ARDENT
CONSULTING ENGINEERS

TRIBE AVONMOUTH HOUSE LIMITED

AVONMOUTH HOUSE, 6 AVONMOUTH STREET, LONDON

NOISE & VIBRATION ASSESSMENT

REPORT REF. 2102760-02A

October 2021

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REV	ISSUE PURPOSE	AUTHOR	CHECKED	APPROVED	DATE
-	DRAFT	CM	LD	DRAFT	20/09/21
-	FINAL	CM	CM	LD	05/10/21
A	Updated site description and layout	CM	CM	LD	19/10/21

Distribution

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1. INTRODUCTION

1.1. Ardent Consulting Engineers were instructed by Tribe Avonmouth House Limited to undertake a Noise and Vibration Assessment to support the mixed use development at Avonmouth House, 6 Avonmouth Street, London SE1 6NX (hereafter referred to as the 'site').

Site Location

1.2. To the north of the site is Newington Causeway, Avonmouth Street is directly adjacent to the site, running from the north to the south east, Avonmouth Street leads directly onto Tiverton Street. To the west of the site is the Southwark Playhouse and beyond that is a railway line. The surrounding area and approximate site boundary (shown in red) are shown in Figure 1-1.

1.3. It is understood that the Southwark Playhouse is to be relocated before the site will be completed and occupied, therefore the noise from the Southwark Playhouse has not been considered as part of this assessment.

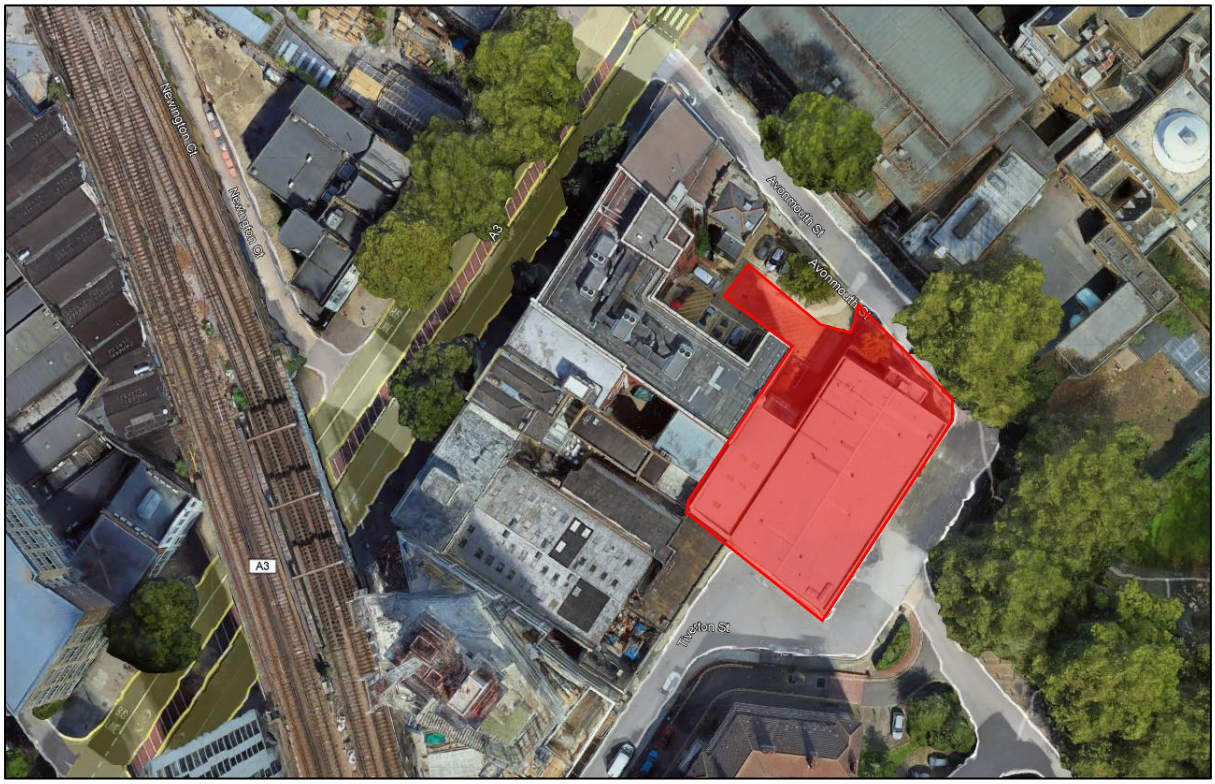


Figure 1-1: Site Boundary and Surrounding Area

Site Proposals

1.4. The scheme proposals are as follows:

"Demolition of existing building and structures and erection of a part 2, part 7, part 14, part 16 storey plus basement mixed-use development comprising 1733sqm (GIA) of space for Class E employment use and/or community health hub and/or Class F1(a) education use and 233 purpose-built student residential rooms with associated amenity space and public realm works, car and cycle parking, and ancillary infrastructure."

1.5. An extract of the indicative proposals for the ground floor and first floor is shown in Figure 1.2:

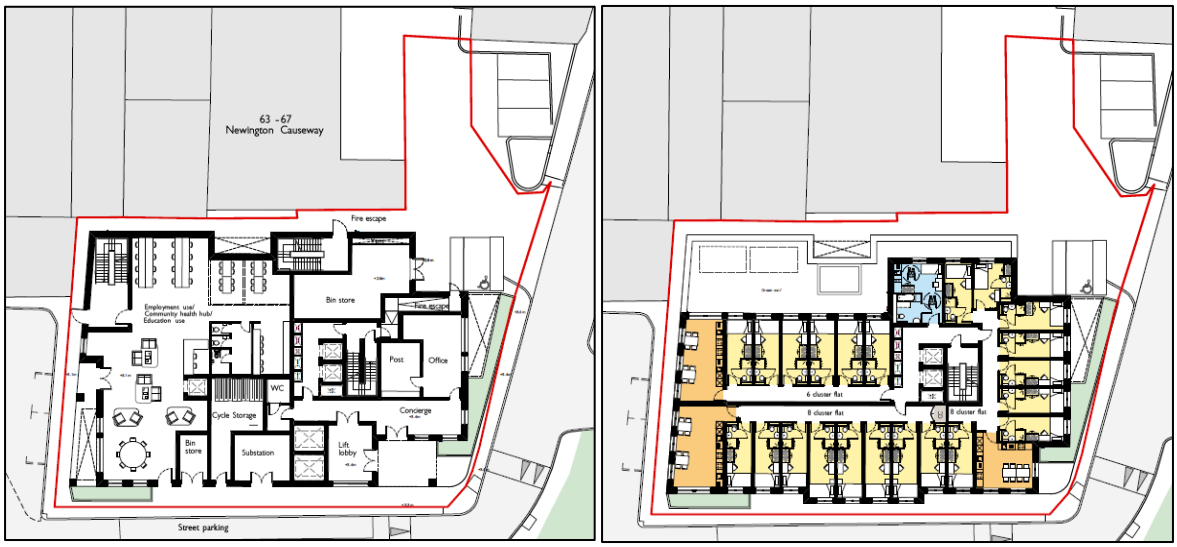


Figure 1-2: Site Proposals – Ground Floor and Third Floor (Extract)

2. LOCAL AUTHORITY LIAISON

2.1. Contact[1] was made with Ken Andrews, Environmental Protection Officer at London Borough of Southwark Council to discuss the proposals and approach to the assessment. The following assessment criteria and methodology was agreed:

- A survey at two locations on site for approximately 48 hours was agreed as appropriate for the site.
- It was agreed that noise impact from the Southwark Playhouse would be excluded from assessment of noise at the site, as this is proposed to be relocated before occupation of the site.
- Assessment of the site in terms of the guidance criteria for internal and external noise levels of BS8233, with an aim to achieve the external noise level criteria as far as practicable taking into account good acoustic design principals. The assessment will also consider ProPG and AVO guidance.

2.2. It was also advised that reference should be made to the London Borough of Southwark Technical Guidance for Noise, which is shown in Appendix F of this report, along with a summary of any other relevant policy and guidance.

[1] Email contact on 23/04/2021 with Ken Andrews, Environmental Protection Officer, London Borough of Southwark Council

3. ENVIRONMENTAL NOISE AND VIBRATION LEVELS

3.1. An environmental noise and vibration survey was undertaken at the site between 7th July and 9th July 2021 as shown in Figure 3-1. Time histories of the measured noise data are shown in Appendix A.

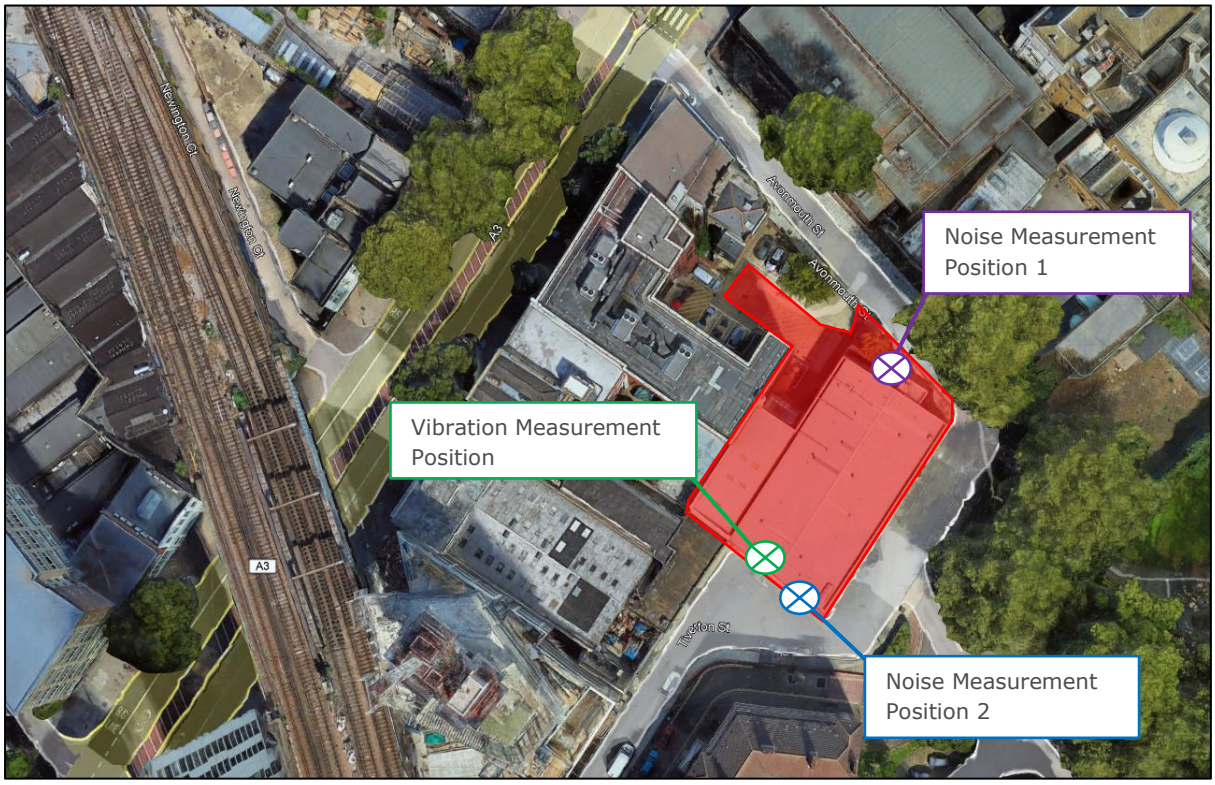


Figure 3-1: Measurement Positions

3.2. Measurement positions were selected in order to obtain representative baseline levels due to the main observed noise and vibration sources at the site.

3.3. A description of the measurements positions is as follows:

- **Noise Measurement Position 1** – The microphone was mounted at first floor level overlooking Avonmouth Street and with line of sight to Newington Causeway.
- **Noise Measurement Position 2** - The microphone was mounted first floor window overlooking Tiverton Street and with line of sight to the railway line.
- **Vibration Measurement Position –** Located at ground floor level and mounted on the exposed concrete slab of the building.

3.4. The equipment used was as follows:

- Svantek 977 Sound Level Meter (serial number: 34131)
- Svantek 977 Sound Level Meter (serial number: 34133)
- Rion NC-74 Calibrator (serial number: 34172694)
- Rion VM-56 Tri-Axial Vibration Monitor (serial number: 00680037)

3.5. All equipment used has been professionally calibrated. Field calibration of the sound level meter (and complete measurement signal chain) was undertaken before and after measurement to ensure no drift of the calibration signal. Calibration certificates are shown in Appendix D.

3.6. Observations regarding the prevailing weather condition were taken during the survey, conditions were considered suitable for environmental noise measurements, i.e. no precipitation and low wind speeds.

3.7. A summary of the noise level measurements taken at the site are summarised in Table 3-1:

Monitoring Position	Ambient Sound Level dB $L_{Aeq, T}$		Typical Background Sound Level, $L_{A90, T}$		Representative Night-time L_{AFmax} dB(A)
	Daytime	Night time	Daytime	Night time	
1	54	51	49	46	74
2	54	46	48	43	68

Table 3-1: Summary of Measured Noise Levels

3.8. The representative L_{Amax} level is the value which has been exceeded fewer than 10 times in the 8-hour night-time period, i.e. one which can be considered to be 'not normally exceeded' as per the WHO guidelines.

3.9. Anticipated sound levels mean façades overlooking Avonmouth Street and Newington Causeway are considered 'medium risk' category and all other façades are considered 'low risk' category, when compared with Figure 1 included in Section 2 of ProPG, as shown in Appendix F.

3.10. Based on the above, an Acoustic Design Statement confirming how noise levels will be reduced to prevent significant adverse impact will be required.

3.11. This would not prohibit the development as good acoustic design processes can be followed to reduce sound levels to as low as practical across the site.

3.12. Representative octave band levels are provided in Table 3-2. These are used in glazing calculations to ensure a robust assessment of internal noise levels.

		Octave Band Centre Frequency, dB							
		63	125	250	500	1k	2k	4k	8k
MP1	$L_{Aeq,T}$ (day)	61	56	51	51	50	47	41	34
	$L_{Aeq,T}$ (night)	57	50	49	49	48	44	36	26
	$L_{AFmax,T}$ (night)	79	75	73	73	67	65	58	50
MP2	$L_{Aeq,T}$ (day)	57	54	52	49	48	47	47	40
	$L_{Aeq,T}$ (night)	52	47	46	43	41	38	34	26
	$L_{AFmax,T}$ (night)	67	63	63	61	64	63	55	46

Table 3-2: Octave Band Data for Noise Monitoring Locations

3.13. Where appropriate acoustic screening and distance correction have been applied to the above octave band noise levels. Due to the proximity to the façades of the existing building, a 3dB correction has been applied to the above octave band noise levels to obtain free field noise levels.

Vibration Survey

3.14. The VDV X, Y and Z vibration axis parameters were measured throughout the duration of the survey. Measured levels are summarised below in Table 3-3 the daytime and night time periods.

	VDV (X)	VDV (Y)	VDV (Z)	BS6472 (low probability of adverse comment)
Daytime 07:00-23:00)	0.001	0.001	0.008	0.2 – 0.4
Night Time (23:00-07:00)	0.001	0.001	0.005	0.1 – 0.2

Table 3-3: Measured Daytime Vibration Dose Values

3.15. The measured vibration levels are significantly below the lowest category in BS6472 (low probability of adverse comment), therefore it is not considered that vibration is of concern at the site.

3.16. The measured vibration levels are also significantly below the criterion of London Borough of Southwark, which considers the night time period only.

3.17. In terms of reradiated noise due to vibration, it is considered that this does not require assessment to demonstrate compliance with the 35dB $L_{ASmax,}$ criterion of London Borough of Southwark given the distance of the main source of vibration to the site, approximately 60m, and the measured vibration levels at the site.

3.18. No further mitigation would be required with regard to vibration incident at the development site.

4. CONSTRUCTION PHASE

4.1. Given the proximity of proposed construction to neighbouring noise sensitive properties such as residential areas, it is possible that site clearance, preparation and construction noise may impact nearby receptors.

4.2. A detailed construction programme; specific plant data and operations are not available at this stage of the project. Therefore, it is not possible to undertake a detailed assessment of likely impact at this time.

4.3. Reasonable construction noise limits can be derived using the Example Method 1 (the ABC Method) of BS 5228, within section E.3.2. Table E.1 from the standard is reproduced below in Table 4-1:

Table E.1 Example threshold of significant effect at dwellings

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A [A]	Category B [B]	Category C [C]
Night-time (23.00–07.00)	45	50	55
Evenings and weekends [D]	55	60	65
Daytime (07.00–19.00) and Saturdays (07.00–13.00)	65	70	75

NOTE 1 A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.

NOTE 2 If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3 dB due to construction activity.

NOTE 3 Applied to residential receptors only.

[A] Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.

[B] Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.

[C] Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.

[D] 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.

Table 4-1: Table E.1 from BS 5228: Part 1

4.4. Existing ambient noise levels at the site will place the site and surroundings within Category C of Table E.1.

4.5. Therefore, the following ambient noise levels (as a result of construction activities) should be considered as reasonable limits to adhere to during construction works.

Time Period	Construction Noise Limits L_{Aeq} (dB)
Saturday 08:00 – 13:00	55
Weekdays 08:00 – 18:00	65

Table 4-2: Construction Noise Limits

5. FIXED MECHANICAL PLANT NOISE

5.1. The proposals will introduce fixed mechanical plant, the details of which are not yet known. London Borough of Southwark Council guidance states that the cumulative rating level should not exceed the typical minimum background sound level at any time and the cumulative specific sound level should not be greater than 10dB below the typical minimum background sound level at the closest sensitive receptors.

5.2. The typical minimum background sound level is considered to be the typical occurring minimum background sound level, i.e. not the absolute minimum background sound level. The typical minimum background sound level is 44dB $L_{A90,T}$ and 39dB $L_{A90,T}$ during the daytime and night time periods respectively.

5.3. The cumulative rating level from plant associated with the site must not exceed 44dB $L_{Ar,Tr}$ and 39dB $L_{Ar,Tr}$ at the closest sensitive receptors during daytime and night time periods respectively, when assessed in accordance with BS4142.

5.4. Additionally, the cumulative specific level from plant associated with the site must not exceed 34dB $L_{Aeq,T}$ and 29dB $L_{Aeq,T}$ at the closest sensitive receptors during daytime and night time periods respectively, when assessed in accordance with BS4142.

5.5. It is anticipated that the night time criterion will govern the selection and if required, attenuation of plant associated with the site. All plant associated with the site should be selected, located, oriented and where required attenuated to achieve the criteria.

5.6. The above criteria need to be considered on the basis of the configuration of plant and the operational conditions.

6. MITIGATION RECOMMENDATIONS

6.1. The measured noise levels and indicative layout have been used to undertake calculations, as presented in Appendix B, for suitable façade treatments, outlined as follows.

6.2. The aim of this section is to identify mitigation measures capable of providing suitable levels of attenuation to achieve the required internal sound levels based on the predicted noise levels and the planning noise assessment.

6.3. To achieve suitable internal amenity sound levels during normal conditions, windows must remain closed, but not sealed, and an alternative means of ventilation, such as trickle ventilation, should be provided.

External Building Fabric - Non-Glazed Elements

6.4. It is assumed that the non-glazed external building fabric elements comprise masonry cavity walls. This would typically provide a sound reduction performance of at least the figures shown in Table 6-1 when tested in accordance with BS EN ISO 10140-2:2010 (figures derived from: Representative Values of Airborne SRI for Some Common Structures: Appendix B of Flakt Woods 'Guide to Noise Control').

Element	Octave band centre frequency SRI, dB					
	125	250	500	1k	2k	4k
Masonry Cavity Wall	34	43	55	66	77	85

Table 6-1: Non-glazed Elements Assumed Sound Reduction Performance

Residential

External Building Fabric - Glazing

6.5. Table 6-2 sets out the required glazing performance types for residential units on site, these specifications take into account the glass, frame, seals and associated fittings.

