Cole Jarman

Barnes Primary School, Additional Classrooms

Plant Noise Assessment

Report 20/0083/R2

Barnes Primary School, Additional Classrooms

Plant Noise Assessment

Report 20/0083/R2

McBains

Beechwood Grove Park
Waltham Road
Maidenhead
SL6 3LW

Revision	Description	Date	Prepared	Approved
0	1st Issue	27th November 2020	Jo Lacy	Andy Emery
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Cole Jarman Limited Reg. in England and Wales No. 7102436
An RSK Company
Registered Office Spring Lodge, 172 Chester Road, Helsby WA6 0AR
www.colejarman.com info@colejarman.com

Head Office +44 (0)1932 829007
John Cree House, 24b High Street, Addlestone, Surrey, United Kingdom KT15 1TN
Manchester 0161 470 8888 | Fourways House, 57 Hilton Street, Manchester M1 2EJ
Bristol 0117 287 2633 | The Old School, Stillhouse Lane, Bristol BS3 4EB

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Attachments

Plant Noise Assessment

1 Introduction

1.1 It is proposed to add additional classrooms and other facilities at Barnes Primary School, by converting the existing two storey Caretaker's House into teaching space. A new air source heat pump (ASHP) is to be installed to serve the new building.

1.2 Cole Jarman have been instructed to undertake an environmental noise survey at the site and assess plant noise from proposed mechanical services plant items.

1.3 This report details the survey methodology and results, provides details of BREEAM 2018 POL05 under which one credit is sought, and details an undertaken plant noise assessment.

2 Site Description

2.1 The existing Caretaker's House is located to the northeast side of Cross Street, to the southwest of the adjacent KS2 part of the school site. The site is bounded to the northwest and southeast by residences on Westfields Avenue and Railway Side. The site and surrounding area can be seen on the attached site plan 20/0083/R2/F1.

3 Environmental Noise Survey

3.1 An attended noise survey was undertaken at the site on 22nd July 2020.

3.2 Noise measurements were made in the Key Stage 2 playground, close to the boundary with the existing Caretakers House, highlighted on the attached site plan 20/0083/R2/F1 as MP1.

3.3 The microphone was at 1.5m above local ground level in a free field position.

3.4 Measurements were made in the L_{Aeq}, L_{AE}, L_{Amax} and L_{A90} indices (see Glossary of Acoustic Terms for an explanation of the noise units used), using the equipment listed in table T1 below:

Item	Manufacturer	Type
Sound Level Analyser	Norsonic	118
Acoustic Calibrator	Norsonic	1251

T1 Equipment used during attended noise survey.

3.5 The microphone was fitted with a windshield and calibrated before and after the survey to ensure a consistent and acceptable level of accuracy was maintained throughout. No significant drift was observed.

3.6 Weather conditions during the survey period were warm and dry with very light cloud cover and little to no wind.

Results

3.7 The noise climate at the site during the survey period was noted to be primarily affected by aircraft approaching London Heathrow airport to land, as well as distant road traffic.

3.8 The period results of the measurements are tabulated below:

Period	L_{Aeq}	L_{Amax}	L_{A90}
MP1 – on school site			
1020-1030	49	68	34
1030-1045	51	68	36
1045-1100	46	63	35
1100-1115	50	69	35

T2 Attended noise survey results

3.9 The representative background noise level ($L_{A90,15min}$) measured at the site during the daytime is considered to be 35dB.

