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64-66 CHARLOTTE STREET & 32 TOTTENHAM STREET NOISE IMPACT ASSESSMENT

Technical Report: R6759-2 Rev 1

Date: 24th May 2017

For: Salash Holdings Ltd c/o Porta Planning LLP 67-69 George Street London W1U 8LT



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1.0 INTRODUCTION

- 1.1 24 Acoustics Ltd has been instructed to undertake a noise impact assessment relating to proposed internal alterations at 64-66 Charlotte Street and 32 Tottenham Street, Camden, London. It is proposed to create three new residential properties at 66 Charlotte Street within the mixed-use development (other uses include offices, retail and a restaurant). In addition, it is proposed to install a new kitchen extract system at the site associated with ground floor and basement level restaurant use at 64 Charlotte Street.
- 1.2 The assessment has been completed following ambient and background noise surveys undertaken at the site undertaken between 4th and 11th October 2016 and 23rd and 30th March 2017.
- 1.3 All sound pressure levels quoted in this report are in dB relative to 20 μ Pa. All sound power levels are quoted in dB relative to 10⁻¹² Watts. A glossary of the acoustic terminology used in this report is provided in Appendix A.

2.0 SITE DESCRIPTION AND PLANNING HISTORY

- 2.1 64-66 Charlotte Street and 32 Tottenham Street is located on the northern corner of the junction between Charlotte Street and Tottenham Street in Camden, London. The site is located in a mixed commercial and residential area of Camden. The front elevations face Charlotte Street and Tottenham Street respectively which are busy single carriage way roads. The rear of the site faces Charlotte Mews which comprises also a mix of residential and commercial uses.
- 2.2 The site is subject to a lengthy planning history. A mansard roof is currently under construction at 64 Charlotte Street which was previously consented in July 2016 (Planning Reference: 2015/6701/P). Consent for a land use swap was approved in December 2016 (Planning Reference: 2016/3133/P) which related to basement and ground floor level B1 offices and A3 restaurant and the installation of new kitchen extract plant associated with the new restaurant kitchen use.

- 2.3 Planning consent is sought from Camden Borough Council for internal alterations at 64-66 Charlotte Street and 32 Tottenham Street to create three new residential units within 66 Charlotte Street. The ground and basement levels across all three buildings will comprise office, retail and restaurant spaces. The proposals include also the construction of an extension at ground and first floor level to the rear of 66 Charlotte Street and the construction of a mansard roof to provide residential accommodation at 66 Charlotte Street.
- 2.4 Noise from external ambient noise sources has the potential to affect new residential properties. Therefore, an assessment of internal noise levels of new residential spaces has been undertaken.
- 2.5 In addition, an assessment of noise from plant associated with the basement and ground floor level restaurant use has been undertaken.
- 2.6 Road traffic noise from Charlotte Street and Tottenham Street is the dominant source of ambient noise affecting the front elevations at the site. Existing plant associated with other nearby properties at the rear of the site is the dominant sources of ambient noise affecting the rear elevations.
- 2.7 Figure 1 shows the site location. Figures 2 and 3 shows the proposed basement and ground floor layout. Figure 4 shows the location of proposed plant.



3.0 STANDARDS AND GUIDANCE

Local Planning Authority Guidance - London Borough of Camden

3.1 The London Borough of Camden planning guidance developmental policy 28 (DP28 Noise and Vibration) [Reference 1] states in Tables A and B that noise levels from external noise road traffic and railway noise sources which planning permission would not be granted and which attenuation measures will be required. Tables A and B are summarised below in Table 1.

