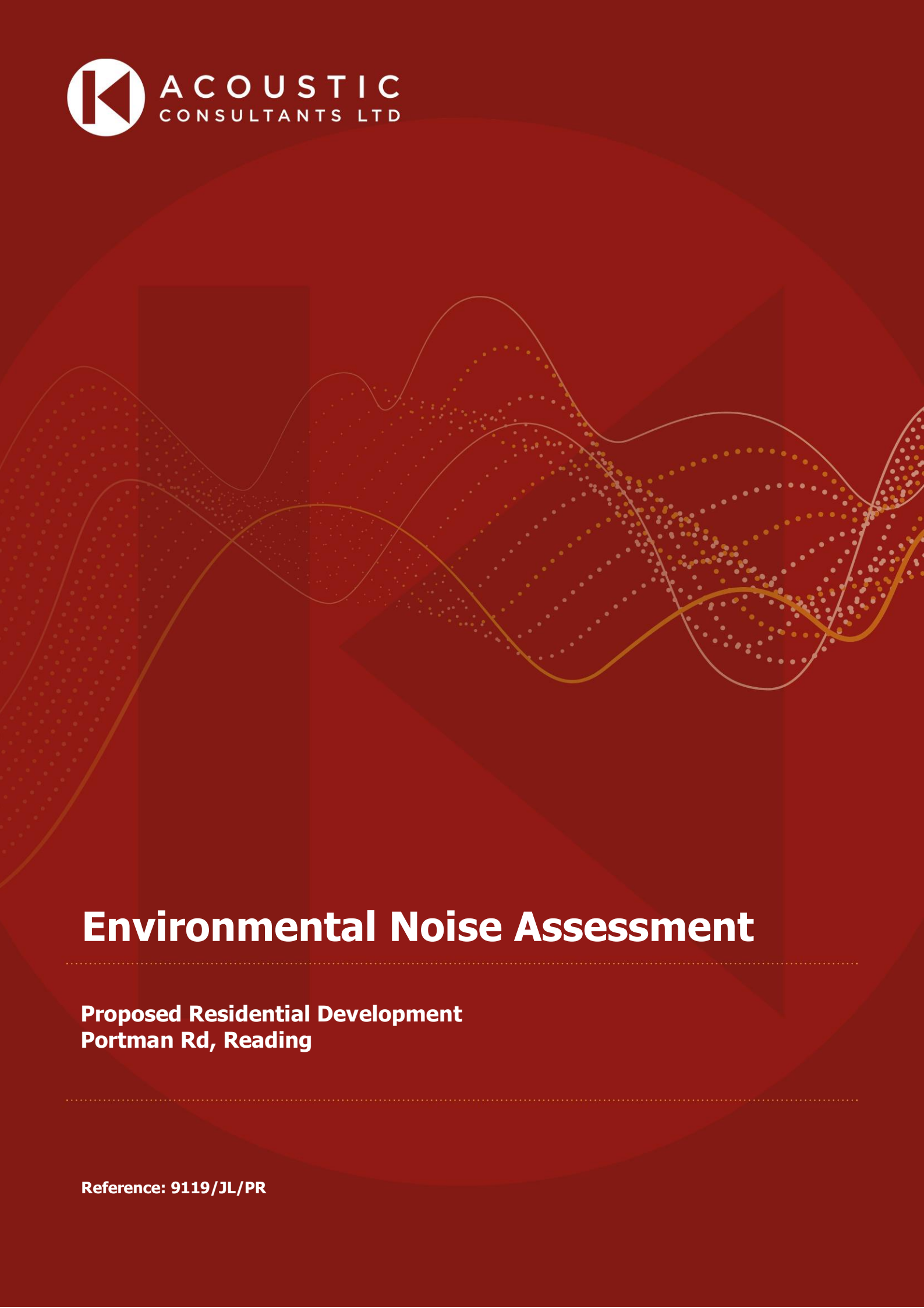




Environmental Noise Assessment

**Proposed Residential Development
Portman Rd, Reading**

Reference: 9119/JL/PR

Client:

Stonegate Homes Ltd

Document Control

Version	Revision Description	Date	Author:	Reviewed by:
1.0	1 st Issue	20/08/2021	Jonas Lopez	Pedro Rodrigues
Rev A	Minor Amendments to Text	20/08/2021	Jonas Lopez	Pedro Rodrigues
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The report has been prepared in good faith, with all reasonable skill and care, based on information provided or available at the time of its preparation and within the scope of work agreement with the Client. We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above. The report is provided for the sole use of the named Client and is confidential to them and their professional advisors. No responsibility is accepted to other parties.

The report limits itself to addressing solely on the noise aspects as included in this report. We provide advice only in relation to noise and acoustics. It is recommended that appropriate expert advice is sought on all the ramifications (e.g. CDM, structural, condensation, fire, legal, etc.) associated with any proposals in this report or as advised and concerning the appointment. It should be noted that noise predictions are based on the current information as we understand it and on the performances noted in this report. Any modification to these parameters can alter the predicted level. All predictions are in any event subject to a degree of tolerance of normally plus or minus three decibels. If this tolerance is not acceptable, then it would be necessary to consider further measures.