Glazing Type	Sound Reduction Index, R_w	Octave band centre frequency SRI, dB					
		125	250	500	1k	2k	4k
Type 1	35	24	24	32	37	42	43
Type 2 (no markup)	31	20	18	28	38	34	38

Table 6-2: Required Minimum Attenuation Values for Glazing - Residential

External Building Fabric - Ventilation

6.6. Table 6-3 sets out the required ventilation performance types for residential units on site:

Ventilation Type	Element Normalised level difference, D_{new}	Octave band centre frequency SRI, dB					
		125	250	500	1k	2k	4k
Type 1	43	41	39	38	47	43	46
Type 2 (no markup)	35	36	34	31	34	38	38

Table 6-3: Required Minimum Attenuation Values for Ventilation - Residential

6.7. Table 6.2 and 6.3 should be viewed in conjunction with Figure 6-1, which indicates the extent of each glazing and ventilation specification.

Figure 6-1: Glazing and Ventilation Specifications Layout - Residential

6.8. Where non-sensitive rooms and sensitive rooms form part of an open plan area, for example a dining and kitchen area, the glazing and ventilation specification for the more sensitive room should be used across the combined area.

Non Residential

External Building Fabric - Glazing

6.9. Table 6-4 sets out the required glazing performance for non residential areas at the site, these specifications take into account the glass, frame, seals and associated fittings.

Glazing Type	Sound Reduction Index, R_w	Octave band centre frequency SRI, dB					
		125	250	500	1k	2k	4k
All Areas	31	20	18	28	38	34	38

Table 6-4: Required Minimum Attenuation Values for Glazing – Non Residential

External Building Fabric - Ventilation

6.10. Table 6-5 sets out the required ventilation performance for non residential areas at the site:

Ventilation Type	Element Normalised level difference, D_{new}	Octave band centre frequency SRI, dB					
		125	250	500	1k	2k	4k
All Areas	32	36	36	35	33	29	31

Table 6-5: Required Minimum Attenuation Values for Ventilation – Non Residential

6.11. All major building elements should be tested in accordance with BS EN ISO 10140-2:2010. Sole glass performance data would not necessarily demonstrate compliance with this specification.

6.12. It should be noted that there may be additional considerations for glazing requirements such as overheating, security, thermal performance, and air quality. Alternative glazing could be used assuming the minimum acoustic performance is met.

Overheating

4.1. Consideration has been given to the potential for adverse noise impact during overheating conditions; where residents may open windows to control temperature. The expected noise levels place façades overlooking Avonmouth Street and

Newington Causeway in the 'medium risk' category and all other façades in the 'low risk' category under overheating condition according to the AVO guidance as set out in Appendix F.

6.13. In these circumstances a Level 2 Overheating assessment is recommended for parts of the site which fall within the medium category as per the Level 1 risk assessment. The overheating risk categories for the site are shown in Appendix C of this report.

External Amenity Areas

6.14. There is a shared external amenity area at the 7th floor. As shown in Figure 6-2.

Figure 6-2: External Amenity Areas

6.15. Based on the measurements taken at the site, the shared amenity area will meet the upper guideline value of 55dB $L_{Aeq,16hour}$ for external amenity areas, as defined in BS8233:2014.

Construction Phase

6.16. In accordance with local guidance, construction activities should only take place between 08:00 and 18:00 on weekdays and between 08:00 – 13:00 on Saturdays. No construction activity should be carried out during the night, on Sundays or on bank holidays without additional consideration to controlling noise and with the prior approval of the LPA.

6.17. During construction, the contractor will employ best practicable means to control noise from construction operations.

6.18. Temporary screening in the form of solid timber hoarding can be used where operations are adjacent to sensitive receptors. Consideration will be given to neighbouring residential properties when locating the temporary site compounds and material stockpiles.

6.19. Stationary equipment and plant such as generators will be placed as far as practicable from noise sensitive properties, and preferably in areas benefiting from existing or purpose-built attenuation such as bunding or behind non-sensitive buildings.

6.20. Delivery of materials and removal of waste from the site will be planned to minimise disturbance to neighbouring properties. Idling of plant, machinery and delivery vehicles should be prohibited when not in use.

6.21. If required noise levels can be monitored regularly in accordance with BS 5228 to ensure the above set limits are not exceeded. In addition to the above all other guidance within BS 5228–1 will be followed at all times.

7. CONCLUSIONS

7.1. A noise and vibration survey has been undertaken at the site and measured noise levels have been used to calculate and assess suitable glazing and ventilation specifications.

7.2. Based on the measured vibration levels it is not considered that vibration is of any concern on this site. The measured vibration levels are also significantly below the criteria of London Borough of Southwark and it is not considered that reradiated noise will be a concern at the site.

7.3. In terms of ProPG risk categories façades to the east of the site and facades overlooking Newington Causeway in the 'medium risk' category and all other façades in the 'low risk' category. Expert Acoustics advice has been sought and good acoustic design processes have been followed to reduce sound levels across the site.

7.4. Criteria for the cumulative specific level and rating level of noise from fixed mechanical plant at the nearest receptors has been proposed, based on the criteria of London Borough of Southwark Council.

7.5. Closed but not sealed windows will be provided to control internal amenity sound levels and alternative means of ventilation, such as trickle ventilation, should be provided. Windows are not sealed shut and residents will have a choice to open them for ventilation whilst accepting slightly higher internal sound levels.

7.6. The risk of noise impact under overheating conditions within properties has been considered in accordance with AVO Guidance. The assessment results in façades to the east of the site and facades overlooking Newington Causeway in the 'medium risk' category and all other façades in the 'low risk' category.

7.7. External sound levels at the shared amenity area at the site meet the guidance criteria.

7.8. Control measures will be implemented to manage potential impacts from construction noise.

7.9. This assessment demonstrates that the site is suitable for residential development subject to the recommendations included in this report.

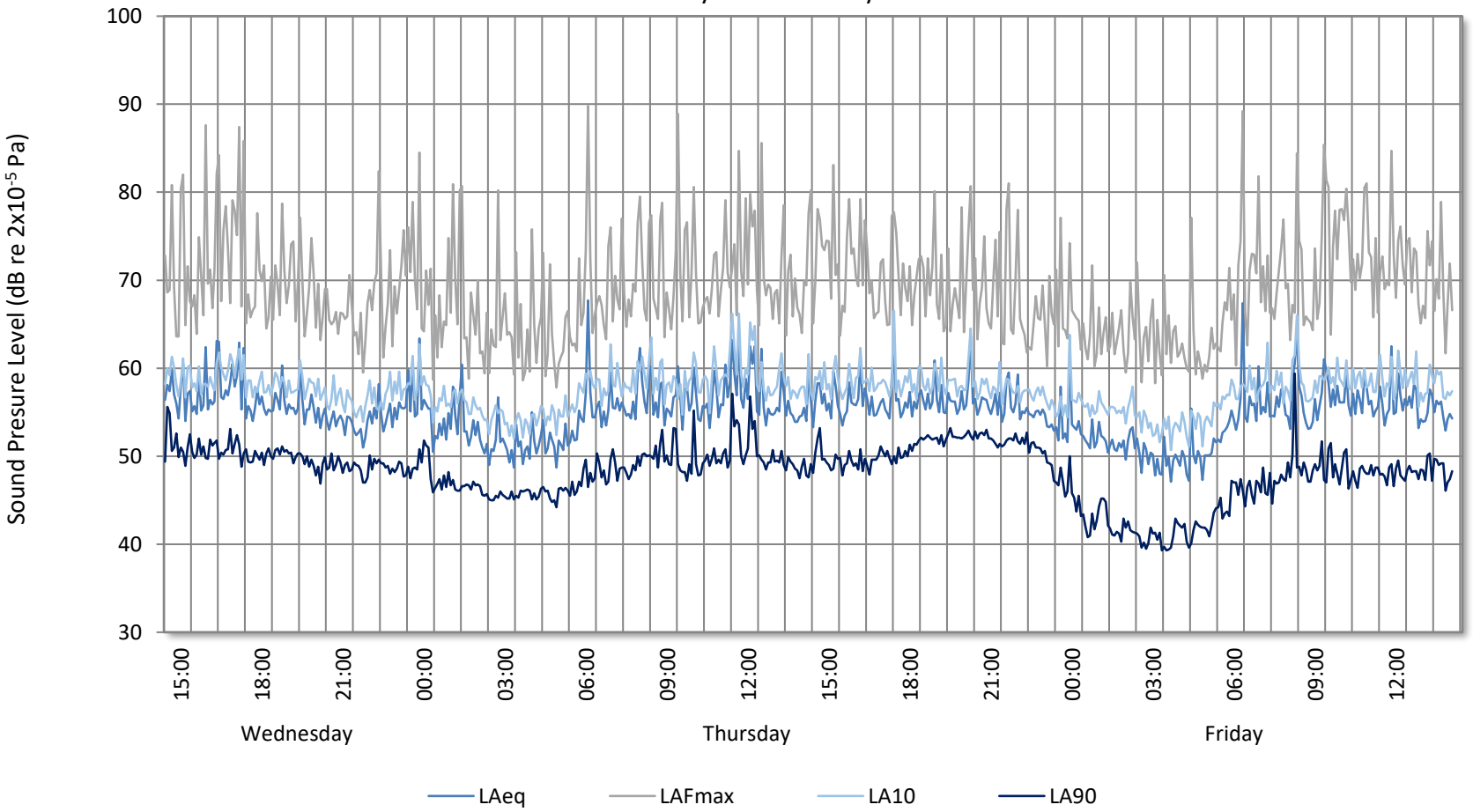
APPENDIX A

Avonmouth House, Southwark

Measurement Position 1

Environmental Noise Time History

7 July 2021 to 9 July 2021

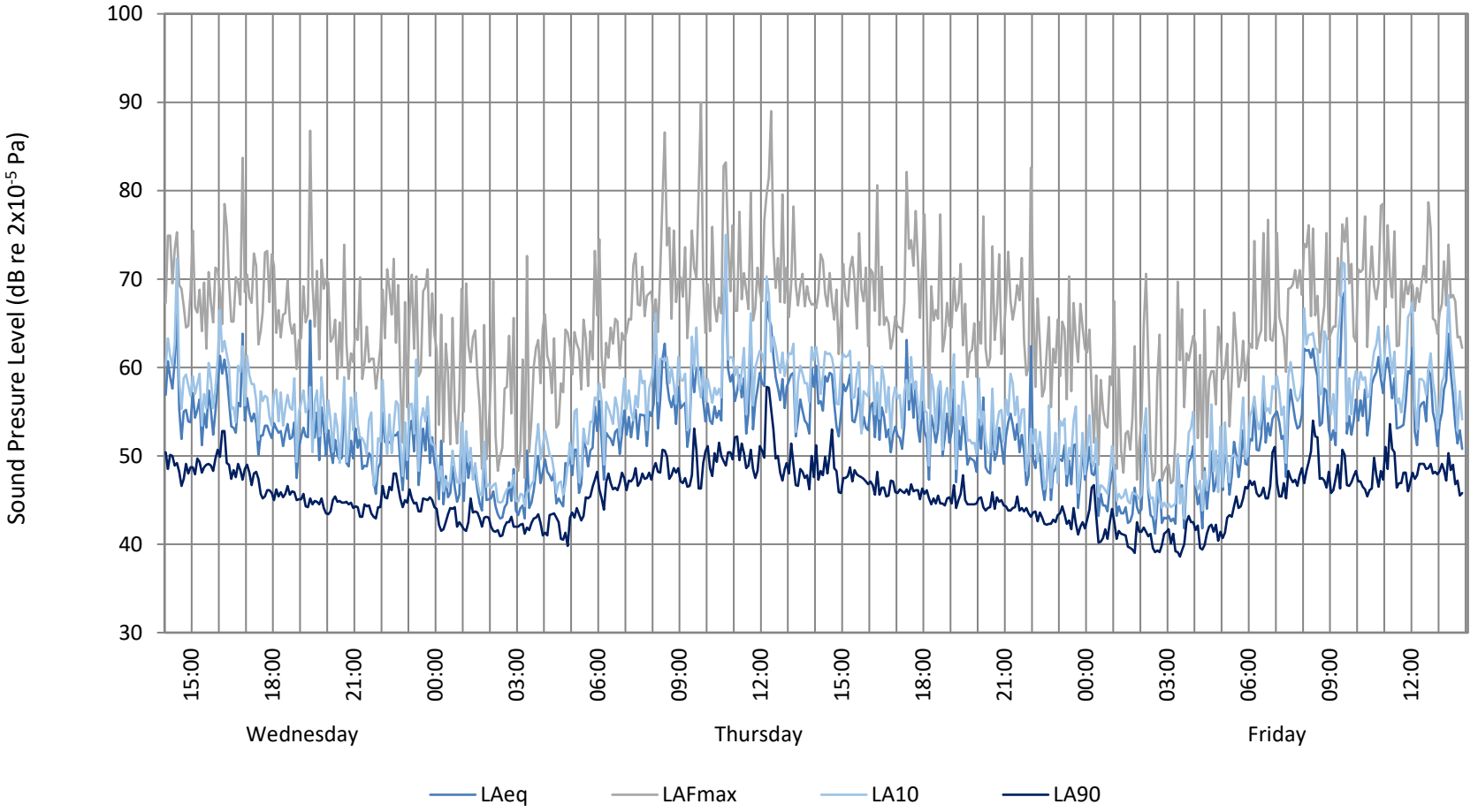


Avonmouth House, Southwark

Measurement Position 2

Environmental Noise Time History

7 July 2021 to 9 July 2021



APPENDIX B

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Position 1

Description	
Ardent CE Project No.	**2102760**
Property Address	**Avonmouth House, Avonmouth Street, London**
Room Type	**Bedroom**
Parameter	**LAeq, 16h**

Room Dimensions and Areas	
Room volume	27.0
Total Surface area	61.3
Wall façade area	4.1
Roof façade area	0.00
Glazing area	2.3
Dne Ref Area, A0	10.00

- Based on typical size

Total façade area	6.44

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	**- Typical Bedroom RT**
Alpha bar	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	
Total Absorption	8.71	8.71	8.71	8.71	8.71	8.71	8.71	8.71	
10Log S/A	-1.31	-1.31	-1.31	-1.31	-1.31	-1.31	-1.31	-1.31	

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	61	56	51	51	50	47	41	34	54
Façade to free field	-3	-3	-3	-3	-3	-3	-3	-3	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	58	53	48	48	47	44	38	31	51

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	19	24	24	32	37	42	43	48	35	**Pilkington 10/16/6**
Transmission Coefficient	0.012589	0.003981	0.003981	0.000631	0.000200	0.000063	0.000050	0.000016		
Wall SRI	28	34	43	55	66	77	85	85	55	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	32	41	39	38	47	43	46	46	43	**Airvac 5000 EAW - AC2**
Transmission Coefficient	0.000631	0.000079	0.000126	0.000158	0.000020	0.000050	0.000025	0.000025		
Average Transmission Coeff	0.006536	0.001814	0.001664	0.000476	0.000103	0.000101	0.000057	0.000045		
Average SRI	22	27	28	33	40	40	42	43	37	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	35.8	25.3	19.9	14.5	6.8	3.7	-4.7	-12.8	17.2	
Lp (Direct)	36.2	25.6	20.2	14.8	7.1	4.0	-4.4	-12.5	17.5	**Criteria**
Lp (Rev & Direct)	39	28	23	18	10	7	-2	-10	20.4	**≤ 35**
BS8233	38	27	22	16	9	6	-3	-11	19	**≤ 35**

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Position 1

Description	
Ardent CE Project No.	**2102760**
Property Address	**Avonmouth House, Avonmouth Street , London**
Room Type	**Bedroom**
Parameter	**LAeq, 8h**

Room Dimensions and Areas	
Room volume	27.0
Total Surface area	61.3
Wall façade area	4.1
Roof façade area	0.00
Glazing area	2.3
Dne Ref Area, A0	10.00

- Based on typical size

Total façade area	6.44

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	**- Typical Bedroom RT**
Alpha bar	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	
Total Absorption	8.71	8.71	8.71	8.71	8.71	8.71	8.71	8.71	
10Log S/A	-1.31	-1.31	-1.31	-1.31	-1.31	-1.31	-1.31	-1.31	

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	57	50	49	49	48	44	36	26	52
Façade to free field	-3	-3	-3	-3	-3	-3	-3	-3	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	54	47	46	46	45	41	33	23	49

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	19	24	24	32	37	42	43	48	35	**Pilkington 10/16/6**
Transmission Coefficient	0.012589	0.003981	0.003981	0.000631	0.000200	0.000063	0.000050	0.000016		
Wall SRI	28	34	43	55	66	77	85	85	55	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	32	41	39	38	47	43	46	46	43	**Airvac 5000 EAW - AC2**
Transmission Coefficient	0.000631	0.000079	0.000126	0.000158	0.000020	0.000050	0.000025	0.000025		
Average Transmission Coeff	0.006536	0.001814	0.001664	0.000476	0.000103	0.000101	0.000057	0.000045		
Average SRI	22	27	28	33	40	40	42	43	37	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	31.8	19.3	17.9	12.5	4.8	0.7	-9.7	-20.8	14	
Lp (Direct)	32.2	19.6	18.2	12.8	5.1	1.0	-9.4	-20.5	15	**Criteria**
Lp (Rev & Direct)	35	22	21	16	8	4	-7	-18	18	**≤ 30**
BS8233	34	21	20	14	7	3	-8	-19	16	**≤ 30**

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Position 1

Description	
Ardent CE Project No.	**2102760**
Property Address	**Avonmouth House, Avonmouth Street , London**
Room Type	**Bedroom**
Parameter	**LAmax**

Room Dimensions and Areas	
Room volume	27.0
Total Surface area	61.3
Wall façade area	4.1
Roof façade area	0.00
Glazing area	2.3
Dne Ref Area, A0	10.00

- Based on typical size

Total façade area	6.44

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	**- Typical Bedroom RT**
Alpha bar	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	
Total Absorption	8.71	8.71	8.71	8.71	8.71	8.71	8.71	8.71	
10Log S/A	-1.31	-1.31	-1.31	-1.31	-1.31	-1.31	-1.31	-1.31	

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	79	75	73	73	67	65	58	50	74
Façade to free field	-3	-3	-3	-3	-3	-3	-3	-3	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	76	72	70	70	64	62	55	47	71

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	19	24	24	32	37	42	43	48	35	**Pilkington 10/16/6**
Transmission Coefficient	0.012589	0.003981	0.003981	0.000631	0.000200	0.000063	0.000050	0.000016		
Wall SRI	28	34	43	55	66	77	85	85	55	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	32	41	39	38	47	43	46	46	43	**Airvac 5000 EAW - AC2**
Transmission Coefficient	0.000631	0.000079	0.000126	0.000158	0.000020	0.000050	0.000025	0.000025		
Average Transmission Coeff	0.006536	0.001814	0.001664	0.000476	0.000103	0.000101	0.000057	0.000045		
Average SRI	22	27	28	33	40	40	42	43	37	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	53.8	44.3	41.9	36.5	23.8	21.7	12.3	3.2	38	
Lp (Direct)	54.2	44.6	42.2	36.8	24.1	22.0	12.6	3.5	38	**Criteria**
Lp (Rev & Direct)	57	47	45	40	27	25	15	6	41	**≤ 45**
BS8233	56	46	44	38	26	24	14	5	40	**≤ 45**

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Position 2

Description	
Ardent CE Project No.	**2102760**
Property Address	**Avonmouth House, Avonmouth Street , London**
Room Type	**Bedroom**
Parameter	**LAeq, 16h**

Room Dimensions and Areas	
Room volume	27.0
Total Surface area	61.3
Wall façade area	4.1
Roof façade area	0.00
Glazing area	2.3
Dne Ref Area, A0	10.00

- Based on typical size

Total façade area	6.44

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	**- Typical Bedroom RT**
Alpha bar	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	
Total Absorption	8.71	8.71	8.71	8.71	8.71	8.71	8.71	8.71	
10Log S/A	-1.31	-1.31	-1.31	-1.31	-1.31	-1.31	-1.31	-1.31	

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	57	54	52	49	48	47	47	40	54
Façade to free field	-3	-3	-3	-3	-3	-3	-3	-3	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	54	51	49	46	45	44	44	37	51

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	18	20	18	28	38	34	38	48	31	**Pilkington 6/16/6**
Transmission Coefficient	0.015849	0.010000	0.015849	0.001585	0.000158	0.000398	0.000158	0.000016		
Wall SRI	28	34	43	55	66	77	85	85	55	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	36	36	34	31	34	38	38	38	35	**Standard Trickle Vent**
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158		
Average Transmission Coeff	0.007122	0.004253	0.006370	0.001807	0.000676	0.000390	0.000303	0.000252		
Average SRI	21	24	22	27	32	34	35	36	31	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	32.2	27.0	26.7	18.3	13.0	9.6	8.5	0.7	21.9	
Lp (Direct)	32.5	27.3	27.0	18.6	13.3	9.9	8.8	1.0	22	**Criteria**
Lp (Rev & Direct)	35	30	30	21	16	13	12	4	25	**≤ 35**
BS8233	34	29	29	20	15	12	11	3	24	**≤ 35**

