Compliance 4 Buildings Ltd

BS 4142:2014

NOISE SURVEY

Report Template

V1.1

Technical Report Number: 202321058M1058C/1

Our Reference: 202321058M1058C

Client: LUMI 1 Limited

Site: 82 High Street, Camden, NW1 0LT

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Site Address:	82 High Street, Camden, NW1 0LT
Client:	LUMI 1 Limited
Client Address:	82 Camden High Street
Submitted To:	Nathan Abel
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Date:	22nd March 2023

QA CONTROL:

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REVISION HISTORY:

REVISION	DESCRIPTION	DATE	PREPARED	APPROVED
Final	Final	22nd March 2023	Tony Trup	Elliot Hurst

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APPENDICES

1.0 QUALIFICATIONS AND EXPERIENCE

The survey was undertaken by Elliot Hurst, BSc, MSc AMIOA. Elliot has substantial experience in acoustic surveying and holds the industry-standard Postgraduate Diploma in Acoustics and Noise Control and a MSc in Applied Acoustics.

The assessment and report were written by Tony Trup, BMus MIOA. Tony has been in acoustics consultancy since 2012 and has significant experience in building and mechanical acoustics.

About Compliance 4 Buildings Ltd

Compliance 4 Buildings Ltd is a consultancy established in 2019 offering a project managed approach to building compliance and acoustics.

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Compliance 4 Buildings Accreditations

Compliance 4 Buildings hold numerous professional accreditations. Compliance 4 Buildings is insured and Registered with all appropriate authorities. Our testing equipment is of the highest quality and fully calibrated and serviced in line with manufacturer’s instructions.

1.0 INTRODUCTION

A kitchen extract fan has been installed at 82 Camden High Street, London, NW1 0LT.

Compliance 4 Buildings have been instructed to undertake a noise impact assessment in accordance with the Local Authority's requirements, and, where required, specify mitigation measures. This report presents our findings.

2.0 PROJECT DESCRIPTION

2.1 Location and context

The site is located at 82 Camden High Street, London, NW1 0LT, within the purview of the London Borough of Camden.

The area is generally mixed use on a primary high street, with commercial uses on ground floors, and residential at first floor and above in most buildings.

Figure 1 Site location (maps.google.co.uk)