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1. Introduction

Stonegate Homes Ltd appointed Acoustic Consultants Limited to provide a noise assessment for the proposed residential development at Portman Road, Reading RG30 1AH.

It is understood that the proposed development has been approved subject to planning conditions (Ref. 201391).

This report addresses specifically planning condition 11 and informs the plant noise limits that can be used to address planning condition 14 at a later stage once plant associated with commercial premises to be located within the ground floor level are known.

This report provides the results of a noise survey conducting on the site and an assessment of external sources of noise on the sensitive elements of the development.

The noise impact assessment has been undertaken in accordance with British Standard 8233:2014 (BS8233), British Standard 4142:2014 and the local authority criteria.

2. The Site

The site is located near Portman Road to the north-west of Reading and is surrounded by residential developments to the north, east and south and by retail units to the west.

At this stage the proposed site plan is not known. The aim of this assessment is to provide outline advice to guide the design of the residential development.

The main sources of noise affecting the site are road traffic along Oxford Road and Curzon Street and plant noise from retail units to the west. A google image of the site location highlighted in red is shown in the figure below.

Figure 1: Google Site Location



Figure 2: Proposed Site Plant



3. Planning & Noise

3.1. Planning Conditions

3.1.1. Planning Condition 11

"11. No development shall commence on site until a detailed scheme, informed by an assessment of the current noise environment, including noise from the ground floor commercial units, for protecting the dwellings from the external noise environment of the area has been submitted to and approved, in writing, by the Local Planning Authority. The scheme itself shall be designed, specified and constructed so that the sound insulation performance of the structure and the layout of the dwellings are such that the indoor ambient noise levels do not exceed the values detailed in Table 4 of BS 8233:2014 and the and that the individual noise events do not exceed 45 dB LA,max,F more than 10 times a night. Where opening windows will lead to an internal noise level increase of 5 dBA or greater above BS 8233:2014 recommended internal levels, the scheme shall include provision of alternative mechanical ventilation with minimum performance equivalent to a mechanical heat recovery (MVHR) system with cool air bypass as an alternative means of cooling and ventilation. Noise from the system should not result in BS8233 internal levels being exceeded.

Thereafter, the development shall not be carried out other than in accordance with the approved scheme which shall be completed before any part of the accommodation hereby approved is occupied, unless the Local Planning Authority otherwise agrees in writing. "

REASON: These details are required due to insufficient information being contained within this submission and in order to safeguard the amenity of occupants in accordance with Policy CC8 of the Reading Borough Local Plan 2019.

3.1.2. Planning Condition 14

"14. No mechanical plant shall be installed until a noise assessment of the proposed mechanical plant has been submitted and approved by the Local Planning Authority. The assessment shall be carried out for in accordance with BS4142:2014 methodology. The predicted specific sound level (LAeq,TR) (with reference to BS:4142) as measured at a point 1 metre external to the nearest noise-sensitive facade shall be at least 10dB below the pre-existing background sound level, LA90,T when all plant/equipment (or any part of it) is in operation. The predicted rating level, LAr,Tr (specific sound level plus any adjustment for the characteristic features of the sound) as measured at a point 1 metre external to the nearest noise-sensitive façade (habitable window of a dwelling) shall not exceed the pre-existing background sound level, LA90,T when all plant/equipment (or any part of it) is in operation. The plant shall thereafter only be installed in accordance with the assessment and shall thereafter be maintained so that it operates to the same standard.



REASON: To safeguard the amenities of the adjoining premises and the area generally, in accordance with Policy CC8 and EN17 of the Reading Borough Local Plan 2019."

4. Noise & Acoustic Criteria

The following guidance documents have been used for to address planning conditions 11 and inform on the plant limits that will be required to address condition 14.

4.1. Condition 11

4.1.1. British Standard 8233:2014

This standard, entitled 'Guidance on sound insulation and noise reduction for buildings', provides advice on noise as it affects buildings of all types, giving consideration to various common sources of noise and is referred to in the condition.

This is considered relevant when assessing noise from existing anonymous noise sources (road and rail traffic) as it effects the proposed residential properties.

It outlines design guidance in general terms, and provides criteria for the indoor ambient noise levels (IANLs) for different types of room. These are stated in terms of the 'equivalent continuous sound pressure level' over the reference time period, the $L_{Aeq, T}$. The IANLs specified by British Standard 8233 that are relevant to this development are as follows.

Table 1: IANL criteria of British Standard 8233:2014

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq, 16 \text{ hr}}$	--
Dining	Dining room / area	40 dB $L_{Aeq, 16 \text{ hr}}$	--
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq, 16 \text{ hr}}$	30 dB $L_{Aeq, 8 \text{ hr}}$

Section 7.7.2 Note 4 of the British Standard states *"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. Sporadic noise events could require separate values"*.

4.1.2. Maximum Noise Levels from Individual Events

British Standard 8233:2014 provides no definitive criteria for maximum noise levels from individual events ($L_{Amax,F}$). Section 3.4 of the WHO Guidance states *"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 L_{Amax} more than 10-15 times per night (Vallet & Verbey 1991)"*.