4 Guidance and Standards

4.1 BREEAM POL 05

4.1.1 One BREEAM credit is targeted under POL 05, which may be awarded if the following requirements are met:

"There are no noise-sensitive areas within the assessed building or within 800m radius of the assessed site.
OR
2 Where there are noise-sensitive areas within the assessed building or noise-sensitive areas within 800m radius of the assessed site, a noise impact assessment compliant with BS 4142:2014(223) is commissioned. Noise levels must be measured or determined for:
2.a Existing background noise levels:
2.a.i at the nearest or most exposed noise-sensitive development to the proposed site
2.a.ii including existing plant on a building, where the assessed development is an extension to the building
2.b Noise rating level from the assessed building.
3 The noise impact assessment must be carried out by a suitably qualified acoustic consultant.
4 The noise level from the assessed building, as measured in the locality of the nearest or most

exposed noise sensitive development, must be ***at least 5dB lower*** *than the background noise throughout the day and night.*
5 If the noise sources from the assessed building are greater than the levels described in criterion 4, measures have been installed to attenuate the noise at its source to a level where it will comply with the criterion."

4.2 BS 4142:2014+A1:2019[1]

4.2.1 The relevant British Standard for assessing noise from mechanical services is BS 4142:2014+A1:2019 (henceforth "BS 4142"). All relevant details of this standard are contained within the attached Appendix A.

4.2.2 Assessment of the noise from the development against the criteria of BREEAM POL 05 above will be undertaken in accordance with the principles contained within BS 4142.

4.3 Local Authority Requirements

4.3.1 The site is located within the London Borough of Richmond upon Thames. The current local plan includes a Supplementary Planning Document *Development Control for Noise Generating and Noise Sensitive Development* (Adopted September 2018). Table 2 and supporting commentary in the document indicate that noise from new mechanical services installations should be assessed with reference to BS4142 guidance and as a general rule within the borough, the rating noise level should be controlled to no more than 5dB below the background noise level.

5 Suitably Qualified Acoustician

5.1 All consultants at Cole Jarman hold academic qualifications necessary to operate as professional acoustic consultants, holding diplomas or Bachelors/Masters degrees in acoustics related fields.

5.2 Cole Jarman are Sponsor members of the Institute of Acoustics, with all consultants being individual members. Cole Jarman is also a member of the Association of Noise Consultants, with the majority of consultants being ANC accredited sound insulation testers.

5.3 Jo Lacy, who has conducted the noise assessment for Barnes Primary School is an associate member of the Institute of Acoustics (IoA) and holds Bachelors and Masters Degrees in Acoustics. Andy Emery has checked all of the calculations and the report associated with this assessment. Andy is a full member of the IoA with over 13 years experience of acoustic design, he also holds a Masters Degree in Acoustics.

[1] BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*

6 Plant Noise Limits

6.1 Taking account of the results of the daytime noise measurements detailed in section 3 of this report, along with the guidance and standards set out in 4, a daytime plant noise limit of **30dB(A)** is derived.

6.2 The plant noise limit is to be achieved at 1m from the windows of all nearby noise sensitive receptors. Penalties for tonality, intermittency, impulsivity and any other characteristics in line with BS 4142 are to be applied as necessary.

6.3 No night-time noise measurements have been undertaken at the site, however it is noted the background noise levels measured during the daytime are already low. Section 11(1) of BS4142 provides some guidance on these situations as follows:

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

6.4 Considering this, we recommend the same limit of **30dB(A)** be applied during the night-time as well as the daytime. To put the recommended limit of 30dB(A) in context, allowing for a typical loss of 12dB(A) from a partially open window would result in noise levels below 20dB(A) inside any residences exposed to this level of external plant noise.

6.5 Internal noise levels below 20dB(A) are more than 10dB(A) below the guideline level of $L_{Aeq,8h}$ 30dB suggested in BS8233:2014[2], as being appropriate or bedrooms to provide suitable conditions for sleeping.

7 Plant Noise Assessment

7.1 Proposed Installation

7.1.1 It is proposed to install a single Air Source Heat Pump (ASHP) to serve underfloor heating to the new additional classrooms being created at Barnes Primary School. The unit being installed is a Daikin EPGA16DAV3.

7.1.2 BS 4142 character corrections have been considered for this plant item based on the manufacturer's provided acoustic spectra and the understood usage of the equipment. No character corrections are considered necessary for the chosen plant item.