Time Period	Table A: External noise levels adjoining roads which planning permission will not be granted	Table B: External noise levels adjoining roads which attenuation measures will be required
Daytime (07:00-19:00)	72 dB LAeq, 12 hour	62 dB LAeq, 12 hour
Evening (19:00-23:00)	72 dB L _{Aeq, 4 hour}	57 dB L _{Aeq, 4 hour}
Night-time (23:00-07:00)	66 dB LAeq, 8 hour	52 dB LAeq, 8 hour
Night-time (23:00-07:00)	N/A	>82 dB L _{Amax} (not to be exceeded several times an hour)

Table 1: Summary of DP28, Tables A & B

- 3.2 Local planning authority guidance refers to PPG24 [Reference 2] in relation to impact from external noise sources at residential development sites which in turn refers to internal noise levels criteria of BS 8233 [Reference 3]. It is therefore considered that internal noise levels within proposed new residential uses from external ambient noise sources should be assessed in accordance guidance BS 8233:2014.
- 3.3 Developmental Policy 28 states also in Table E that noise from plant and machinery should be 5 dB or lower than the background noise level for daytime, evening and night-time periods when assessed at the nearest noise sensitive property. This assumes that noise from the plant does not contain a distinguishable noise character. It is assumed that the assessment should be undertaken in accordance with guidance provided by BS 4142 [Reference 4].
- 3.4 For plant that contains an impulsive or tonal noise character, when assessed at the nearest sensitive property, the policy states that noise from plant and machinery should be at least 10 dB lower than the prevailing background noise level.



<u>BS 8233: 2014</u>

- 3.5 BS 8233:2014 provides design guidance for dwelling houses, flats and rooms in residential use and recommends that internal noise levels in dwellings do not exceed 35 dB L_{Aeq,16 hour} in living rooms and bedrooms during the day, 40 dB L_{Aeq, 16 hour} in dining rooms during the day and 30 dB L_{Aeq, 8 hour} in bedrooms at night.
- 3.6 BS 8233 also notes that "Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or L_{Amax,F}, depending on the character and number of events per night."
- 3.7 The World Health Organisation (WHO) provides guidance on desirable internal noise levels to minimise the risk of sleep disturbance. The WHO 2000 guidelines suggest internal noise levels not regularly exceeding 45 dB L_{Amax,f} for 'a good night's sleep'.

British Standard 4142:2014

3.8 BS 4142:2014 provides a method for rating the effects of industrial and commercial sound on residential areas. The standard advocates a comparison between the typical measured L_{A90} background noise level and L_{Aeq} noise level from the source being considered. For rating purposes if the noise source is tonal, intermittent or otherwise distinctive in character, a rating correction is applied. The standard states that a difference between the rating level and the background level of around +10 dBA is an indication of a significant adverse impact, depending on the context and a difference of around +5 dBA is likely to be an indication of an adverse impact again depending on the context. Where the rating level does not exceed the background noise level, this is an indication of the specific noise source having a low impact (depending upon the context).



4.0 ASSESSMENT METHODOLOGY

- 4.1 The following assessment methodology has been used:
 - i. Ambient and background noise measurements have been undertaken to determine existing levels of environmental noise at the proposed site;
 - Calculations and assessment has been undertaken to determine internal noise levels within proposed residential properties to achieve BS 8233:2014 criteria. Consideration of mitigation measures by specification of acoustic glazing and ventilation where necessary.
 - iii. Calculations of the noise level from plant associated with the restaurant use at the nearest residential properties from manufacturers data;
 - iv. An assessment of the noise impact from proposed plant has been undertaken in accordance with the guidance of BS 4142. A target difference of -5 dB or lower (when there is no impulsive or tonal noise character) between the rating noise level and background noise level when assessed at the nearest noise sensitive property.

5.0 ENVIRONMENTAL NOISE SURVEYS

Environmental Noise Measurements

- 5.1 Environmental noise measurements were undertaken between 4th and 11th October 2016 and 23rd and 30th March 2017 to determine the external noise levels at the existing site. Noise monitoring equipment was located at three locations at the site as shown in Figure 1 and described as follows:
 - Location 1: Front elevation of 64 Charlotte Street, overlooking Charlotte Street at second floor level.
 - Location 2: Front elevation of 32 Tottenham Street, overlooking Tottenham Street at second floor level.
 - Location 3: Rear façade of 64 Charlotte Street at second floor level.
- 5.2 Measurements were undertaken in samples of 5 or 15 minutes in terms of the overall freefield A-weighted L_{eq} , L_{90} and $L_{max,f}$ noise levels.