4.1.3. Retail/ Commercial Operational Levels.

We would assess the noise transfer between retail areas and floors immediately above. At this stage, the specific commercial/ retail operations are unknown, therefore, we have used typical retail noise levels and floor construction to address this.

4.2. Condition 14

Plant associated with the commercial units on the ground floor level are unknown at this stage, therefore we have provided plant noise limits based on the noise survey carried out on site and planning condition 14 which requires "*specific sound level ($L_{Aeq,TR}$) (with reference to BS:4142) as measured at a point 1 metre external to the nearest noise-sensitive façade*" to be "*at least 10dB below the pre-existing background sound level, $L_{A90,T}$ when all plant/equipment (or any part of it) is in operation*".

4.2.1. British Standard 4142:2014

For industrial and commercial noise, the most relevant guidance is provided within British Standard 4142:2014+A1:2019. The methods described in the British Standard use outdoor sound levels to assess the likely effects of sound upon people who might be inside or outside a dwelling or other premises used for residential purposes.

The initial estimate principle is that of establishing the 'difference' between the 'rating level' and the 'background sound level'.

The 'rating level' is the 'specific sound level' of the source over a period of one hour during the day (07:00 to 23:00 hours) and over a period of 15 minutes during the night (23:00 to 07:00 hours). Clause 9 entitled 'Rating Level' 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."

An acoustic character correction should be added to the 'specific sound level' if it exhibits any tonality, impulsivity, other specific characteristics and/or intermittency at the assessment location. The value of the character correction varies, dependent on the prominence of the character of the sound source at the assessment location.

In Clause 11 of the Standard, entitled 'Assessment of the Impacts', it states:

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

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

In all instances the context needs to be considered when determine the overall impact and Observed Effect Level. In terms of context British Standard 4142:2014 states:

"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.

- 1) Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night. Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.*
- 2) The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.*

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

5. Noise Survey

A partially attended noise monitoring exercise was carried on site between the 30th July 2021 and 2nd of August 2021 to determine the noise levels likely to impact upon the proposed residential development.

5.1. Monitoring Equipment

Sound Pressure Levels were measured using three Class 1 sound level meters with a half-inch condenser microphones, using the 'fast' setting. The equipment is checked regularly using a Quality System meeting the requirements of British Standard EN ISO/IEC 17025:2017 "General requirements for the competence of testing and calibration laboratories"; in accordance with British Standard EN 10012:2003 "Measurement management systems. Requirements for measurement processes and measuring equipment"; and traceable to the National Standards.

This equipment was checked and calibrated as noted below and the certificates are available for inspection.

Table 2: Equipment and Calibration Status

Equipment Description / Manufacturer / Type	Serial Number	Date of Calibration	Calibration Certification Number
SLM, NTI, XL2	A2A-11041-E0	04/05/2021	37820
Pre-Amp, NTI, MA220	1822	05/05/2021	37818
Microphone, NTI, MC230A	9583	06/05/2021	37819
Calibrator, CEL-110	045169	04/05/2021	37818
SLM, Svantek, 959	14784	22/04/2020	34608
Microphone, GRAS, 40AE	183810	22/04/2020	34608
Calibrator, Norsonic, 1251	35230	15/01/2020	33792

The measurement system was checked before and after use with the noted calibrator and no significant drift was detected.

5.2. Weather Conditions

Conditions during the survey were generally dry and clement, with an average temperature approximately 20 degrees Celsius and wind speeds not normally exceeding 5 metres per second. These weather conditions are not expected to have adversely affected the measured noise data.

5.3. Monitoring Procedure

5.3.1. Noise Monitoring

In order to assess the existing ambient and background noise climate at the site, two sets of long-term monitoring equipment were set up between the 30th of July 2021 and the 2nd of August 2021.

One set of equipment was installed near Portman Road to capture noise from Oxford Road and nearby retail units. The second set was installed towards Curzon Street. Both proposed monitoring locations are shown in Figure 3.

The main noise source affecting the site is understood to be from road traffic from the surrounding road network.

5.3.2. Monitoring Locations

The monitoring locations are displayed below in Figure 3.