[2] British Standard 8233:2014 - Guidance and sound insulation and noise reduction for buildings

7.1.3 The external condenser unit is proposed to be mounted at ground level in the existing playground area, against a boundary wall adjacent to the rear of the Caretakers' House. This location is highlighted on the attached site plan 20/0083/R2/F1.

7.2 Assessment

7.2.1 Noise from the proposed plant item has been assessed to the nearest and the most exposed noise sensitive location. This represents the worst-case scenario as all other noise sensitive windows in the area would benefit from additional distance and/or screening losses from the plant items. The assessment position is indicated on the attached site plan 20/0083/R2/F1 and are described below:

- AP1 – Upper floor rear window to 88 Westfields Avenue

7.2.2 The condenser unit will be available for use 24-hours a day, though during the night time period, when operational the condenser will typically operate at a reduced duty.

7.2.3 The assessment has taken account of point source radiation and distance losses, screening and façade reflections, as appropriate. The assessed manufacturer noise data for the external condenser unit are laid out in table T3 below:

Plant Item	**Sound Pressure Level, dB (L_p at 1m) at Octave Band Centred Frequency (Hz)**							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Daikin EPGA16DAV3 (full duty)	58	55.5	53	50	47	43	39	33
Daikin EPGA16DAV3 (night-time set back)	51	49	47	43	43	35	30	27

T3 Manufacturer noise data

7.3 Required Mitigation Measures

7.3.1 The results of our assessment indicate that mitigation of noise emissions from the condenser unit will be required in order to meet the noise emission limit, 30dB(A).

7.3.2 It will be necessary to install an acoustic enclosure around the condenser unit which must meet the insertion losses in each octave band as defined in table T4 below:

Enclosure	Insertion Loss (dB) Required at Octave Band Centred Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
ASHP Acoustic Enclosure	5	7	10	12	14	16	13	12

T4 Enclosure insertion loss requirements

7.3.3 We would typically expect the insertion losses required for the enclosure to be achievable with acoustic louvres of 300mm depth, or by a solid panel enclosure with convoluted attenuated air intake and discharge paths. The enclosure must be sized to allow adequate airflow to the ASHP while providing the sound reduction performance set out above. Companies such as Caice[3], Tek[4], EEC[5] and Environ[6] should be able to supply an enclosure meeting these requirements. The ASHP should be mounted on suitable resilient pads within the enclosure to minimise structure-borne noise transmission.

7.4 Assessment Results

7.4.1 With the specified mitigation measures in place, we have assessed the following noise levels at the nearest and most exposed noise sensitive locations, shown in table T5 below:

Location	Operating mode	Rating Noise Level, dB(A) (*Limit*)
AP1 – 88 Westfields Avenue	Full duty	29 *(30)*
AP1 – 88 Westfields Avenue	Night-time set back	23 *(30)*

T5 Plant noise emission levels at the nearest noise sensitive locations

7.4.2 The full details of the calculations can be seen in the attached calculations sheets 20/0083/R2/CS1 – 20/0083/R2/CS4. It can be seen from the results in table T5 above that with the specified mitigation measures in place, the calculated noise rating levels will meet the requirements of BREEAM POL 05 and the local planning authority.

[3] https://www.caice.co.uk/
[4] http://www.tek-ltd.com/
[5] http://eec.co.uk/
[6] http://www.environ.co.uk/

8 Conclusion

8.1 It is proposed to add additional classrooms and other facilities at Barnes Primary School, by converting the existing two storey Caretaker's House into teaching space. A new air source heat pump (ASHP) is to be installed to serve underfloor heating within the new building.

8.2 Cole Jarman have been instructed to undertake an environmental noise survey at the site and assess plant noise from proposed mechanical services plant items.

8.3 This report has provided details of an undertaken environmental noise survey, details of BREEAM 2018 POL 05 under which one credit is sought and details an undertaken plant noise assessment. Mitigation measures have been proposed where necessary and practicable in order to achieve local planning authority and POL 05 requirements, in the form of an acoustic enclosure around the external ASHP unit.