- 5.3 Noise measurements were undertaken with the following instrumentation:
 - 3 x Rion NL52 Class 1 accuracy sound level meter;
 - Bruel and Kjaer Type 4231 Class 1 accuracy acoustic calibrator.
- 5.4 The instrumentation was calibrated before and after the surveys in accordance with the manufacturer's instructions. No significant drift in calibration was recorded. Instrumentation was fitted with an environmental weather shield during the surveys.
- 5.5 Weather conditions during the survey periods were generally fine and dry. Wind speeds were lower than 5 m/s during the measurement periods.

<u>Results</u>

5.6 The results of the ambient noise measurements are presented in graphical format in Appendix B and shown in Tables 2 to 4. 24 Acoustics considers the typical maximum noise level to be the 10th highest noise level during the relevant night-time assessment period.

	Daytime, dB (07:00 - 19:00)	Evening, dB (19:00 - 23:00)	Night-time, dB (23:00 - 07:00)	
Date	LAeq, 12 hour	LAeq, 4 hour	LAeq, 8 hour	Typical L _{Amax, f}
Thu 23/03/2017	68	64	60	80
Fri 24/03/2017	69	64	60	78
Sat 25/03/2017	65	63	60	77
Sun 26/03/2017	63	59	60	79
Mon 27/03/2017	66	61	60	81
Tue 28/03/2017	71	62	60	79
Wed 29/03/2017	66	61	61	83
Thu 30/03/2017	68	-	-	-
Noise Level	67	62	60	80

 Table 2: Ambient Noise Measurement Results – Location 1



	Daytime, dB (07:00 - 19:00)	Evening, dB (19:00 - 23:00)	y, dB Night-time, dl 23:00) (23:00 - 07:00	
Date	LAeq, 12 hour	LAeq, 4 hour	L _{Aeq} , 8 hour	Typical L _{Amax, f}
Thu 23/03/2017	64	64	57	79
Fri 24/03/2017	67	61	58	78
Sat 25/03/2017	61	59	56	76
Sun 26/03/2017	60	56	58	79
Mon 27/03/2017	65	58	57	79
Tue 28/03/2017	65	60	58	79
Wed 29/03/2017	64	59	58	80
Thu 30/03/2017	66	-	-	-
Noise Level	65	60	58	79

Table 3: Ambient Noise Measurement Results – Location 2

	Daytime, dB (07:00 - 19:00)	Evening, dB (19:00 - 23:00)	Night-time, dB (23:00 - 07:00)	
Date	LAeq, 12 hour	LAeq, 4 hour	LAeq, 8 hour	Typical L _{Amax, f}
Tue 04/10/2016	57	50	48	65
Wed 05/10/2016	61	54	45	65
Thu 06/10/2016	63	52	45	62
Fri 07/10/2016	57	49	45	61
Sat 08/10/2016	52	48	46	63
Sun 09/10/2016	49	45	45	63
Mon 10/10/2016	59	49	45	63
Tue 11/10/2016	61	-	-	-
Noise Level	59	50	46	63

Table 4: Ambient Noise Measurement Results – Location 3

5.7 Measured ambient noise levels at Locations 1 and 2 exceed the values provided in DP28 Table B for road traffic noise sources which indicates mitigation measures are required to achieve acceptable internal noise levels. Noise levels at Location 3 are dominated by plant at the rear of the site associated with other nearby properties. 5.8 The results of the background noise measurements at the rear of the development (Location 3, relating to proposed restaurant plant and machinery) are shown in Table 5. BS 4142 requires a representative background noise level to be used for the assessment period under consideration. In this instance, it is considered that the typical noise level is representative (24 Acoustics determines the typical noise level to be the average minus one standard deviation) for each relevant assessment period.