Figure 3: Monitoring Locations

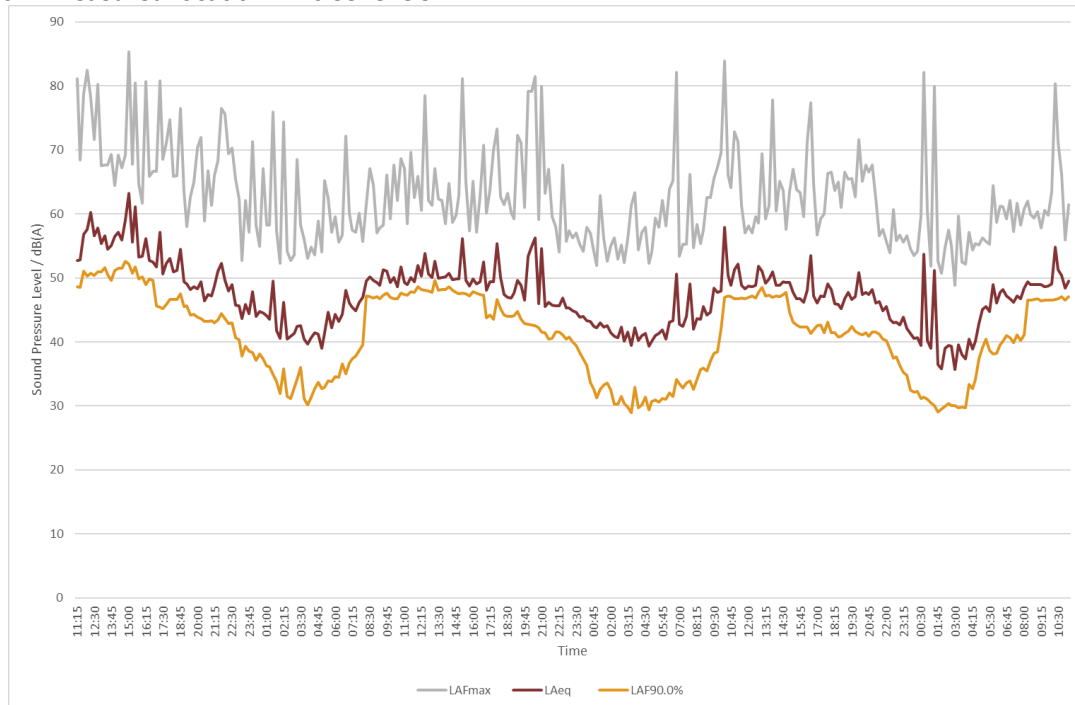


5.4. Measured Noise Levels

5.4.1. Monitoring Location 1

The relevant data from the survey is the A-weighted L_{eq} , and L_{max} , spectral values and L_{A90} values which are displayed below in both tabulated and graph form below. The variation in noise levels is provided below:

Chart 1: Measured location 1 noise levels



From the measured road traffic noise data, we have determined the following free-field octave band design 'daytime' and 'night-time' equivalent noise levels at the monitoring location:

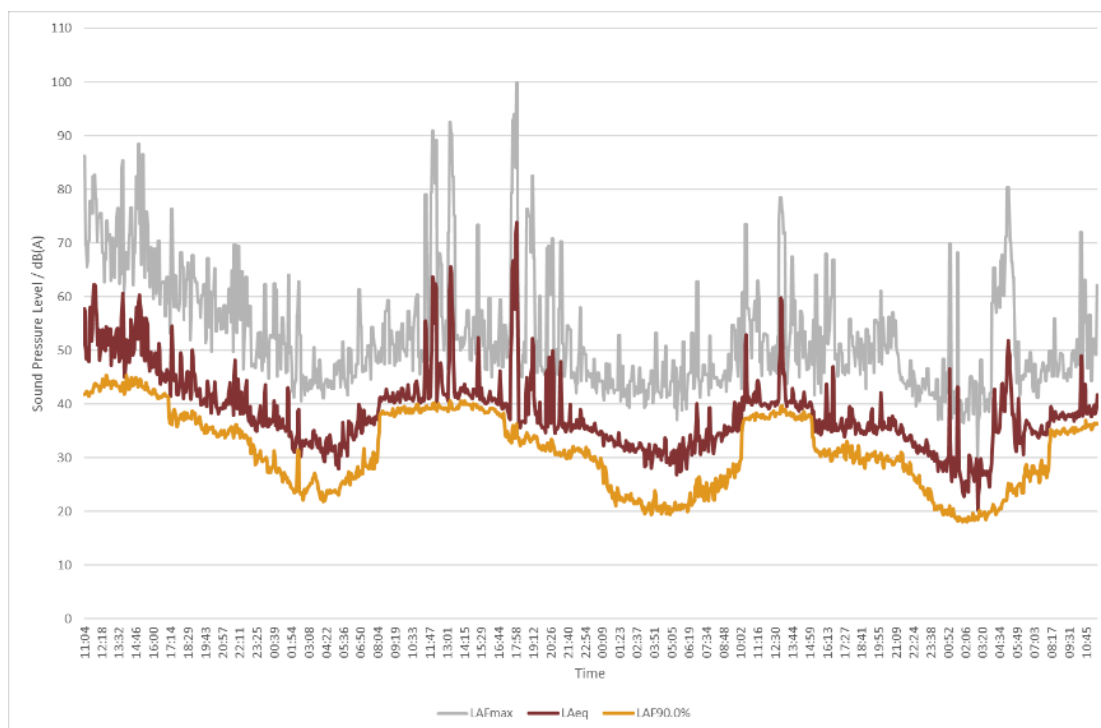
Table 3: Logarithmically averaged noise data from location 1

Period	Parameter	Sound Pressure Level per Octave Band / dB								dB(A)
		63	125	250	500	1000	2000	4000	8000	
Day	L_{eq16hr}	61	53	48	46	47	45	41	39	52
Night	L_{eq8hr}	55	45	41	41	40	36	32	29	44
	L_{Fmax}	80	72	72	68	67	62	56	53	71

5.4.2. Monitoring Location 2

The relevant data from the survey is the A-weighted L_{eq} , and L_{max} , spectral values and L_{A90} values which are displayed below in both tabulated and graph form below. The variation in noise levels is provided below:

Chart 2: Measured location 2 noise levels



From the measured road traffic noise data, we have determined the following free-field octave band design 'daytime' and 'night-time' equivalent noise levels at the monitoring location:

Table 4: Logarithmically averaged noise data from location 2

Period	Parameter	Sound Pressure Level per Octave Band / dB								dB(A)
		63	125	250	500	1000	2000	4000	8000	
Day	L _{eq16hr}	61	52	47	48	47	43	35	30	51
Night	L _{eq8hr}	50	39	32	32	32	29	24	20	36
	L _{Fmax}	65	66	70	72	71	64	53	49	74

We have also determined the following background noise levels (L_{A90, 15 min}) at the monitoring location 2 which will be used later in this report to set plant noise limits for any potential proposed plant associated with the proposed development.

