheless, industrial noise is again not explicitly included or excluded from these guideline values.

2.1.4 PPG 24

‘Planning Policy Guidance 24: Planning and Noise’⁶ (PPG24), now withdrawn, steered the user towards the BS 4142 methodology where the industrial noise was ‘dominant’ and where BS 4142 was ‘appropriate’:

Annex 1 paragraph 3 *“The NEC [Noise Exposure Category] noise levels should not be used for assessing the impact of industrial noise on proposed residential development because the nature of this type of noise, and local circumstances, may necessitate individual assessment and because there is insufficient information on people's response to industrial noise to allow detailed guidance to be given. However, at a mixed noise site where industrial noise is present but not **dominant**, its contribution should be included in the noise level used to establish the appropriate NEC”*

Annex 3 paragraph 19 *“The likelihood of complaints about noise from industrial development can be assessed, where the Standard is **appropriate**, using guidance in BS 4142: 1990”.*

However, PPG 24 did highlight that *“In addition, general guidance on acceptable noise levels within buildings can be found in BS 8233: 1987”*. No further guidance was provided on when it would be appropriate to include a consideration of absolute levels, or, again, how to reconcile the potentially significantly different conclusions reached when applying BS 4142 and when applying absolute internal criteria from BS 8233/WHO 1999 guidelines.

2.1.5 NPPF, NPSE & Planning Practice Guidance

As stated, PPG 24 has been withdrawn, though consideration of its recommended approach to existing industrial noise affecting new residential developments is still relevant. Only limited guidance specifically relating to industrial noise assessment is provided in its replacement, the National Planning Policy Framework⁷ (NPPF), along with the accompanying Noise Policy Statement for England⁸ (NPSE) and the planning practice guidance on noise⁹.

A specific reference to industrial noise is provided in the NPPF which states in paragraph 123 that planning decisions should aim to *“recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were*

established". The need to carefully consider noise from existing industrial activities affecting new residential development is reiterated in the planning practice guidance.

The NPPF, NPSE and planning practice guidance focus on providing an overview on how to determine when noise should be a consideration in the planning process advising that Local planning authorities 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.*

...this would include identifying whether the overall effect of the noise exposure ... is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation."

The lowest observed adverse effect (LOAEL) is defined as the level *"above which the noise starts to cause small changes in behaviour and 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)."*

The significant observed adverse effect level (SOAEL) is defined as a noise that *"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 above this level the planning process should be used to avoid this effect occurring, by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused."*

Current planning guidance is therefore based on determining what the SOAEL and the LOAEL are for the situation under consideration. However, it does not provide guidance on how to determine the SOAEL and the LOAEL in specific circumstances, for example, by referencing particular guidance or methodologies, instead general factors to consider are listed. Of particular relevance to determining the method of assessment for existing industrial noise affecting new residential properties are the references to:

- *"the source and absolute level of the noise together with the time of day it occurs"*
- *"for non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise"*
- *"the spectral content of the noise (ie whether or not the noise contains particular high or low frequency content) and the general character of the noise (ie whether or not the noise contains particular tonal characteristics or other particular features)."*

Considering the level of the noise source relative to existing noise levels is slightly less explicit but it is strongly implied by the statement with regard to night time impacts that *"The adverse effect can also be greater simply because there is less background noise at night"*.

With regard to absolute internal noise levels, such as those in BS 8233, the planning practice guidance states that *"consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time"*. Whilst not explicitly stating that this is an acceptable solution, it is implied that it could be.

Consideration is given in the planning practice guidance to impacts on external areas of new residential developments in that *"the noise impact may be partially off-set if the residents of those dwellings have access to:*

- *a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling, and/or;*
- *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 with increasing noise exposure and could be such that significant adverse effects occur, and/or;*
- *a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings, and/or;*
- *a relatively quiet, protected, external publically 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)."*

No definition of 'relatively quiet', or of the point at which noise levels in a garden or balcony would constitute a significant adverse effect, is provided.

2.1.6 Summary of Applicable Guidance and Planning Policy Discussion

The current planning policy guidance (NPPF, NPSE and planning practice guidance) outlines what planning authorities should consider in determining applications for new residential developments affected by existing industrial noise. The key factor is whether or not the proposed new houses would be subject to adverse effects from the existing industrial noise and, if those adverse effects would be significant. However, the advice on determining the onset of adverse effects and significant adverse effects is fairly broad-brush. It includes references to the consideration of both absolute levels and levels relative to the existing background. Reference to specific methodologies or guideline levels for specific noise sources, such as BS 4142, BS 8233 and WHO guidelines, are not made. By necessity the planning policy guidance is written with a view to maximising its applicability to a wide range of noise sources and situations.