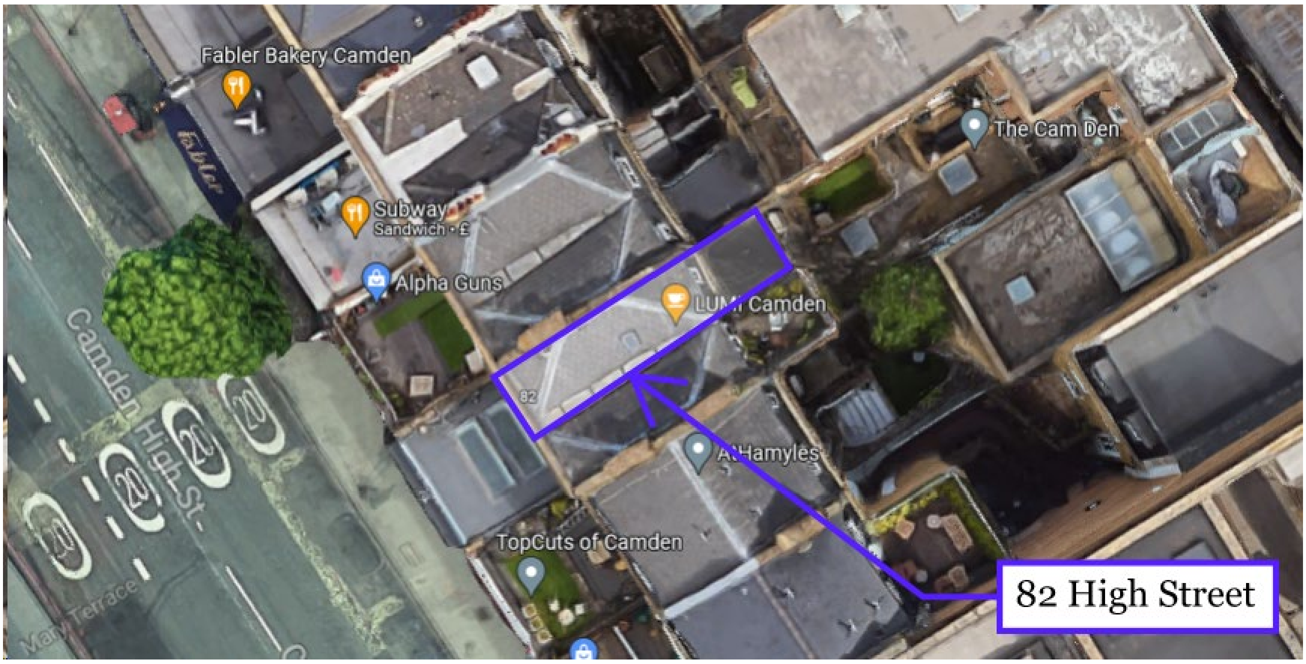

Figure 2 Satellite image (Google, Getmapping plc, Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Maps)

The site comprises a ground floor retail unit with residential apartments above. There is an enclosed yard/lightwell at the rear, in which the kitchen extract fan has been installed.

The dominant sources of noise at the rear of site comprise mechanical plant serving 82 Camden High Street and neighbouring premises, train noise, noise from a boiler flue emanating from a property directly behind the property and road traffic from Camden High Street and surrounding areas.

2.2 Installation

The kitchen extract fan to be assessed has been installed to the rear of the property in an enclosed courtyard. The fan is located internally, and the discharge duct penetrates the façade at ground floor level, rising to roof level (above second storey). See Photo 1 and Figure 3.

A bird net is installed approximately 3m from ground floor level, spanning the entire courtyard.

We understand the proposed operating hours of the equipment are daily from 09:30 to 17:00 and 09:00 to 16:00 Sundays and Bank Holidays.

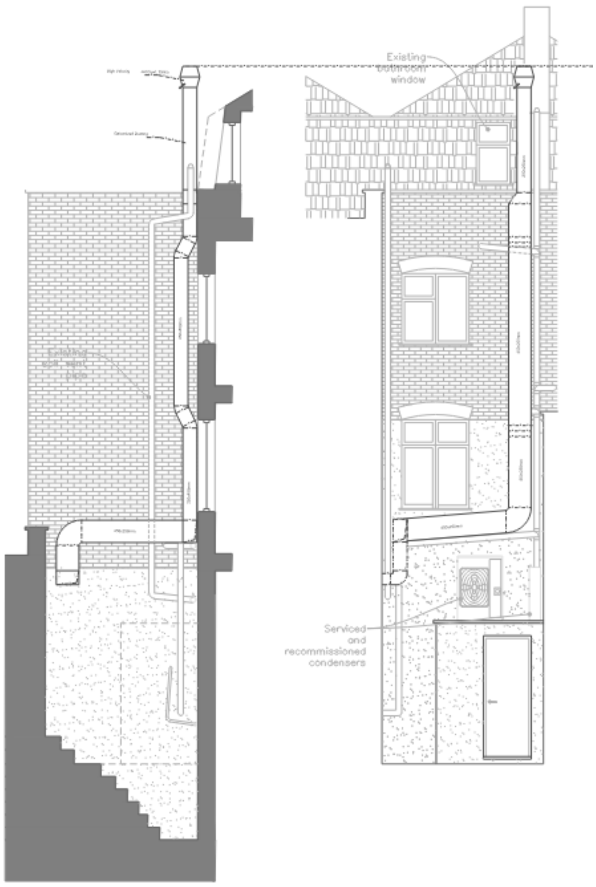

Figure 3 Elevations

2.3 Noise-sensitive receptors (NSRs)

The nearest noise-sensitive receptors are the residential premises at first, second and third floors of 82 High Street. The nearest window is a bathroom window, approximately 1.3 m from the fan discharge (see Figure 3).