End of Section

Glossary of Acoustic Terms

L_{Aeq}:

The notional steady sound level (in dB) which over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measurement over that period. Values are sometimes written using the alternative expression dB(A) L_{eq}.

L_{Amax}:

The maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise when occasional loud noises occur, which may have little effect on the L_{Aeq} noise level. Unless described otherwise, L_{Amax} is measured using the "fast" sound level meter response.

L_{A10} & L_{A90}:

If non-steady noise is to be described, it is necessary to know both its level and degree of fluctuation. The L_{An} indices are used for this purpose. The term refers to the A-weighted level (in dB) exceeded for n% of the time specified. L_{A10} is the level exceeded for 10% of the time and as such gives an indication of the upper limit of fluctuating noise. Similarly L_{A90} gives an indication of the lower levels of fluctuating noise. It is often used to define the background noise.

L_{A10} is commonly used to describe traffic noise. Values of dB L_{An} are sometimes written using the alternative expression dB(A) L_n.

L_{AX}, L_{AE} or SEL

The single event noise exposure level which, when maintained for 1 second, contains the same quantity of sound energy as the actual time varying level of one noise event. L_{AX} values for contributing noise sources can be considered as individual building blocks in the construction of a calculated value of L_{Aeq} for the total noise. The L_{AX} term can sometimes be referred to as Exposure Level (L_{AE}) or Single Event Level (SEL).

End of Section

Title: Site plan showing noise survey measurement position and noise assessment receiver position

Figure 20/0083/R2/F1

Project: Barnes Primary School Additional Classrooms

Date: 4 December 2020 Revision: 1

Scale: Not to scale

Cole Jarman Limited
t +44 (0)1932 829007 f +44 (0)1932 829003

John Cree House, 24B High Street, Addlestone, Surrey KT15 1TN
e info@colejarman.com w www.colejarman.com

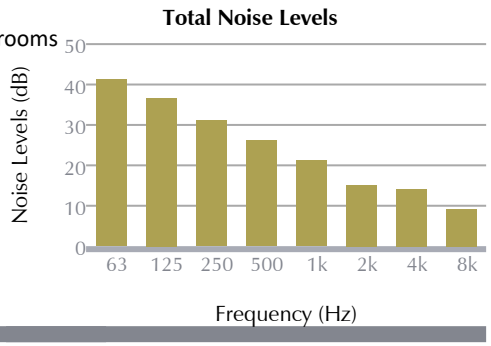
ASHP heating to AP1 day

		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - ASHP heating									
Sound Pressure Levels @ 1m		**58.0**	**55.5**	**53.0**	**50.0**	**47.0**	**43.0**	**39.0**	**33.0**
Conformal area correction - sound pressure to sound power									
Distance (m)	1.0								
Type - Semi-anechoic									
		14.0	*14.0*	*14.0*	*14.0*	*14.0*	*14.0*	*14.0*	*14.0*
Point Source Radiation Loss									
Radiation - Hemispherical									
Single Figure Read	8.0								
		-8.0	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*
Point Source Distance Loss									
Start Distance (m)	1.0								
End Distance (m)	11.0								
		-20.8	*-20.8*	*-20.8*	*-20.8*	*-20.8*	*-20.8*	*-20.8*	*-20.8*
Silencer									
Silencer - Acoustic Enclosure									
		-5.0	*-7.0*	*-10.0*	*-12.0*	*-14.0*	*-16.0*	*-13.0*	*-12.0*
Facade Reflection									
Reflection (dB)	3.0								
		3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
External Receiver									
External Receiver - AP1 day									
Sound Pressure, Lp		**41.2**	**36.7**	**31.2**	**26.2**	**21.2**	**15.2**	**14.2**	**9.2**