Therefore, in determining the onset of adverse effects and significant adverse effects from industrial noise affecting proposed residential developments, noise consultants are free to apply the methodology/guidance deemed most applicable for the specific circumstances. Unfortunately the use of a methodology based on relative external noise levels (BS 4142) can potentially result in a very different conclusion on the onset of adverse effects and significant adverse effects than the use of a methodology based on compliance with absolute noise limits, both internal and external (BS 8233 and WHO 1999 guidelines). Both BS 4142 and BS 8233 acknowledge the potential for using the opposite approach, but neither provide definitive guidance on when each is most appropriate, or how to resolve any conflict in the conclusions reached.

The potential for conflicting conclusions reached using different approaches can lead to delays to the planning process, costly planning inquiries, aborted developments or land use conflicts.

2.2 Responsibilities for Resolution of a Noise Issue

Once planning permission is granted for a new residential development adjacent to an existing industrial operation the responsibility for dealing with any subsequent noise complaints lies with the Local Authority. Unless there is a clear breach of a planning condition imposed on the residential development, for example, a noise barrier designed to protect future occupiers not being installed, any noise complaints must be investigated by the Local Authority with a view to determining if the noise amounts to a statutory nuisance. Where they are satisfied that a statutory nuisance exists or is likely to occur, the Local Authority must serve a notice under the Environmental Protection Act 1990, requiring the abatement of the nuisance, or requiring necessary works to be carried out to achieve the abatement of the nuisance. An industrial operation adjacent to a new residential development is therefore vulnerable to the serving of such a notice and the resulting costs to

mitigate the noise in order to abate the nuisance. In the worst case scenario, the on-going viability of the industrial operation may be put at risk.

To determine if a noise complaint amounts to a statutory nuisance the Local Authority relies on the professional judgement of the relevant Environmental Health Officer (EHO). There are no set criteria for specific noise sources above which a statutory nuisance is deemed to occur. In coming to a decision the EHO will take into account the same factors as outlined in the planning practice guidance in determining the onset of adverse and significant adverse effects. Guidance such as BS 4142 and BS 8233 may be used in making the decision.

It is worth noting that this situation does not arise with regards to noise from other noise sources, such as road and rail traffic, which do not fall under the remit of the Environmental Protection Act 1990.

The NPPF and planning practice guidance acknowledge the potential vulnerability of existing industrial premises to statutory nuisance action. The introduction of new noise sensitive development should not place 'unreasonable restrictions' on existing industrial operations.

Therefore, at the planning application stage the Local Authority has a responsibility to protect the future residents from unacceptable industrial noise, **and** the industrial operations from any future requirements to implement potentially costly noise abatement measures.

3 CASE STUDY

3.1 Introduction

A planning application proposing the redevelopment of farmland to form a predominantly residential development, was submitted to the local authority in 2013 (before the recent update to BS 8233). The proposed site is adjacent to an industrial site containing a range of uses including a container yard, warehousing, batching plant, and rail freight terminal. Some elements of the industrial site operate 24 hrs a day. The nature of the sound from the industrial site includes a mechanical drone from the batching plant, impulsive noise from HGVs manoeuvring including the hiss of airbrakes, and mobile plant working in the container yard (engine noise and banging during container movement). Noise from the industrial operations could be a significant contributor to the ambient noise environment at the adjacent proposed development site, depending upon the nature of works on-going.

The nearest existing residential property was over 200m from the site boundary. The proposed development included residential properties approximately 30m from the site boundary.

3.2 Local Authority Requirements

The Local Authority specified the following internal and external criteria at new residential dwellings:

- 50 dB $L_{Aeq,16hr}$ between 07.00 – 23.00 hrs in garden areas
- 35 dB $L_{Aeq,16hr}$ inside dwellings between 07.00 – 23.00 hrs
- 30 dB $L_{Aeq,8hr}$ inside bedrooms between 23.00 – 07.00 hrs
- 45 dB L_{Amax} inside bedrooms between 23.00 – 07.00 hrs

The criteria are based on the guidance on absolute noise levels in BS 8233 and WHO 1999 guidelines. The L_{Aeq} criteria in these documents are based on a 'steady' noise. Only the internal night time L_{Amax} criterion relates to intermittent or impulsive noise.

3.3 Noise Assessment

3.3.1 Approach

Operational noise measurements of current activities on the industrial site were used to determine representative sound power levels for the various activities.