2.4 Subjective impression

While on site, it was felt that noise from the existing condenser and supply fan (not part of this application), were dominant. Some breakout noise from the kitchen extract fan (KEF) in question was audible.

The environmental soundscape consisted primarily of road traffic from the surrounding area.

3.0 ASSESSMENT METHODOLOGY

3.1 Local policy

Camden's Local Plan, Policy A4 Noise and Vibration, states,

"We will only grant permission for noise generating development, including any plant and machinery, if it can be operated without causing harm to amenity."

Appendix 3 of the Local Plan discusses industrial and commercial noise sources, and states,

"Where appropriate and within the scope of the document, it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS4142) will be used. For such cases a 'Rating Leve' of 10 dB below background (15 dB if tonal components are present) should be considered as the design criterion."

3.2 BS 4142:2014

British Standard BS 4142[2014] + A1(2019) *Method for rating and assessing industrial and commercial sound* is widely used by local authorities to determine whether a new industrial noise source is likely to give rise to complaint from people living nearby.

BS 4142[2014] + A1(2019) sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS 4142[2014] + A1(2019) for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,Tr}$ 'specific sound level', immediately outside the dwelling with the LA90,T background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other attention-catching acoustic characteristics, then a penalty depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{Ar,Tr}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

BS 4142[2014] + A1(2019) states: "The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs". An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

- "Typically, the greater this difference, the greater the magnitude of the impact."
- "A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."
- "A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context."
- "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 negligible impact, depending on the context."

- During the daytime, the assessment is carried out over a reference time-period of 1-hour, and 15-minutes during the night-time. The periods associated with day and night, for the purposes of the assessment, are 07.00 to 23.00 and 23.00 to 07.00, respectively.

The initial estimate of the impact may need to be modified due to the context of the assessment. Section 11 of BS 4142[2014] + A1(2019) states that where background sound levels and rating levels are low, absolute levels might be more relevant than the margin by which the rating level exceeds the background.

4.0 NOISE SURVEY

4.1 Personnel

The survey was undertaken by Elliot Hurst, BSc, MSc AMIOA. Elliot has substantial experience in acoustic surveying and holds the industry-standard Postgraduate Diploma in Acoustics and Noise Control.

The assessment was undertaken by Tony Trup BMus MSc MIOA MAES. Tony possesses the industry-standard Postgraduate Diploma in Acoustics and Noise Control, and an MSc in Sound and Music Computing. Tony has over ten years of experience in measuring and assessing noise impact as well as designing mitigation and control of noise and vibration on buildings and infrastructure projects.

4.2 Equipment

Table 1 presents the equipment used during the survey.

ITEM	MAKE AND MODEL	SERIAL NO.	LABORATORY CALIBRATION
Type 1 Sound Level Meter	Svantek 977C	97481	June 2021
Field calibrator	Svantek SV36	109944	June 2022

Table 1 Survey equipment

The sound level meter was calibrated before and after the measurements, and no significant drift was found to have occurred (0.2 dB).

4.3 Measurement position

Due to the installation of a bird net approximately 3 m from ground level, and no access to the nearest-affected residential premises (directly above), we were unable to locate our microphone close to the nearest-sensitive receptors.

Measurements were undertaken with a microphone located on a tripod approximately 1.5 m from ground level, in the rear courtyard where the exhaust duct is located.

4.4 Method

Sound pressure level measurements were undertaken from 07:00 to 09:00 to understand the background sound level in the absence of the specific plant noise. These measurements were undertaken in 15-minute intervals.

Due to the restricted access, we have undertaken an impact assessment of both the measured sound levels, and precited sound levels using manufacturer’s noise data.

4.5 Measurement results

A summary of the measured noise levels is presented in Table 2.