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Position 2

Description	
Ardent CE Project No.	**2102760**
Property Address	**Avonmouth House, Avonmouth Street , London**
Room Type	**Bedroom**
Parameter	**LAeq, 8h**

Room Dimensions and Areas	
Room volume	27.0
Total Surface area	61.3
Wall façade area	4.1
Roof façade area	0.00
Glazing area	2.3
Dne Ref Area, A0	10.00

- Based on typical size

Total façade area	6.44

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	**- Typical Bedroom RT**
Alpha bar	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	
Total Absorption	8.71	8.71	8.71	8.71	8.71	8.71	8.71	8.71	
10Log S/A	-1.31	-1.31	-1.31	-1.31	-1.31	-1.31	-1.31	-1.31	

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	52	47	46	43	41	38	34	26	46
Façade to free field	-3	-3	-3	-3	-3	-3	-3	-3	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	49	44	43	40	38	35	31	23	43

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	18	20	18	28	38	34	38	48	31	**Pilkington 6/16/6**
Transmission Coefficient	0.015849	0.010000	0.015849	0.001585	0.000158	0.000398	0.000158	0.000016		
Wall SRI	28	34	43	55	66	77	85	85	55	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	36	36	34	31	34	38	38	38	35	**Standard Trickle Vent**
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158		
Average Transmission Coeff	0.007122	0.004253	0.006370	0.001807	0.000676	0.000390	0.000303	0.000252		
Average SRI	21	24	22	27	32	34	35	36	31	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	27.2	20.0	20.7	12.3	6.0	0.6	-4.5	-13.3	15	
Lp (Direct)	27.5	20.3	21.0	12.6	6.3	0.9	-4.2	-13.0	16	**Criteria**
Lp (Rev & Direct)	30	23	24	15	9	4	-1	-10	19	**≤ 30**
BS8233	29	22	23	14	8	3	-2	-11	17	**≤ 30**

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Position 2

Description	
Ardent CE Project No.	**2102760**
Property Address	**Avonmouth House, Avonmouth Street , London**
Room Type	**Bedroom**
Parameter	**LAmax**

Room Dimensions and Areas		
Room volume	27.0	**- Based on typical size**
Total Surface area	61.3	
Wall façade area	4.1	
Roof façade area	0.00	
Glazing area	2.3	
Dne Ref Area, A0	10.00	

Total façade area	6.44

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	**- Typical Bedroom RT**
Alpha bar	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	
Total Absorption	8.71	8.71	8.71	8.71	8.71	8.71	8.71	8.71	
10Log S/A	-1.31	-1.31	-1.31	-1.31	-1.31	-1.31	-1.31	-1.31	

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	67	63	63	61	64	63	55	46	68
Façade to free field	-3	-3	-3	-3	-3	-3	-3	-3	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	64	60	60	58	61	60	52	43	65

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	18	20	18	28	38	34	38	48	31	**Pilkington 6/16/6**
Transmission Coefficient	0.015849	0.010000	0.015849	0.001585	0.000158	0.000398	0.000158	0.000016		
Wall SRI	28	34	43	55	66	77	85	85	55	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	36	36	34	31	34	38	38	38	35	**Standard Trickle Vent**
Transmission Coefficient	0.000251	0.000251	0.000398	0.000794	0.000398	0.000158	0.000158	0.000158		
Average Transmission Coeff	0.007122	0.004253	0.006370	0.001807	0.000676	0.000390	0.000303	0.000252		
Average SRI	21	24	22	27	32	34	35	36	31	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	42.2	36.0	37.7	30.3	29.0	25.6	16.5	6.7	35	
Lp (Direct)	42.5	36.3	38.0	30.6	29.3	25.9	16.8	7.0	35	**Criteria**
Lp (Rev & Direct)	45	39	41	33	32	29	20	10	38	**≤ 45**
BS8233	44	38	40	32	31	28	19	9	37	**≤ 45**

ARDENT CONSULTING ENGINEERS

Noise Break-in Calculation - Position 1

Description	
Ardent CE Project No.	**2102760**
Property Address	**Avonmouth House, Avonmouth Street , London**
Room Type	**Office**
Parameter	**LAeq, 16h**

Room Dimensions and Areas	
Room volume	853
Total Surface area	753
Wall façade area	18.7
Roof façade area	0.00
Glazing area	32.3
Dne Ref Area, A0	10.00

Total façade area	50.96

Room Absorption Calcuation	63	125	250	500	1000	2000	4000	8000	
Estimated Reverberation time	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	**Typical Office RT**
Alpha bar	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	
Total Absorption	171.72	171.72	171.72	171.72	171.72	171.72	171.72	171.72	
10Log S/A	-5.28	-5.28	-5.28	-5.28	-5.28	-5.28	-5.28	-5.28	

Façade level	63	125	250	500	1000	2000	4000	8000	A
Measured Noise Level	57	54	52	49	48	47	47	40	54
Façade to free field	-3	-3	-3	-3	-3	-3	-3	-3	
Angle of view	0	0	0	0	0	0	0	0	
Screening (Maekewa)	0	0	0	0	0	0	0	0	
Distance correction	0	0	0	0	0	0	0	0	
Other	0	0	0	0	0	0	0	0	
Noise level at façade (Leq)	54	51	49	46	45	44	44	37	51

Composite SRI	63	125	250	500	1000	2000	4000	8000	Rw	
Glazing SRI	18	20	18	28	38	34	38	48	31	**Pilkington 6/16/6**
Transmission Coefficient	0.015849	0.010000	0.015849	0.001585	0.000158	0.000398	0.000158	0.000016		
Wall SRI	28	34	43	55	66	77	85	85	55	**Typical masonry cavity wall (300mm - 380kg/m2)**
Transmission Coefficient	0.001585	0.000398	0.000050	0.000003	0.000000	0.000000	0.000000	0.000000		
Roof SRI	23	26	43	52	60	65	65	65	51	
Transmission Coefficient	0.005012	0.002512	0.000050	0.000006	0.000001	0.000000	0.000000	0.000000		
Ventilation, Dne	30	36	36	35	33	29	31	38	32	**Standard Trickle Vent 32dB (Tition SFX 4000EA)**
Transmission Coefficient	0.001000	0.000257	0.000263	0.000295	0.000490	0.001148	0.000741	0.000151		
Average Transmission Coeff	0.010817	0.006531	0.010109	0.001063	0.000197	0.000477	0.000246	0.000040		
Average SRI	20	22	20	30	37	33	36	44	31	

Calculated Internal Noise Level, dB	63	125	250	500	1000	2000	4000	8000	A	
Lp (Reverberant), line source	30.1	24.9	24.8	12.0	3.7	6.5	3.6	-11.3	18.5	
Lp (Direct)	34.3	29.1	29.0	16.3	7.9	10.8	7.9	-7.0	23	**Criteria**
Lp (Rev & Direct)	36	31	30	18	9	12	9	-6	24	**≤ 45**
BS8233	32	27	27	14	6	9	6	-9	21	**≤ 45**

APPENDIX C

Noise Impact During Overheating Risk Categories – Day and Night

Risk Category for Level 1 Assessment according to Table 3-2 Acoustics, Ventilation and Overheating: Residential Design Guide	
	High
	Medium
	Low
	Negligible

APPENDIX D

CALIBRATION CERTIFICATE

Date of issue: 27-08-2020 **Certificate No:** 14015927-1 **Page:** 1/8

OBJECT OF CALIBRATION	Manufacturer:	**SVANTEK**	
	Model:	**SV977**	
	Serial No.:	34132	
	Description:	Sound Level Meter	
SENSOR	Manufacturer:	**ACO**	**Svantek**
	Model:	**7052E**	**SV12L**
	Serial No.:	46602	18970
	Description:	Microphone	Preamplifier
APPLICANT	Clement Acoustics First Floor, 1B (C) Yukon Road, Balham, London SW12 9PZ		
ENVIRONMENTAL CONDITIONS	Temperature:	21.2 – 22.4	°C
	Humidity:	47 – 52	%
	Pressure:	100.1 – 100.2	kPa
DATE OF CALIBRATION	27-08-2020		
APPROVED BY	B. Hunt		

AcSoft sound & vibration

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CALIBRATION METHOD

Method described in instruction IN-02 "Calibration of the sound level meter", issue number 11 date 27.01.2016, written on the basis of international standard EN IEC 61672-3:2013 Electroacoustics. Part 3: Periodic tests.

CALIBRATION RESULTS

The sound level meter submitted for testing has successfully completed the Class 1 periodic tests of IEC 61672-3:2013 (BS EN 61672-3:2013), for the environmental conditions under which the tests were performed.

The results are presented on pages 3 to 8 of this certificate (including measurement uncertainty).

CONFORMITY WITH REQUIREMENTS

On the basis of the calibration results, it has been found that, the sound level meter meets metrological requirements specified in the standard IEC 61672-1:2013 Electroacoustics – Sound level meters. Part 1: Specifications, for class 1.

UNCERTAINTY OF MEASUREMENTS

Uncertainty of measurement has been evaluated in compliance with EA-4/02:2013. The expanded uncertainty assigned corresponds to a coverage probability of 95 % and the coverage factor $k = 2$.

NOTES

1. *The information appearing on this certificate has been compiled specifically for this instrument. This calibration certificate is produced with traceable and advanced equipment which permit comprehensive quality assurance verification of all data supplied herein.*
2. *The instrument was running firmware version 1.41.1*
3. *The measurements in this document are traceable to GUM (Central Office of Measures), Poland*
4. *This calibration certificate shall not be reproduced except in full, without written permission from Svantek UK Ltd.*

REFERENCE EQUIPMENT

Description	Manufacturer	Model	Serial Number	Last Calibrated
Signal Generator	Svantek	SV401	124	11.09.19
Sound & Vibration Analyser	Svantek	SV912AE	15940	09.09.19
Thermo-Barometer	LAB-EL	LB-706B	912	13.09.19
Acoustical Calibrator	Svantek	SV30A	44775	09.09.19

CALIBRATION RESULTS Calibration results are as follows:

1. Indication at the calibration check frequency

The sound level meter was calibrated in compliance with the instruction manual. During this process, the indication of this SLM was adjusted to the sound pressure level of the sound level calibrator type SV 30A, No 44775, from SVANTEK. The sound pressure level was corrected by the free-field factor.

Deviation of the acoustic pressure measurement of the A-weighted sound level using the sound calibrator type SV 30A, No 44775, from SVANTEK, was made according to the standard reference conditions: for static pressure 1003 hPa, for temperature 24 °C and for relative humidity 60 %, results:

0.0 ± 0.2 dB

The deviation was determined as a difference between the measured sound level and the sound level corrected by the free-field factor appropriate to mentioned sound calibrator.

2. Self-generated noise with microphone installed

Frequency weighting	A
The highest level of self-generated noise stated in the instruction manual [dB]	15.0
Indication [dB]	9.3

3. Self-generated noise with microphone replaced by the electrical input signal device

Frequency weighting	A	C	Z
The highest expected level of self-generated noise stated in the instruction manual [dB]	12.0	12.0	17.0
Level of self-generated noise [dB]	9.2	8.9	10.0

4. Acoustical signal tests of a frequency weighting C

Frequency	Relative frequency-weighted free-field response	Design-goal frequency weighting	The deviation of frequency weighting	Expanded uncertainty	Acceptable limits
Hz	dB	dB	dB	dB	dB
125.0	-0.07	-0,2	0.1	0.3	±1.5
1000.0	0.01	0,0	0.0	0.3	±1.1
4000.0	-0.79	-0,8	0.0	0.4	±1.6
8000.0	-2.67	-3,0	0.3	0.4	-3.1; +2.5

5. Electrical signal tests of frequency weightings

Frequency	Design-goal frequency weighting			The deviation of frequency weighting			Expanded uncertainty	Acceptable limits
	A	C	Z	A	C	Z		
Hz	dB	dB	dB	dB	dB	dB	dB	dB
63	-26,2	-0,8	0,0	0.1	0.0	0.0	0,3	±1,5
125	-16,1	-0,2	0,0	0.0	0.0	0.0	0,3	±1,5
250	-8,6	0,0	0,0	0.0	0.0	0.0	0,3	±1,4
500	-3,2	0,0	0,0	0.0	0.0	0.0	0,3	±1,4
1000	0,0	0,0	0,0	0.0	0.0	0.0	0,3	±1,1
2000	1,2	-0,2	0,0	0.0	0.0	0.0	0,3	±1,6
4000	1,0	-0,8	0,0	0.0	0.1	0.0	0,3	±1,6
8000	-1,1	-3,0	0,0	0.1	0.1	0.0	0,4	-3,1; +2,1
16000	-6,6	-8,5	0,0	-0.2	-0.2	0.0	0,6	-17,0; +3,5

6. Frequency and time weightings at 1 kHz

	Sound level				Time-averaged sound level
Frequency weighting	A	A	C	Z	A
Time weighting	Fast	Slow	Fast	Fast	-
Indication [dB]	114.0	114.0	114.0	114.0	114.0
The deviation of indication from the indication of A-weighted sound level with Fast time weighting [dB]		0.0	0.0	0.0	0.0
Expanded uncertainty [dB]		0.1			
Acceptable limits[dB]		±0.3	±0.4	±0.4	±0.3

7. Level linearity

Reference level range: HIGH

Expected sound level	Indication	Level linearity error	Expanded uncertainty	Acceptable limits
dB	dB	dB	dB	dB
136.0	136.0	0.0		
135.0	135.0	0.0		
134.0	134.0	-0.1		
133.0	133.0	-0.1		
132.0	132.0	-0.1		
131.0	131.0	-0.1		
130.0	130.0	-0.1		
129.0	129.0	-0.1		
124.0	123.9	-0.1		
119.0	118.9	-0.1		
114.0	114.0	0.0		
109.0	109.0	0.0		
104.0	104.0	0.0		
99.0	99.0	0.0		
94.0	94.0	0.0	0.2	±1.1
89.0	88.9	-0.1		
84.0	84.0	0.0		
79.0	78.9	-0.1		
74.0	73.9	-0.1		
69.0	68.9	-0.1		
64.0	63.9	-0.1		
59.0	58.9	-0.1		
54.0	54.0	0.0		
49.0	49.0	0.0		
44.0	44.0	0.0		
43.0	43.0	0.0		
42.0	42.0	0.0		
41.0	41.0	0.0		
40.0	40.0	0.0		

Level range: LOW

Expected sound level	Indication	Level linearity error	Expanded uncertainty	Acceptable limits
dB	dB	dB	dB	dB
120.0	119.9	-0.1	0.2	±1.1
119.0	118.9	-0.1		
118.0	117.9	-0.1		
117.0	116.9	-0.1		
116.0	115.9	-0.1		
115.0	114.9	-0.1		
114.0	114.0	0.0		
109.0	109.0	0.0		
104.0	104.0	0.0		
99.0	99.0	0.0		
94.0	94.0	0.0		
89.0	89.0	0.0		
84.0	84.0	0.0		
79.0	79.0	0.0		
74.0	73.9	-0.1		
69.0	68.9	-0.1		
64.0	63.9	-0.1		
59.0	58.9	-0.1		
54.0	53.9	-0.1		
49.0	48.9	-0.1		
44.0	43.9	-0.1		
39.0	38.9	-0.1		
34.0	34.0	0.0	0.3	
29.0	29.0	0.0		
28.0	28.0	0.0		
27.0	27.0	0.0		
26.0	26.1	0.1		
25.0	25.1	0.1		

8. Level linearity including the level range control

Level range	HIGH	LOW
Indication for the reference sound pressure level [dB]	113.9	113.9
The deviation of indication [dB]		0.0
Anticipated level that is 5 dB less than the upper limit specified in the instruction manual for level range at 1 kHz [dB]	132.0	115.0
Indication [dB]	131.9	114.9
The deviation of indication [dB]	-0.1	-0.1
Expanded uncertainty [dB]	0.2	
Acceptable limits[dB]	±1.1	

9. Toneburst response

Measurement quantity	Time weighting	Toneburst duration	The indications in response to toneburst relative to steady sound level	Reference toneburst response relative to steady sound level	Deviation of measured toneburst response from reference toneburst	Expanded uncertainty	Acceptable limits
		ms	dB	dB	dB	dB	dB
Time-weighted sound level	Fast	200	-1.0	-1.0	0.0	0.2	±0.8
		2	-18.0	-18.0	0.0		-1.8; +1.3
		0.25	-27.1	-27.0	-0.1		-3.3; +1.3
Time-weighted sound level	Slow	200	-7.4	-7.4	0.0		±0.8
		2	-27.0	-27.0	0.0		-1.8; +1.3
Sound exposure level	-	200	-7.0	-7.0	0.0		±0.8
		2	-27.0	-27.0	0.0		-1.8; +1.3
		0.25	-36.1	-36.0	-0.1		-3.3; +1.3

10. Peak C sound level

Numbers of cycles in test signal	Frequency of test signal	The deviation of indication	Expanded uncertainty	Acceptable limits
	Hz	dB	dB	dB
One	8000	-0.2	0.2	±2.4
Positive half-cycle	500	-0.1		±1.4
Negative half-cycle	500	-0.1		

11. Overload indication

Frequency weighting A

The difference between the levels of the positive and negative one-half-cycles input signals that first cause the displays of overload indication	Expanded uncertainty	Maximum value of the difference
dB	dB	dB
0.1	0.3	1.8

SVANTEK

CALIBRATION CERTIFICATE

Date of issue: 27-08-2020 **Certificate No:** 14015927-2 **Page:** 1/8

OBJECT OF CALIBRATION	Manufacturer:	**SVANTEK**	
	Model:	**SV977**	
	Serial No.:	34133	
	Description:	Sound Level Meter	
SENSOR	Manufacturer:	**ACO**	**Svantek**
	Model:	**7052E**	**SV12L**
	Serial No.:	71011	49912
	Description:	Microphone	Preamplifier
APPLICANT	Clement Acoustics First Floor, 1B (C) Yukon Road, Balham, London SW12 9PZ		
ENVIRONMENTAL CONDITIONS	Temperature:	22.3 – 22.5	°C
	Humidity:	47 – 52	%
	Pressure:	99.8 – 100.0	kPa
DATE OF CALIBRATION	27-08-2020		
APPROVED BY	B. Hunt		

AcSoft
sound & vibration

AcSoft Calibration | Bedford Technology Park
Thurleigh | Bedford | MK44 2YA

+44 (0) 1234 639550

www.acsoft.co.uk

CALIBRATION METHOD

Method described in instruction IN-02 "Calibration of the sound level meter", issue number 11 date 27.01.2016, written on the basis of international standard EN IEC 61672-3:2013 Electroacoustics. Part 3: Periodic tests.

CALIBRATION RESULTS

The sound level meter submitted for testing has successfully completed the Class 1 periodic tests of IEC 61672-3:2013 (BS EN 61672-3:2013), for the environmental conditions under which the tests were performed.

The results are presented on pages 3 to 8 of this certificate (including measurement uncertainty).

CONFORMITY WITH REQUIREMENTS

On the basis of the calibration results, it has been found that, the sound level meter meets metrological requirements specified in the standard IEC 61672-1:2013 Electroacoustics – Sound level meters. Part 1: Specifications, for class 1.

UNCERTAINTY OF MEASUREMENTS

Uncertainty of measurement has been evaluated in compliance with EA-4/02:2013. The expanded uncertainty assigned corresponds to a coverage probability of 95 % and the coverage factor $k = 2$.

