12-14 High Street, Gravesend

Noise Assessment for Planning Condition Discharge

24th February 2023

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Version	1	2	3
Comments	Noise Assessment		
Date	24th February 2023		
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Project Number	22-626		

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1. INTRODUCTION

1.1. Overview

inacoustic has been commissioned to assess the impact of noise at 12-14 High Street, Gravesend, with a view to assisting in the discharge the requirements of the Appeal Decision (ref: APP/K2230/W/22/3297812), imposed on this development by the Planning Inspectorate.

The following technical noise assessment has therefore been produced for submission to Kent County Council as part of an application to discharge the relevant planning conditions.

This report details the existing background sound climate at the nearest receptors, as well as the sound emissions associated with the newly installed plant located around the site.

This noise assessment is necessarily technical in nature; therefore, a glossary of terms is included in Appendix A to assist the reader.

1.2. Scope and Objectives

The scope of this noise assessment can be summarised as follows:

- A sound monitoring survey undertaken in the vicinity of the existing plant equipment and closest noise-sensitive receptors to the Site;
- An assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the existing sources; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of BS4142:2014+A1:2019[1]

[1] British Standard Institution. BS 4142:2014+A1:2019: Methods for rating and assessing industrial and commercial sound.

1.3. Assessment Criteria

1.3.1. Planning Inspectorate Planning Condition

The Appeal Decision applied to the development (as permitted by the Planning Inspectorate) relates to noise, and states the following:

"3) Unless within three months of the date of this decision a scheme for a extract ventilation system and odour control equipment particularly regarding odour elimination abilities and likely noise emissions, is submitted in writing to the local planning authority for approval, the use of the site shall cease and all equipment and materials bought onto the land for the purposes of such use shall be removed until such time as a scheme is approved and implemented."

and

"4) Unless within three months of the date of this decision a sound insulation assessment demonstrating the construction that separates the residential and commercial unit resists the transmission of airborne sound, is submitted in writing to the local planning authority for approval, the use of the site shall cease and all equipment and materials bought onto the land for the purposes of such use shall be removed until such time as a scheme is approved and implemented.

In the event that it does not resist the transmission of airborne sound then the report shall provide suitable details of the substantially enhanced sound insulation performance of/sound reduction achieved by relevant floors/ceilings."

In order to assess the impact of the constructed plant and/or equipment on the future occupants of the nearby residential dwellings, a noise assessment has been undertaken in accordance with BS4142:2014+A1:2019, details of which can be found in the following section.

1.3.2. BS4142:2014+A1:2019

BS4142:2014+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 BS4142:2014+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 $L_{Aeq,T}$ 'specific sound level', immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction 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.

BS4142:2014+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 low 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. The periods associated with day or night, for the purposes of the Standard, are considered to be 07.00 to 23.00 and 23.00 to 07.00, respectively.

2. Site Description

2.1. Site and Surrounding Area

The Consented Development is located at 12-14 High Street, Gravesend, DA11 0BQ.

The location of the development along with the nearest noise sensitive receivers can be seen below in Figure 1.

The ambient sound environment across the site was heavily influenced by moderate to high levels of construction noise arising from a site that occupied the area between New Swan Yard and Queen Street, both to the east. To a lesser extent, other noise sources effecting the development include road traffic travelling on the roads in the surrounding area, as well as some noise arising from items of static plant that are installed to the rear of the development.