Table 2 Summary of measurements, dB sound pressure levels

START TIME	T (MIN)	COMMENT	$L_{AEQ,T}$	$L_{A90,T}$
07:00	15	Background sound level. Fan not operating. Ambient sound comprising mechanical plant from neighbouring premises, and road traffic from High Street and the surrounding area.	49	46
07:15	15		50	47
07:30	15		53	47
07:45	15		48	46

08:00	15		49	46
08:15	15		49	48
08:30	15		49	47
08:45	15		49	46
09:01	5	Kitchen extract fan (KEF) off. Some ambient sound from existing supply fan and condenser unit (not part of this application).	49	46
09:07	2	KEF on setting 1. Some ambient sound from existing supply fan and condenser unit (not part of this application).	49	48
09:10	2	KEF on setting 3. Some ambient sound from existing supply fan and condenser unit (not part of this application).	50	49
09:13	2	KEF on setting 5. Some ambient sound from existing supply fan and condenser unit (not part of this application).	53	52
09:29*1	2	Condenser only. KEF and Supply fans off.	63	63
09:32*1	2	Supply fan only. KEF and condenser off.	65	63
09:35	2	Background. KEF off. Supply fan off. Condenser off.	48	47
09:37	2	Background. KEF off. Supply fan off. Condenser off.	47	45

The results in Table 2 are presented as measured. No corrections have been made.

*1 It is noted that the higher levels are caused by increased duty of the condenser and background noise

5.0 IMPACT ASSESSMENT

5.1 Background sound level

Some plant noise from other installations (notably the fan and condenser serving the nearby commercial premises) was present in the background sound. BS 4142:2014 discusses the treatment of background plant noise as follows, *"Since the intention is to determine a background sound level in the absence of the specific sound that is under consideration, it is necessary to understand that the background sound level can in some circumstances legitimately include industrial and/or commercial sounds that are present as separate to the specific sound."*

BS 4142:2014 also states, *"In practice, there is no 'single' background sound level as this is a fluctuating parameter. However, the background sound level used for the assessment should be representative of the period being assessed."*

On the basis of our measurements, we would propose a background sound level of 46 dB(A) during the daytime.

This background sound level and proposed criterion are subject to approval by the Local Authority.

5.2 Installation details

We understand the installation comprises a Helios 355/4 kitchen extract fan. We understand there are currently no attenuators or anti-vibration measures installed.

5.3 Acoustic feature corrections

In our experience, if kitchen extract fans are properly installed and balanced in accordance with manufacturer's instructions, they produce a steady, broadband sound without pulsating or tonal elements. There was a slight tonal characteristic when the fan was operating at setting 1, and this has been included in our assessment (see Table 3).

5.4 Uncertainty

In our experience, the noise of HVAC plant can vary by ±5 dB versus the design calculations, due to installation, balancing, calculation uncertainty and manufacturing variations. The Local Authority criterion of -10 dB below background sound level includes for a suitable buffer, such that, if the noise levels are 5 dB higher than predicted (as in the worst-case), then the sound level at the nearest receptor would still be substantially below the background sound level and have a negligible impact.

5.5 Assessment (Measured)

The specific sound level is calculated by using the L_{A90} of the measurements with the fan in operation and correcting for the corresponding background sound level measurements (excluding fan noise). The L_{A90} was used as it was considered representative of the steady nature of the fan at 82 High Street, compared to the fluctuating sound level caused by environmental road traffic and neighbouring plant, which may have impacted the $L_{Aeq,T}$ measurements.

It should be noted that, due to the presence of a bird net, and no access to the nearest noise-sensitive window, these measurements were undertaken at ground floor level. For a calculated assessment of predicted noise levels at the nearest noise-sensitive window, see 5.6.

Table 3 Noise impact assessment in accordance with BS 4142:2014, dB sound levels

	SETTING 1	SETTING 3	SETTING 5
Background-corrected specific sound level L_{As}	44	46	51
Acoustic feature corrections	0	0	0
Uncertainty correction	0	0	0
Rating level L_{Ar}	44	46	51
Background sound level	46	46	46
Exceedance over background sound level	-2	0	5
Local Authority requirement	36	36	36
Exceedance over Local Authority requirement	+8	+10	+15
Compliance with Local Authority requirement	Fail	Fail	Fail

5.6 Assessment (Calculated)

Given the duct termination and nearest sensitive window were not accessible, we have calculated the predict noise emissions at this nearest sensitive receptor, using manufacturer noise data presented in Table 4.