NOTES

1. *The information appearing on this certificate has been compiled specifically for this instrument. This calibration certificate is produced with traceable and advanced equipment which permit comprehensive quality assurance verification of all data supplied herein.*
2. *The instrument was running firmware version 1.41.1*
3. *The measurements in this document are traceable to GUM (Central Office of Measures), Poland*
4. *This calibration certificate shall not be reproduced except in full, without written permission from Svantek UK Ltd.*

REFERENCE EQUIPMENT

Description	Manufacturer	Model	Serial Number	Last Calibrated
Signal Generator	Svantek	SV401	124	11.09.19
Sound & Vibration Analyser	Svantek	SV912AE	15940	09.09.19
Thermo-Barometer	LAB-EL	LB-706B	912	13.09.19
Acoustical Calibrator	Svantek	SV30A	44775	09.09.19

CALIBRATION RESULTS Calibration results are as follows:

1. Indication at the calibration check frequency

The sound level meter was calibrated in compliance with the instruction manual. During this process, the indication of this SLM was adjusted to the sound pressure level of the sound level calibrator type SV 30A, No 44775, from SVANTEK. The sound pressure level was corrected by the free-field factor.

Deviation of the acoustic pressure measurement of the A-weighted sound level using the sound calibrator type SV 30A, No 44775, from SVANTEK, was made according to the standard reference conditions: for static pressure 1003 hPa, for temperature 24 °C and for relative humidity 60 %, results:

0.0 ± 0.2 dB

The deviation was determined as a difference between the measured sound level and the sound level corrected by the free-field factor appropriate to mentioned sound calibrator.

2. Self-generated noise with microphone installed

Frequency weighting	A
The highest level of self-generated noise stated in the instruction manual [dB]	15.0
Indication [dB]	9.2

3. Self-generated noise with microphone replaced by the electrical input signal device

Frequency weighting	A	C	Z
The highest expected level of self-generated noise stated in the instruction manual [dB]	12.0	12.0	17.0
Level of self-generated noise [dB]	8.7	8.7	9.0

4. Acoustical signal tests of a frequency weighting C

Frequency	Relative frequency-weighted free-field response	Design-goal frequency weighting	The deviation of frequency weighting	Expanded uncertainty	Acceptable limits
Hz	dB	dB	dB	dB	dB
125.0	-0.12	-0,2	0.1	0.3	±1.5
1000.0	0.00	0,0	0.0	0.3	±1.1
4000.0	-0.80	-0,8	0.0	0.4	±1.6
8000.0	-2.44	-3,0	0.6	0.4	-3.1; +2.5

5. Electrical signal tests of frequency weightings

Frequency	Design-goal frequency weighting			The deviation of frequency weighting			Expanded uncertainty	Acceptable limits
	A	C	Z	A	C	Z		
Hz	dB	dB	dB	dB	dB	dB	dB	dB
63	-26,2	-0,8	0,0	0.1	0.0	0.0	0,3	±1,5
125	-16,1	-0,2	0,0	0.0	0.0	0.0	0,3	±1,5
250	-8,6	0,0	0,0	0.0	0.0	0.0	0,3	±1,4
500	-3,2	0,0	0,0	0.0	0.0	0.0	0,3	±1,4
1000	0,0	0,0	0,0	0.0	0.0	0.0	0,3	±1,1
2000	1,2	-0,2	0,0	0.0	0.0	0.0	0,3	±1,6
4000	1,0	-0,8	0,0	0.0	0.0	0.0	0,3	±1,6
8000	-1,1	-3,0	0,0	0.1	0.1	0.0	0,4	-3,1; +2,1
16000	-6,6	-8,5	0,0	-0.2	-0.2	0.0	0,6	-17,0; +3,5

6. Frequency and time weightings at 1 kHz

	Sound level				Time-averaged sound level
Frequency weighting	A	A	C	Z	A
Time weighting	Fast	Slow	Fast	Fast	-
Indication [dB]	114.0	114.0	114.0	114.0	114.0
The deviation of indication from the indication of A-weighted sound level with Fast time weighting [dB]		0.0	0.0	0.0	0.0
Expanded uncertainty [dB]		0.1			
Acceptable limits[dB]		±0.3	±0.4	±0.4	±0.3

7. Level linearity

Reference level range: HIGH

Expected sound level	Indication	Level linearity error	Expanded uncertainty	Acceptable limits
dB	dB	dB	dB	dB
136.0	136.0	0.0		
135.0	135.0	0.0		
134.0	134.0	0.0		
133.0	133.0	0.0		
132.0	132.0	0.0		
131.0	131.0	0.0		
130.0	130.0	0.0		
129.0	129.0	0.0		
124.0	124.0	0.0		
119.0	119.0	0.0		
114.0	114.0	0.0		
109.0	109.0	0.0		
104.0	104.0	0.0		
99.0	99.0	0.0		
94.0	94.0	0.0	0.2	±1.1
89.0	89.0	0.0		
84.0	84.0	0.0		
79.0	79.0	0.0		
74.0	74.0	0.0		
69.0	69.0	0.0		
64.0	64.0	0.0		
59.0	59.0	0.0		
54.0	54.0	0.0		
49.0	49.0	0.0		
44.0	44.0	0.0		
43.0	43.0	0.0		
42.0	42.0	0.0		
41.0	41.0	0.0		
40.0	40.0	0.0		

Level range: LOW

Expected sound level	Indication	Level linearity error	Expanded uncertainty	Acceptable limits
dB	dB	dB	dB	dB
120.0	120.0	0.0	0.2	±1.1
119.0	119.0	0.0		
118.0	118.0	0.0		
117.0	117.0	0.0		
116.0	116.0	0.0		
115.0	115.0	0.0		
114.0	114.0	0.0		
109.0	109.0	0.0		
104.0	104.0	0.0		
99.0	99.0	0.0		
94.0	94.0	0.0		
89.0	89.0	0.0		
84.0	84.0	0.0		
79.0	79.0	0.0		
74.0	74.0	0.0		
69.0	69.0	0.0		
64.0	64.0	0.0		
59.0	59.0	0.0		
54.0	54.0	0.0		
49.0	49.0	0.0		
44.0	44.0	0.0		
39.0	39.0	0.0		
34.0	34.0	0.0	0.3	
29.0	29.0	0.0		
28.0	28.0	0.0		
27.0	27.0	0.0		
26.0	26.0	0.0		
25.0	25.0	0.0		

8. Level linearity including the level range control

Level range	HIGH	LOW
Indication for the reference sound pressure level [dB]	114.0	114.0
The deviation of indication [dB]		0.0
Anticipated level that is 5 dB less than the upper limit specified in the instruction manual for level range at 1 kHz [dB]	132.0	115.0
Indication [dB]	132.0	115.0
The deviation of indication [dB]	0.0	0.0
Expanded uncertainty [dB]	0.2	
Acceptable limits[dB]	±1.1	

9. Toneburst response

Measurement quantity	Time weighting	Toneburst duration	The indications in response to toneburst relative to steady sound level	Reference toneburst response relative to steady sound level	Deviation of measured toneburst response from reference toneburst	Expanded uncertainty	Acceptable limits
		ms	dB	dB	dB	dB	dB
Time-weighted sound level	Fast	200	-1.0	-1.0	0.0	0.2	±0.8
		2	-18.0	-18.0	0.0		-1.8; +1.3
		0.25	-27.1	-27.0	-0.1		-3.3; +1.3
Time-weighted sound level	Slow	200	-7.4	-7.4	0.0		±0.8
		2	-27.0	-27.0	0.0		-1.8; +1.3
Sound exposure level	-	200	-7.0	-7.0	0.0		±0.8
		2	-27.0	-27.0	0.0		-1.8; +1.3
		0.25	-36.1	-36.0	-0.1		-3.3; +1.3

10. Peak C sound level

Numbers of cycles in test signal	Frequency of test signal	The deviation of indication	Expanded uncertainty	Acceptable limits
	Hz	dB	dB	dB
One	8000	-0.4	0.2	±2.4
Positive half-cycle	500	-0.1		±1.4
Negative half-cycle	500	-0.1		

11. Overload indication

Frequency weighting A

The difference between the levels of the positive and negative one-half-cycles input signals that first cause the displays of overload indication	Expanded uncertainty	Maximum value of the difference
dB	dB	dB
0.1	0.3	1.8

CERTIFICATE OF CALIBRATION

0653

Date of Issue: 03 November 2020 **Certificate Number: UCRT20/2063**

Calibrated at & Certificate issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Approved Signatory

K. Mistry

Customer	Clement Acoustics Ltd 1B(C) Yukon Road London SW12 9PZ			
Order No.	2010210071			
Test Procedure	Procedure TP 1 Calibration of Sound Calibrators			
Description	Acoustic Calibrator			
Identification	*Manufacturer*	*Instrument*	*Model*	*Serial No.*
	Rion	Calibrator	NC-74	34172694

The calibrator has been tested as specified in Annex B of IEC 60942:2003. As public evidence was available from a testing organisation (PTB) responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, the sound calibrator tested is considered to conform to all the class 1 requirements of IEC 60942:2003.

ANV Job No.	UKAS20/11607	
Date Received	02 November 2020	
Date Calibrated	03 November 2020	
Previous Certificate	*Dated*	30 October 2019
	Certificate No.	UCRT19/2206
	Laboratory	0653

Measurements

The sound pressure level generated by the calibrator in its WS2 configuration was measured five times by the Insert Voltage Method using a microphone as detailed below. The mean of the results obtained is shown below. It is corrected to the standard atmospheric pressure of 101.3 kPa (1013 mBar) using original manufacturers information.

Test Microphone	*Manufacturer*	*Type*
	Brüel & Kjær	4134

Results

The level of the calibrator output under the conditions outlined above was

94.00 ± 0.10 dB rel 20 µPa

Functional Tests and Observations

The frequency of the sound produced was	1002.72 Hz	±	0.13 Hz
The total distortion was	1.25 %	±	6.7 % of Reading

During the measurements environmental conditions were

Temperature	22	to	23	°C
Relative Humidity	40	to	48	%
Barometric Pressure	100.5	to	100.6	kPa

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

The uncertainties refer to the measured values only with no account being taken of the ability of the instrument to maintain its calibration.

A small correction factor may need to be applied to the sound pressure level quoted above if the device is used to calibrate a sound level meter which is fitted with a free-field response microphone. See manufacturers handbook for details.

..... END .....

Note:

Calibrator adjusted prior to calibration?	NO	
Initial Level	N/A	dB
Initial Frequency	N/A	Hz

Additional Comments The results on this certificate only relate to the items calibrated as identified above.

None

Calibrated by: C. Hirlav

R 1

CERTIFICATE OF CALIBRATION

Date of Issue: 12 October 2020

Certificate Number: TCRT20/1594

Issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Approved Signatory

K. Mistry

Client	Clement Acoustics Ltd First Floor 1B, © Yukon Road London SW12 9PZ
Purchase Order No.	2010020070
Instrument	Rion VM-56 Tri-Axial Vibration Meter
Serial No.	00680037
Accelerometer Type	VM-56
Accelerometer Serial No.	80040
Program	2.0
Client Asset No.	N/A
Procedure ID.	VM-56 Issue 1
Job Number	TRAC20/10341
Date of Calibration	12 Oct 2020
Previous Cert. number	N/A
Date of Previous Cert.	N/A
Rig Number	5
Kit Number	24
Calibration Status	**Passed Calibration**

This calibration is traceable to National Standards. ANV Measurement Systems sources used to perform calibrations are calibrated at the National Physical Laboratory or by UKAS laboratories accredited for the purpose.

The performance of the system (the meter, accelerometer) was found to be within the manufacturer's specification.

Comment

This certificate reports recorded values for the instrument 'As Received'.

Environment

The ambient environmental conditions at the time of the calibration were;
Temperature: 24.1 ± 1°C, Humidity: 38 ± 5%RH, Atmospheric pressure 100.8 ± 1 kPa

Test results

Each accelerometer axis was mounted co-axially with a Rion LS-10C servo accelerometer, and tests conducted for the dynamic range, PPV linearity and frequency response of the complete system. Additional electrical tests were carried out on the amplitude linearity of the instrument.

PPV linearity response for the complete system at 16 Hz With PV-83CW serial No. 80040
Weightings for all channels turned OFF

Target Vel. mm/s	Actual Vel. mm/s	Indicated (X) mm/s	Error (X) %	Indicated (Y) mm/s	Error (Y) %	Indicated (Z) mm/s	Error (Z) %
0.50	0.51	0.56	10.47	0.56	10.47	0.56	10.47
1.00	1.01	1.11	9.48	1.12	10.47	1.05	3.56
2.50	2.53	2.77	9.28	2.72	7.31	2.59	2.18
5.00	5.07	5.52	8.89	5.43	7.11	5.15	1.59
10.00	10.12	10.94	8.10	10.55	4.24	10.24	1.18
20.00	20.24	21.85	7.95	21.17	4.59	20.60	1.77

Permitted tolerance ± 10% ± 1 LSD (Least Significant Digit).

Linearity errors in dB measured electrically at 40 Hz
Weightings for all channels turned OFF
Level changes in dB; reading error in dB given for each axis. "m/s^2" is actual reading in m/s^2.

1 m/s^2 Range

Level dB	Error (X) dB	m/s^2 (X)	Error (Y) dB	m/s^2 (Y)	Error (Z) dB	m/s^2 (Z)
0	REF	0.99189	REF	0.99131	REF	0.99112
-20	0.02	0.09946	0.02	0.09940	0.02	0.09938
-40	0.03	0.00995	0.03	0.00995	0.03	0.00994
-60	-0.02	0.00099	0.08	0.00100	-0.01	0.00099
-66	0.05	0.00050	0.06	0.00050	0.06	0.00050
-72	0.03	0.00025	0.03	0.00025	0.04	0.00025

Permitted tolerance ±1.0 dB.

10 m/s^2 Range

Level dB	Error (X) dB	m/s^2 (X)	Error (Y) dB	m/s^2 (Y)	Error (Z) dB	m/s^2 (Z)
20	-0.04	9.87521	-0.05	9.85640	-0.04	9.86660
0	REF	0.99220	REF	0.99172	REF	0.99175
-20	0.02	0.09949	0.02	0.09944	0.02	0.09943
-30	0.04	0.03153	0.03	0.03146	0.02	0.03142
-40	0.02	0.00994	0.02	0.00994	0.02	0.00994
-52	0.06	0.00251	0.07	0.00251	0.10	0.00252

Permitted tolerance ±1.0 dB.

CERTIFICATE OF CALIBRATION

Certificate Number
TCRT20/1594

Frequency Responses For Complete System

Measured on the 1 m/s^2 range with weightings as indicated in the table and PV-83CW serial No. 80040

Frequency Hz	Applied Acc. m/s^2	X (Wd) rms m/s^2	Error X %	VDV (X) $m/s^{1.75}$	Error X %
3.981	0.285	0.15803	6.6	0.31097	6.6
5.012	0.355	0.15633	6.7	0.30709	6.5
6.310	0.355	0.12292	6.2	0.24067	5.7
7.943	0.355	0.09709	6.1	0.18937	5.1
10.00	0.355	0.07737	6.6	0.15113	5.8
12.59	0.355	0.06178	7.8	0.12203	8.1
15.85	0.355	0.05002	10.1	0.09846	10.1
19.95	0.550	0.06253	11.9	0.12305	11.9

Frequency Hz	Applied Acc. m/s^2	Y (Wd) rms m/s^2	Error Y %	VDV (Y) $m/s^{1.75}$	Error Y %
3.981	0.285	0.15746	6.2	0.30871	5.8
5.012	0.355	0.15314	4.5	0.29919	3.8
6.310	0.355	0.12154	5.0	0.23630	3.7
7.943	0.355	0.09653	5.4	0.18863	4.7
10.00	0.355	0.07765	7.0	0.15280	7.0
12.59	0.355	0.06173	7.7	0.12133	7.5
15.85	0.355	0.04931	8.5	0.09702	8.5
19.95	0.550	0.06162	10.3	0.12121	10.2

Frequency Hz	Applied Acc. m/s^2	Z (Wb) rms m/s^2	Error Z %	VDV (Z) $m/s^{1.75}$	Error Z %
3.981	0.285	0.26306	3.1	0.53004	5.6
5.012	0.355	0.37734	2.4	0.76290	5.2
6.310	0.355	0.38732	2.3	0.77679	4.2
7.943	0.355	0.37481	1.8	0.74718	3.1
10.00	0.355	0.35411	1.0	0.69825	1.2
12.59	0.355	0.32817	1.1	0.64677	1.2
15.85	0.355	0.29546	1.1	0.58183	1.1
19.95	0.550	0.36171	-8.3	0.71203	-8.3
25.12	0.550	0.33467	3.4	0.65866	3.4
31.62	0.550	0.27333	2.4	0.53799	2.4
39.81	0.550	0.21875	1.5	0.43049	1.5
50.12	0.550	0.17553	2.8	0.34545	2.8
63.10	0.550	0.13738	4.5	0.27037	4.5
79.43	0.550	0.10075	4.4	0.19829	4.4

Tolerance required @ 4 Hz to 63 Hz +12%/-11% ; @ 80 Hz +26%/-21%

All results meet the manufacturer's specification.

END OF CALIBRATION

CALIBRATED BY :- A. Lloyd

APPENDIX E

ACOUSTIC TERMINOLOGY

The effects of noise on human beings may be expressed in terms of physiological damage and annoyance. It is, however, only the annoyance impacts that need to be considered in detail when addressing environmental noise impacts. Annoyance also includes the immediate effects of activity interference, for example sleep disturbance and speech interference.

The practice has become to measure sound levels in decibels (dB). The decibel scale is logarithmic rather than linear and it is useful to bear in mind that a noise level change of 3dB would be equivalent to doubling the energy level (for example doubling the volume of traffic) and that an increase of 10 dB is perceived, subjectively, as a doubling of loudness. The human ear responds differently to sounds of different frequency. The ear perceives high frequency sound of a given sound pressure level more loudly than a low frequency sound at the same level. The A-weighted sound level, dB(A), takes this response into consideration and is commonly used for measurement of environmental noise in UK. It thus indicates the subjective human response to sound.

Environmental noise levels vary continuously from second to second, it is clearly impractical to specify the sound level continuously and thus time averaging is required. In practice human response has been related to various units which include allowance for the fluctuating nature of sound with time. For the purpose of this report these include:

LAeq,T : the equivalent A-weighted continuous sound level.

This unit relates to the equivalent level of continuous sound for a specific time period T, for example 16 hours for daytime noise. It contains all the sound energy of the varying sound levels over the same time period and expresses it as a continuous sound level over that period. The unit is used for assessing traffic and industrial noise for planning purposes and in particular for PPG24.

LA10,T : the A-weighted level of sound exceeded for 10% of the time period T.

This unit is used for traffic noise measurement and is the preferred unit for prediction of traffic noise in the publication, 'Calculation of Road Traffic Noise'.

LA90,T : the A-weighted level of sound exceeded for 90% of the time period T.

This unit is commonly used to represent the background noise and is used in assessing the effects of industrial noise in UK.

LAmax : the maximum A-weighted level of sound over a period of measurement.

LAr,T : the rating level.

The specific Noise plus any adjustments for the characteristic features of the noise. Used for comparison between background levels with the noise source off.

SEL : the Sound Exposure Level.

Sound exposure level abbreviated as SEL and LAE, is the total noise energy produced from a single noise event condensed into a 1 second time period.

Rw : weighted sound reduction index.

A laboratory-measured value as defined in ISO717 Part 1.

DnTw :

The equivalent of Rw, but measured onsite as oppose to in a laboratory

APPENDIX F

RELEVANT POLICY & GUIDANCE

National Planning Policy Framework (NPPF) – July 2021

Under the NPPF: paragraph 185 of Section 15, with regard to environmental noise; Planning policies and decisions should aim to: -

- mitigate and reduce to a minimum, potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

Noise Policy Statement for England (NPSE)

To avoid and mitigate adverse noise effects on health arising from and impacting on new development, the NPPF makes reference to NPSE. The NPSE was published in March 2010 and covers all forms of noise, other than occupational noise. For the purposes of this report, "Neighbourhood Noise" is most relevant as NPSE defined at paragraph 2.5:

"neighbourhood noise which includes noise arising from within the community such as industrial and entertainment premises, trade and business premises, construction sites and noise in the street. "

NPSE introduces three concepts to the assessment of noise in the UK:

- NOEL – No Observed Effect Level – This is the level below which no effect can be detected and below which there is no detectable effect on health and quality of life due to noise.
- LOAEL – Lowest Observable Adverse Effect Level – This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL – Significant Observed Adverse Effect Level – This is the level above which significant adverse effects on health and quality of life occur.

NPSE does not numerically define levels for the NOEL, LOAEL or SOAEL rather it makes it clear that the noise level is likely to vary depending upon the noise source, the receptor and the time of day/day of the week, etc.