ASHP heating night mode to AP1 night

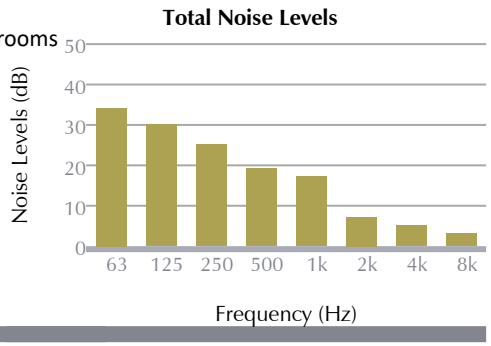
		Octave Band Centre Frequency (Hz)							
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Noise Source									
Noise Source - ASHP heating night mode									
Sound Pressure Levels @ 1m		**51.0**	**49.0**	**47.0**	**43.0**	**43.0**	**35.0**	**30.0**	**27.0**
Conformal area correction - sound pressure to sound power									
Distance (m)	1.0								
Type - Semi-anechoic									
		14.0	*14.0*	*14.0*	*14.0*	*14.0*	*14.0*	*14.0*	*14.0*
Point Source Radiation Loss									
Radiation - Hemispherical									
Single Figure Read	8.0								
		-8.0	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*	*-8.0*
Point Source Distance Loss									
Start Distance (m)	1.0								
End Distance (m)	11.0								
		-20.8	*-20.8*	*-20.8*	*-20.8*	*-20.8*	*-20.8*	*-20.8*	*-20.8*
Silencer									
Silencer - Acoustic Enclosure									
		-5.0	*-7.0*	*-10.0*	*-12.0*	*-14.0*	*-16.0*	*-13.0*	*-12.0*
Facade Reflection									
Reflection (dB)	3.0								
		3.0	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*	*3.0*
External Receiver									
External Receiver - AP1 night									
Sound Pressure, Lp		**34.2**	**30.2**	**25.2**	**19.2**	**17.2**	**7.2**	**5.2**	**3.2**

Project Name	Barnes Primary School, Additional Classrooms
Project Reference	20/0083
Receiver Reference	AP1 day
Description	88 Westfields Avenue
Noise Limit	30
dBA	28.7



Reference	Noise Levels (dB)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
ASHP heating	41.2	36.7	31.2	26.2	21.2	15.2	14.2	9.2

Project Name	Barnes Primary School, Additional Classrooms
Project Reference	20/0083
Receiver Reference	AP1 night
Description	88 Westfields Avenue
Noise Limit	30
dBA	22.6



Reference	Noise Levels (dB)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
ASHP heating night mode	34.2	30.2	25.2	19.2	17.2	7.2	5.2	3.2

Appendix A

Subject:	**Summary of relevant British Standard**		
Project:	**Barnes Primary School, Additional Classrooms**		
Date:	**27 November 2020**	**Prepared:**	**JL**
Revision:	**0**	**Approved:**	**AE**

This document sets out the various standards and national guidance upon which the design advice has been based.

A1 BS 4142:2014

A1.1 Regarding noise impact from a commercial or industrial source, BS 4142:2014 provides an assessment methodology and criteria relating to:

a. sound from industrial and manufacturing processes;

b. sound from fixed installations which comprise mechanical and electrical plant and equipment;

c. sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and

d. sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

A1.2 The application of the standard is detailed below:

"This standard is applicable to the determination of the following levels at outdoor locations:

a) rating levels for sources of sound of an industrial and/or commercial nature; and
b) ambient, background and residual sound levels,

for the purposes of:

1) investigating complaints;
2) assessing sound from proposed, new, modified or additional source(s) of sound of an industrial and/or commercial nature; and
3) assessing sound at proposed new dwellings or premises used for residential purposes."

Summary of relevant British Standard

A1.3 The rating level of noise from the facility is calculated, over a set period, at each of the nearest noise sensitive locations. This rating level is then compared with the existing background sound level.