	Day Level, dB (07:00 - 19:00)	Evening Level, dB (19:00 - 23:00)	Night Level, dB (23:00 - 07:00)
Date	Typical LA90, 1 hour	Typical La90, 1 hour	Typical La90, 15 min
Tue 04/10/2016	49	47	45
Wed 05/10/2016	51	45	40
Thu 06/10/2016	49	45	41
Fri 07/10/2016	47	44	42
Sat 08/10/2016	45	44	41
Sun 09/10/2016	43	41	40
Mon 10/10/2016	49	45	41
Tue 11/10/2016	49	-	-
Noise Level	43	41	40

 Table 5: Background Noise Measurement Results – Location 3

5.9 Background noise levels were found to be partly influenced by construction works ongoing at the site. Background noise measurement results from the weekend period have therefore been selected for use within this assessment which are considered to present a representative background noise level at the rear of the development site.

Plant Noise Limits

5.10 Plant noise limits have been determined based on the background noise measurement results and local planning authority criteria. Proposed plant should therefore not exceed the following noise levels at the nearest noise sensitive receptors:

Daytime (07:00 – 19:00)	38 dB LAeq, 1 hour
Evening (19:00 – 23:00)	36 dB LAeq, 1 hour
Night-time (23:00 – 07:00)	35 dB LAeq, 15 min

5.11 If plant contains an impulsive or tonal noise character then the above limits should be reduced by 5 dB accordingly.



6.0 CALCULATIONS AND NOISE IMPACT ASSESSMENT

Internal Noise Assessment

- 6.1 Calculations have been undertaken using ambient noise measurement results as described in Section 5 to determine the glazing and ventilation requirements for the new residential properties at 66 Charlotte Street (including within proposed mansard roof areas) which will ensure that the noise levels inside the properties does not exceed 35 dB LAeq, 16 hour during the day and 30 dB LAeq, 8 hour at night (and also not regularly exceed 45 dB LAmax.f at night). Calculations are based on room volumes and elevation designs of the proposed scheme.
- 6.2 The existing external walls are understood to comprise a solid brick/masonry construction. The analysis given below is based on the assumption that the envelope construction achieves a sound insulation performance in the region of 55 dB R_w.
- 6.3 Calculations have assumed windows of new residential properties will remain closed to provide adequate internal noise levels. The proposed ventilation strategy should also allow adequate ventilation to meet ventilation requirements as per Part F of the Building Regulations with windows closed.
- 6.4 Calculations have identified minimum required acoustic glazing and ventilation specifications for each relevant room in the proposed residential property at 66 Charlotte Street. These specifications are shown below in Table 6.

Facade	Room	Glazing Type	Ventilation Type
Front façade facing	Living Rooms	Glazing Type B	Vent Type A
Charlotte Street	Bedrooms	Glazing Type C	Vent Type B
Rear façade facing	Living Rooms	Glazing Type A	Vent Type A
Charlotte Mews	Bedrooms	Glazing Type A	Vent Type A

Table 6: Acoustic Glazing and Ventilation Requirements – 66 Charlotte Street.



- 6.5 Glazing (achieving a minimum weighted sound reduction index of 30 dB R_w) and passive trickle ventilator (achieving minimum weighted performance value of 32 dB D_{n,e,w}) is suitable for non-habitable rooms (i.e. bathrooms and corridors/hallways). This glazing requirement may be achieved using 4-16-4 configuration units.
- 6.6 Glazing types when installed should be capable of achieving the performance stated below in Table 7.