National Planning Practice Guidance (2014)

The purpose of the guidance is to complement the NPPF and provide advice on how to deliver its policies.

The purpose of the guidance is to complement the NPPF and provide advice on how to deliver its policies.

The guidance includes a table (as shown in Table 1) that summarises "the noise exposure hierarchy, based on the likely average response" and which offers "examples of outcomes" relevant to the NOEL, LOAEL and SOAEL effect levels described in the NPSE.

Perception	Examples of outcomes	Increasing effect level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, eg turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, eg avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, eg regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, eg auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 1: Noise Exposure Hierarchy, Based on the Likely Average Response.

Calculation of Road Traffic Noise – 1988

For new developments, road traffic noise levels should be predicted in accordance with CRTN. This prediction method uses the traffic flow, vehicle speed, and percentage of heavy-duty vehicles (HDVs, over 3.5 tonnes), road gradient and other factors to calculate noise levels at receptor points.

Design Manual for Road and Bridges, Volume 11 (LA111 – Noise and Vibration

Changes in noise level as a result of additional vehicles on the public highway can be assessed using methodologies presented in Design Manual for Road and Bridges (DMRB LA111),

This guidance document sets out the requirements for noise and vibration assessments from road projects. The construction, operation and maintenance of highway projects can lead to changes in noise and vibration levels in the surrounding environment.

The magnitude of change (in sound level) is defined in Table 3.54a of the guidance for short term and Table 3.54b for long term, as presented in Table 2:

Short term magnitude	**Short term noise change (dB $L_{A10,18hr}$ or L_{night})**
Major	Greater than or equal to 5.0
Moderate	3.0 to 4.9
Minor	1.0 to 2.9
Negligible	less than 1.0
Long term magnitude	**Long term noise change (dB $L_{A10,18hr}$ or L_{night})**
Major	Greater than or equal to 10.0
Moderate	5.0 to 9.9
Minor	3.0 to 4.9
Negligible	less than 3.0

Table 2 (Table 3.54a and b DMRB, LA 111 - Magnitude of Change)

Control of Pollution Act 1974

The local authority has powers under the Control of Pollution Act 1974 to control noise from construction sites. Section 60 of the Act allows a local authority to serve a notice of its requirements for the control of site noise. This notice may include specification of plant that is or is not to be used, hours during which the construction works can be carried out and levels of noise emission. Section 61 of the Act allows a contractor or developer to take the initiative and agree with the local authority the methods of construction, steps to minimise noise and hours of work.

The Environmental Protection Act 1990

Local authorities have a duty to deal with statutory nuisances under the Environmental Protection Act 1990. For noise to amount to a statutory nuisance, it must be "prejudicial to health or a nuisance" as outlined in Section 79 of the Act. Any proposed development should not result in a statutory nuisance being declared.

Should the Local Authority declare a development to cause a statutory0020nuisance, an abatement notice can be served to the developer who has up to 21 days to appeal to Magistrates' Court, as detailed in Section 80 of the Act.

The Building Regulations 2010

Building Regulations approvals are required for most new buildings and for most types of works on existing buildings. Part 10 of The Building Regulations 2010 contains provisions, including power for local authorities to test building work, take samples, and provision to ensure compliance. Part E of the Regulation 'Resistance to the passage of sound' is expanded in Approved Document E, which provides robust details to control and mitigate noise within buildings. This Document is separated over four parts which include:

- E1: Protection against sound from other parts of the building and adjoining buildings;
- E2: Protection against sound within dwelling-house etc.;
- E3: Reverberation in the common internal parts of buildings containing flats or rooms for residential purposes;
- E4: Acoustic conditions in schools.

World Health Organisation

The WHO document Guidance on Community Noise specifies additional information for noise affecting noise sensitive receptors and forms the basis of many noise limitations and design ranges for internal and external ambient noise levels. It defines noise as 'a class of sounds that are considered unwanted' (by the listener), 'that adversely affects, or may affect the physiological and psychological wellbeing of people.' Much of the research around this study is based on transportation noise.

Further guidance on the recommended levels is given in the World Health Organisation (WHO) Guidelines for Community Noise. In this document it is stated that:

"*To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB L_{Aeq} on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB L_{Aeq}."*

WHO also states the following paragraph with regard to the effects of LAmax events in a night-time period:

"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45dB L_{Amax} more than 10-15 times per night (Vallet & Vernet 1991)."

WHO guidance 'Night Noise Guidelines for Europe' is concerned with the longer-term average noise levels that are covered by the EU Directive on Environmental Noise, although this does appear to suggest external maximum noise levels of around 57dBA outside bedrooms during the night to achieve internal maximum levels of 42dBA.

The World Health Organisation has recently published Environmental Noise Guidelines – for the European Region (2018) to provide recommendations for protecting human health from exposure to noise sources such as transportation (road traffic, railway and aircraft), wind turbine noise and leisure noise.

The guidance document defines the 'strength' of recommendation (for protecting against noise exposure) as either 'strong' or conditional', outlined below.

Strength of Recommendation

*"A **strong** recommendation can be adopted as policy in most situations. The guideline is based on the confidence that the desirable effects of adherence to the recommendation outweigh the undesirable consequences. The quality of evidence for a net benefit – combined with information about values, preference*

and resources – inform this recommendation, which should be implemented in most circumstances."

*"A **conditional** recommendation requires a policy-making process with substantial debate and involvement of various stakeholders. There is less certainty of its efficacy owing to lower quality of evidence of a net benefit, opposing values and preferences of individuals and populations affected or the high resource implications of the recommendation, meaning there may be circumstances or settings in which it will not apply."*

External (free-field) recommendations included in the Environmental Noise Guidelines for the European Region are presented in Table 3 for specific noise sources.

Noise Source	dB L_{den}	dB L_{night}	dB $L_{Aeq,\ 24hr}$ (yearly average)	Recommendation
Road Traffic	53	45	-	Strong
Railway	54	44	-	Strong
Aircraft	45	40	-	Strong
Wind Turbine	45	-	-	Conditional
Entertainment	-	-	70	Strong/Conditional

Table 3: Extract from Environmental Noise Guidelines for the European Region

BS8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings

Formerly a Code of Practice, the 2014 revision of BS8233 is now presented and intended as a guidance document. The standard is mainly concerned with building design from an acoustic standpoint. It does however, contain information relevant to environmental noise more specifically by stating guidance for desirable internal noise levels for dwellings and other buildings.

Table 2 of BS8233:2014 provides suitable internal levels for spaces such as open-plan offices and restaurants and notes that an upper and lower noise levels should be considered, as presented in Table 4.

Objective	Typical Situation	Design range dB LAeq,T
Typical noise levels for acoustic privacy in shared spaces	Restaurant	40 - 55
	Open plan office	45 - 50
	Night club, public house	40 - 45
	Ballroom, banqueting hall	35 - 40

Table 4: Extract from Table 2 – Indoor ambient noise levels in spaces when they are unoccupied and privacy is also important

An extract of Table 4 of the document relevant for residential development is reproduced in Table 5.

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

Table 5: Extract from Table 4 – Indoor ambient noise levels in dwellings

Whilst the above criteria is for dwellings, BS8233 states that these recommendations are similar for hotel guestrooms and therefore these have been adopted as the criteria for assessment.

The guidance of BS8233:2014 with regards to external amenity spaces is as follows:

"*For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport*

network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."

ProPG: Planning and Noise - May 2017

Guidance in ProPG Planning and Noise provides an approach which aims to inform developers, practitioners and local authorities on how potential residential sites should be assessed. ProPG states that the guidance can be used for other types of residential institution and therefore it is considered applicable to the site.

The guidance also builds upon government planning policy that noise should not be treated in isolation and there should be a holistic approach to good acoustic design.

ProPG sets out a 2-stage approach; the first of which is a risk assessment to identify the likelihood of significant adverse impact, then depending on the outcome of this risk assessment the extent of the acoustic design statement required. The graphic in Figure 1 is an extract from ProPG and indicates the level of risk associated with ranges of sound levels and provides some guidance on the likely extent of work associated with progressing a development exposed to these sound levels.

In relation to maximum noise levels, ProPG states that:

"In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ *more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events."*

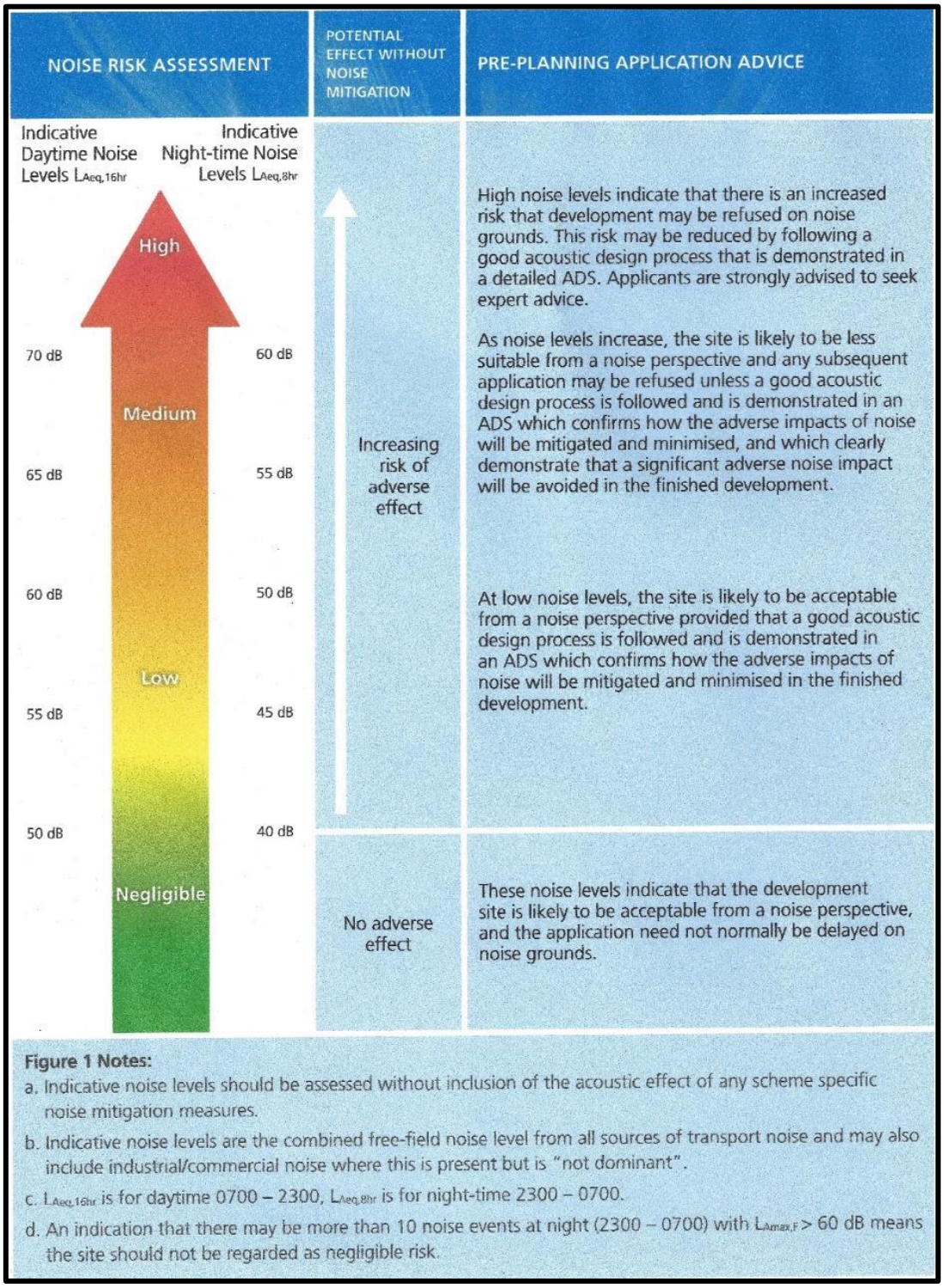


Figure 1: Extract from Figure 1 in ProPG – Initial Site Noise Risk Assessment

Acoustics Ventilation and Overheating - Residential Design Guide, January 2020

Acoustics Ventilation and Overheating (AVO) recommends an approach to acoustic assessments for new residential development taking consideration for acoustics, ventilation, and overheating. AVO states that the guidance can be used for other types of residential institution and therefore it is considered applicable to the site.

Section 3 involves a two-level risk assessment approach to estimate the potential impact on occupants in the case of overheating.

The Level 1 site risk assessment is based on external free-field noise levels and the assumed scenario where a partially open window is used to mitigate overheating (Table 3-2 of the guidance).

The sound level reduction from outside to inside for a partially open window is 13dB in this instance. A Level 1 site risk assessment is considered adequate if the site falls within the 'Negligible risk' category. A Level 2 assessment can optionally be undertaken to give more confidence in the case of Low or Medium risk sites, where appropriate. The Level 2 assessment is strongly recommended for 'High' risk sites.

The Level 2 assessment suggests that assessment of the adverse effect from noise exposure should include an estimate of how frequently and for what duration the overheating condition occurs (Table 3-3 of the guidance)

Figure 2 explains the two-level noise assessment procedure for overheating conditions.

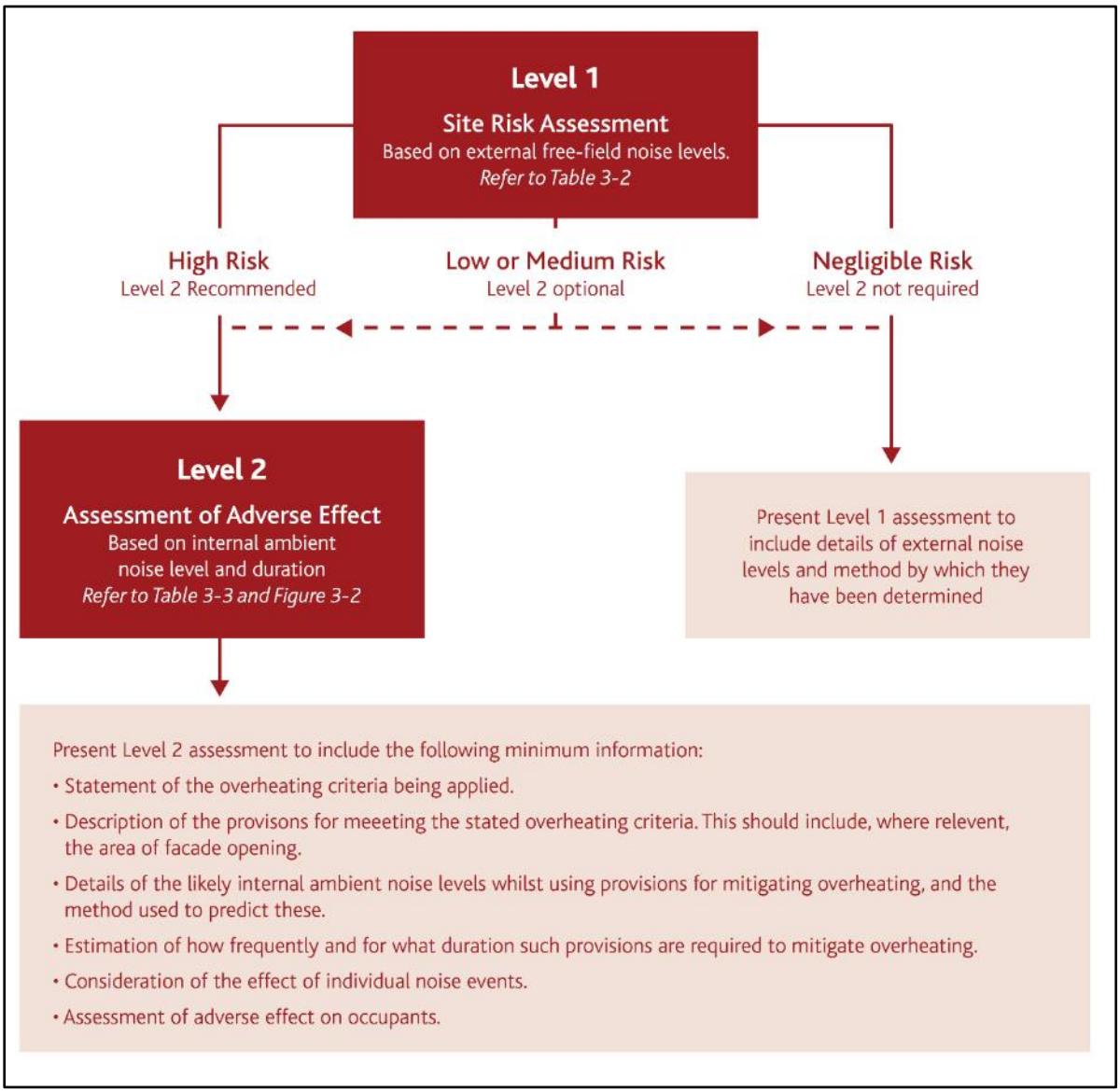


Figure 2: Two-level Assessment Procedure (Figure 3.1 of AVO Guidance)

Figure 3 shows the Level 1 site risk assessment of noise, relating to overheating conditions.

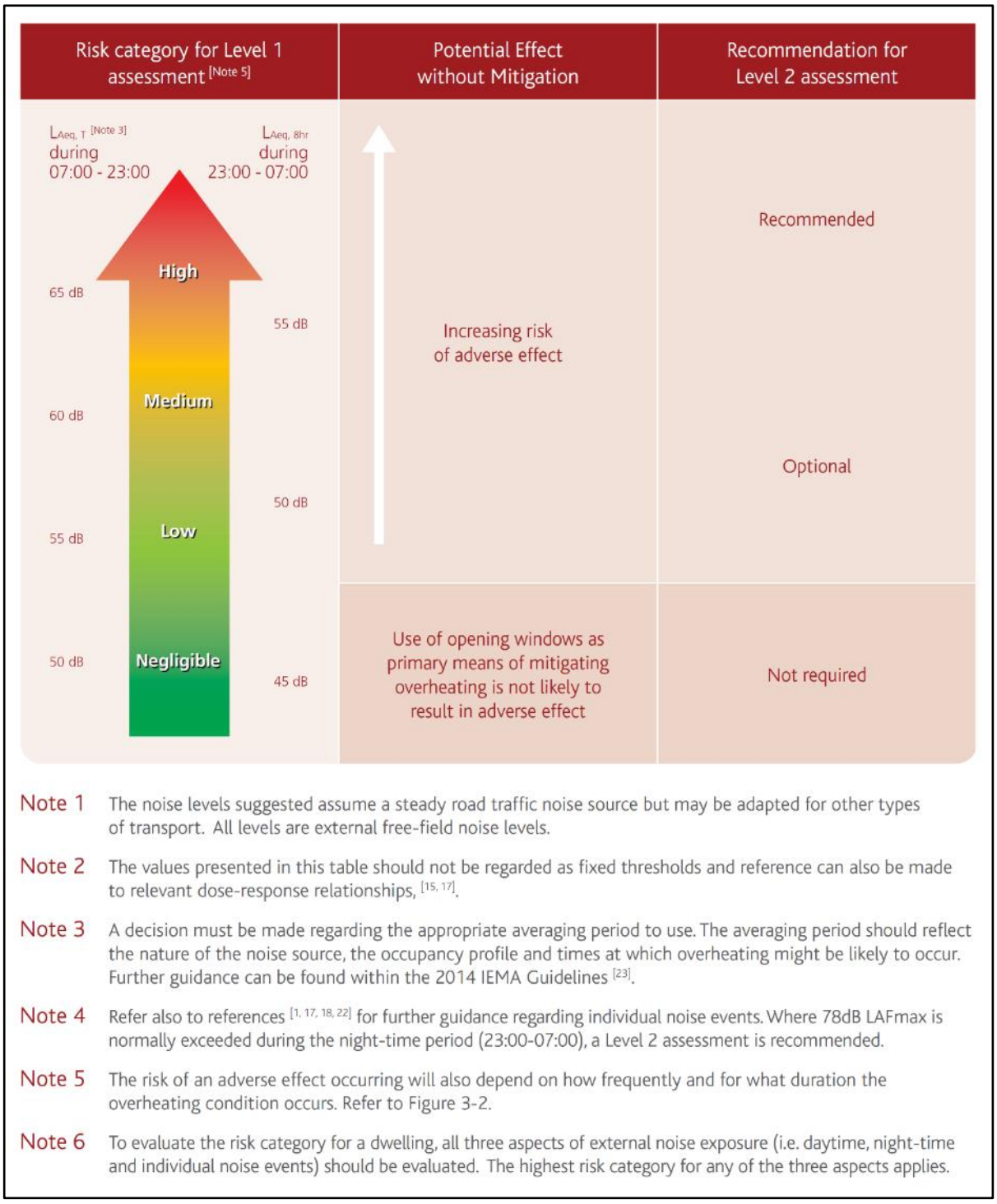


Figure 3: Level 1 Risk Assessment (Figure 3.2 of AVO guidance)

Figure 4 shows the Level 2 site risk assessment of noise, relating to overheating conditions.

