NOISE IMPACT ASSESSMENT

Unit 3, The Montague Centre, BN11 1YJ

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1.0 INTRODUCTION

DAA Group has been appointed to carry out a BS4142:2014+A1:2019 Noise Impact Assessment at Unit 3, The Montague Centre BN11 1YJ to support a Planning Application for the Installation of a kitchen extraction system.

This report has been carried out in accordance with the provisions of:

- The National Planning Policy Framework, the Noise Policy Statement for England (NPSE)
- The World Health Organisation Guidelines for Community Noise 1999 (WHO)
- The Environmental Health legislation 'the Control of Odour and Noise from Commercial Kitchen Exhaust Systems (2018).'
- RES7 and H18 of the Worthing Local Plan and Policy 16 of the Worthing Core Strategy.

The technical content of this assessment has been provided by a Tech member of the Institute of Acoustics.

The Institute of Acoustics is the UK's professional body for those working in Acoustics, Noise and Vibration.

2.0 NOISE CRITERIA

2.1 NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

The Department for Communities and Local Government introduced the National Planning Policy Framework (NPPF) in March 2012. The latest revision of the NPPF is dated March 2021.

The NPPF sets out the Government's planning policies for England and how these are expected to be applied. It provides a framework where local Councils can produce their own local and neighbourhood plans which reflect the needs of their communities.

In conserving and enhancing the natural environment, the planning system should prevent both new and existing development from contributing to, or being put at, unacceptable risk from environmental factors including noise.

Planning policies and decisions should aim to avoid noise giving rise to significant adverse impacts on health and quality of life as a result of new development. Conditions may be used to mitigate and reduce noise to a minimum so that adverse impacts on health and quality of life are minimised. It must be recognised that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them. Reference is made within NPPF to the Noise Policy Statement for England (NPSE) as published by DEFRA in March 2010.

2.2 NOISE POLICY STATEMENT FOR ENGLAND (NPSE)

The long-term vision of the NPSE is stated within the documents scope, to 'promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development'. The policy aims are stated to:

- avoid significant adverse impacts on health and quality of life;
- mitigate and minimise adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life.

The application of NPSE should mean that noise is properly taken into account at the appropriate time (for example in planning applications or appeals) where it must be considered alongside other relevant issues. The guiding principles of Government policy on sustainable development should be used to assist in the implementation of the NPSE.

The NPSE should apply to all types of noise apart from occupational noise in the workplace. The types of noises defined in the NPSE includes:

- Environmental noise from transportation sources;
- Neighbourhood noise which includes noise arising from within the community; industrial premises, trade and business premises, construction sites and noise in the street

The Noise Policy Statement England (NPSE) outlines observed effect levels relating to the

above, as follows:

- **NOEL – No Observed Effect Level**

o This is the level below which no effect can be detected. In simple terms, below

this level, there is no detectable effect on health and quality of life due to the noise.

• **LOAEL – Lowest Observed Adverse Effect Level**

o This is the level above which adverse effects on health and quality of life can be detected.

• **SOAEL – Significant Observed Adverse Effect Level**

o This is the level above which significant adverse effects on health and quality of life occur.

As stated in The Noise Policy Statement England (NPSE), it is not currently possible to have a single objective based measure that defines SOAEL that is applicable to all sources of noise in all situations. Specific noise levels are not stated within the guidance for this reason, and allow flexibility in the policy until further guidance is available.

2.3 ProPG: PLANNING AND NOISE

As outlined above, the National Planning Policy Framework encourages improved standards of design, although it provides no specific noise levels which should be achieved on site for varying standards of acoustic acceptability, or a prescriptive method for the assessment of noise.
ProPG: Planning and Noise was published in May 2017 in order to encourage better acoustic design for new residential schemes in order to protect future residents from the harmful effects of noise. This guidance can be seen as the missing link between the current NPPF and its predecessor, PPG24 (Planning Policy Guidance 24: Planning and Noise), which provided a prescriptive method for assessing sites for residential development, but without the nuance of 'good acoustic design' as outlined in ProPG.
ProPG allows the assessor to take a holistic approach to consider the site's suitability, taking into consideration numerous design factors which previously may not have been considered alongside the noise level measured on site, for example the orientation of the building in relation to the main source of noise incident upon it.
It should be noted this document is not an official government code of practice, and neither replaces nor provides an authoritative interpretation of the law or government policy, and therefore should be seen as a good practice document only.