Figure 1: Development Site and Surrounding Area

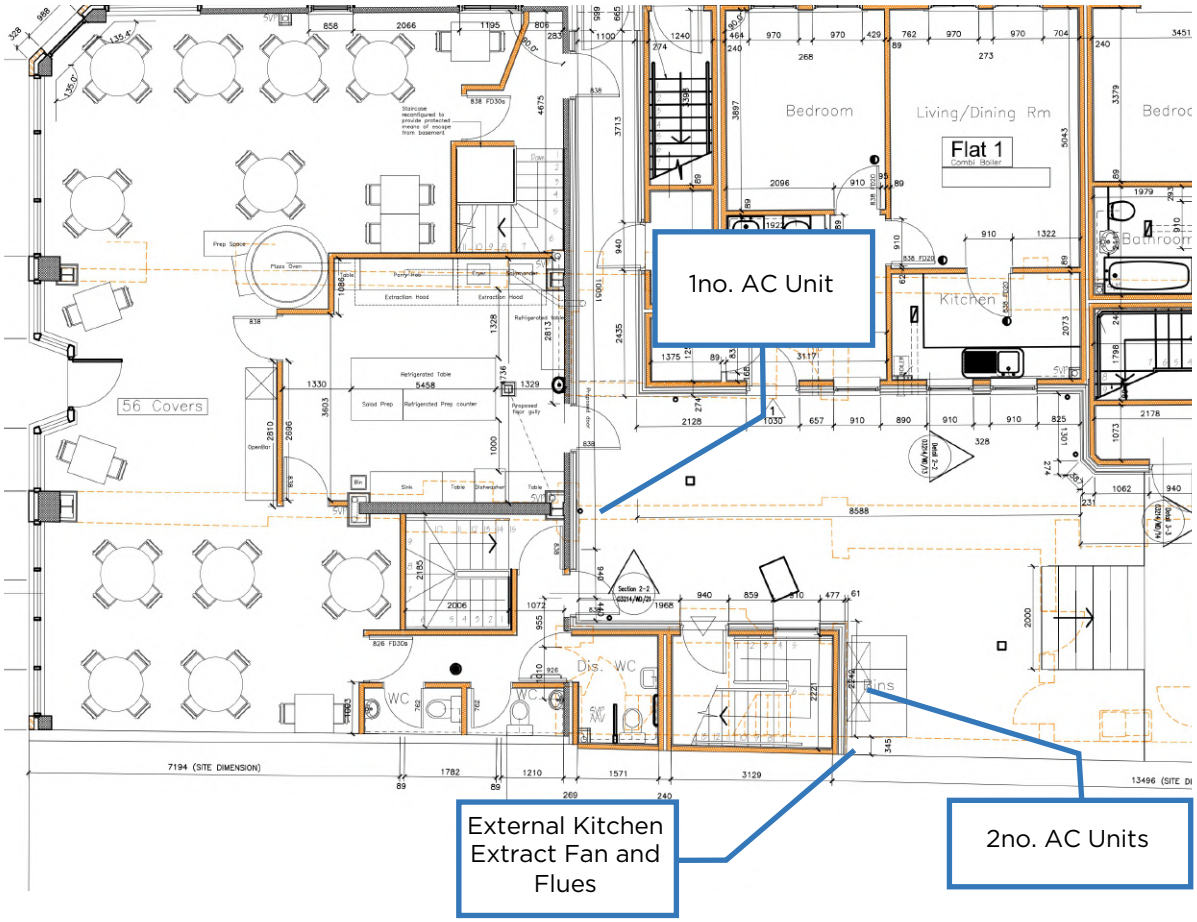
2.2. Consented Development

The Development comprises the change of use of 12-14 High Street from a retail (A1) to a restaurant (A3) space.

The external mechanical plant installed to the rear of the site comprises a kitchen extract unit, which has an inlet unit on the top-storey external wall, a total of 3no. air conditioning units are also associated with the development.

The locations of the mechanical plant can be seen below in Figure 2.

FIGURE 2: LOCATION OF MECHANICAL PLANT - PLAN



3. Operational Noise Assessment

3.1. General

The prevailing noise conditions in the area have been determined by an environmental noise survey conducted on Monday 30th and Tuesday 31st of January 2023. A source measurement exercise was also carried out on the initial day of the survey.

3.2. Measurement Details

All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and, in accordance with the principles of BS 7445[2].

All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672[3]. A full inventory of this equipment is shown in Table 1 below.