Table 4 In-duct sound power levels of proposed plant, dB re 2 x 10^{-2} W at octave band centre frequencies, Hz

ITEM	125	250	500	1K	2K	4K	8K
Helios GBW 355/4 (Exhaust)	72	69	68	63	59	55	46

Table 5 Calculated sound propagation of extract fan, dB at octave band centre frequencies, Hz

ITEM	125	250	500	1K	2K	4K	8K	DB(A)
Sound power level	72	69	68	63	59	55	46	69
Combined ducting losses (straights, bends, end reflection)	-13	-9	-11	-11	-11	-11	-11	-
Sound power level at outlet	60	59	57	52	48	44	36	-
Directivity (150 degrees)	-6	-8	-10	-13	-16	-18	-20	-
Propagation (1m hemispherical)	-8	-8	-8	-8	-8	-8	-8	-
Sound pressure level at 1m from nearest noise sensitive window	46	43	39	31	24	19	8	40
Acoustic feature corrections	0	0	0	0	0	0	0	
Uncertainty	0	0	0	0	0	0	0	
Rating level $L_{A,r}$								40
Background sound level								46
Local Authority requirement								36
Exceedance over Local Authority requirement								+4
Compliance with Local Authority requirement								

Duct breakout noise

We have also calculated an approximate reverberant sound pressure level from noise breaking out through the duct using an assumed reverberation time of 1.0 seconds across all frequencies for the courtyard. The predicted sound pressure level is 52 dB(A). It should be noted that this is not to be relied on for a detailed assessment due to the uncertainty in the assumed reverberation time, but it may indicate that ductwork breakout is in exceedance of the background sound level and the Local Authority's requirements. Our subjective impression was that ductwork breakout was audible, which also supports this.

6.0 DISCUSSION

It can be seen from the measurements in Table 2 that, as the fan duty was increased, so too the $L_{A90,T}$ increased. Given the measurement position was at ground level, it is likely that much of the sound at this level comes from ductwork break-out.

An approximate calculation of reverberant sound pressure level from ductwork breakout indicates it is likely to be problematic, and this is reinforced by our subjective impression of the sound.

It should also be noted that an existing supply fan and condenser unit were also operational at the time of the measurements. These do not form part of the same planning application, and were therefore left operational as they form part of the existing ambient and background soundscape. These plant items were audible, and therefore likely had a bearing on the measured sound levels.

By considering our calculated impact assessment as well as the measurements, it does appear as though the Kitchen Extract Fan (KEF) is in exceedance of the Local Authority's requirements, and mitigation measures are therefore required.

7.0 MITIGATION MEASURES

7.1 Noise

Airborne noise from the duct termination and breakout from the ductwork itself are thought to exceed the Local Authority's requirements. We therefore recommend installing an in-duct attenuator, which will reduce both the exhaust noise and the ductwork breakout noise. This attenuator should be installed as close to the fan as possible, on the exhaust side.

The following table presents our calculations, assuming an in-duct attenuator is installed, with minimum insertion losses as per Table 6 These insertion losses could be achieved with a five-foot long 5UGLS attenuator from IAC (Industrial Acoustics Company), or another attenuator from an alternative supplier.