2.4 BRITISH STANDARD 4142:2014:A1:2019

British Standard (BS) 4142:2014 "Methods for rating and assessing industrial and commercial sound" describes methods for assessing the likely effects of sound on premises used for residential purposes.
It includes the assessment of sound from industrial and manufacturing processes, M&E plant and equipment, loading and unloading of goods and materials, and mobile plant/vehicles on the site. It can be used to assess sound from proposed, new, modified or additional industrial/commercial sources, at existing or new premises used for residential purposes.
The method described in BS4142: 2014 use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.
The standard describes methods to measure and determine ambient, background and residual sound levels, and the rating levels of industrial/commercial sound. BS 4142: 2014 requires consideration of the level of uncertainty in the data and associated calculations.
BS 4142 is not intended to be used for the derivation or assessment of internal sound levels, or for the assessment of non-industrial / commercial sources such as recreational

activities, motorsport, music and entertainment, shooting grounds, construction and demolition, domestic animals, people, and public address systems for speech.
The Reference Time Interval, T, is defined in the standard as the “specified interval over which the specific sound level is determined”, which is 1 hour during the daytime (07:00 to 23:00 hours) and 15 minutes during the night (23:00 to 07:00 hours).
Ambient sound is defined in BS 4142: 2014 as "totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far". It comprises the residual sound and the specific sound when present.
Residual sound is defined in BS 4142: 2014 as "ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound".
The background sound level is the LA90, T of the residual sound level, and is the underlying level of sound. Measurements of background sound level should be undertaken at the assessment location where possible or at a comparable location.
The measurement time interval should be sufficient to obtain a representative value (normally not less than 15 minutes) and the monitoring duration should reflect the range of background sound levels across the assessment period. The background sound level used for the assessment should be representative of the period being assessed.
The specific sound level is the LAeq,T of the sound source being assessed over the reference time interval, Tr. BS 4142: 2014 advises that Tr should be 1 hour during the day and 15 minutes at night.
The rating level is the specific sound level plus any adjustment for the characteristics of the sound (tone, impulse, intermittent or other acoustic feature). The standard describes subjective and objective methods to establish the appropriate adjustment. The adjustments for the different features and assessment methods are summarised in the table below.

Acoustic Feature Corrections in BS4142: 2014

Acoustic Feature	Adjustment for Acoustic Feature		
	Subjective Methods	Objective Methods	
Tonality	+2 dB if just perceptible +4 dB if clearly perceptible +6 dB if highly perceptible	Third Octave Analysis	Narrow Band Analysis
		+6 dB if tones identified	Sliding scale of 0 to +6 dB depending on audibility of tone
Impulsivity	+3 dB if just perceptible +6 dB if clearly perceptible +9 dB if highly perceptible	Sliding scale of 0 to +9 dB depending on prominence of impulsive sound	
Intermittency	+ 3 dB if intermittency is readily distinctive	n/a	
Other	+ 3 dB if neither tonal nor impulsive, but otherwise readily distinctive	n/a	

Where tonal and impulsive characters are present in the specific sound within the same reference period then these two corrections can both be taken into account. If one feature is dominant, it might be appropriate to apply a single correction. The rating level is equal to the specific sound level if there are no features present.

The level of impact is assessed by comparing the rating level of the specific sound source with the background sound level. Typically the greater the difference the greater the magnitude of the impact, depending on the context.

Other factors that may require consideration include the absolute level of sound, the character and level of the residual sound compared to the specific sound, and the sensitivity of the receptor and scope for mitigation.

When the rating level is above the background sound level, a difference of around +5 dB is likely to indicate an adverse impact and a difference of around +10 dB or more is likely to indicate a significant adverse impact, depending on the context.

The lower the rating level with respect to the background sound level, the less likely it is that the specific sound source will have an 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.