Zone Location	SRI (dB) per Octave Band Centre Frequency (Hz)						
Zone Location	125	250	500	1k	2k	4k	
Glazing Type A	21	17	25	35	37	31	
Glazing Type B	24	24	32	37	37	44	
Glazing Type C	24	25	31	42	44	49	

Table 7: Required Glazing Performance

- 6.7 In making a comparison with the values in Table 7, it is important that the glazing figures used are the result of tests in accordance with ISO 10140, Part 2: 2010 and that the quoted minimum sound reduction specifications are met by the entire glazing system as a whole, including frames, seals, any insulated panels and not just the glass.
- 6.8 In order to assist with the selection process, the following glazing configuration, if installed properly, would be capable of achieving the required sound reduction performance:

Glazing Type A: 4 mm glass: 16 mm cavity (minimum): 4 mm glass (or equivalent); Glazing Type B: 10 mm glass: 16 mm cavity (minimum): 6 mm glass (or equivalent); Glazing Type C: 6 mm glass: 12 mm cavity (minimum): 6.4 mm Stadip Silence (or equivalent).

6.9 The acoustic performance criteria for specified ventilation types are shown in Table 8.

Vontilation	SRI (dB) per Octave Band Centre Frequency (Hz)						
ventilation	125	250	500	1k	2k	4k	
Vent Type A	37	36	35	36	34	45	
Vent Type B	43	33	33	52	52	55	

Table 8: Ventilation Acoustic Performance

6.10 The above Type A and Type B ventilation acoustic specification relates to a minimum acoustic performance rating of 36 dB D_{n,e,w} and 39 dB D_{n,e,w} respectively.



6.11 In order to assist with the selection process, the following ventilators, if installed properly, would be capable of achieving the required sound reduction performance:

Vent Type A: Acoustically attenuated trickle ventilator;

Vent Type B: Rytons Cowled 125mm Acoustic AirCore, with Hit & Miss Ventilator, or,

Acoustically attenuated passive wall vent or acoustically attenuated window trickle ventilator.

- 6.12 In making a comparison with the above specification, it is important that the figures used are the result of laboratory tests. Note that the stated minimum performance value assumes one ventilator per habitable room.
- 6.13 Assuming ventilation and glazing measures are provided as described above, it is considered internal noise levels within residential properties following proposed changes will be acceptable.

Plant Noise Assessment

- 6.14 The proposed internal alterations to the ground and basement level office and restaurant uses will include the installation of air extraction plant associated with the restaurant kitchen. Planning consent was granted in December 2016 for the installation of kitchen extract plant at 64 Charlotte Street (Planning Reference: 2016/3133/P)
- 6.15 The following assessment has been undertaken with respect to the proposed internal alterations, including changes to the floor layout of ground and basement level areas and introduction of new residential receptors to the rear of 66 Charlotte Street which have the potential to be affected by noise from plant associated with the restaurant operation.
- 6.16 The proposed plant will comprise a single kitchen extract fan located internally at basement level. The extract ducting will be routed through the lower ground floor level and exit the building at first floor level. The external ducting will extend up the rear façade of 32 Tottenham Street and vent at 1 m above eaves level.
- 6.17 It is understood the fan unit will be a Flakt Woods, Estoc Targe 80-500-3 or similar. This assessment should be updated following final plant selection or where any significant changes to the plant system design are made.



- 6.18 Whilst the extract fan will likely be in operation during daytime and evening periods only (during the opening hours of the restaurant use), for the purposes of this assessment it is assumed that the extract fan system could be in operation past 23:00 hours.
- 6.19 The proposed extract fan manufacturers stated in-duct sound power levels are detailed in Table 9:

Model	Sound Power Level (dB) per Octave Band Frequency, Hz										
	63	125	250	500 1k		2k	4k	8k			
Flakt Woods,			70	76	70	71	67	60			
(Outlet, in-duct level)	-	//	/9	76	78	/1	67	60			

Table 9: Manufacturer's stated plant noise levels.

6.20 A silencer is recommended to be fitted to the kitchen extract system on the atmosphere side of the fan with minimum acoustic performance criteria as provided below in Table 10.