A1.4 The standard recommends the following reference time period T_r over which the specific sound should be evaluated, for each of the day and night periods:

T_r = 1 hour during the day; and

T_r = 15 minutes during the night.

A1.5 The standard states that daytime is typically between 07:00h and 23:00h. Accordingly, night-time is between 23:00h and 07:00h.

A1.6 The reason for the shorter night time assessment period of 15 minutes is identified in the standard as follows:

"The shorter reference time interval at night means that short duration sounds with an on time of less than 1 h can lead to a greater specific sound level when determined over the reference time interval during the night than when determined during the day."

A1.7 The rating level of noise for the assessment periods, $L_{Ar,\,Tr}$ is the calculated noise level at the nearest receiver location, adjusted depending on the acoustic characteristic of the noise source. Adjustment factors are based on any tonality, impulsivity, intermittency and other characteristics present in the resultant sound at the receiver position. The level or appropriateness of any penalty will depend both on the type of noise source and the context in which it is perceived. Similarly, in accordance with BS 4142, the period of time for which an individual noise source is active during the relevant reference time period will also be considered in establishing the rating level.

A1.8 It will also be necessary to consider the existing noise climate and what sound sources contribute to it. For example, where a noise generating activity is proposed adjacent to an existing similar noise generating site, the impact of the new noise source would be less than if it were to be planned in a location where its character and type is different to and more noticeable than any existing noise source nearby.

A1.9 With regard to the background sound level against which the rating level is compared, the standard states the following:

"In using the background sound level in the method for rating and assessing industrial and commercial sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods."

A1.10 The periods of interest over a 24 hour day are usually related to day time activities (07:00-23:00h) and night time (23:00-07:00h). However the standard makes the following statement:

"Among other considerations, diurnal patterns can have a major influence on background sound levels and, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes. Furthermore, in this general context it can also be necessary to separately assess weekends and weekday periods."

A1.11 Therefore, the periods of time which are typically considered 'waking up' and 'falling asleep' stages, for example 06:00h to 07:00h and 23:00h to 24:00h, may need to be considered independently. Alternative periods may also be identified where breakdown beyond the standard day and night time analysis will be necessary, for example where background sound levels are shown to be regularly elevated. Similarly, both weekend and weekday periods may need to be considered separately, with criteria set for both. The requirement to analyse specific time periods should be considered for each site individually.

A1.12 Once the rating level at each receptor has been calculated, reference can be made to the following commentary in BS 4142 in relation to conducting an initial assessment of the impact, based on the difference between the rating level of the noise source and the pre-existing background sound level.

"Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (see Clause 8) from the rating level (see Clause 9), and consider the following.

NOTE 1 More than one assessment might be appropriate.

a) Typically, the greater this difference [between industrial site noise rating level and baseline background level], the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) 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.

NOTE 2 Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."

A1.13 It can be seen that the likelihood of a significant adverse impact occurs once the rating level is at least 10 dB greater than the representative background sound level (depending on context).

A1.14 In addition to the above, BS 4142 also states:

"For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."

A1.15 When assessing whether the existing sound levels are low, it is also relevant to refer to other standards which provide absolute thresholds for suitable noise levels inside buildings, such as BS 8233:2014 as described above. A rating level of 30 dB is typically considered a lower limit for design criteria; background levels below 30 dB and rating levels below 35 dB were considered 'very low' in BS 4142:1997. Where the existing background level is considered low on this basis, the aim would typically be to achieve a rating level of 30 dB, regardless of the comparison with the background level.

A1.16 Following the initial impact assessment described above, it is necessary to modify the initial impact assessment based on context.

A1.17 The standard states the following (with emphasis added) regarding the introduction of a new noise-sensitive receptor in paragraph 8.5:

"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 ought to 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."***

A1.18 This explicitly states that standards other than BS 4142 can be considered in the context of a scheme, where new noise sensitive development is proposed next to an existing noise source.