3.0 SITE SURVEYS

3.1 SITE DESCRIPTION

The application site is a two storey property situated in the Montague centre, located at the south eastern pedestrian precinct entrance of the shopping centre at Liverpool Road and with a frontage onto Montague
Place to the south and Alexander Terrace and Liverpool Gardens to the west.The rest of the area is a mix of commercial and residential properties, typical of an urban cityscape environment, with the dominant source being road traffic noise from the surrounding roads. (See Figure 3.1)

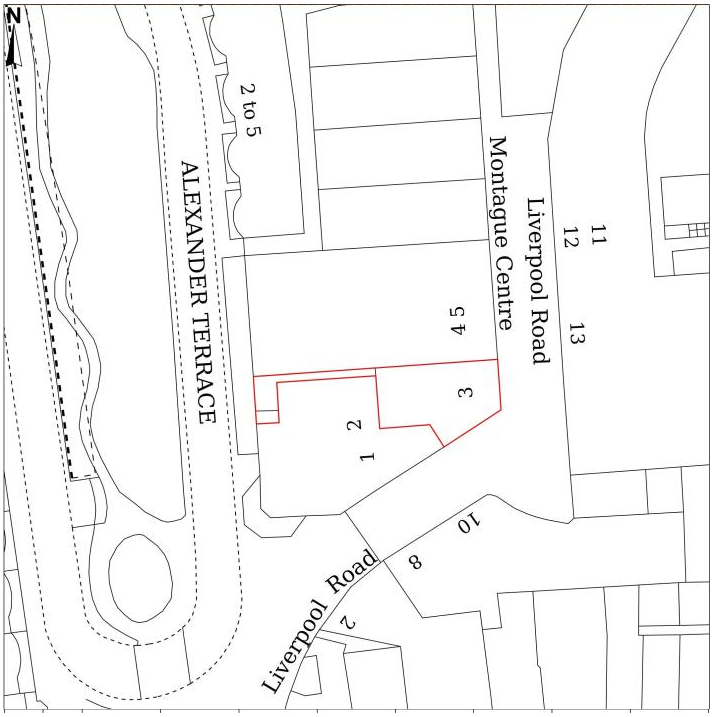


Figure 3.1 – Site Location

3.2 ENVIRONMENTAL SITE SURVEY PROCEDURE

In order to characterise the sound profile of the area at the closest sensitive receptor (NSR), an environmental sound survey has been carried out from 05/06/2023 to 06/06/2023. The monitoring position was chosen in order to collect representative sound levels at the NSR and the proposed location of the plant.
Noise Measurements were carried out 1m from the rear façade. The monitoring location is shown in Figure 5.2.

3.3 EQUIPMENT

Instrument manufacturer	**Rion**
Model	**NA-28**
Serial Number	**00501390**
Microphone Type	**UC-59**
Serial Number	**14934**
Calibrator	**NC-74**
Serial Number	**34504747**
Cirrus CK: 675 Outdoor Kit	

All equipment used during the survey was field calibrated at the start and end of the measurement period with a negligible deviation of ≤0.5 dB. All sound level meters are calibrated every 24 months and all calibrators are calibrated every 12 months, by a third-party calibration laboratory. All microphones were fitted with a protective windshield for the entire measurements period.

Copies of Calibration certificates are available upon request.

3.4 METEOROLOGICAL CONDITIONS

As the environmental noise survey was carried out over a long un-manned period no localized records of weather conditions were taken. However, during the set up and collection of the monitoring equipment, the weather conditions have been documented in the following table. All measurements have been compared with met office weather data of the area, specifically the closest weather station, the data from the weather station is outlined in the table below. When reviewing the time history of the noise measurements, any scenarios that were considered potentially to be affected by the local weather conditions have been omitted. The analysis of the noise data includes statistical and percentile analysis and review of minimum and maximum values, which aids in the preclusion of any periods of undesirable weather conditions. The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise. The table below presents the average temperature, wind speed and rainfall range for each 24-hour period during the entire measurement.

Weather Conditions – Shoreham Airport Weather station				
Time Period	**Air Temp (◦C)**	**Rainfall mm/h**	**Prevailing Wind Direction**	**Wind Speed (m/s)**
05/06/2023 – 00:00 – 23:59	8 - 20	0.0	NNE	0 – 12
06/06/2023 – 00:00 – 23:59	9 - 20	0.0	NNE	0-14