Model	Minimum Sound Reduction Index (dB) per Octave Band Frequency (Hz)										
	63	125	250	500	1k	2k	4k	8k			
Silencer	2	4	9	15	17	14	10	8			

Table 10: Attenuator Minimum Acoustic Performance Specification

- 6.21 Calculations have been undertaken to determine the noise level at the nearest residential properties from kitchen extract plant including the influence of proposed silencer. Calculations have been completed using single octave data as shown in full in Appendix C.
- 6.22 The nearest existing and proposed residential properties to the plant are located at the rear of 32 Tottenham Street and 64-66 Charlotte Street. The nearest noise sensitive receptor location to the plant is located directly below the ducting vent at 32 Tottenham Street.
- 6.23 Calculations indicate that, with the proposed plant installed, including proposed silencer, the noise level at the closest noise sensitive receptor) will be 32 dB L_{Aeg}.
- 6.24 Operation of the extract fan will not contain any distinguishable or tonal characteristics.



6.25 Calculations indicate that noise emissions from the proposed plant will not exceed the determined noise limits for daytime, evening or night-time periods in accordance with the local planning authority planning guidance and described in Section 5.8. On the above basis, it is therefore considered that noise from the proposed plant is acceptable.

Internal extract fan ducting

- 6.26 With respect to the proposed internal alterations. It is proposed the fan and ducting located internally will be enclosed to minimise noise transfer to other areas of the building using the following construction:
 - Plant and ducting mounted on using anti-vibration mounts;
 - 50 mm cavity with mineral wool infill;
 - 12.5 mm Gyproc Soundbloc plasterboard;
 - 12.5 mm Knauf Fireboard plasterboard.
- 6.27 It is worth noting that the performance of the above detail is highly dependant on good workmanship. The plasterboard enclosing fan and ducting should be staggered and sealed.
- 6.28 On the above basis, it is considered that internal and external noise levels from proposed plant will be acceptable.

Sound Insulation Between Proposed Uses

- 6.29 With respect to the proposed development and internal alterations to ground floor areas, an enhanced level of sound insulation is considered necessary to minimise associated noise impact from activities in the ground floor restaurant at the proposed first floor level residential properties.
- 6.30 From consideration of the anticipated internal noise levels from restaurant activities and potential limitations of the existing party floor construction, it is considered reasonable that the party floor construction between the first floor residential properties and ground floor restaurant should achieve a minimum sound insulation level of 55 dB R_w.
- 6.31 It is understood that the existing floor construction comprises of; existing floor boards, timber joist system and a plaster ceiling.



- 6.32 It is recommended that the new floor construction comprises the following:
 - Existing floor boards;
 - Existing timber joists;
 - Existing plaster ceiling or 12.5 mm plasterboard layer;
 - Resilient hangers (e.g. British Gypsum GAH2, or equivalent);
 - 100 mm minimum mineral wool infill above;
 - Two layers of 15 mm plasterboard (joints staggered and sealed).
- 6.33 There should be no penetrations for services/lighting within the proposed independent ceiling. Lighting should be surface mounted or provided by other means. Where flush mounted lighting is required an additional decorative ceiling should be provided.
- 6.34 The above construction is dependent on good workmanship. Care should be taken to ensure the existing floor construction is made good and suitable detailing provided to control flanking elements.
- 6.35 A planning condition could be provided to control the transfer of noise between ground and first floor level uses to minimise potential noise impact.