Table 1: Inventory of Sound Measurement Equipment

Measurement Position	Make, Model & Description	Serial Number
MP1	Brüel & Kjær 2238 Sound Level Meter	2756961
	Brüel & Kjær ZC 0030 Preamplifier	-
	Brüel & Kjær 4188 Microphone	2407240
	Cirrus CR:515 Acoustic Calibrator	80029

The sound measurement equipment used during the survey was field calibrated at the start and end of the measurement period. A calibration laboratory has calibrated the field calibrator used within the twelve months preceding the measurements. A drift of less than 0.2 dB in the field calibration was found to have occurred on the sound level meter.

The weather conditions during the survey were conducive to environmental noise measurement; it being dry, with low wind speeds as observed onsite during the attended measurements. The microphone was fitted with a protective windshield for all of the measurements.

The measurement position is identified in an aerial photograph, shown in Figure 3 overleaf.

[2] British Standard 7445: 2003: Description and measurement of environmental noise. BSI
[3] British Standard 61672: 2013: Electroacoustics. Sound level meters. Part 1 Specifications. BSI.

Figure 3: Measurement Position

The summarised results of the baseline environmental noise measurements are presented below as the lowest prevailing background sound measured during the daytime (07:00-23:00) at MP1. It is understood that the plant equipment associated with the development will not be operated during the night-time period.

Table 2: Summary of Noise Measurement Results

Period	Lowest Prevailing Background Sound Level $L_{A90,T}$ dB
Daytime (07:00-23:00)	40

3.3. Measured Source Data

Measurements have been undertaken around the site to determine the source noise emissions arising from mechanical plant at the site. The parameters reported are based on the Equivalent Continuous Sound Level, $L_{Aeq,T}$ measured over 1-minute intervals. Source data was measured for the purposes of populating a noise model, where items of static plant were measured in isolation.

The results of the source noise measurement exercise of the mechanical plant at the site are set out in Table 3.

TABLE 3: MEASURED SOURCE NOISE LEVELS

Source and Description	Distance from Source	$L_{Aeq,T}$	L_{A90}
1no. AC Unit	1m	56.3	55.5
2no. AC Units	1m	59.5	58.5
Kitchen Extract Fan	1m	57.2	56.5
Nearest Receptor Window (On)	1m	54.8	53.5
Nearest Receptor Window (Off)	1m	49.4	46.5

3.3.1. Specific Sound Level Summary

The specific sound level at the Nearest Noise Sensitive Receptor (NNSR) has been calculated from the measured sound level at 1m from the source. All noise sources where switched 'on' and then 'off' for the purposes of this assessment. The specific sound level 1m from the boundary of the nearest noise sensitive receptor, as calculated from the measured ambient and residual sound levels at source is set out in Table 4.

TABLE 4: SPECIFIC SOUND LEVEL SUMMARY – ALL PLANT EQUIPMENT

Source	Specific Sound Level (dB)
Ambient Sound Level (@ 1m from Source) – On	55
Residual Sound Level (@ 1m from Source) – Off	49
Specific Sound Level at NSR 1	53

In order to calculate the specific sound level at the nearest NSR, the residual sound level specified in Table 4 has been logarithmically subtracted from the ambient sound level. Therefore, the total calculated specific sound level at the receptor is 53 dB(A).

3.4. Noise Modelling

3.4.1. Source Data

The sound source data associated with the Proposed Development has been measured on site in isolation, with the results shown in Table 3.

3.4.2. Calculation Process

Calculations were carried out using Cadna/A, which undertakes its calculations in accordance with guidance given in ISO9613-1:1993 and ISO9613-2:1996.

3.4.3. Sound Data Assumptions

The land between Proposed Development and nearest receptors is mostly hard, therefore the ground factor has been set to 0.2 within the calculation software.

In order to accurately model the land surrounding the development, OpenStreetMap was used, which was based on data provided by the Ordnance Survey, along with associated topographic contours sourced from Defra. The assessment considers open propagation from the Site.

3.4.4. Specific Sound Level Map

The sound map showing the daytime specific sound level emissions from the existing development, can be seen in Figure 4.