Table 3.4 – Weather Summary

4.0 NOISE SURVEY

Period	Lowest Recored $L_{A90, 15}$
07:00 – 23.00	37dB
23:00 – 07:00	30dB

Table 4.1 Lowest recorded Background Noise Level

5.0 NOISE IMPACT ASSESSMENT

5.1 It is understood that the proposed outdoor plant is comprised of the following units:

- Helios GigaBox centrifugal fan – GBW 560/6/6

The flue outlet location is shown below in figure 5.2

Proposed Plant	LWA (dB(A))
GBW 560/6/6	72

Table 5.1 – Manufacturer supplied Sound power level @outlet



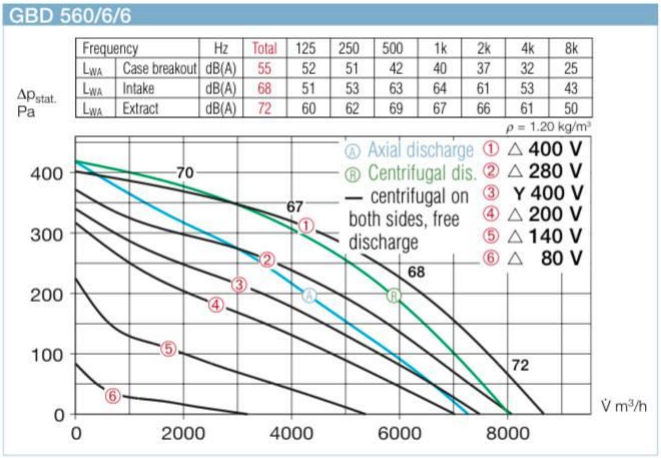


Figure 5.1.1 – Proposed Plant Data

5.2 CLOSEST NOISE SENSITIVE RECEIVER

The closest noise sensitive receiver to the installation location of the flue outlet has been identified as being a residential window located approximately 10 metres from the proposed location of the extraction outlet and fan as shown in Figure 5.2.

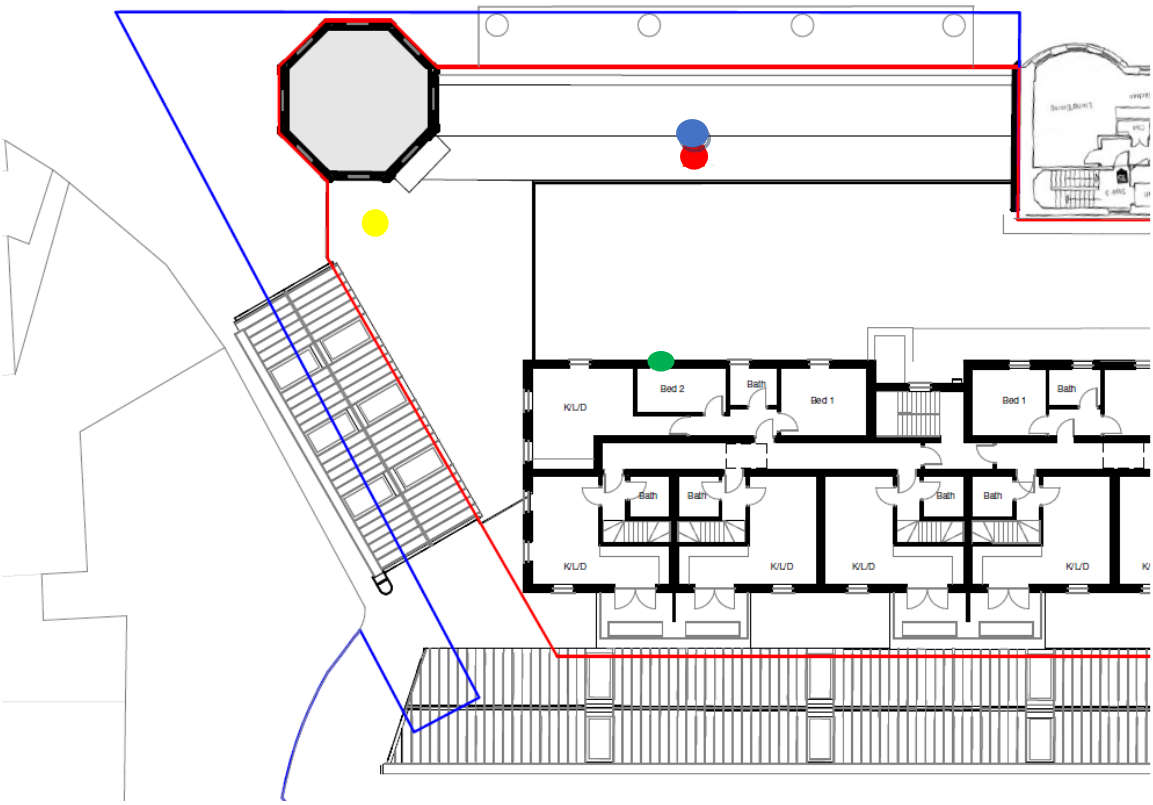


Figure 5.2 – Flue Outlet Location

●	Proposed Location Kitchen Extraction Outlet
●	Nearest Residential Noise Sensitive Window
●	Measurement Location
●	Proposed Location Kitchen Extraction Fan

5.3 NOISE EMMISSION CRITERION

It is understood that the permitted operating hours are between 07.00 and 23:00.