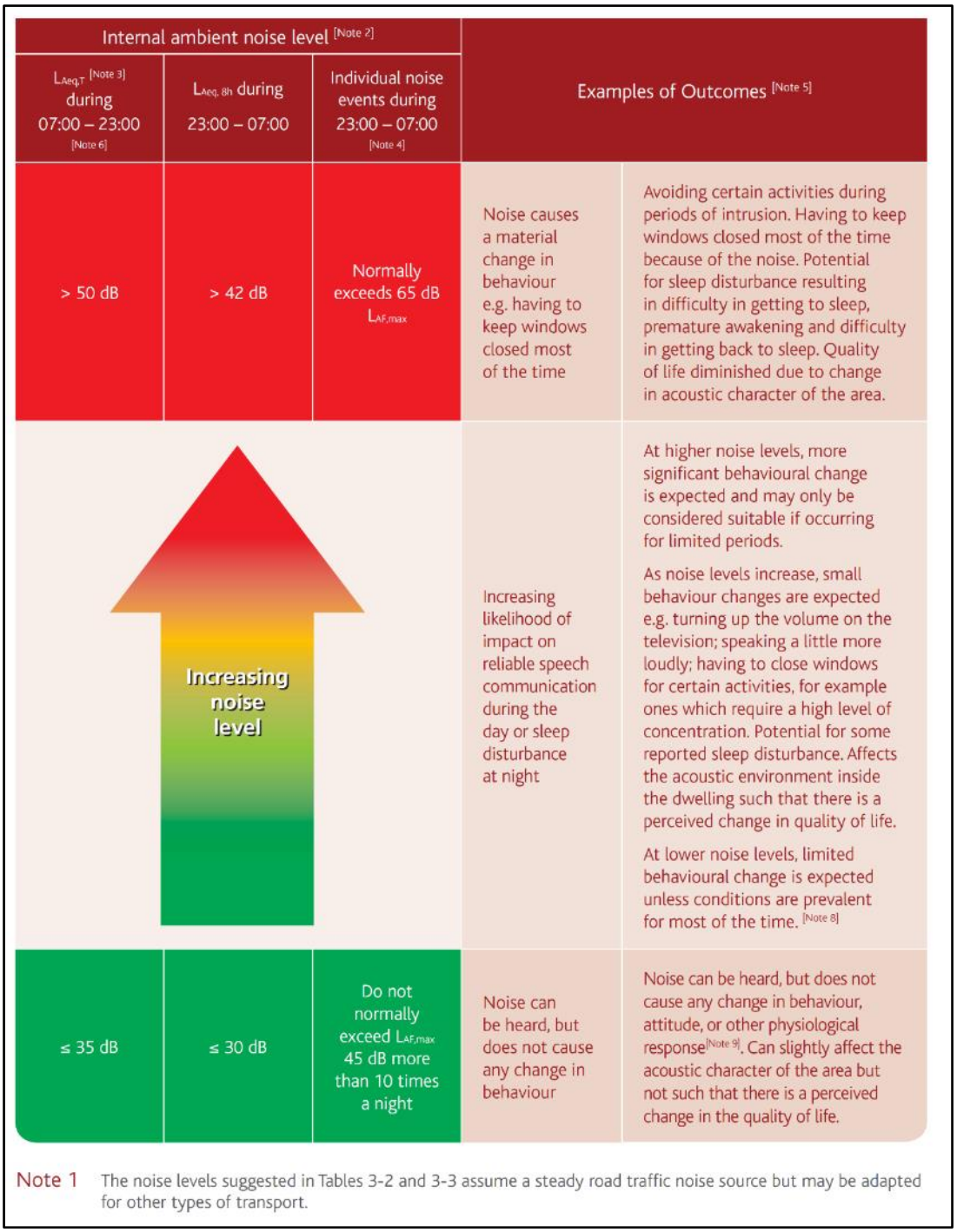


Figure 4: Level 2 Risk Assessment (Figure 3.3 of AVO guidance)

The noise levels suggested in Figure 3 and Figure 4 assume a steady road traffic noise source but may be adapted for other types of transport by taking account of the differing responses to different transport sources.

BS6472-1:2008 – Guide to Evaluation of Human Exposure to Vibration in Buildings - Part 1: Vibration sources other than blasting

This document offers guidance on how people inside buildings respond to vibration: the judgement criteria are more stringent at higher frequencies than in the superseded standard due to changes in the vertical frequency weighting.

Assessment of building vibration with respect to human response: When the appropriately-weighted vibration measurements or predictions have been used to derive the VDV (Vibration Dose Value) for either 16hr (daytime) or 8h (night-time) at the relevant places of interest, their significance in terms of human response can be derived from Table 6, shown below:

Vibration dose value ranges which might result in various probabilities of adverse comment within residential buildings

Place and time	Low probability of adverse comment $m \cdot s^{-1.75}$ 1)	Adverse comment possible $m \cdot s^{-1.75}$	Adverse comment probable $m \cdot s^{-1.75}$ 2)
Residential buildings 16 h day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8 h night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

NOTE For offices and workshops, multiplying factors of 2 and 4 respectively should be applied to the above vibration dose value ranges for a 16 h day.

Table 6: Vibration Dose Values from BS6472-1:2008

BS4142:2014 Methods for rating industrial and commercial sound

BS4142:2014 uses a comparison between the rating and background sound levels to establish an initial estimate of the likely significance of impact. The standard notes:

a) *Typically, the greater this difference, the greater the magnitude of the impact.*

b) *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*

c) *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*

d) *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.*

The context of the assessment must then be considered, which can significantly alter the outcome of the assessment. Factors that might alter the outcome of the assessment include the absolute level of sound compared to the residual sound level, the character of the sound compared to the residual, the sensitivity of the receptor etc.

The London Plan 2021

The latest version of the London Plan, as published in March 2021, provides an overall strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20–25 years. The 'Publication London Plan' brings together the geographic and locational aspects of the Mayor's other strategies, including a range of environmental issues such as climate change (adaptation and mitigation), air quality, noise and waste.

The most relevant guidance in terms of the impact and assessment of noise is found within Policy D14: Noise, which states:

"…Policy D14 Noise

A *In order to reduce, manage and mitigate noise to improve health and quality of life, residential and other non-aviation development proposals should manage noise by:*

1) *avoiding significant adverse noise impacts on health and quality of life*

2) *reflecting the Agent of Change principle as set out in Policy D13 Agent of Change*

3) *mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on existing noise-generating uses*

4) *improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquillity)*

5) *separating new noise-sensitive development from major noise sources (such as road, rail, air transport and some types of industrial use) through the use of distance, screening, layout, orientation, uses and materials – in preference to sole reliance on sound insulation*

6) *where it is not possible to achieve separation of noise-sensitive development and noise sources without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through applying good acoustic design principles*

7) *promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.*

B *Boroughs, and others with relevant responsibilities, should identify and nominate new Quiet Areas and protect existing Quiet Areas in line with the procedure in Defra's Noise Action Plan for Agglomerations…"*

Policy D14: Noise refers to Policy D13: Agent of Change, which states:

"…***Policy D13 Agent of Change***

A *The Agent of Change principle places the responsibility for mitigating impacts from existing noise and other nuisance-generating activities or uses on the proposed new noise-sensitive development. Boroughs should ensure that Development Plans and planning decisions reflect the Agent of Change principle and take account of existing noise and other nuisance generating uses in a sensitive manner when new development is proposed nearby.*

B *Developments should be designed to ensure that established noise and other nuisance-generating uses remain viable and can continue or grow without unreasonable restrictions being placed on them.*

C *New noise and other nuisance-generating development proposed close to residential and other noise-sensitive uses should put in place measures to mitigate and manage any noise impacts for neighbouring residents and businesses.*

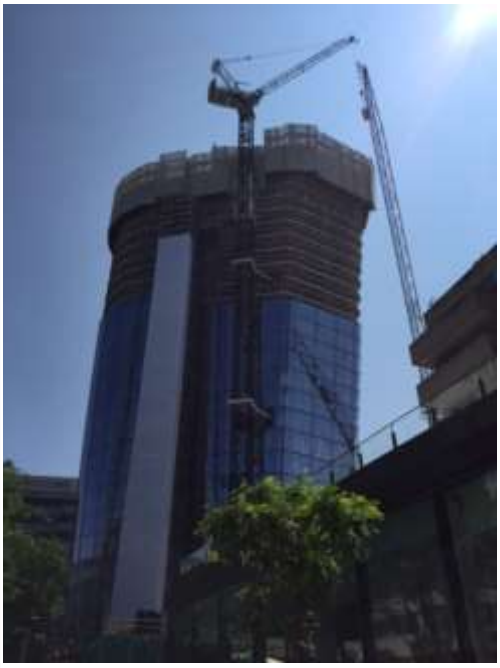
D *Development proposals should manage noise and other potential nuisances by:*

1) ensuring good design mitigates and minimises existing and potential nuisances generated by existing uses and activities located in the area

2) exploring mitigation measures early in the design stage, with necessary and appropriate provisions including ongoing and future management of mitigation measures secured through planning obligations

3) separating new noise-sensitive development where possible from existing noise-generating business and uses through distance, screening, internal layout, sound-proofing, insulation and other acoustic design measures.

E *Boroughs should not normally permit development proposals that have not clearly demonstrated how noise and other nuisances will be mitigated and managed…"*



London Borough of Southwark Technical Guidance for Noise

Amended November 2019

Rev 3

@lb_southwark facebook.com/southwarkcouncil

Southwark Council
southwark.gov.uk

Contents

1.0 Introduction

This technical guidance for noise provides details of expected acoustic standards for various types of development. It is intended:

- To help ensure consistency in the approach to dealing with noise and planning in Southwark;
- To highlight the existing policy framework in London and Southwark, and emphasise the importance of noise as a material planning consideration;
- To provide guidance on measures that can be implemented to mitigate the potentially harmful impacts of noise, both as a result of new noise sources, and as a result of placing new sensitive receptors close to existing noise sources;
- To provide guidance on the use of planning conditions and Section 106 obligations to reduce noise exposure;
- To provide guidance on the requirements of noise assessments and the circumstances under which these will be required;

Part A of this TGN details the policy background for noise and planning in Southwark.

Part B of this TGN details the actual standards and guidance. Specific compliance standards in Part B are written in embedded text boxes. Other text provides background information and guidance, and details the approach that would be expected in order to comply with the standards.

2.0 Background

The London Borough of Southwark is an inner London borough with a population of approximately 315,000 covering 11 square miles, stretching from London Bridge and Canada Water on the River Thames in the North down to Dulwich in the South. In the 2011 census Southwark had the 9th highest population density of any Local Authority in England and Wales. Southwark is experiencing rapid population growth and extensive development in buildings and infrastructure. As a densely populated urban borough, many developments in Southwark involve a risk of new noise impacts, either through new exposure or new sources of noise, both during the construction and operational phases.

The Environmental Protection Team (EPT) at the London Borough of Southwark (LBS) receives hundreds of planning consultation enquiries each year. National, Regional and Local Planning Policy dictate the policy context through which EPT operate. Further guidance is taken from British Standards and documents issued by relevant institutes such as the Institute of Acoustics and the Chartered Institute of Environmental Health. This TGN has been produced to provide the detail of technical standards expected and how policy translates into practical constraints and obligations, accounting for local context in Southwark.

All expected standards detailed within this TGN comply with the National Planning Policy Framework, National Planning Practice Guidance and Regional and Local Planning Policy.

PART A: Policy Background

3.0 Noise Policy Context

3.1 National Policy

3.1.1 Noise Policy Statement for England

The overarching framework for national noise policy is the Noise Policy Statement for England (NPSE). The long term vision identified in the policy is 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 aims of the policy are:

> *Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*
>
> - *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 NPSE introduces the concept of adverse effects common to toxicology to the assessment of noise impacts:

- *NOEL – No Observed Effect Level*

  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*

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

- *SOAEL – Significant Observed Adverse Effect Level*

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

Noise effect levels are not set at fixed figures but vary depending on the context and character of the noise and site specific factors which may impact on the severity of the effect. The NPSE states:

> '*It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.*'

Further information and discussion relating to possible objective levels for NOELs SOAELs and LOAELs is available at:

http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=18157

3.1.2 National Planning Policy Framework

The concepts outlined in the NPSE are incorporated into the National Planning Policy Framework (NPPF). Paragraphs 170, 180 and 182 relate to noise:

> ***170.*** *Planning policies and decisions should contribute to and enhance the natural and local environment by:*
>
> *…*
>
> *e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and*
>
> ***180.*** *Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*
>
> *a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*
>
> *b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and*
>
> *…*
>
> *182. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.*

3.1.3 National Planning Practice Guidance

Practical guidance on how the NPPF should be applied is contained within the Noise National Planning Practice Guidance (NPPG). The guidance includes qualitative examples of how to interpret adverse effect levels in a Planning context.

Perception	**Examples of Outcomes**	**Increasing Effect Level**	**Action**
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			

Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

The NPPG also gives further guidance on the factors influencing whether noise may be a concern at the planning stage and how adverse effects can be mitigated, including through the use of good acoustic design.

3.1.4 Permitted Development Rights

The General Permitted Development (England) Order 2015 (GPDO) contains details of developments which are permitted by prior notification rather than full planning consent. The Order was subsequently amended to include responsibilities in relation to noise to certain classes of permitted development.

For further details of Permitted Development rights see the Order itself or the following website:

http://planningguidance.communities.gov.uk/blog/guidance/when-is-permission-required/what-are-permitted-development-rights/

Where noise is a material consideration it must be adequately assessed in planning applications and conditions may be applied in respect of noise. Where noise is not a material consideration under the GPDO it may still impact on the suitability of the housing as required by the Housing Act. Dwellings which do not provide a suitable acoustic environment may be subject to enforcement action and so it is strongly recommended that noise is properly considered for all permitted development applications.

3.1.5 Noise Mapping

The Environmental Noise Directive requires European Member States to establish, through the process of noise mapping, the number of people exposed to noise levels above 55 dB(A) L_{den} and 50 dB(A) L_{night} from major roads, major railways, major airports and in agglomerations (large urban areas). In these urban areas, noise from all other roads, railways, aircraft movements and significant industrial premises has been mapped, in addition to other major sources.

In England the Directive is implemented through The Environmental Noise (England) Regulations 2006. Those areas/noise sources in England for which noise mapping has occurred are identified in The Environmental Noise (Identification of Noise Sources) (England) Regulations 2007.

The Environmental Noise (England) Regulations 2006 require noise action plans to be developed on a five year rolling programme. Action plans have to be developed for the major noise sources and areas for which maps have been produced. The action plans will seek to manage noise issues and effects including noise reduction if necessary, based on the results obtained through the mapping process.

Noise sources included in the noise mapping 2017 can be found at: -

https://www.gov.uk/government/publications/strategic-noise-mapping-2019

Details of noise action plans can be found at:

h

https://www.gov.uk/government/publications/noise-action-plans-large-urban-areas-roads-and-railways-2019

3.2 Greater London Policy

3.2.1 The London Plan and Mayor's Ambient Noise Strategy

Policy 7.15 of the London Plan is entitled Reducing and Managing Noise and contains the following requirements:

Strategic

A The transport, spatial and design policies of this plan will be implemented in order to reduce and manage noise to improve health and quality of life and support the objectives of the Mayor's Ambient Noise Strategy.

Planning decisions

B Development proposals should seek to manage noise by:

a.) avoiding significant adverse noise impacts on health and quality of life as a result of new development;

b.) mitigating and minimising the existing and potential adverse impacts of noise on, from, within, as a result of, or in the vicinity of new development without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens on existing businesses;

c.) improving and enhancing the acoustic environment and promoting appropriate soundscapes (including Quiet Areas and spaces of relative tranquility);

d.) separating new noise sensitive development from major noise sources (such as road, rail, air transport and some types of industrial development) through the use of distance, screening or internal layout – in preference to sole reliance on sound insulation;

e.) where it is not possible to achieve separation of noise sensitive development and noise sources, without undue impact on other sustainable development objectives, then any potential adverse effects should be controlled and mitigated through the application of good acoustic design principles;

f.) having particular regard to the impact of aviation noise on noise sensitive development;

g.) promoting new technologies and improved practices to reduce noise at source, and on the transmission path from source to receiver.

LDF preparation

C Boroughs and others with relevant responsibilities should have policies to:

a.) manage the impact of noise through the spatial distribution of noise making and noise sensitive uses;

b.) identify and nominate new Quiet Areas and protect existing Quiet Areas in line with the procedure in Defra's Noise Action Plan for Agglomerations.

The London Plan can be viewed at:

https://www.london.gov.uk/what-we-do/planning/london-plan

The London Plan addresses the spatial implications of the Ambient Noise Strategy.

Noise is included in the Mayor's Environment Strategy. Chapter 9 is available at:

https://www.london.gov.uk/sites/default/files/london_environment_strategy_0.pdf

3.3 Local Planning Policy

The Local Plan is a set of borough-wide planning policy documents that are used to set out how Southwark will be regenerated and protected. It sets out masterplans, development sites and is used to decide if development proposals should be given planning permission. It consists of two adopted planning policy documents: The saved Southwark Plan policies (2007) and the Core Strategy (2011).

3.3.1 Saved Southwark Plan Policies and the New Southwark Plan

The saved Southwark Plan policies (2007) are available at:

http://www.southwark.gov.uk/downloads/download/4441/core_strategy_and_saved_southwark_plan_policies

The local plan is currently being reviewed and updated. The New Southwark Plan is currently in its second draft and further consultation will be taking place. Details of the new draft plan are available at this webpage:

http://www.southwark.gov.uk/downloads/download/4346/new_southwark_plan_preferred_option

Some saved policies from the 2007 Southwark Plan that are relevant to noise and acoustic standards are:

Policy 3.1 - Environmental Effects

Planning permission for the establishment of uses that would cause material adverse effects on the environment will not be granted, and proposals for activities that will have a material adverse impact on the environment and quality of life will be refused.

Policy 3.2 – Protection of Amenity

Planning permission for development will not be granted where it would cause loss of amenity, including disturbance from noise, to present and future occupiers in the surrounding area or on the application site.

Policy 3.3 – Sustainability Assessment

Planning permission will not be granted for Major Development unless the applicant demonstrates that the economic, environmental and social impacts of the proposal have been addressed through a Sustainability Assessment. The level of detail required in the Sustainability Assessment should correspond to the scale and complexity of the development.

Policy 4.2 - Quality of Residential Accommodation

Planning permission will be granted for residential development, including dwellings within mixed use schemes, provided that they:

i. Achieve good quality living conditions; and

ii. Include high standards of:

- *Accessibility, including seeking to ensure that all new housing is built to Lifetime Homes standards;*
- *Privacy and outlook;*
- *Natural daylight and sunlight;Ventilation;*
- *Space including suitable outdoor/green space;*
- *Safety and security; and*
- *Protection from pollution, including noise and light pollution.*

3.3.2 The Core Strategy

The Core Strategy (2011) is available at:

http://www.southwark.gov.uk/downloads/download/4441/core_strategy_and_saved_southwark_plan_policies

The current Core Strategy (2011) contains relevant local policy. In particular:

Strategic Policy 1 – Sustainable development

Which requires that '*Development will improve the places we live and work in and enable a better quality of life for Southwark's diverse population. It will help meet the needs of a growing population in a way that respects the limits of the planet's resources and protects the environment.*'

And;

Strategic Policy 13 – High environmental standards

This Policy includes a commitment that '*Development will help us live and work in a way that respects the limits of the planet's natural resources, reduces pollution and damage to the environment and helps us adapt to climate change.*'

The policy aims to achieve this commitment by '*Setting high standards and supporting measures for reducing air, land, water, noise and light pollution and avoiding amenity and environmental problems that affect how we enjoy the environment in which we live and work.*'

3.3.3 Borough-Wide Supplementary Planning Documents

In addition to Policy there are local supplementary planning documents and guidance which give further detail on required standards. The Sustainable Design and Construction SPD contains details on '*Designing out pollution and nuisance*' including through the use of site layout, building form and massing; landscaping; building design and materials and mechanical systems. The SPD states:

- *Existing sources of high and frequent noise near the site need to be considered when planning the layout of a site and the form and massing of buildings. Noise sensitive uses, such as hospitals, schools and residential developments, and amenity areas should be separated from noise sources.*
- *The most effective solution is likely to be by considering how the design and layout of the development can buffer background noise levels, for example by acting as a shield to a busy road. Buildings should not make*

background noise levels worse by channeling or amplifying existing noise – for example by creating a canyon effect.