FIGURE 4: SPECIFIC SOUND LEVEL MAP

It should be noted that there are no residential dwellings situated on the southern façade adjacent to the existing plant. The assessment has instead considered the dwellings that overlook the courtyard area to the north.

TABLE 5: PREDICTED SPECIFIC SOUND LEVEL SUMMARY

NSR	Specific Sound Level (dB)
Worst-affected	53

It is noted that the specific sound level derived from modelling noise propagation of measured source data across the site, aligns with the calculated specific sound level shown in Section 3.3.1.

3.5. Assessment

3.5.1. Rating Penalty Principle

Section 9 of BS4142:2014+A1:2019 describes how the rating sound level should be derived from the specific sound level, by determining a rating penalty.

BS4142:2014+A1:2019 states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

a) subjective method;
b) objective method for tonality;
c) reference method."

Given that the Consented Development is not operational, the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014+A1:2019 , which states:

"Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed.

Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources."

BS4142:2014+A1:2019 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

Tonality

A rating penalty of +2 dB is applicable for a tone which is *"just perceptible"*, +4 dB where a tone is *"clearly perceptible"*, and +6 dB where a tone is *"highly perceptible"*.

Impulsivity

A rating penalty of +3 dB is applicable for impulsivity which is *"just perceptible"*, +6 dB where it is *"clearly perceptible"*, and +9 dB where it is *"highly perceptible"*.

Other Sound Characteristics

BS4142:2014+A1:2019 states that where *"the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distance against the residual acoustic environment, a penalty of +3 dB can be applied."*

Intermittency

BS4142:2014+A1:2019 states that when the *"specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time … if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied."*

3.5.2. Rating Penalty Assessment

Considering the content of Section 3.5.1, an assessment of sound sources associated with the plant, in terms of whether any rating penalties are applicable, and has been detailed in Table 6 below.

TABLE 6: RATING PENALTY ASSESSMENT

Source	Tonality	Impulsivity	Intermittency	Other Sound Characteristics	Discussion
All Sources	0 dB	0 dB	0 dB	+3 dB	None of the external plant associated with the development was deemed to be either tonal or impulsive. It is also understood that the equipment will operate continuously during the operation hours of the restaurant, so no penalty has been applied for intermittency. A penalty of +3 dB has been applied for other sound characteristics, due to the dominance of the plant equipment amongst the ambient sound environment.

In summary, a rating penalty correction of +3 dB has been applied.

3.5.3. BS4142:2014+A1:2019 Assessment

The BS4142:2014+A1:2019 assessment of typical operations at the nearest noise sensitive receptor, during the daytime periods, can be seen in Table 7.

TABLE 7: BS4142:2014+A1:2019 ASSESSMENT AT RECEPTOR – DAYTIME (07:00-23:00)

Results	Sound Level (dB)	Notes
Specific Sound Level	53	As shown in Table 4
Rating Penalty	+3	As discussed in Table 6.
Rating Sound Level	56	-
Daytime Background Sound Level	40	As shown in Table 2.
Excess of Rating over Daytime Noise Background Noise Level	+16	Assessment indicates a "**Significant Adverse Impact**".

It is understood that the plant is not to operate during the night-time hours (23:00-07:00), so the assessment has been completed for the daytime period only.

3.5.4. Mitigation Discussion

As can be seen from the assessment results, the nearest noise-sensitive receptor is subject to a '*Significant Adverse Impact'* in BS4142 terms. Therefore, mitigation will be required in order to reduce the sound levels to a minimum. The individual contributions from each item of plant at the receptor are calculated in the noise modelling software, this has been used to help guide the mitigation methods.

Assessing the propagation of noise across the rear of the site, each item of plant equipment (as mentioned in Table 3) requires a reduction of approximately 12 dB.