It is determined that the proposed kitchen extraction system is not considered to contain tones. In addition, the proposed operation of the equipment is also unlikely to be sufficiently intermittent to attract attention at the nearest noise sensitive property.

The criteria for plant sound, to be achieved at a point 1m from the closest noise sensitive window, has been set as shown in Table 5.3 in order to comply with the Local Authority requirements.

Time Period	Noise Criterion at Nearest Residential Receiver
Proposed Hours (07.00 – 23.00)	**27**

Table 5.3 - Proposed noise emissions criterion

5.4 BS4142 ASSESSMENT – 1m outside Nearest residential Window

BS4142:2014 Assessment	
Source Operating Period	Kitchen Extract Fan 07.00 – 23:00
Reference Time Interval (Tr)	15 minutes
Element	Level (dB)
Specific Sound Level	19
Representative Background Noise Level (LA90)	37
Acoustic correction	3
Rating Level	22
Excess of Rating over Background Sound Level	-15

The combined Rating for the out and the breakout noise of the fan is 22dB
Detailed calculations are shown in Appendix B.

5.5 MITIGATION MEASURES

5.5.1 – Noise Emissions

In order to achieve the specific sound level and subsequent rating level shown in the assessment above, the following mitigation measures are required.

There are three main noise transmission paths to be considered from the fan to the receptor.

I. Discharge duct opening.
II. Fan casing & flexible connection noise break-out.
III. Duct break-out noise on the fan inlet ducting.

To reduce duct breakout noise on the fan inlet an attenuator is required to be fitted on the discharge side of the fan, similar to an Acoustica CP01-M50-120 the below insertion losses:

INSERTION LOSS (dB) – CENTRE BAND FREQUENCY								
Hz	63	125	250	500	1K	2K	4K	8K
CP01-M50-120	4	8	12	19	28	23	16	12

The attenuator's acoustic media shall have to be lined with 'Melinex' to enable the kitchen extract system to be regularly steam cleaned.

5.2.2 – Break Out Noise

As the fan is to be located outside the breakout noise from the fan needs to be mitigated. An acoustic enclosure around the fan is required, similar to a Helios Acoustic Enclosure with the below insertion losses.

The Acoustic panel construction
The panel is made of a sandwich of internal perforated galvanised sheet steel 0.9mm thk with 50mm rockwool material of 60kg/m³ density with an outer skin of 1.0mm sheet steel.

Reduction for panel

Mid band freq Hz	63	125	250	500	1K	2K	4K	8K
Sound reduction dB	12	18	24	32	34	39	42	44

5.5.3 - Vibration

In addition to the control of airborne noise transfer, it is important to consider the transfer of noise as vibration to adjacent properties as well as any sensitive areas of the same building. The duct should be isolated from the structure of the building using anti-vibration. The isolators shall incorporate rubber or neoprene high-frequency isolation pads. The fan should be installed with flexible connections to adjacent structures. Antivibration mounts are widely available from suppliers/installers often in pedestal rubber mountings.
Examples of these are MPO and MP1, and ISL Maxi pedestal vibration mounts. These types of anti-vibration and shock isolators are industry standard and commonplace for mechanical plant installations. They are designed to provide medium to high frequency isolation from vibration and noise via high resilience rubber.

5.6 BS8233 ASSESSMENT

The highest value of 27dB(A) is to be considered externally at 1m from the receiving residential window. Windows may be closed or partially closed leading to further attenuation, as follows.
Further calculations have been undertaken to assess whether the noise emissions from the plant unit installation would be expected to meet the recognized British Planning Compliance Review recommendations, in order to further ensure the amenity of nearby noise sensitive receivers.
British Standard 8233:2014 'Sound insulation and noise reduction for buildings – Code of Practice' gives recommendations for acceptable internal noise levels in residential properties. Assuming worst case conditions, of the closest window being for a bedroom, BS8233:2014 recommends 35dB(A) for internal resting/sleeping conditions during daytime hours.
With a calculated external level of 22dB(A), the residential window itself would not need to provide any additional attenuation in order for the recommended internal noise conditions to be achieved. According to BS8233:2014, even a partially open window offers 10dB attenuation, thus leading to a further reduced interior noise level.