Table 6 Calculated sound propagation of extract fan with in-duct attenuator, dB at octave band centre frequencies, Hz

ITEM	125	250	500	1K	2K	4K	8K	DB(A)
Sound power level	72	69	68	63	59	55	46	69
Attenuator (IAC 5UGLFS)	**-17**	**-31**	**-40**	**-41**	**-28**	**-22**	**-14**	**-**
Combined ducting losses (straights, bends, end reflection)	-13	-9	-11	-11	-11	-11	-11	-
Sound power level at outlet	60	59	57	52	48	44	36	-
Directivity (150 degrees)	-6	-8	-10	-13	-16	-18	-20	-
Propagation (1m hemispherical)	-8	-8	-8	-8	-8	-8	-8	-
Sound pressure level at 1m from nearest noise sensitive window	29	12	0	0	0	0	0	13
Acoustic feature corrections	0	0	0	0	0	0	0	
Uncertainty	0	0	0	0	0	0	0	
Rating level LA,r								13
Background sound level								46
Local Authority requirement								36
Exceedance over Local Authority requirement								-23
Compliance with Local Authority requirement								PASS

It should be noted that, while the predicted exhaust noise with an attenuator installed is significantly less than the Local Authority requirement, which may be thought of as over-specification. However, the ductwork breakout noise was predicted only to fall to 36 dB(A) with an attenuator this long installed, and it is on this basis that we recommend the attenuator.

Alternative suitable suppliers of attenuators include:

Caice

Allaway Acoustics

Any proposed attenuator should be provided by a reputable manufacturer with suitable experience, and should have been tested in a reputable acoustic test facility. Laboratory insertion losses should be presented to us prior to procurement to confirm compliance.

The attenuator should be installed as close as possible to the fan, ideally within the building and before the duct penetrates the wall.

7.2 Vibration

The fan and duct are currently rigidly fixed into the structure, which can result in structureborne noise and vibration.

We would recommend the fan is installed on spring isolation mounts with a minimum deflection of 25 mm. The ductwork should be connected to the fan with flexible canvas connections on both sides.

Suitable anti-vibration fixings and mounts can be sourced from a range of suppliers, including:

Mason UK

Christie and Grey

AMC Mecanocaucho

8.0 CONCLUSIONS

An attended noise survey was undertaken of kitchen extract fan noise at 82 Camden High Street.

Due to access restrictions, the impact of the fan has been assessed using calculated levels as well as measurements. Both assessments indicated an exceedance of the Local Authority's requirements due to exhaust and duct breakout noise.

Mitigation measures have been specified to reduce the levels of exhaust and duct breakout noise to comply with the Local Authority's requirements, in the form of a five-foot-long attenuator. Consideration should also be given to anti-vibration measures.

We would also note that an existing supply fan and condenser unit were clearly audible during our survey, but these do not form part of the present retrospective planning application.

2.0 REFERENCES

[1] BS 4142[2014] + A1(2019) – Method for Rating and Assessing Industrial and Commercial Sound. British Standards Institute, 2014.

[2] BS 8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings. British Standards Institute, 2014.

[3] BS 7445:2003 Part 1 – Description and Measurement of Environmental Noise: Guide to Quantities and Procedures. British Standards Institute, 2003.

[4] BS 7445:1991 Part 2 – Description and Measurement of Environmental Noise: Guide to Acquisition of Data Pertinent to Land Use. British Standards Institute, 1991.

[5] BS 7445:1991 Part 3 – Description and Measurement of Environmental Noise: Guide to Application to Noise Limits. British Standards Institute, 1991.

[6] BS 5969:1981 – Specification for Sound Level Meters. British Standards Institute, 1981

[7] ISO 9613-2:1996 – Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation. International Organization for Standardization, 1996.

[8] BS EN 12354-4:2017 – Estimation of Acoustic Performance in Buildings from the Performance of Elements. Transmission of Indoor Sound to the Outside. British Standards Institute, 2017

3.0 APPENDIX

APPENDIX 1: ACOUSTIC TERMINOLOGY

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20µPa (20×10^{-6} Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10(s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20µPa.
A-weighting, dB(A)	The unit of sound level weighted according to the A-Weighting Scale, which considers the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so several different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

To assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided. The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. To express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

SOUND LEVEL	LOCATION
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory

SOUND LEVEL	LOCATION
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source. A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time-period of interest. In the UK, traffic noise is measured as the L_{A10}, the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the

time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq}.

This is a notional steady level that would, over a given period, deliver the same sound energy as the actual fluctuating sound. To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS 4142[2014] + A1(2019) specifies background noise measurement periods of 1-hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as L_{A90},1hour dB and L_1 dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125ms.