The standalone AC unit which is situated 2m above ground level and immediately to the rear of the restaurant, can be mitigated using a louvred enclosure. This can be installed around the unit in its existing condition, alternatively, the unit could be moved to floor level before having the louvred surround installed. An example that would provide the required levels of sound reduction would be a Caice SH150 acoustic louvre, the technical details of which can be seen in Appendix C. It is important that the manufacturer's installation guide is followed when the work is being carried out.

The twin AC fans, which is situated further away from the rear of the restaurant and below the extract flues, will require an acoustic enclosure that surrounds both individual units, such as an Environ Environmental System - this can be installed around the units in their existing condition. Whilst Environ do not provide data sheets for the performance of individual housings, it is understood that such a product (or similar) would provide the required 12 dB of sound reduction. An example of a unit achieving the required sound reduction is shown in Appendix C.

On-site observations and noise modelling found the kitchen extract fan to be the dominant item of plant equipment at the nearest receptor from a noise perspective. To mitigate noise from this item and of this nature, an acoustic fan jacket should be installed. Acoustic fan jackets which are appropriate for outdoor use are available and would be capable of achieving the required 12 dB attenuation. Products such as ISL's Acoustic Fan Jacket claim to achieve a noise reduction of 15 dB, details of this product can be seen in Appendix C.

Finally, a silencer should be installed in order to abate noise breakout from the cowl of the extract system, this should be installed between the extract fan and the cowl/outlet at the top. It is important to maintain a distance between the fan and silence to ensure that laminar airflow is achieved and allows the silencer to work properly. It is understood that the fan installed is a Flaktwood 45 Maxfan Compac, with outlet noise data being used in the subsequent insertion loss calculations. The required insertion loss to sufficiently mitigate cowl breakout is shown in Table 8 below.

TABLE 8: PROPOSED SILENCER – REQUIRED PERFORMANCE

Source	Specific Sound Level (dB)						
	125	250	500	1000	2000	4000	8000
Silencer	8	27	28	30	29	26	25

3.5.5. Specific Sound Level Map – Mitigation Installed

The sound map showing the daytime specific sound level emissions from the proposed development, with the proposed mitigation measures, can be seen in Figure 5.

FIGURE 5: SPECIFIC SOUND LEVEL MAP WITH MITIGATION

TABLE 9: PREDICTED SPECIFIC SOUND LEVEL SUMMARY

NSR	Specific Sound Level (dB)
Worst-affected	40

3.5.6. Rating Penalty Assessment

Considering the content of Section 3.5.4, an assessment of sound sources associated with the existing plant, in terms of whether any rating penalties are applicable, and has been detailed in Table 10 below.

TABLE 10: RATING PENALTY ASSESSMENT – WITH MITIGATION

Source	Tonality	Impulsivity	Intermittency	Other Sound Characteristics	Discussion
All Sources	0 dB	0 dB	0 dB	0 dB	No external plant associated with the development was deemed to be either tonal or impulsive. It is also understood that the equipment will operate continuously during the operation hours of the restaurant, so no penalty has been applied for intermittency. Based on the application of mitigation measures, the plant noise will be suppressed to such a degree that it will be no greater than the lowest background noise level, and so indistinguishable against the noise environment.

In summary, no rating penalty has been applied.

3.5.7. BS4142:2014+A1:2019 Assessment

The BS4142:2014+A1:2019 assessment of typical operations at the nearest noise sensitive receptor, during the daytime periods, can be seen in Table 11.

TABLE 11: BS4142:2014+A1:2019 ASSESSMENT AT RECEPTOR – DAYTIME (07:00-23:00)

Results	Sound Level (dB)	Notes
Specific Sound Level	40	As shown in Table 4
Rating Penalty	0	As discussed in Table 6.
Rating Sound Level	40	-
Daytime Background Sound Level	40	As shown in Table 2.
Excess of Rating over Daytime Noise Background Noise Level	0	Assessment indicates a "**Low Impact**".

With the mitigation measures applied, it can be seen that the proposed development will have a *low impact* at the nearest residential receptor.