Receiver	Design Range – for resting/ sleeping conditions in a bedroom during daytime in BS8233:2014	Internal Noise Level at Receiver With Open Window (Due to Plant Installation)
Residential Window as in figure 5.2	35dB(A)	12dB(A)

6.0 SUMMARY AND CONCLUSIONS

DAA Group has been appointed to carry out a Noise Impact Assessment at Unit 3, The Montague Centre BN11 1YJ. The purpose of the survey was to assess the level of noise emanating from the proposed kitchen extraction system to the nearest residential units and to advise on the level and type of mitigation that will be required.

Manufacturer's noise data of proposed kitchen extract fan has been used to obtain Specific and Rated Noise Level at the nearest noise sensitive receiver in accordance with British Standard BS4142:2014+A1:2019 for compliance with Local Authority requirements.

The rating level was compared with the representative background noise level to assess the likelihood of impact considering the environmental noise context of the area as per the requirements of BS4142:2014+A1+2019.

A Rating level of 22dB has been calculated, which is -15dB below the lowest recorded background noise level (L90). It has been demonstrated that adverse effects have been minimised and significant effects or nuisance will be avoided with the proposed mitigation measures.

It has been concluded that noise emissions from the proposed plant would not have an adverse impact on the nearest residential receivers provided that the mitigation measures presented in 5.5 is followed.

APPENDIX A ACOUSTIC TERMINOLOGY

B.1 WEIGHTED DECIBEL, dB(A)

The unit generally used for measuring environmental, traffic or industrial noise is the A-weighted sound pressure level in decibels, denoted dB(A). The weighting is based on the frequency response of the human ear and has been found to correlate well with human subjective reactions to various sounds. An increase or decrease of approximately 10 dB corresponds to a subjective doubling or halving of the loudness of a noise, and a change of 2 to 3 dB is subjectively barely perceptible.

B.2 EQUIVALENT CONTINUOUS SOUND LEVEL, LAeq

Another index for assessment for overall noise exposure is the equivalent continuous sound level, L_{Aeq}. This is a notional steady level which would, over a given period, deliver the same sound energy as the actual time-varying sound over the same period.

B.3 MAXIMUM NOISE LEVEL, LAmax

The maximum noise level identified during a measurement period. Experimental data has shown that the human ear does not generally register the full loudness of transient sound events of less than 125 ms in duration.

B.4 NOISE RATING, NR

Noise ratings are used as a single figure criterion for specifying services noise in buildings. Each noise rating value has an associated spectrum of defined values in each third or octave frequency band. To determine the noise rating of a room the measured spectrum is compared to a set of noise rating curves. The highest NR curve that crosses any single frequency band of the measurement determines the noise rating for the room. The single figure noise rating is read at the 1 kHz band.

B.5 SOUND LEVEL DIFFERENCE (D)

The sound insulation required between two spaces may be determined by the sound level difference needed between them. A single figure descriptor which characterises a range of frequencies, the weighted sound level difference, D, is sometimes used (BS EN ISO 717-1). This parameter is not adjusted to reference conditions.

The standardized level difference, Dn, T is a measure of the difference in sound level between two rooms, in each frequency band, where the reverberation time in the receiving room has been normalised to 0.5 s. This parameter measures all transmission paths, including flanking paths.

The weighted standardized level difference, DnTw, is a measure of the difference in sound level between two rooms, which characterises a range of frequencies and is normalised to a reference reverberation time

B.6 SOUND REDUCTION INDEX (R)

The sound reduction index (or transmission loss) of a building element is a measure of the loss of sound through the material, i.e. its attenuation properties. It is a property of the component, unlike the sound level difference which is affected by the common area between the rooms and the acoustic of the receiving room. The weighted sound reduction index, Rw, is a single figure description of sound reduction index characterising a range of frequencies, which is defined in BS EN ISO 717-1: 1997. The Rw is calculated from measurements in an acoustic laboratory

B.7 STATISTICAL NOISE LEVELS (L_{A90}, (T) L_{A1}, (T) L_{A10}, (T) etc.)