7.0 CONCLUSIONS

- 7.1 24 Acoustics Ltd has been instructed by Salash Holdings Ltd, c/o Porta Planning LLP to undertake a noise impact assessment in relation to the proposed development at 64-66 Charlotte Street and 32 Tottenham Street, Camden, London.
- 7.2 Environmental noise measurements have been undertaken at the site between 4th and 11th October 2016 and 23rd and 30th March 2017.
- 7.3 Recommendations have been provided for acoustic glazing to habitable rooms of proposed new residential properties. It is concluded that with the recommended measures given, noise within habitable rooms, due to external ambient sources, would comply with maximum internal levels of 35 dB L_{Aeq 16 hour} during the daytime and 30 dB L_{Aeq 8 hour} and not to regularly exceed 45 dB L_{Amax, f} at night.
- 7.4 A plant noise impact assessment has been undertaken based on measured background noise levels and local planning authority guidance. The assessment has indicated that noise impact from the proposed plant at the nearest noise sensitive property will be lower than the determined noise limits and is therefore considered acceptable.
- 7.5 A review of the sound insulation performance of party floors between the ground floor commercial and first floor level proposed residential units has been undertaken. Recommendations have been made to minimise the impact of noise transfer from the ground floor restaurant use.



REFERENCES

- 1. Camden Borough Council. Camden Development Policies (DP28, Noise and Vibration), 2010.
- 2. Department of the Environment. Planning Policy Guidance (PPG) 24, Planning and Noise, September 1994.
- 3. British Standards Institution. British Standard 8233: Guidance on sound insulation and noise reduction for buildings, 2014.
- 4. British Standards Institution. British Standard 4142: 'Method for Rating and Assessing Industrial and Commercial Sound', 2014.















APPENDIX A – ACOUSTIC TERMINOLOGY

Noise is defined as unwanted sound. The range of audible sound is from 0 to 140 dB. The frequency response of the ear is usually taken to be around 18 Hz (number of oscillations per second) to 18000 Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument. The weighting which is most widely used and which correlates best with subjective response to noise is the dBA weighting. This is an internationally accepted standard for noise measurements.

For variable sources, such as traffic, a difference of 3 dBA is just distinguishable. In addition, a doubling of traffic flow will increase the overall noise by 3 dBA. The 'loudness' of a noise is a purely subjective parameter, but it is generally accepted that an increase/ decrease of 10 dBA corresponds to a doubling/ halving in perceived loudness.

External noise levels are rarely steady, but rise and fall according to activities within an area. In attempt to produce a figure that relates this variable noise level to subjective response, a number of noise indices have been developed. These include:

i) The L_{Amax} noise level

This is the maximum noise level recorded over the measurement period.

ii) The LAeq noise level

This is "equivalent continuous A-weighted sound pressure level, in decibels" and is defined in British Standard BS 7445 as the "value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time internal, T, has the same mean square sound pressure as a sound under consideration whose level varies with time".

It is a unit commonly used to describe construction noise and noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise. In more straightforward terms, it is a measure of energy within the varying noise.



iii) The L_{A10} noise level

This is the noise level that is exceeded for 10% of the measurement period and gives an indication of the noisier levels. It is a unit that has been used over many years for the measurement and assessment of road traffic noise.

iv) The LA90 noise level

This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during the quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.













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APPENDIX C – CALCULATED NOISE LEVELS

Unit	63	125	250	500	1k	2k	4k	8k	dB(A)	Comments
Unit Lw										
1) Flakt Woods, Estoc Targe 80-500-3	77	77	79	76	78	71	67	60	84	Manufacturers data, in duct level
Duct Losses										
	-22	-17	-19	-17	-12	-9	-9	-9		500mm ducting directed through building (approx. 26m length) to vent at 1m above eaves level
Distance Loss										
	-16	-16	-16	-16	-16	-16	-16	-16		Distance from vent to nearest window = 3.5m
Screening										
	0	0	0	0	0	0	0	0		None
Directivity										
	-2	-2	-4	-6	-6	-8	-8	-8		Duct vents vertically away from nearest windows
Silencer										
	-2	-4	-9	-15	-17	-14	-10	-8		Proposed silencer
Level at nearest sensitive window										
	34	38	31	22	27	24	24	19	32	Noise level from plant
Total									32	Noise level from plant at nearest sensitive window

 Table C1: Calculated Noise Levels, Nearest Noise Sensitive Window.