4. Internal Building Fabric Assessment

4.1. Sound Insulation Design Criteria

A sound insulation assessment has been carried out to assess the impact of noise from the ground floor commercial unit transmitting into the adjacent residential property above, in order to determine if the floor construction sufficiently resists the passage of sound. Sound insulation against airborne noise should achieve a $D_{nT,w}$ + C_{tr} of not less than 48 dB for walls and/or floors where residential use parties non-domestic use, in accordance with BS EN ISO 140-4:1998. This would ensure that the floor will achieve 5 dB greater than the minimum building regulations requirements outlined in Approved Document E of the UK Building Regulations for a change of use floor.

4.1.1. Party Floor Construction – Measured Performance

During the site visit carried out on Monday 30th of January, the separating floor between the ground floor (restaurant) and first floor (residential) of the building was tested. A description of the test is described in Table 12, along with a comparison between the required and existing performance of the floor from an airborne sound perspective.

Table 12: Floor Build Up and Sound Insulation Performance

Description of Construction	Required D_{nTw} + C_{tr} (dB)	Measured D_{nTw} + C_{tr} (dB)	Compliant with Requirements
Separating floor between the ground floor (restaurant) and first floor (residential)	48	57	Yes

As shown in the table above, the performance of the separating floor is compliant with the limits outlined in Approved Document E, and demonstrates that the partition sufficiently resists the passage of sound.

5. Conclusion

inacoustic has been commissioned to prepare a noise assessment for the operational noise at 12-14 High Street, Gravesend, DA11 0BQ to determine the impact of noise upon nearby existing properties.

This technical noise assessment has been produced for submission to Kent County Council as part of a Planning Condition Discharge, with respect to noise.

The assessment of the external mechanical plant has concluded that mitigation is required to reduce the *significant adverse impact* to a *low impact* at the nearest noise sensitive receptor.

The assessment of the separating floor between the restaurant space and the residential dwelling above sufficiently resists the passage of sound to a degree that is compliant with Approved Document E.

Subject to the implementation of the mitigation measures outlined in this report, it is considered that noise should not be a constraint to discharging the obligations of Planning Conditions 3 and 4.

6. APPENDICES

6.1. Appendix A – Definition of Terms

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 ($20x10^{-6}$ 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-scale, which takes into account 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 a number of 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.

In order 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. In order 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.

TABLE A1: TYPICAL SOUND LEVELS FOUND IN THE ENVIRONMENT

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
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 be 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}.

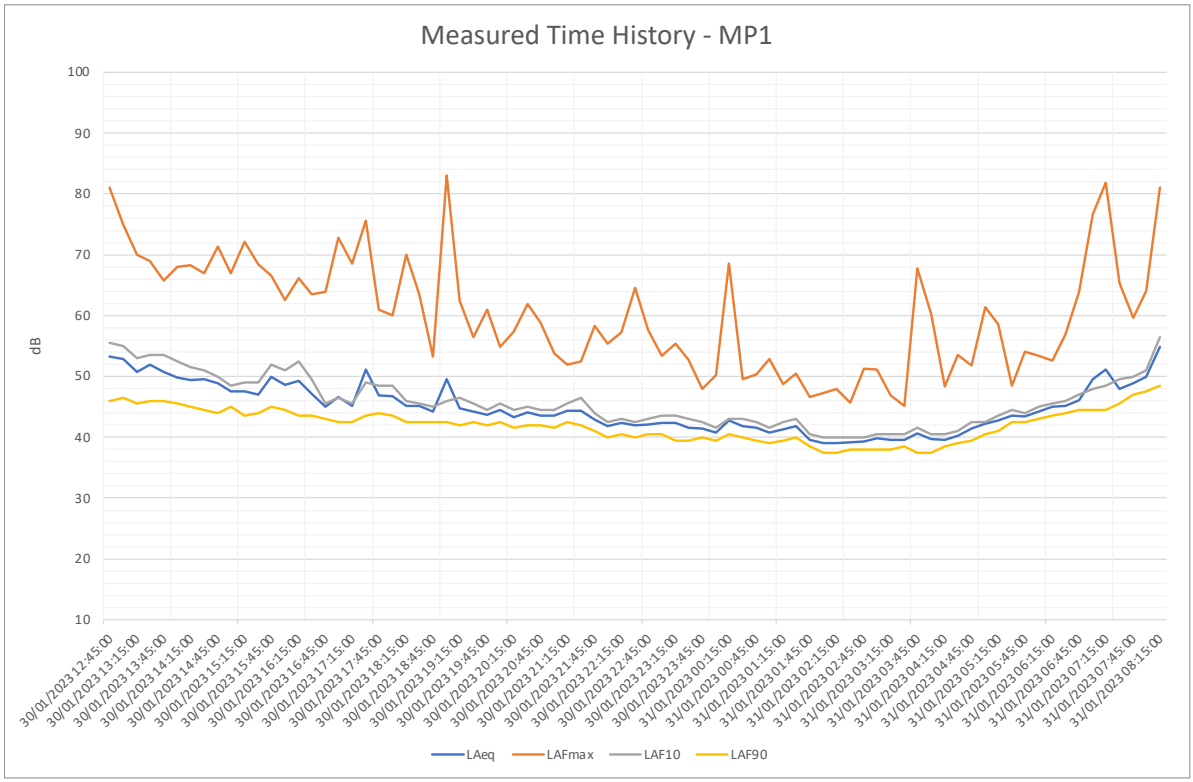
This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