For levels of noise that vary widely with time, for example road traffic noise, it is necessary to employ an index which allows for this variation. The L_{A10} is the level exceeded for ten per cent of the time under consideration, has historically been
adopted in the UK for the assessment of road traffic noise. The LA90 is the level exceeded for ninety per cent of the time, has been adopted to represent the background noise level. The L_{A1} the level exceeded for one per cent of the time, is representative of the maximum levels recorded during the sample period. A weighted statistical noise levels are denoted LA10, dB LA90, dB. etc. The reference time (T) is normally included, e.g. LA10, (5min), & LA90, (8hr).

B.8 TYPICAL NOISE LEVELS

Typical noise levels are given in the following table.

Noise Level dB(A)	Example
130	Threshold of pain
120	Jet aircraft take-offs at 100 m
110	Chain saw at 1 m
100	Inside disco
90	Heavy lorries at 5 m
80	Kerbside of busy street
70	Loud radio (in typical domestic room)
60	Office or restaurant
50	Domestic fan heaters at 1m
40	Living room
30	Ventilation Noise in Theatre
20	Remote countryside on still night
10	Sound insulated test chamber
0	Threshold of hearing.

APPENDIX B CALCULATIONS

Kitchen Extract System.															
NOISE EMISSION CALCULATION															
ITEM	PARAMETER				HZ		63	125	250	500	1K	2K	4K	8K	dBA
1	**Schedule of Plant**		Qty												
2	**Helios Gigabox**														
3	Model: GBW 560/6/6		1	Swl	dB	+	60	60	62	69	67	66	61	50	72
4	Ductwork natural losses		Lot	IL	dB	-	15	10	3	2	6	8	8	9	
5	Discharge Attenuator Model: CP01-M50-120	Primary	1	IL	dB	-	4	8	12	19	28	23	16	12	
6															
7															
8															
9															
10															
11	Revised Sound Power Level:		1	Swl	dB	+	41	42	47	48	33	35	37	29	47
12															
13															
14															
15	Distance to nearest receptor Metres:	r	10		dB	-	28	28	28	28	28	28	28	28	28
16	SPL=SWL -20log(r) + 10log(Q) -11 dB.		Q	2											
17															
18															
19															
20	Spl at receptor				dB	+	13	14	19	20	5	7	9	1	19
21															
22															
23	Façade correction		3		dB	+	3	3	3	3	3	3	3	3	3
24															
25															
26															
27	Specific noise level at receptor				dB	+	16	17	22	23	8	10	12	4	22
28	(1m outside noise sensitive window)														
29	**Lowest Background Noise Levels: (L_{A90})**														
30	**Daytime (07:00-23:00)**				dB	+									**37**
31	**Difference:** (Daytime Assessment level)				dB	-									**-15**
32															
33															
34															
35															
36															
	E&OE														

Kitchen Extract System - BREAK OUT															
NOISE EMISSION CALCULATION															
ITEM	**PARAMETER**				**HZ**		**63**	**125**	**250**	**500**	**1K**	**2K**	**4K**	**8K**	**dBA**
1	**Schedule of Plant**		Qty												
2	**Helios Gigabox**														
3	Model: GBW 560/6/6		1	Swl	dB	+	52	52	51	42	40	37	32	25	55
4	Helios Acoustic Housing		1		dB	-	12	18	24	32	34	39	42	44	
5															
6															
7															
8															
9															
10															
11	Revised Sound Power Level:		1	Swl	dB	+	40	34	27	10	6	-2	-10	-19	30
12															
13															
14															
15	Distance to nearest receptor Metres:	r	10		dB	-	28	28	28	28	28	28	28	28	28
16	SPL=SWL -20log(r) + 10log(Q) -11 dB.		Q	2											
17															
18															
19															
20	Spl at receptor				dB	+	12	6	-1	-18	-22	-30	-38	-47	2
21															
22															
23	Façade correction		3		dB	+	3	3	3	3	3	3	3	3	3
24															
25															
26															
27	Specific noise level at receptor				dB	+	15	9	2	-15	-19	-27	-35	-44	5
28	(1m outside noise sensitive window)														
29	**Lowest Background Noise Levels: (L_{A90})**														
30	**Daytime (07:00-23:00)**				dB	+									**37**
31	**Difference:** (Daytime Assessment level)				dB	-									**-32**
32															
33															
34															
35															
36															
	E&OE														

APPENDIX C MEASUREMENTS