Table 5: Baseline Background Sound Levels at location 2

Period	L _{A90,15min}	
	Range	Mode
Day (07:00 - 23:00)	22 - 45	39
Evening (19:00 - 23:00)	24 - 38	34
Night (23:00 - 07:00)	18 - 33	24

6. External Noise Control

It will be necessary to design the building fabric of the Residential buildings to control external noise levels to meet BS8233 internal noise levels.

6.1. Calculated Internal Levels

6.1.1. Calculation Method

The internal ambient noise levels have been predicted in accordance with the method of Annex G.2 of British Standard 8233:2014. The predicted internal noise levels are those which would be expected in an unfurnished room. Predictions below are based on design road traffic noise levels as stated in section 5 above.

The calculations assume the following:

- Room size: 24m² to daytime rooms and 9m² to bedrooms
- Windows: 3m² to daytime rooms and 1.5m² to bedrooms
- Façade: 8m² to daytime rooms and 10m² to daytime bedrooms
- Vents: 1 open per room.

We advise that building elements, having the sound insulation performances noted below, be incorporated into the design of the façades including the windows and the building roof.

6.2. Building Façade Constructions

Alternative constructions to those noted below could be used, however they would need to be assessed to ensure they control external noise to within the recommended internal ambient noise level criteria.

6.2.1. External Wall Construction

The external walls can be of a conventional construction comprising either masonry or light weight metal/timber frame.

- The masonry construction could comprise of at least two skins of block (one of density 1880 Kg/m³, 100mm cavity, 100mm block (density of 400 Kg/m³). Room side of the block work would be plastered or plasterboard on dabs.
- The lightweight construction could comprise of a single frame (minimum 100mm) construction with two layers of board each side of the stud (minimum density 20 Kg/m²) and 50 millimetre of mineral wool insulation within the cavity.

Table 6: Minimum sound reduction index of external walls

Freq. (Hz)	63	125	250	500	1000	2000	4000	8000	R_w
R (dB)	31	38	46	45	55	66	77	70	52

6.3. Roof Construction

The exact construction of the roof is unknown. The roof could be constructed using traditional techniques, such as a timber construction with concrete tiles (minimum density 30 Kg/m²) with a loft space and a plasterboard ceiling above the habitable rooms. Alternatively, the roof can be a flat 100mm concrete construction, of a density at least 230 kg/m². This construction is expected to achieve the following sound reduction index:

The above constructions are expected to achieve the following sound reduction indices:

Table 7: Required Minimum Sound Reduction Index of Roof

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k	R_w
R (dB)	39	42	40	43	51	58	63	63	49

Any alternative constructions should achieve the above noted performance. Please note that any proposed plant located on the roof might affect noise levels within proposed rooms below.

6.3.1. Window Construction

The windows on all elevations could be openable with an alternative form of ventilation provided. The windows should be constructed housed in sturdy and good quality frames with airtight compression seals.

The sound insulation performance for the windows should achieve the following as a minimum, a typical build up is also provided. The supplier should confirm the performance (octave band R and R_w) is achievable with the chosen system. The performance is provided below:

Table 8: Required minimum sound insulation of windows

Façade	R dB per Octave Band (Hz)								R_w (dB)	Typical Construction
	63	125	250	500	1k	2k	4k	8k		
Bedrooms	16	21	20	31	39	37	47	46	33	6/12/6.4
Living Rooms	20	24	20	25	35	38	35	36	31	6/12/4

6.4. Ventilation Provisions

The ventilation provisions should include the necessary sound attenuation in order that the ingress of external noise is controlled to be compatible with the building fabric. The supplier of any chosen ventilation product should provide test data confirming that the ventilation system meets the following performance data.

6.4.1. Trickle Vents

Trickle vents are feasible and will need to achieve the following performance:

Table 9: Required D_{ne} of trickle vents

Façade	D_{ne} dB per Octave Band (Hz)								D_{new} (dB)	Typical Construction
	63	125	250	500	1k	2k	4k	8k		
Bedrooms	30	37	37	36	47	49	55	61	44	Titon, SF X V75 / SFSA C75 (open)
Living Rooms	30	35	35	36	34	29	33	34	32	Titon, XS13 4400 EA+XC13 412 Canopy (open)

Also, condition 11 also requires the following:

"Where opening windows will lead to an internal noise level increase of 5 dBA or greater above BS 8233:2014 recommended internal levels, the scheme shall include provision of alternative mechanical ventilation with minimum performance equivalent to a mechanical heat recovery (MVHR) system with cool air bypass as an alternative means of cooling and ventilation. Noise from the system should not result in BS8233 internal levels being exceeded."