A noise model was developed to include the general plot layout of the proposed residential development, the layout of the industrial site, and the observed position of activities within the industrial site. The noise modelling included both stationary and mobile/moving point sources as appropriate to best represent each activity. Separate daytime and night-time operational scenarios were modelled based upon typical existing operations at the site, followed by modelling of separate daytime and night-time operational scenarios based upon the realistic future operation of the site, as envisaged by the owner. This included for the potential intensification of some activities and an extension of the operating hours of some activities, which are unrestricted under the planning controls on the site.

Background L_{A90} levels at night were noted as being in the low 30 dB range, and during the day the low 40 dB range.

3.3.2 Results

The BS 4142 assessment indicated that the rating levels of the industrial noise at the closest approaches of the proposed residential development would exceed the background noise levels by 10-15 dB during the day and 20-25 dB at night for the existing scenario. The rating level included a penalty for acoustic character of the noise. The predictions included the attenuation provided by a substantial noise barrier on the site boundary. Based on the guidance in BS 4142 the results of the assessment indicated a high likelihood of complaints from future residents. The rating level increased slightly for the scenario considering the potential future operation of the site. This assessment is based purely upon noise levels predicted outside the proposed dwellings.

The assessment against the internal absolute noise criteria specified by the Local Authority demonstrated that the necessary reduction should be readily achievable through consideration of appropriate glazing and ventilation. However, to maintain the appropriate internal noise levels, windows would be required to remain closed.

The daytime (free-field) noise levels at the most exposed façade of the properties were found to exceed the requirement for noise levels in gardens specified by the Local Authority, by a maximum of around 5 dB. However, it was anticipated that suitable noise levels in the gardens were achievable by orienting the layout of the development so as to provide shielding to gardens in the form of buildings.

With respect to L_{Amax} levels, predictions were also undertaken within the noise model, of noise levels at the proposed dwellings. This accounted for the L_{Amax} attributable to each of the noise sources modelled, including the operation of HGV air brakes at a yard directly adjacent to the residential development, which would be used at night. The assessment demonstrated that the external and internal criteria recommended by the BS 8233/WHO 1999 guidelines, and specified by the Local Authority, would be met.

3.3.3 Conclusions

The results of the BS 412 assessment indicated a high likelihood of complaints from future residents of the proposed new dwellings at the closest approach to the existing industrial site.

Conversely, the internal and external criteria required by the Local Authority, based on the guidance in BS 8233 and the WHO 1999 guidelines, appeared readily achievable.

4 EXAMPLE ATTEMPTS AT RESOLUTION

4.1 Published Guidance

Some UK local authorities have issued guidance to assist those involved in development to resolve noise issues. Some have issued more detailed guidance indicating assessment methodologies and noise levels that may be considered acceptable for various scenarios, and in some circumstances these have attempted to provide guidance on the assessment of industrial noise affecting proposed residential development. The following is an extract from guidance published by Leeds City Council where an attempt to resolve this issue is made.

“3.1 This advice aims to protect the occupiers of your new noise sensitive premises from noise from existing industrial or commercial premises.

Developers should carry out an assessment in accordance with BS4142 to determine the rating level at the new development. This rating level can be determined including proposed attenuation measures. It is recommended that during normal daytime hours, 0700 to 2300 hours, the BS4142 rating level, measured over 1 hour, should be 5dB below the background level (L_{A90}). During the night-time period, 2300 to 0700 hours, the BS4142 rating level, measured over 5 minutes, should be 5dB below the background level (L_{A90}). However, it is recognised that a flexible approach may be required in certain circumstances where the need is justified. The following minimum standards may be accepted notwithstanding the rating level:-

- NR 25 in bedrooms (2300 to 0700)*
- NR 30 in all habitable rooms (0700 to 2300)*
- If there is a distinguishable tone the NR curves should be reduced to NR 20 and NR 25 respectively*
- Noise Rating curves should be measured as a 15 minute linear L_{eq} at the octave band centre frequencies 31.5 Hz to 8 kHz.*
- For outdoor areas a BS 4142 rating of up to +5 dB higher than the background level (L_{A90}) may be accepted.*
- In addition the levels specified in Appendix 1 should not be exceeded.*
- All indoor levels shall be taken with windows open **or** with alternatively provided acoustic ventilation over and above “background” ventilation.”¹⁰*

Appendix 1 of this document states that the noise level should not exceed:

- “ $L_{Aeq}(1 \text{ hour})$ of 35 dB in living rooms during the daytime;*
- $L_{Aeq}(1 \text{ hour})$ of 55 dB in gardens during the daytime;*
- $L_{Aeq}(1 \text{ hour})$ of 30 dB in bedrooms during the night; and*
- L_{Amax} of 45 dB in bedrooms at night.”*

These values are taken directly from BS 8233: 1999, although the L_{Aeq} values are referenced over a 1-hour period.