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 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 $L_{A90,15mins}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125 ms.

6.2. Appendix B – Measurement Results

FIGURE 6: MEASURED TIME HISTORY - MP1



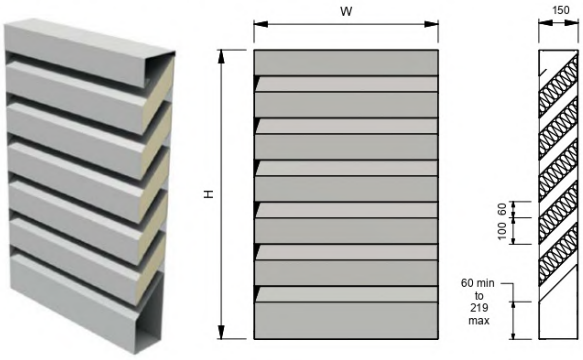
6.3. Appendix C – Sound Data Sheets

FIGURE 7: CAICE SH150 ACOUSTIC LOUVRE

SH150 Acoustic Louvre Technical Data

caice

Single Bank Acoustic Louvre, Higher Performance Profile, 150mm Deep



Typical weight 35kg/m²

Generally louvres above 50kg will be supplied in modules for assembly on site. Joining brackets and fixings will be provided for assembly.

Installation services, support steelwork, flashings, fixings to the structure and mastic will not be provided unless stated.

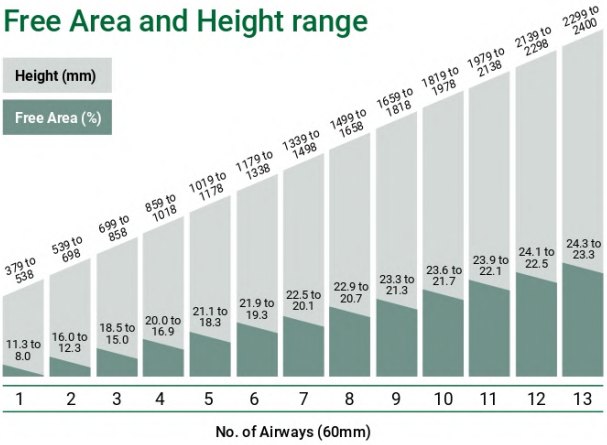
Refer to the Acoustic Louvre Schedule and Product Code Definitions for the size and specification of each Acoustic Louvre.

A minimum of 10mm clearance should be allowed between the structure and the Acoustic Louvre sizes shown.