Typically, an open window provides a noise reduction of 15dB, meaning that the BS8233 external threshold noise limits are 50dB, $L_{Aeq, 16 \text{ hours}}$ and 45dB, $L_{Aeq, 8 \text{ hours}}$ during the daytime and night time periods respectively. Based on the planning above condition, the above threshold levels can be uplifted by 5dB, resulting in 55dB $L_{Aeq, 16 \text{ hours}}$ and 50dB $L_{Aeq, 8 \text{ hours}}$. Based on the external noise levels measured on site, these threshold levels with an uplifted level of 5dB are likely to be met and therefore there is no need to apply MVHR units on the proposed scheme.

The overheating requirements stated in Condition 11 are therefore likely to be achieved with current site noise levels.

6.5. Effect of Mitigation Measures

With the noted building fabric construction, and suitable ventilation provisions, the predicted internal noise levels within the proposed dwellings are within the criteria of British Standard 8233:2014 of 35 dB $L_{Aeq} (16 \text{ hour})$ in the daytime rooms, and 30 dB $L_{Aeq} (8 \text{ hour})$ and 45 dB $L_{Amax(F)}$ in the night-time rooms.

Calculations for the worst-case rooms is provided below:

Bedrooms:

Free Field Level at Façade									
Octave Band	63	125	250	500	1000	2000	4000	8000	dBA
Day, $L_{eq(16\text{ hour})}$	61	52	47	48	47	43	35	30	51
Night $L_{eq(8\text{ hour})}$	50	39	32	32	32	29	24	20	36
Night-time $L_{max(1\text{ hour})}$	65	66	70	72	71	64	53	49	74
Building Façade Construction									
External Element	63	125	250	500	1000	2000	4000	8000	
SF X V75 / SFA C75 (open) - 44 Dnew	D_{se}	30	37	37	36	47	49	55	61
	Number of	1							
		0.00133	0.00027	0.00027	0.00033	0.00003	0.00002	0.00000	0.00000
2x100mm block plastered/render both sides 100mm void, 1880 Kg/m ³ + 400 kg/m ³ - 52 Rw		31	38	46	45	55	66	77	70
	Area	6							
		0.00064	0.00013	0.00002	0.00003	0.00000	0.00000	0.00000	0.00000
Double Glazed: 6/12/6.4 - 33 Rw		16	21	20	31	39	37	47	46
	Area	2							
		0.00502	0.00159	0.00200	0.00016	0.00003	0.00004	0.00000	0.00001
Calculations to BS EN 12354									
	63	125	250	500	1000	2000	4000	8000	
Sum	0.00699257	0.001981483	0.00228613	0.000511458	5.49315E-05	5.61364E-05	8.03309E-06	6.09219E-06	
10log sum	-21.5536325	-27.03009671	-26.40899065	-32.91189693	-42.60178518	-42.50755522	-50.9511742	-52.15226809	
10log S/A	-0.01733713	-0.017337128	1.222448322	2.355747741	3.080348972	1.027395567	-0.125560369	-0.125560369	
correction factor +3	3	3	3	3	3	3	3	3	
Octave Band	63	125	250	500	1000	2000	4000	8000	dBA
Day, $L_{eq(16\text{ hour})}$	42.5	27.9	24.4	20.2	10.8	4.7	-13.6	-19.5	22
Night $L_{eq(8\text{ hour})}$	31.5	14.5	9.3	4.3	-4.8	-9.4	-24.5	-29.6	9
Night-time $L_{max(1\text{ hour})}$	46.5	42.4	47.4	44.4	34.4	25.8	5.3	0.1	44

Living Room

Free Field Level at Façade									
Octave Band	63	125	250	500	1000	2000	4000	8000	dBA
Day, $L_{eq(16\text{ hour})}$	61	52	47	48	47	43	35	30	51
Building Façade Construction									
External Element	63	125	250	500	1000	2000	4000	8000	
Standard Trickle - XS13 4400 EA+XC13 412 Canopy - 32 Dnew	D_{se}	30	35	35	36	34	29	33	34
	Number of	2							
		0.00200	0.00063	0.00063	0.00050	0.00080	0.00252	0.00100	0.00080
2x100mm block plastered/render both sides 100mm void, 1880 Kg/m ³ + 400 kg/m ³ - 52 Rw		31	38	46	45	55	66	77	70
	Area	7							
		0.00056	0.00011	0.00002	0.00002	0.00000	0.00000	0.00000	0.00000
Double Glazed: 4/12/4 - 31 Rw		20	24	20	25	35	38	35	36
	Area	3							
		0.00300	0.00119	0.00300	0.00095	0.00009	0.00005	0.00009	0.00008
Calculations to BS EN 12354									
	63	125	250	500	1000	2000	4000	8000	
Sum	0.00555603	0.00193772	0.003650039	0.001473197	0.000893296	0.002565573	0.001097257	0.000871641	
10log sum	-22.5523544	-27.12709075	-24.37702526	-28.31739313	-30.49004482	-25.90815547	-29.59691733	-30.59662383	
10log S/A	-1.84123354	-1.841233542	-0.666985504	0.287241513	0.736575534	-1.589652604	-2.837533833	-2.837533833	
correction factor +3	3	3	3	3	3	3	3	3	
Octave Band	63	125	250	500	1000	2000	4000	8000	dBA
Day, $L_{eq(16\text{ hour})}$	39.7	25.9	24.6	22.8	20.5	18.7	5.1	-0.6	26

7. Commercial/ Retail Noise Control

It will be necessary to design the separation elements between the proposed Commercial units on the ground floor and the residential rooms above as requested by planning condition 11.