- *Consideration should be given as to how landscaping can screen and contain noise and light, such as through earth mounds and expanses of dense, tall foliage.*

- *Development should maximise the use of passive design features that provide natural background ventilation. These include making effective use of landscaping, the site's microclimate and the layout of buildings. Dwellings that only have windows that open onto busy roads or railways are not supported by the council. Glazing should be used on windows to reduce noise levels inside buildings. However, this will only be effective when windows are closed and so should be used in conjunction with other solutions.*

- *Noise generating developments should contain noise through appropriate sound insulation and other noise reducing technologies.*

- *Mechanical systems should only be used as a complement to natural ventilation to ensure a constant standard of indoor air quality. They should not create a noise nuisance and should be efficient, where possible including technology to recover heat energy for other uses. Where mechanical systems are used, careful consideration will need to be given to ensure air intakes are positioned appropriately.*

- *Where mechanical ventilation is used, it should be designed to ensure no noise nuisance is caused to occupiers of other properties and that noise disturbance does not affect the property in which ventilation is situated.*

Within section 11 'Design Standards for Major Developments', section 11.4 'Standards For Avoiding Pollution And Environmental Nuisance' contains the following guidance*:

Indoor noise levels

Residential development should be designed so that noise levels for indoor spaces are below

LAeq 16 hour 35 dB (07.00-23.00) and LAeq 8 hour 30 dB

LAFmax 45 dB (23.00-07.00)

Non-residential buildings should be designed to meet the recommended levels set out in British Standard BS8233:1999 (in particular Tables 5 and 6).

For changes of use/conversions, the building should be adapted so that it meets the British Standard levels for the proposed use. Information on how a development has been designed to minimize noise impact and meet the guidance in section 5.2 should be included as part of the Design and Access Statement.

Where noise sensitive uses are proposed in locations that may be affected by noise, such as from railways, busy roads and industrial activity, applications should include a formal acoustic study that explains how noise impacts have been mitigated.

*Note: Since this SPD BS8233:2014 has been released. It is now expected that standards in BS8233:2014 and Part B of this TGN are followed.

3.3.4 Local Area Supplementary Planning Documents

Southwark Council has adopted a number of area-based SPDs which cover specific regions of the Borough.

The adopted SPD for Blackfriars Road includes the following requirements in relation to noise:

> *Management plans*
>
> *There is a need to ensure effective and coordinated management of development to minimise the impact on residents, workers and visitors. This is important both during and post construction. Planning conditions, or s106 planning obligations, will require that construction management plans are in place for development along the Blackfriars Road corridor. Developers and contractors will be strongly encouraged to engage with the Bankside and London Bridge Logistics Group which has been established to coordinate all aspects of the construction process in the opportunity area, including traffic management, noise and pollution control, local employment and public realm works. In order to reduce the impact of construction on existing residents and businesses, developers and contractors will be encouraged to work together, and the logistics group aims to achieve excellence in construction management, as certified by the national Considerate Contractors Scheme.*
>
> *Similarly, planning conditions or s106 planning obligations will require delivery and servicing plans to address the delivery and servicing arrangements for completed developments. This could include hours of operation being managed within reasonable parameters. Travel plans will be sought and we will encourage membership of the Bankside and Borough travel planning groups, coordinated by Better Bankside and Waterloo Quarter Business Improvement Districts.*

The adopted SPD for Dulwich includes the following requirements in relation to noise:

> *The evening economy generates jobs and has the potential to add vitality to the town and local centres as well as making them safer by increasing activity, patterns of movement and opportunities for natural surveillance. However, it can also be associated with noise, crime, anti-social behaviour and community safety problems, particularly in the case of nightclubs, large drinking establishments and late-night take-aways.*
>
> *Proposals for development that would provide for evening and night activity will be supported provided that the proposal is in a suitable location within a district town or local centre. However the volume of evening economy uses needs to be managed to ensure that impact on residential amenity and community safety is taken into account. The location of residential neighbours, the proposed hours, activities and any potential disturbance arising will be taken into account.*

The adopted SPD for Elephant and Castle includes the following requirements in relation to noise:

The Sustainable Design and Construction SPD internal noise standards are repeated.

> *Developers should give careful consideration to the design and layout of proposed development to ensure that future occupiers have a satisfactory standard of amenity, particularly where there is a risk that occupiers could be exposed to high levels of noise. A range of measures can be used, including the provision of non-residential space as a buffer or orienting windows and balconies away from potential noise sources. Dwellings that only have windows that open onto busy roads or railways are not supported by the council. Glazing should be used on windows to reduce noise levels inside buildings. However, this will only be effective when windows are closed and so should be used in conjunction with other solutions, such as mechanical ventilation.*
>
> *The noise standards set out in the policy will help ensure appropriate sound insulation so that future occupiers and users of development do not suffer a loss of amenity from transportation and other environmental sources, including, in the Enterprise Quarter, the Ministry of Sound. We will require the submission of a noise assessment to ensure all potential noise impacts and mitigation measures have been properly considered. There is further guidance on this issue set out in our Sustainable Design and Construction SPD 2008.*
>
> *The introduction of residential or other noise sensitive developments close to existing significant noise sources e.g. (road or rail and commercial premises) in the area will need to include design measures which will help reduce and mitigate the impacts of the noise. The measures and standards set out in policy SPD 5 will help enable residential use to coexist with other noise generating uses.*

For further details and other relevant Local Planning Policy please refer to the Policy Documents themselves.

4.0 Planning Conditions and S.106 Obligations in Southwark

In respect of Planning Conditions the NPPF requires that:

> '*Planning conditions should only be imposed where they are necessary, relevant to planning and to the development to be permitted, enforceable, precise and reasonable in all other respects.*'

The Environmental Protection Team will recommend planning conditions in relation to noise where these meet the above tests and allow development to proceed that would otherwise be considered unacceptable. Details of the types of conditions and necessary standards are given in section 5 of this TGN.

In respect of Planning Obligations the NPPF requires that:

> *'Local planning authorities should consider whether otherwise unacceptable development could be made acceptable through the use of conditions or planning obligations. Planning obligations should only be used where it is not possible to address unacceptable impacts through a planning condition.*
>
> *Planning obligations should only be sought where they meet all of the*
>
> *following tests:*
>
> - *necessary to make the development acceptable in planning terms;*
> - *directly related to the development; and*
> - *fairly and reasonably related in scale and kind to the development.'*

In respect of noise, the Southwark Section 106 Planning Obligations & CIL SPD states that:

> *'planning obligations may also be sought, on a case by case basis where there are identified direct impacts from development to address the following areas:*
>
> *…*
>
> - *Measures to improve and address negative impacts on air quality and noise*
> - *Servicing, construction management and management agreements'*

PART B: Technical Standards and Guidance

5.0 Assessing Noise and Vibration Impacts and Required Standards in L.B. Southwark

Table 1. Summary of TGN Noise Standards

5.1 Standards Required of Acoustic Consultants

Most suitably qualified consultants will be Members of the Institute of Acoustics (MIOA) and\or Members of the Association of Noise Consultants in addition to holding relevant technical qualifications such as a Diploma or Degree in Acoustics or related engineering fields.

All noise assessments must be conducted by persons suitably qualified in the field of Acoustics and the assessment should contain details of the assessor's qualifications, competency, professional memberships and experience.

When providing information to support planning applications consultants are expected to act at all times honestly, impartially and objectively and to gather evidence and report findings in a scientifically rigorous manner. Assessments should be open and clear in respect of the level of uncertainty attached to their conclusions.

5.2 Sound from Fixed Plant and Industry

The methodology of BS 4142:2014+A1:2019 should be followed in full when assessing the impacts from the following noise sources:

- *sound from industrial and manufacturing processes;*
- *sound from fixed installations which comprise mechanical and electrical plant and equipment;*
- *sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and*
- *sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.*

BS 4142:2014+A1:2019 should not be used to assess sources outside of its intended scope and inappropriate use of the standard will not be accepted as valid acoustic assessment for the purposes of planning applications.

The BS 4142:2014+A1:2019 methodology involves predicting or measuring the specific sound level from the source in question and applying rating penalties for acoustic character features such as tonality, impulsivity or irregularity. This rated sound level is then compared to the existing typical L_{A90} background sound level. Impacts are assessed as follows:

a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) 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.

It is necessary to submit a noise assessment for any development which could result in a change in noise impact on any sensitive receptor (a sensitive receptor is any receptor that may be adversely impacted by noise such as residential dwellings, schools, hospitals etc.). Examples of such developments are those that involve installing new noise-generating plant, new work processes or equipment or making changes to buildings or structures that affect sound transmission.

It is also necessary to submit a noise assessment for any development which places new sensitive receptors where they may be affected by noise from existing commercial uses. Examples of this would be a new residential flat on a High Street served by air conditioning and kitchen ventilation plant or a new housing development on the edge of an

existing industrial estate. When locating sensitive uses near to existing commercial noise sources it is essential to use good acoustic design to minimise noise impact. See section 5.4 of this guidance for further information. In accordance with the 'Agent of Change' principle, it is the developer initiating the change that will be expected to fully mitigate any impacts from the change. Where this is not demonstrated in the application, a recommendation for refusal of planning permission will be made.

Southwark is a densely populated Borough and the Council receives many applications for commercial and industrial plant each year. In many areas existing noise levels already cause adverse or significantly adverse effects. It is essential that assessments consider not only the impact of the new noise source but also the cumulative impact of the new source in addition to existing noise in order to prevent gradually creeping background levels over time.

In order for planning permission to be recommended it is required that the assessment Rating sound level does not exceed the typical minimum L_{A90} (15 minute) background sound level at any time. Furthermore in order to prevent gradually creeping background levels over time it is required that the unrated 'Specific' sound level does not exceed 10dB below the typical minimum L_{A90} (15 minute) background sound level at any time. The 'Specific', 'Rating' and 'Background' sound levels shall be calculated fully in accordance with the methodology of BS 4142:2014+A1:2019 .

The same standard is applied for all fixed plant, including permanent backup generators and other systems which may only run for part of the time. In exceptional cases it may be possible to deviate from this standard, however, this must be by special agreement which would usually only be given where the following apply:

- The existing background level is very low (below 30dB L_{A90})
- It is impossible to achieve the required standard despite using all reasonable means of mitigation AND there is no significant adverse effect from the plant

In such cases it would be expected that plant noise adverse effects are mitigated and minimised as far as possible in line with the requirements of paragraph 180 of the NPPF.

5.2.1 Mitigation of Commercial Noise Impacts

In all cases where plant does not meet the required standards it is necessary to use mitigation measures. The following should be considered:

- Relocation of plant or noise-generating activity
- Substitution for alternative or quieter plant or processes
- Reduction in source noise levels via engineering methods (e.g. lower-noise fans, flow smoothing on duct bends etc.)
- Change in working practices or processes to reduce noise (e.g. changing times of operation, reducing fan\jet power)
- Use of duct attenuators
- Use of acoustic barriers
- Use of acoustic absorption
- Vibration isolation and\or damping
- Enclosure of plant in insulating enclosures
- Insulation of building envelopes

Applicants are advised to consider plant choice, engineering methods and working practices as the favoured means of reducing noise. These can save energy and lead to significant savings in operating costs. Pathway methods such as barriers, enclosure and absorption can be expensive and in some cases also lead to higher ongoing costs.

5.3 Noise and Vibration from Transportation Sources

Transportation noise should be assessed when a development gives rise to the possibility that any sensitive receptor may be exposed to adverse impacts from transportation noise. Examples would be locating housing on a busy road, adjacent to a railway line or within airport noise contours. The noise assessment should cover a period sufficient to be representative of the prevailing noise climate. In most cases this will require assessment covering midweek and weekends.

Assessments which may result in a significant impact on traffic flows (for example area-wide redevelopments, transport infrastructure, or land uses expected to generate very large transport impacts) should consider and account for the impact of increased traffic on predicted future noise level. Road traffic and rail calculation methodologies are detailed in the Control of Traffic Road Noise (CTRN) and Control of Rail Noise (CRN). Design Manual for Roads and Bridges (DMRB) sets out a method for evaluating immediate and long term impact from changes in 18-hour traffic flow.

Assessments should include full details of proposed building construction and composite façade calculations to predict the internal noise level in habitable rooms.

Residential dwellings shall achieve the following internal sound standards:

Bedrooms - 35dB $L_{Aeq\ T}$†, 30 dB $L_{Aeq\ T}$*, 45dB $L_{AFmax\ T}$ *
Living rooms- 35dB $L_{Aeq\ T}$ †
Dining room - 40 dB $L_{Aeq\ T}$ †
*** - Night-time 8 hours between 23:00-07:00**
† - Daytime 16 hours between 07:00-23:00.

Where there is any concern over the efficacy of measures submitted to comply with these standards or for all major developments (over 10 dwellings or over 1000m^2 in size), post-completion verification testing will be required in a sample of the most affected rooms.

BS 8233:2014 advises that the limits shown above can be relaxed by up to 5 dB and 'reasonable' internal conditions still achieved. In most cases in Southwark this would not be considered as good acoustic design and would not be compliant with local Strategic Policy 13 requiring 'high environmental standards'. Applying a 5dB relaxation would only be considered in situations where it can be demonstrated that it is technically unfeasible to achieve the standards above despite taking all possible design and insulation measures. Further discussion should take place with the Local Planning Authority before specifying any façade that will not achieve these standards internally.

With respect to the night-time L_{AFmax} noise levels, the WHO Guidelines for Community Noise state:

> *'For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10–15 times per night'*

Regular individual noise events (for example, passing aircraft, trains, and loud road vehicles) can cause sleep disturbance. Buildings shall be designed to ensure that individual noise events do not exceed 45dB L_{AFmax} more than 10 times in any night inside any bedroom. The 10th highest individual L_{AFmax} event in any night shall be determined and the noise level from this event shall be used to inform the mitigation design target.

Where there is any concern over the efficacy of measures submitted to comply with this standard or for all major developments (over 10 dwellings or over 1000m^2 in size), post-completion verification testing will be required in a sample of the most affected rooms.

L_{AFmax} should be reported for individual noise events. Time-based reporting periods (such as L_{AFmax} per X minute periods) should only be used where it can be demonstrated that typically only one significant event occurs in each reporting period. It may be necessary to use the sound level trace to verify when individual events have occurred. It is important that assessment of L_{AFmax} events covers enough time to gain a representative picture of the typical level and regularity of such events. Reports should not exclude L_{AFmax} events from emergency vehicles where these are a relatively common feature of the acoustic environment (such as on busy urban roads).

Where it is unavoidable to rely on closed windows to achieve L.B. Southwark environmental noise standards there must be a suitable alternative means of ventilation provided which is sufficient to ventilate the premises and to adequately control excess heat in the summer months. When designing ventilation to mitigate noise, due consideration must be given to the impact of local air quality and the need to minimise exposure to poor air quality.

The Association of Noise Consultants 'Acoustics Ventilation and Overheating Guide' has further information and recommendations on the interplay between these issues.

The following standards should be achieved in external private residential amenity areas:

50dB $L_{Aeq, 16hr}$ † .
†Daytime - 16 hours between 07:00-23:00hrs.

Where this is not possible to achieve despite implementing all reasonable mitigation measures, the standard can be relaxed by 5dB so that the sound level in private gardens and balconies does not exceed 55dB $L_{Aeq, 16hr}$.

In very high noise areas where the less stringent standard of 55dB $L_{Aeq\ 16hr}$ cannot reasonably be achieved, with careful design it should be achieved in some parts of the amenity space.

BS8233:2014 gives further advice on sound insulation and noise reduction for buildings. Where transportation noise affects schools, the requirements of Department for Education Building Bulletin 93 '*BB93: Acoustic design of schools - performance standards*' should be followed.

Transportation can also be a source of vibration; in particular railways and subway systems. Where there is a risk that a development may lead to adverse effects from vibration or re-radiated noise (either through creating a new vibration source or more commonly through placing sensitive receptors close to existing vibration sources), a vibration assessment will be required. The following standards should be achieved:

All developments must be designed to ensure that habitable rooms in the residential element of the development are not exposed to vibration dose values (VDV) in excess of 0.13 m/s during the night-time period of 23.00 – 07.00hrs

Developments must be designed to ensure that re-radiated noise within habitable residential rooms does not exceed 35dB LAmax(s).

Where assessment shows that habitable rooms will be exposed to unacceptable levels of vibration, expert advice should be sought on vibration mitigation measures and proposals submitted to LBS in advance of determination of the application.

5.4 Good Acoustic Building Design

Paragraph 130 of the NPPG states:

Permission should be refused for development of poor design that fails to take the opportunities available for improving the character and quality of an area and the way it functions, taking into account any local design standards or style guides in plans or supplementary planning documents.

Further specific information on Acoustic Design is available in the NPPG on Noise.

It is therefore essential that developments use good acoustic design to achieve internal sound standards as far as is reasonably practicable. In order to do this successfully noise and vibration must always be considered at the initial design stage. If noise and vibration are only considered after site and building plans have been finalised (for example when specifying performance requirements of the building envelope), then the development is very unlikely to comply with the requirements of planning policy.

Good acoustic design will include:

- Location of buildings on the site to minimise noise exposure (this will include maximising separation of noise sources and sensitive receptors and use of buildings or topography to screen noise)
- Layout of habitable rooms within buildings to reduce noise exposure to more noise-sensitive rooms
- Ensuring dwellings exposed to high noise levels are dual aspect to provide each unit with access to a relatively quiet façade when possible
- Access to relatively quiet external amenity space
- Measures to reduce noise at source and\or on the transmission path where possible
- Design and insulation of the building envelope

Such measures should always be implemented in preference to sole reliance on insulation of the building envelope. In cases where the methods above would be effective in reducing noise exposure, relying only on sound insulation of the building envelope will not be regarded as good acoustic design. Such an approach leads to unsatisfactory development where dwellings are unnecessarily sealed from their environment and provide relatively poor amenity.

It is essential that developments use good acoustic design to achieve internal sound standards in preference to sole reliance on insulation of the building envelope. Where good acoustic design principles are not applied a development does not comply with the NPPF. In such cases a recommendation to refuse the application will be made, even where required internal sound standards are achieved.

If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended. External amenity areas such as balconies and gardens should be protected from noise as far as is reasonably practicable. The following mitigation measures should be considered:

- Building design, location and layout to shield amenity areas or place them away from noise sources where possible
- Use of acoustic fencing with a gap-free joining system and a minimum density of 12Kg/m^2 (or solid blockwork walls) to gardens
- Use of high, solid and imperforate balustrades to balconies and terraces
- Use of Class A acoustic absorption (suitable for outdoor areas) on balcony undersides and soffits
- Enclosure of balconies and terraces to form ‘winter gardens’

It is expected that the IOA’s Professional Practice Guidance on Planning and Noise is followed for all new developments: http://www.ioa.org.uk/publications/propg

5.5 Internal transference of noise within buildings

Approved Document E of the Building Regulations 2010 details legal standards for buildings for resistance to the passage of sound. In addition to the Regulation requirements, Approved Document E states:

> '*The performance standards set out in tables 1a and 1b are appropriate for walls, floors and stairs that separate spaces used for normal domestic purposes*. *A higher standard of sound insulation may be required between spaces used for normal domestic purposes and communal or non-domestic purposes. In these situations the appropriate level of sound insulation will depend on the noise generated in the communal or non-domestic space. Specialist advice may be needed to determine if a higher standard of sound insulation is required, and, if so to determine the appropriate level*.'