A1.19 It goes on to state that where the initial estimate of the impact needs to be modified due to the context, all pertinent factors should be taken into consideration, including the following:

"1) The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

2) The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.

NOTE 3 Consideration ought to be given to evidence on human response to sound and, in particular, industrial and/or commercial sound where it is available. A number of studies are listed in the "Effects on humans of industrial and commercial sound" portion of the "Further reading" list in the Bibliography.

3) 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:

i) facade insulation treatment;

ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and

iii) acoustic screening."

A1.20 As detailed in point 1 above following the initial impact assessment it is necessary to consider if the assessed impact should be changed due to the absolute level of the noise. When considering absolute noise levels for new dwellings it is appropriate to consider the criteria for dwellings near to industrial noise given within BS 8233. Where the noise rating level is below the criteria set for external amenity areas within BS 8233 the noise impact is considered to not be an adverse impact.

A1.21 Where the impact affects internal noise levels it is appropriate to install mitigation in the form of façade insulation treatment and alternative ventilation. In order to establish the required performance of this mitigation it is necessary to consider the absolute internal noise levels from the industrial source.

A1.22 BS 8233 provides appropriate criteria for absolute noise levels from industrial noise within dwellings. This is based on the following guidance on internal noise within dwellings in BS 8233:

"This subclause applies to external noise as it affects the internal acoustic environment from sources without a specific character, previously termed "anonymous noise". Occupants are usually more tolerant of noise without a specific character than, for example, that from neighbours which can trigger complex emotional reactions. For simplicity, only noise without character is considered in Table 4. For dwellings, the main considerations are:

a) for bedrooms, the acoustic effect on sleep; and

b) for other rooms, the acoustic effect on resting, listening and communicating.

NOTE 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."

A1.23 The guidance above makes it clear that noise which has a specific character may require lower noise criteria than proposed for anonymous steady noise sources. BS 4142 deals with this by applying penalties to certain characteristic. Consequently, the rating level already accounts for noise which has a specific character, such that the L_{Aeq} noise level will be lower than the rating level.

A1.24 Paragraph 6.5.2 of BS 8233 states the following for residential developments in areas affected by industrial noise:

"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."

A1.25 The quote above is explicit in stating that the methods for **rating** the noise in BS 4142 should be applied i.e. deriving a rating level, L_{Ar}. It does not state that a full BS 4142 'assessment' should be conducted. The reference to the background noise level relates only to a statement of the scope of BS 4142.

A1.26 It is clear that BS 4142 notes the use of façade insulation treatment (and associated appropriate ventilation) as mitigation. This is consistent with PPG guidance as noted in relevant sections of this appendix. In terms of ventilation, it notes that such mechanisms should be provided to reduce the need to have windows open but it does not state that windows must be kept closed. This principle is in line with BS8233 guidance where assessment should be considered with windows closed, but background ventilation provided; it is also in line with PPG where windows can be closed some of the time (i.e. not all of the time) to ensure a SOAEL is not reached.

Summary of relevant British Standard

A1.27 BS 8233 directs BS 4142 to be used in order to establish the noise rating level from the industrial noise source. This allows for the character of the source to be fully taken into account so that the noise criteria from BS 8233 table 4 (Section 7) can be applied to this type of source. It is important to highlight that BS 8233 is explicit when stating that only the noise rating levels from BS 4142 should be applied. It does not state that a full assessment in line with the BS 4142 methodology should be conducted.

End of Section

Cole Jarman Limited Reg. in England and Wales No. 7102436
An RSK Company

Registered Office Spring Lodge, 172 Chester Road, Helsby WA6 0AR
www.colejarman.com info@colejarman.com

Head Office +44 (0)1932 829007
John Cree House, 24b High Street, Addlestone, Surrey, United Kingdom KT15 1TN

Manchester 0161 470 8888 | Fourways House, 57 Hilton Street, Manchester M1 2EJ
Bristol 0117 287 2633 | The Old School, Stillhouse Lane, Bristol BS3 4EB