APPENDIX 2: BS 4142[2014] + A1(2019) FURTHER INFORMATION

Rating Level

According to BS 4142[2014] + A1(2019), a correction may be applied to the specific sound level to account for certain acoustic characteristics that may make the noise generated by the <source> more noticeable, this is called the **Rating Level**.

It is appropriate to add a character correction where there is a new source that cannot be measured in line with BS 4142[2014] + A1(2019). There are 3 methods for approaching this:

- Subjective method
- Objective method (for tonality)
- Reference method

Subjective Method

The subjective method establishes a rating penalty that is added to the specific noise level if any of the following is present at the assessment position. If a tone is expected to be present a character correction of 0 dB to 6 dB is added depending on how perceptible it is at noise sensitive locations.

Table 7 - Subjective Method – Tonality

BS 4142[2014] + A1(2019) SECTION 9.2 SUBJECTIVE METHOD	PERCEPTIBILITY OF NOISE SENSITIVE FACADES	CORRECTION
Tonality Ranging from not tonal to prominently tonal	Not Tonal	+0
	Just Perceptible	+2
	Clearly Perceptible	+4
	Highly Perceptible	+6

If the source is expected to be impulsive a character correction of 0 dB to 9 dB is added depending on how perceptible it is at noise sensitive locations.

Table 8 - Subjective Method - Impulsivity

BS 4142[2014] + A1(2019) SECTION 9.2 SUBJECTIVE METHOD	PERCEPTIBILITY OF NOISE SENSITIVE FACADES	CORRECTION
Impulsivity Considering both the rapidity and any overall change in sound level	Not Tonal	+0
	Just Perceptible	+2
	Clearly Perceptible	+4
	Highly Perceptible	+6

When the sound features are neither tonal nor impulsive, a character correction of +3 is added for the readily distinctive quality against the acoustic environment or for the intermittency of the source.

Table 9 - Subjective Method – Distinctive/Intermittency

BS 4142[2014] + A1(2019) SECTION 9.2 SUBJECTIVE METHOD	PERCEPTIBILITY OF NOISE SENSITIVE FACADES	CORRECTION
Really Distinctive	Is not Present	+0
	Is Present	+3
Intermittency	Is not Present	+0
	Is Present	+3

Noise Criteria

The significance of the resulting noise on the residential property depends on the margin by which it exceeds the background noise levels. British Standard 4142:2014 provides the following guidance within section 11.

Table 10 - Assessment of Impact

DIFFERENCE	ASSESSMENT OF IMPACT
+10 dB	Indication of a significant adverse impact
+ 5 dB	Indication of an adverse impact
+ 0 dB	Indication of a low impact

BS4142:2014 advises, "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 significant adverse impact." The local authority requirement that noise from the equipment should not exceed 10dB. 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.

Noise Meter Floor

BS 4142[2014] + A1(2019) suggests that Care is necessary in circumstances where background sound levels are low to ensure that self-generated and electrical noise within the measurement system does not unduly influence reported values, which might be the case if the measured background sound levels are less than 10 dB above the noise floor of the measuring system. The floor of a typical class 1 noise meter is in the region of 14 dB(A) and therefore measurements of less than 24 dB(A) should be assessed with care.

Octave Band Frequency Analysis

All calculations carried out are done so on an octave band centre frequency basis and not an overall dB(A) level. This ensures that the tonal element from any proposed plant is minimised. A large majority of manufacturer's data is supplied in the octave band centre frequency (Hz) format.

BS 4142[2014] + A1(2019) Penalties

Whilst BS 4142[2014] + A1(2019) allows receptor assessments to made to achieve levels equal to prevailing background noise levels, it also ensures that appropriate and more stringent penalties are applied to the specific noise level to ensure the correct level of protection for the local residents.

APPENDIX 3: PHOTOS

Photo 1 View of exhaust ductwork from yard

Photo 2 View of exhaust ductwork penetrating the facade

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