The proposed commercial units are unknown at this stage, therefore we have provided a noise transmission assessment based on the typical operational noise levels of a A1/A3 retail unit type.

7.1. Typical A1/A3 Operational Noise Levels

The proposed operations are unknown at this stage. For this reason we have assumed a noise level of 70dB(A). This is considered typical based on surveys completed in other retail stores. The operational Octave Band frequency noise levels considered are also shown below.

Table 10: A1/3 Usage - Octave Band, Frequency Levels, dB

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k	dBA
$L_{eq, T}$	59	66	65	68	65	62	56	56	70

7.2. Floor Construction

The floor construction will need to be as a minimum an Approved Document E construction. The construction type can vary but we have found that typically this would achieve the following minimum octave band sound reduction:

Table 11: Minimum Sound Insulation Performance of Separating Floor between Retain and First Floor

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k	R_w
R (dB)	23	41	49	52	61	66	75	75	59

7.3. Effect of Retail Noise Control Measures

With the operational noise levels in the retail areas stated in Table 10 above along with the assumed floor achieving sound reduction indices stated above, the predicted internal equivalent noise level within the dwelling is expected to be 22dBA $L_{Aeq(T)}$; see room to room calculations below. This is easily within the criteria of BS8233 and therefore the planning condition requirements are considered acceptable.

$$(SPL2 = SPL1 - Rav + 10\log S - 10\log A)$$

	Hz	Hz	Hz	Hz	Hz	Hz	Hz	Hz	dB(A)
	63	125	250	500	1000	2000	4000	8000	Av.
Area of partition (S, m2)	9								
Abs. in receiving room (A)	7.5	7.5	5.7	4.4	3.7	5.9	7.7	7.7	
SPL 1 (source room)	59	66	65	68	65	62	56	56	70
Average S.R.I (-RAV)	-23	-41	-49	-52	-61	-66	-75	-75	
(10 log S)	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	
(- 10 log A)	-8.8	-8.8	-7.5	-6.4	-5.7	-7.7	-8.9	-8.9	
SPL 2 (receiving room)	36.8	25.8	18.0	19.1	7.9	-2.2	-18.3	-18.3	19
SPL 2 (incl +3dB flanking factor)	39.8	28.8	21.0	22.1	10.9	0.8	-15.3	-15.3	22

8. Plant Noise Control

Planning condition 14 requires an assessment of plant associated with the development (ground floor commercial units only) upon the nearest noise sensitive receivers.

Plant units associated with the proposed development have the potential to operate 24 hours a day. Plant associated with the development (commercial units only) are unknown at this stage.

As such we have provided plant noise limits over the 24-hour period based on the monitoring data obtained above, British Standards 4142:2014+A1:2019 and planning condition 14 which requires specific plant noise levels to be at least 10dB below existing background noise levels at the nearest noise sensitive receivers.

We have provided noise limits for plant noise at the existing and proposed sensitive receivers on and around the site.

Based on the above criteria and the assessment time periods stated, the maximum Rating Noise limits of noise from plant associated with the development are as follows.

These limits should be determined at the façade of the nearest existing sensitive receivers:

Table 12: Plant Noise Rating Level Limits

Time Period	Limits at Existing and Proposed Receivers $L_{Ar(T)}$
Daytime (07:00 to 19:00 hrs)	29 dB $L_{Ar(1 \text{ hour})}$
Evening (19:00 to 23:00 hrs)	24 dB $L_{Ar(1 \text{ hour})}$
Night Time (23:00 to 07:00 hrs)	14 dB $L_{Ar(15 \text{ min})}$

With plant meeting the above limits, the impact will be low in terms of BS4142 and the requirements of planning condition 14 will be achieved.

It is considered that with suitable engineering noise control measures, the above noise limits should be achieved.

9. Summary & Conclusions

Stonegate Homes Ltd appointed Acoustic Consultants Limited to provide noise and acoustic advice for the proposed residential development at Portman Road, Reading RG30 1AH.

It is understood that the proposed development has been approved subject to planning conditions (Ref. 201391).

This report addresses specifically planning condition 11 and informs the plant noise limits that can be used to address planning condition 14 at a later stage once plant associated with commercial premises to be located within the ground floor level are known.

This report provides the results of a noise survey conducting on the site and an assessment of external sources of noise on the sensitive elements of the development.

Noise mitigation advice is provided in this report in the form of building façade constructions and ventilation provisions to the internal spaces of the scheme. With the proposed fabric construction and suitable ventilation provisions, the predicted internal equivalent noise levels due to external noise are within the British Standard 8233:2014 criteria for good conditions.