Tonal industrial noise sources are addressed more thoroughly through the use of NR curves, rather than relying solely on the overall L_{Aeq} . Intermittent industrial noise sources, such as bangs, clicks, clatters, or thumps, are only covered at night through the L_{Amax} criterion.

4.2 Specific Example Case

An example is provided below where the assessment of the suitability of a proposed residential development, located adjacent to a commercial/industrial operator, involved the incorporation of both the relative BS 4142 and absolute BS 8233 assessment methodologies.

As part of the assessment it was requested that BS 4142 methodology be applied during the day and evening, and BS 8233 during the night. This was based upon the judgement that during the day and evening people could be outside, but at night only internal noise levels would need to be assessed because the occupants would be indoors. This resulted in the allowance of higher noise emissions by the commercial/industrial operator during the night than during the day. Whilst possibly pragmatic, the approach to daytime and evening assessment is not consistent with the scope of BS 4142 which is only intended to assess the likelihood of complaints arising “*from people residing in the building*”, not those using garden areas, and at night, does not consider the likelihood of complaints from those residing within the building, which would be identified using BS 4142. This demonstrates another interpretation of the use of these Standards.

5 DRAFT REVISED BS 4142

The 1997 version of BS 4142 states in the foreword that it “*may be helpful in certain aspects of environmental planning and may be used in conjunction with recommendations on noise levels and methods of measurement published elsewhere.*” This indicates that guidance on absolute noise limits, such as BS 8233 or the WHO 1999 guidelines, could be considered in conjunction with the results of a BS 4142 assessment though it is not explicit.

The draft revision of BS 4142 produced in 2014¹¹ goes a step further. Section 11 explicitly states that as well as considering the difference between the rating level and the background noise level, the “*absolute level of sound*” and the “*overall context*” in which the industrial sound is heard, should also be considered. This is illustrated in Example 4 in Annex A which describes a scenario where a factory is emitting noise with a rating level that is 6 dB above the background noise level. In this situation the document concludes that “*there could be a significant adverse impact depending on the context...Assessment indicates that the uncertainty should be carefully considered and it might be appropriate to consider the absolute criteria given in BS 8233.*” However, this draft does not state explicitly which result from assessment in accordance with BS 4142 or BS 8233 takes precedence.

6 CONCLUSIONS

A review of current policy and guidance highlights that the key factor in determining the acceptability of new residential development affected by existing industrial noise is the identification of the onset of adverse effects and significant adverse effects. By necessity, the guidance on how this is determined is provided in terms of a range of factors to be considered, rather than reference to individual guidance and methodologies for specific situations. Historically the emphasis in assessments of industrial noise has been on BS 4142 and its focus on comparing the industrial noise relative to the background noise level. The guidance on absolute L_{Aeq} levels in BS 8233 and the WHO 1999 guidelines suggests these limits are only intended for steady, continuous or anonymous noise. This is made more explicit in the 2014 version of BS 8233 which states lower limits may be applicable for noise with ‘specific character’.

As demonstrated by the case study considered in this paper, it is entirely feasible for an assessment based on the BS 4142 methodology to indicate a very different outcome in terms of the significance of adverse effects, than an assessment based on compliance with absolute internal and external criteria from BS 8233 and WHO 1999 guidelines.

Resolving this conflict is critical for Local Authorities who have a duty to protect both future residents affected by existing industrial noise and the industrial premises which create the noise. Such premises run the risk of future enforcement action under the Environmental Protection Act 1990 if the right balance is not achieved.

The recent revision to BS 8233 does provide a step forward and the draft update to BS 4142 also acknowledges that consideration of absolute levels may also form part of an assessment. However, there is an absence of specific definitive guidance which can be applied consistently, and regarding which results take precedence. This can result in the decision falling to Local Authorities to judge what they deem to be acceptable for each individual development. Whilst this allows flexibility it also results in a wide variation in approach and criteria across England which can cause uncertainty, inequality and inefficiencies in the planning process.

7 REFERENCES

- 1 British Standard BS 4142: 1997 'Method for rating industrial noise affecting mixed residential and industrial areas', British Standards Institute.
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