It is necessary to submit an assessment of internal sound transference for any development which includes domestic spaces adjacent to non-domestic or commercial uses. It is also necessary to submit an assessment of internal sound transference for any development which may increase noise impacts in existing multi-use buildings. Some examples of where an assessment would be required are:

- A new development incorporating an A4 bar on the ground floor and residential flats above
- Conversion of an existing ground floor A1 shop to an A3 restaurant where there is an existing residential flat above
- Conversion of an office sharing a party wall with a light industrial use into a residential dwelling
- Any situation where an assessment is required as a result of other standards (such as BB93)

Habitable rooms within a development sharing a party ceiling/floor element with commercial premises shall be designed and constructed to provide reasonable resistance to the transmission of sound sufficient to ensure that noise due to the commercial premises does not exceed NR20 when measured as an L_{Aeq} across any 5 minute period.

In many cases an airborne sound insulation standard will be specified rather than requiring compliance with a noise rating criterion. In such cases the standards will depend on the proposed use and be subject to consideration as follows:

Party walls, floors and ceilings between the commercial premises and residential dwellings shall be designed to achieve the following minimum airborne sound insulation weighted standardized level difference:

- **For A4\AA premises, D1\D2 premises such as places of worship, concert halls, community space for hire or B2\B8 industrial premises, standards will be judged on a case by case basis depending on the assessment and exact nature of the use. Greater than 60dB $D_{nT,w} + C_{tr}$ is likely to be necessary.**
- **For A3 or A5 premises or large A1 cafes, shops and supermarkets: At least 55dB $D_{nT,w} + C_{tr}$ and potentially greater depending on scale. Assessment is required.**
- **For small A1 café or shop: At least 50dB $D_{nT,w} + C_{tr}$**

When assessing the level of sound insulation required it is important that realistic source levels are used for the noise-generating use. Depending on the proposed use, L_{AFmax} levels are also likely to be relevant and should be considered when assessing necessary partition insulation. Some typical sound levels are given in the table below[1]:

[1] Data for A4\night clubs taken from 'NANR 92 – Salford University Noise from Pubs and Clubs Final Report for DEFRA (March 2005)'. Data for kitchens from 'Achutan C. Assessment of noise exposure in a hospital kitchen. Noise Health 2009;11:145-50'

Commercial Use	Typical internal sound level
A4\AA Public House \ Bar (no music)	88 dB L_{Aeq}*
A4\AA Public House \ Bar (featured live or recorded music)	95 dB L_{Aeq}*
Night Club dancefloor area	Up to 105 dB L_{Aeq}*
A3 Restaurant busy dining area (no music)	80-85 dB L_{Aeq}
A3\A5 kitchen area	80-90 dB L_{Aeq}
A3\A5 kitchen typical L_{AFmax} (metal pans, kitchen equipment)	95 dB $\mathbf{L_{AFmax}}$

**For entertainment venues it should be noted that whilst there is no constant difference between the two indices, L_{AFmax} is expected to be between 5 and 15 dB higher than L_{Aeq}.*[1]

The levels in the table above are typical and will vary depending on the size and exact nature of the premises. It is important that assessments submitted with planning applications consider a realistic worst-case scenario for the planning use class and specific premises that would be consented. Where a realistic predicted source level has not been used in an assessment, or where it cannot be demonstrated that a suitable level of sound insulation is achievable in practice, the application will be recommended for refusal.

Where commercial uses are placed above residential dwellings, an impact sound insulation limit will also be specified. These will be determined on a case by case basis and in such cases specialist advice and assessment will be necessary.

In most cases sound insulation can be improved by installing secondary ceilings and\or floors separated by a gap from existing and structurally isolated by resilient acoustic mounts. Use of layers of high density plasterboard with staggered joints can provide the necessary mass. Workmanship in installation is crucial to avoid gaps where boards join or around edges and care must be taken to retain structural isolation and prevent structural or flanking sound transmission. It is strongly recommended that works are specified and actively supervised by a suitably qualified acoustic consultant. Building Regulations 2010 Approved Document E and BS8233:2014 provide further details on sound insulation.

In situations considered particularly sensitive, post construction validation testing will be required to demonstrate that standards are met. Testing should be fully in accordance with the methodology of ISO 16283-1:2014 (for airborne sound) and ISO 16283-2:2018 (for impact sound).

Where dwellings (or parts of dwellings) within larger blocks are acoustically insulated against environmental noise, occupants tend to perceive internal sound transference from other dwellings as more disruptive. Furthermore, where new dwellings are placed above or adjacent to existing dwellings (for example addition of storeys to existing housing blocks, or converted basements and lofts to form additional residential dwellings), existing residents tend to perceive greater annoyance and impact on amenity from ordinary living noise as a result of the noise source being new. To counter these issues and protect amenity, the following standard is applied:

In the following cases sound insulation standards are expected to exceed the requirements of Building Regulations Approved Document E:

- **Where dwellings (or parts of dwellings) within larger blocks are significantly acoustically insulated against environmental noise**
- **Where additional dwellings are created which share a party element with an established dwelling**

In such cases sound insulation standards are required to exceed the requirements of Building Regulations Approved Document E by 5dB such that airborne sound insulation weighted standardised level difference is increased by 5dB $D_{nT,w} + C_{tr}$ and the maximum allowable weighted standardised impact sound pressure level is reduced by 5dB $L_{nT,w}$.

5.6 Noise from Entertainment and Leisure Venues

Where developments incorporate entertainment venues such as public houses, bars, night clubs, sports venues, leisure venues, performance spaces etc. an acoustic assessment must be submitted to detail the impact of this on sensitive receptors. An acoustic assessment would also be necessary in the case of placing new sensitive receptors where they may be affected by noise from existing entertainment and leisure venues. The 'Agent of Change' principle will be applied in order to protect existing entertainment venues from introduction of sensitive uses in the surrounding area. In such cases the full cost of and responsibility for mitigating risks will fall on the 'Agent of Change'.

Assessment should include measurement of the background sound level at times appropriate to the operation of the premises; identify sensitive receptors; and predict the specific noise level from the venue at the façade (and in external amenity areas where appropriate). Assessments and predictions must consider a realistic worst-case for the permitted use (such as during a busy live music event). Noise from entertainment venues may include amplified sound, music, PA systems, and noise from people drinking or smoking outside and dispersing from the premises.

The following external standards should be achieved:

The L_{Fmax} sound from amplified and non-amplified music and speech shall not exceed the typical minimum L_{90} (5min), 1m from the facade of any sensitive receptor in all third octave bands between 63 Hz and 8 kHz.

Noise from people in beer gardens, terraces and other outdoor areas to licensed premises can cause significant disruption to residents. Where applications include outdoor areas (or changes to outdoor areas) an assessment of noise impact will be required. Details of what an assessment should cover can be found in section 5.9 of this TGN.

Outdoor areas to licensed premises may be considered unacceptable in principle in some cases, depending on the level of impact. In other cases conditions may be imposed to mitigate and minimise impact. Such conditions may cover:

- Design (including location, barriers, absorption)
- Hours of use (exact hours are determined on a case by case basis but as a maximum outdoor areas are expected to close by no later than 22:00 on any day)
- Capacity
- How the area is used and managed

All new residential units shall be designed to ensure that the internal noise levels within habitable rooms as a result of entertainment noise shall not exceed 27dB L_{Aeq} (5 minute). Predictions and measurements should be made inside the relevant residential units with windows and doors closed.[2]

Where entertainment venues are located alongside sensitive receptors in mixed use buildings, unacceptable impacts on residential amenity from internal or structure-borne noise must be avoided. **Section 5.5 of this guidance has further details on internal sound transference for entertainment venues.**

When locating sensitive uses near to entertainment venues it is essential to use good acoustic design to minimise noise impact. See section 5.4 of this guidance for further information.

More information and practical and management advice on controlling noise at source from entertainment venues can be found in Southwark's Licensing Policy at:

https://www.southwark.gov.uk/assets/attach/7473/StatementofLicensingPolicy-2019-21.pdf

[2] Taken from DEFRA NANR163 (Table 4) as the highest entertainment noise level which was considered to be 'clearly acceptable'

5.7 Construction Noise and Vibration

Construction and demolition sites are a significant source of complaints to the Local Authority. Where developments are expected to have a significant impact on the local area during the construction phase, submission of a Construction Environmental Management Plan (CEMP) will be required.

The CEMP shall oblige the applicant, developer and contractors to commit to current best practice with regard to construction site management and to use all best endeavours to minimise off-site impacts, and will include the following information:

- **A detailed specification of demolition and construction works at each phase of development including consideration of all environmental impacts and the identified remedial measures;**
- **Site perimeter automated noise monitoring;**
- **Engineering measures to eliminate or mitigate identified environmental impacts e.g. hoarding height and density, acoustic screening, sound insulation, location of specific activities on site, etc.;**
- **Arrangements for a direct and responsive site management contact for nearby occupiers during demolition and/or construction (signage on hoardings, newsletters, residents liaison meetings, etc.)**
- **A commitment to adopt and implement the Considerate Contractor Scheme; Site traffic – Routing of in-bound and outbound site traffic, arrangements on site, location of lay off areas, etc**

Where a CEMP is required through the planning process it will relate to factors beyond just noise. For example, site waste management, air quality and emissions, dust management, site contamination and other issues. The above standard relates only to the noise aspects of a CEMP and is therefore not an exhaustive list of likely requirements.

Further information is available from the following sources:

- S61 of Control of Pollution Act 1974,
- BS 5228-1:2009+A1:2014 ‘Code of practice for noise and vibration control on construction and open sites’,
- BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from ground-borne vibration,
- BS 6472-1:2008 ‘Guide to evaluation of human exposure to vibration in buildings - vibration sources other than blasting,
- Relevant CIRIA practice notes, and
- BRE practice notes.

Whilst Best Practicable Means must be used at all times in the control of noise from construction sites it is recognised that construction sometimes involves high noise levels. The following parameters should be used:

Parameter	Trigger (Amber)	Action (Red)
Environmental Noise Unit – dB(A)	75 dB $L_{Aeq\ 5min}$ (short term)	80 dB $L_{Aeq\ 5min}$
	70 dB $L_{Aeq\ 10hr}$ (daily)	75 dB $L_{Aeq\ 10hr}$ (daily)

Vibration	1mm/sPPV for occupied residential and educational buildings 3mm/sPPV for occupied commercial premises where work is not of an especially vibration sensitive nature or for potentially vulnerable unoccupied buildings 5mm/sPPV for other unoccupied buildings
Hoardings	Min height 2.3m Min density 7Kg/m^2

Standard permitted site hours are:
Monday to Friday – 08.00 – 18.00hrs
Saturday – 09.00 – 14.00hrs
Sundays & Bank Hols – no works

Trigger levels can give advanced warning of a potential problem whilst action levels indicate a need to reduce noise or stop works.

Full details of expected practice in respect of all construction and demolition sites (whether or not a CEMP is required) are available in the Southwark Council Environmental Code of Construction Practice available at:

https://www.southwark.gov.uk/assets/attach/3011/Technical-Guidance-for-Demolition-Construction.pdf

Any programmed/expected work required outside the standard site hours will require permission from Southwark's Environmental Protection Team under S61 of the Control of Pollution Act 1974 (e.g. regular extensions for set-up and clean down periods, extended concrete pours, the delivery and collection of abnormal loads, etc.). An application form can be found on the Southwark website at the following location:

https://forms.southwark.gov.uk/ShowForm.asp?fm_fid=900

Follow the instructions on the web page to the form, complete it and submit it on-line. Forms need to be submitted a minimum of 28 working days before permission is needed to be in place for regular extended site hours and 5 working days before permission is needed to be in place for a short, temporary extension to site hours (i.e. lasting less than 8 weeks in total).

Where changes need to be made to existing issued S.61 consents, details of the dispensation and variation procedure can be found in the schedule to the consent.

5.8 Noise from Servicing Commercial Uses

Noise from servicing of commercial uses can cause complaints. This is particularly problematic where servicing takes place at night or in the late evenings or early mornings. The following standards apply:

Deliveries or collections to commercial units shall only be between the following hours: 08.00 – 20.00hrs Mon – Sat and 10.00 – 16.00hrs Sundays and Bank Holidays

In some cases it may be possible to agree variations to these times. This will depend on the number and scale of deliveries, the context of the application and the character of the area. Any variation to these standards will be assessed individually where suitable information can be submitted to demonstrate that deliveries and collections will not cause disturbance to nearby sensitive receptors. Where there is doubt over the impact it is necessary to submit a full acoustic assessment to examine this.

For larger commercial uses or in areas of particular sensitivity a service management plan shall be submitted detailing how all elements of the site are to be serviced and the controls and mitigations that will be put in place.

Full details of good practice, principles and processes for 'quiet deliveries' including practical advice and sector-specific guidance can be found at:

https://www.gov.uk/government/publications/quiet-deliveries-demonstration-scheme

https://tfl.gov.uk/info-for/deliveries-in-london/delivering-efficiently/retiming-deliveries

5.9 Other Noise Sources (children's playgrounds and nurseries, sports pitches, beer gardens etc.)

There are various noise sources which do not fall into the specific categories previously described in this TGN and\or which are not covered by existing recognised standards. Any noise source that may impact on sensitive receptors should be assessed as part of a planning application. Examples would include new car parks; children's play in playgrounds and nursery play areas; beer gardens; multi-use games areas; sports pitches; skate parks; etc.

Where no relevant standards exist to guide an acoustic assessment, the assessment should include:

- **Comprehensive measurement of examples of the noise source from existing sites operating elsewhere†**
- **Comparison and verification of measured data against existing data sources where possible (e.g. from scientific literature or international standards)**
- **Assessment of the existing background level at the receptor location**
- **Calculation of the predicted specific noise level at the façade, gardens and amenity areas of sensitive receptors, based on relevant obtained data**
- **Comparison of noise levels to relevant general standards such as WHO standards and BS8233:2014**
- **Full consideration of the impact of L_{AFmax} noise (for example from door slams, ball strikes, shouts or whistles)**
- **Consideration of the character of the noise and whether this may exacerbate the impact on amenity**
- **Full consideration and reporting of assessment uncertainty***

† Acoustic consultant's 'stock' or 'library' data can only be accepted in assessments where full details of how, where and when it was obtained are provided.

*** See University of Salford '*A Good Practice Guide on the Sources and Magnitude of Uncertainty Arising in the Practical Measurement of Environmental Noise*' [2007] for further details.**

As there are no specific standards governing how to assess irregular noise sources, extra care should be taken to ensure that source data and predictions are sufficiently robust and the assessment should be open and clear in respect of the level of uncertainty attached to the conclusions.

In the case of placing new sensitive receptors where they may be affected by existing noise sources such as the above, assessment should follow the same principles as above however the source data should be based on maximum typical existing (measured) noise levels from the sites, accounting for any possible future changes in intensity of use.

Where significant adverse impacts are identified as a result of the assessment the application is likely to be refused. Other adverse effects should be mitigated and minimised as far as possible. Mitigation may involve measures to reduce the noise at source, such as anti-rattle fencing on MUGAs, or measures to reduce or prevent transmission of sound, such as acoustic fencing around a playground or car park.

Noise management measures can be crucial for mitigating behavioural noise sources. It is not always possible to specify sufficiently enforceable or precise noise management measures to form the basis of a reasonable planning condition. In such cases a recommendation for refusal of permission will be made. Where it is judged that specific, precise, reasonable and enforceable noise management measures can be detailed, a condition can be recommended to the Planning Department to cover this requiring an enforceable noise management plan.

In cases where ongoing noise management and control is considered particularly important, a noise management plan (detailing controls and mitigations) will be required.

5.10 Quiet Areas and Places of Relative Tranquillity

The NPPF requires that Local Planning Authorities '*identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason*.'

The NPPG states:

> *For an area to justify being protected for its tranquillity, it is likely to be relatively undisturbed by noise from human sources that undermine the intrinsic character of the area. It may, for example, provide a sense of peace and quiet or a positive soundscape where natural sounds such as birdsong or flowing water are more prominent than background noise, e.g. from transport.*
>
> *Consideration may be given to how existing areas of tranquility could be further enhanced through specific improvements in soundscape, landscape design (e.g. through the provision of green infrastructure) and/or access.*

As a densely populated urban Borough, areas that are *relatively* quiet are particularly valued. Such areas may include:

- Parks
- Pedestrianised streets and squares
- Waterside areas
- Areas in and around places of worship
- Cemeteries
- Community gardens
- Communal amenity areas to estates and housing blocks

Where applications are received that may adversely affect any spaces prized for relative tranquillity, an assessment of noise impact will be expected.

Where possible, developments will be expected to contribute to the improvement of health and quality of life by creating new quiet spaces and areas of tranquillity or contributing to improvement of existing spaces.

The following are some examples of design good design that can help to reduce noise impact and improve relative tranquillity:

- Using building locations and site layout to form barriers and reduce noise
- Using other physical barriers or ground level changes to provide shielding from noise sources such as roads
- Green walls to reduce noise reflection
- Planting of trees and shrubs
- Plants and ground greening to reduce reflection and encourage wildlife

5.11 Noise Standards in Applications for Prior Consent for Permitted Development

Noise is a consideration for some permitted development applications as specified in section 3.14 of this TGN. In such cases noise must be assessed exactly as it would in a full planning application, as detailed in section 5 of this TGN. L.B Southwark will apply the same acoustic standards detailed in this TGN to such applications, as far as they are relevant and applicable under the General Permitted Development Order.

Where noise is not strictly a material consideration under the GPDO, it may still impact on the ongoing suitability of the housing as required by the Housing Act 2004. Noise is a specified hazard under the 'housing health and safety rating system' (HHSRS) used under the Act. The fact dwellings were created by permitted development does not affect legal obligations.

Dwellings which do not provide a suitable acoustic environment may be subject to enforcement action which could potentially result in expensive remedial costs and\or prohibition of use. It is therefore strongly recommended that all significant sources of noise are properly considered for all sensitive permitted development applications, even in cases where this is not strictly required by the GPDO.

Appendix A: Glossary

Term	Definition
dB	Decibel. Decibels are not an absolute unit of measurement; they logarithmically express a ratio between two quantities. In this guidance dB refers to Decibels of Sound Pressure relative to a reference value of 2 X 10^{-5} Pascals.
$D_{nT,w +Ctr}$	Weighted standardized level difference (dB). Ctr refers to the spectral adaption term. Used for measuring airborne sound insulation in buildings.
L_{Aeq}	A-weighted equivalent continuous noise level. A single sound level with the same energy content over a given time period as the varying acoustic signal measured
L_{AFmax}	A-weighted, fast, maximum, root mean squared (RMS) sound level.
L_{10}	A statistical noise measure to show the noise level exceeded for 10% of the measurement period.
L_{90}	A statistical noise measure to show the noise level exceeded for 90% of the measurement period.
L_{den}	The equivalent continuous noise level over a whole 24-hour period, but with noise in the evening (19:00 to 23:00) increased by 5 dB(A) and noise at night (23:00 to 07:00) increased by 10 dB(A) to reflect the greater noise-sensitivity of people at those times.
L_{night}	The equivalent continuous noise level over the night-time period (23:00 to 07:00). L_{night} does not contain any night-time noise weighting.
$L_{nT,w}$	Weighted standardised impact sound pressure level. Used for measuring impact sound insulation in buildings.
NR	Noise Rating Curves. A method for rating the acceptability of indoor environments for the purposes of hearing preservation, speech communication and annoyance, based on curves developed by Kosten and van Os (1962).
PPV	Peak Particle Velocity. A measure of vibration primarily used for assessing risk to building damage. The greatest instantaneous particle velocity during a given time interval.
Sensitive Receptor	Any receptor that may be adversely affected by the noise or vibration in question. In most cases this would refer to residential dwellings, schools, hospitals etc. but may also refer to sites which may be adversely affected for other reasons (for example containing equipment sensitive to noise or vibration).
VDV	Vibration Dose Value. A cumulative measurement of the vibration level received over an 8-hour or 16-hour period, commonly used for assessing human annoyance response to vibration.

Appendix B: Abbreviations

Abbreviation	Meaning
CEMP	Construction Environmental Management Plan
EPT	Environmental Protection Team
GPDO	General Permitted Development Order
LBS	London Borough of Southwark
LOAEL	Lowest Observed Adverse Effect Level
LPA	Local Planning Authority
MUGA	Multi Use Games Area
NOEL	No Observed Effect Level
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NPSE	Noise Policy Statement for England
SOAEL	Significant Observed Adverse Effect Level
SPD	Supplementary Planning Document
TGN	Technical Guidance for Noise