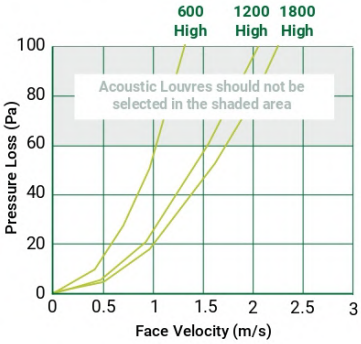
Performance

Acoustic Data	dB in each Octave Band Centre Frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Sound reduction index	5	5	7	9	13	13	13	12
Weighted sound reduction index (Rw)	13							
Static insertion loss	4	5	7	12	16	16	16	18
Regenerated sound power level at 1m/s face velocity	53	47	38	36	33	29	18	12
Regenerated sound power level at 2m/s face velocity	70	65	58	53	51	51	45	35

Free Area and Height range



Free area and pressure drop shown is based on a 1150mm wide single piece louvre fitted with bird mesh and will vary slightly for different widths and larger heights. Pressure losses for Class A rated louvres and/or Insect mesh are available upon request.



If you require further technical data please contact Caice: 0118 918 6470 | enquiries@caice.co.uk | caice.co.uk

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FIGURE 8: ENVIRON ACOUSTIC ENCLOSURE (EXAMPLE)

environ™ Acoustic Enclosures

Environ Technologies Ltd
Regus House, 1010 Cambourne Business Park
Cambourne, Cambridgeshire, UK, CB23 6DP
Tel: +44 (0)870 383 3344
Fax: +44 (0)1223 598001
www.environ.co.uk

environlite ELV1.1.25AC Acoustic Performance Data

Noise Measurement Information:

Test: Environ Lite Acoustic Enclosure

Test Standard:

BS EN ISO 140-3 Acoustics - Measurement of Sound Insulation in Buildings and of Building Elements - Part 1: Airborne Sound Insulation

Sound Level Measuring Equipment:

Norsonic 830 RTA Precision Sound Analyser Type 1
CEL 284/2 Acoustic Calibrator Type 1
JBL Loudspeaker driven by CEL Loudspeaker driven by 830 White Noise Source

Transmission Loss Data:

Transmission Loss — Environ ELV1.1.25AC Acoustic Enclosure							
Octave Frequency in Hertz (dB ref 2 x 10^{-5} Pascal's)							
63	**125**	**250**	**500**	**1K**	**2K**	**4K**	**8K**
14	16	23	30	37	39	38	39
Summary							
Transmission Loss Equates to an Overall Reduction of 26 dB(A)							

Support Information:

Monitoring was carried out using the BS3740 technique, insofar as measurements were taken in each quadrant and the results averaged. Internal Test Room: W 6m x D 16m x H 5m. Background noise in the semi-reverberant test room was such as not to interfere with the practical measurements

Environ acoustic enclosure designs are protected under patent

Figure 9: ISL Acoustic Fan Jacket

JACKETS

Acoustic Fan Jackets

Acoustic Fan Jackets

ISL's Acoustic Fan jackets provides a
flexible hard wearing wrap-around cover to reduce fan casing breakout noise from long or short cased axial fans in the HVAC, industrial and off-shore industries.

For indoor use the jackets are generally manufactured with an outer noise barrier material laminated to inner acoustic foam, terminal box cutout also included if required.

For outdoor use the jackets are generally manufactured with an outer sewn silicone coated glass fabric fully enclosing acoustic insulation with outer noise barrier material, terminal box cutout also included if required .

Fastening with Velcro flaps and additional fixing straps with 'D' rings if required.

The pre-shaped jackets are easy to install & remove, they reducing site installation working hours and costs over site installed acoustic insulation slabs with protection covers significantly.

Fire retardant or Class `0' fire rated construction available.

Acoustic performance, two options are available, either standard achieving a typical installed breakout noise reduction of up to 9dB, or high acoustic performance achieving a typical installed breakout noise reduction of up to 15dB.

Technical details; Full technical details are available upon request, please call or email.

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