It was also determined that current external levels are likely to achieve the planning 11 requirements for purge ventilation when the internal noise levels stated in BS8233:2014 are uplifted by 5dB and therefore no MVHR system is required.

Plant noise limits have also been provided to assist the BS4142:2014 assessment of any future proposed plant associated with the commercial units on the ground floor and to comply with the planning condition 14 requirements of achieving a rating plant noise levels which is at least 10dB lower than the current background noise levels at the nearest noise sensitive receivers.

10. Appendix 1 – Glossary of Acoustic Terminology

A-weighted sound pressure p_A – value of overall sound pressure, measured in pascals (Pa), after the electrical signal derived from a microphone has been passed through an A-weighting network

A-weighted sound pressure level, L_{pA} - quantity of A-weighted sound pressure given by the following formula in decibels (dBA)

$$L_{pA} = 10 \log_{10} (p_A/p_0)^2$$

where:

p_A is the A-weighted sound pressure in pascals (Pa);
 p₀ is the reference sound pressure (20 µPa)

Background sound level, L_{A90,T} – A-weighted sound pressure level that is exceeded by the residual sound assessment location for 90% of a given time interval, T, measured using weighting F and quoted to the nearest whole number of decibels

Break-in - noise transmission into a structure from outside.

Decibel (dB) – The decibel is the unit used to quantify sound pressure levels. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). Therefore, a logarithmic scale is used to describe sound pressure levels and also sound intensity and power levels. The logarithms are taken to base 10. Hence an increase of 10 dB in sound pressure level is equivalent to an increase by a factor of 10 in the sound pressure level (measured in Pascals). Subjectively, this increase would correspond to a doubling of the perceived loudness of sound.

Equivalent continuous A-weighted sound pressure level, L_{Aeq,T} – value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, T = t₂ – t₁, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation:

$$L_{Aeq,T} = 10 \log_{10} \left\{ (1/T) \int_{t_1}^{t_2} [p_A(t)^2/p_0^2] dt \right\} \quad (1)$$

where:

p₀ is the reference sound pressure (20 µPa); and
 p_A(t) is the instantaneous A-weighted sound pressure (Pa) at time t

NOTE The equivalent continuous A-weighted sound pressure level is quoted to the nearest whole number of decibels.

Facade level – sound pressure level 1 m in front of the façade. Facade level measurements of L_{pA} are typically 1 dB to 3 dB higher than corresponding free-field measurements because of the reflection from the facade.

Free-field level – sound pressure level away from reflecting surfaces. Measurements made 1.2 m to 1.5 m above the ground and at least 3.5 m away from other reflecting surfaces are usually regarded as free-field. To minimize the effect of reflections the measuring position has to be at least 3.5 m to the side of the reflecting surface (i.e. not 3.5 m from the reflecting surface in the direction of the source).

Octave and Third Octave Bands – The human ear is sensitive to sound over a range of frequencies between approximately 20 Hz to 20 kHz and is generally more sensitive to medium and high frequencies than to low frequencies within the range. There are many methods of describing the frequency content of a noise. The most common methods split the frequency range into defined bands, in which the mid-frequency is used as the band descriptor and in the case of octave bands is double that of the band lower. For example, two adjacent octave bands are 250 Hz and 500 Hz. Third octave bands provide a fine resolution by dividing each octave band into three bands. For example third octave bands would be 160 Hz, 250 Hz, 315 Hz for the same 250 Hz octave band.

Sound pressure level – Sound pressure level is stated on many of the charts. It is the amplitude of the acoustic pressure fluctuations in a sound wave, fundamentally measured in Pascals (Pa), typically from 20 micro-Pascals to 100 Pascals, but commonly simplified onto the decibel scale.

Sound reduction index, R – laboratory measure of the sound insulating properties of a material or building element in a stated frequency band.

Specific sound level, $L_s = L_{Aeq,Tr}$ – equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r .

Structure-borne noise – audible noise caused by the vibration of elements of a structure, the source of which is within a building or structure with common elements

Rating level, $L_{Ar,Tr}$ – Specific sound level plus any adjustment for the characteristic features of the sound.

Reverberation Time, T – The reverberation time is defined as the time taken for a noise level in an enclosed space to decay by 60 dB from a steady level, once the noise source has stopped. It is measured in seconds. Often a 60 dB decay cannot be measured so the reverberation time is measured over a lesser range and corrected back to the time for a 60 dB drop assuming a constant decay rate. Common parameters are T20 (time taken for a 20 dB decay multiplied by three) and T30 (time taken for a 30 dB decay multiplied by two).

Vibration Dose Value, VDV – measure of the total vibration experienced over a specified period of time.

Estimated Vibration Dose Value, $eVDV$ – estimation of the total vibration experienced over a specified period of time. This is usually based on the number of events and shortened measurement data.



Weighted sound reduction index, R_w – Single-number quantity which characterizes the airborne sound insulating properties of a material or building element over a range of frequencies. The weighted sound reduction index is used to characterize the insulation of a material or product that has been measured in a laboratory (see BS EN ISO 717-1).



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