
RADELAN ESTATES LTD

NOISE IMPACT ASSESSMENT REPORT

12 BOLTON STREET, BURY BL9 0LQ

Client: Radelan Estates Ltd

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1 INTRODUCTION

1.1 Overview

- 1.1.1 By instruction from Radelan Estates Ltd ('the client'), NoiseAir was commissioned to undertake a noise impact assessment (NIA) in relation to a planning application for the conversion of 12 Bolton Street, Bury to residential use.
- 1.1.2 This report is issued for planning purposes only and does not constitute detailed design covering the implementation of all recommendations made within this report.
- 1.1.3 General limitations with respect to this NIA are outlined in **Appendix A**.

1.2 Site Description

- 1.2.1 The proposed development site is located at Bolton Street, Bury. The site location and context are shown in **Figure 1** below.



Figure 1: Site Location and Context

- 1.2.2 The site is primarily surrounded by commercial businesses. Most notably, a live music bar called Blind Tiger is located at 16-18 Bolton Street Bury, next door the proposed development.



Figure 2: Street View Bolton Street

1.3 Development Proposals and General Information

- 1.3.1 The proposal is to retain retail use to the ground floor and convert the first floor to two residential units. The proposed development plans are shown in **Figure 3**.
- 1.3.2 At the time of writing, a planning application for the proposals has been submitted and the following comments received from Bury Council Environmental Health:

“Insufficient information provided on noise from the surrounding environment and no noise survey has been conducted to establish if the site is suitable for the proposed development. The premises next door, 14 Bolton Street is a bar, Blind Tiger with a late licence. Currently the bar closes at 4:30am.

Insufficient information has been provided by the applicant and, on this basis, this application should be refused”

- 1.3.3 In response to these comments, the applicant has commissioned this report in order to collate information and submit the detail requested by Bury Council Environmental Health.



Figure 3: Proposed Development Plans

2 ASSESSMENT METHODOLOGY AND SCOPE OF WORKS

National Planning Policy Framework [NPPF 2021]

- 2.1.1 The NPPF is a document that sets out the government's planning policies for England and how they are expected to be applied. It aims to achieve sustainable development.
- 2.1.2 The NPPF states that planning policies and decisions should prevent unacceptable levels of noise pollution from new and existing development.
- 2.1.3 The NPPF affirms that National Policy Statements form part of the national planning policy framework and should be considered in planning decisions. The Noise Policy Statement for England (NPSE) is one of them.
- 2.1.4 The NPSE sets out the government's overall policy on noise within the context of sustainable development. It introduces three concepts for noise management: avoid significant adverse effects; mitigate and minimise adverse effects; and where possible, contribute to improvements in health and quality of life.
- 2.1.5 It also establishes a hierarchy of noise management actions: avoid; reduce; remedy; mitigate; compensate.

Noise Policy Statement for England (NPSE)

- 2.1.6 The Noise Policy Statement for England (NPSE), published in March 2010, states the long-term vision of Government noise 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".
- 2.1.7 The NPSE also introduces the below categories with respect to 'adverse 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’.

2.1.8 The NPSE states that significant adverse effects on health and quality of life should be avoided. Where the impact lies somewhere between LOAEL and SOAEL, it requires that all reasonable steps are taken to mitigate and minimise the adverse effects of noise. In this regard, a certain degree of impact between LOAEL and SOAEL would be acceptable in terms of planning policy, provided that the impact has been mitigated and minimised by design.

Planning Practice Guidance - Noise [PPG 2019]

2.1.9 PPG 2019 provides guidance on how noise should be considered in planning decisions. It was published in 2014 and updated in 2019. The document advises on how to avoid, mitigate or minimise adverse effects of noise through good acoustic design and appropriate conditions or obligations.

2.1.10 **Table 1** summarises the noise exposure hierarchy outlined within the PPG.

Table 1: National Planning Practice Guidance noise exposure hierarchy		
Perception	Increasing Effect Level	Action
Not noticeable	No Observed Effect	No specific measures required
Noticeable and not intrusive	No Observed Adverse Effect	No specific measures required
Lowest Observed Effect Level		
Noticeable and intrusive	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Effect Level		
Noticeable and disruptive	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Unacceptable Adverse Effect	Prevent

2.2 Scope of Works

- 2.2.1 This report presents and utilises the results of a noise survey at the proposed development site.
- 2.2.2 General noise affecting the development has been assessed in accordance with BS 8233:2014, which sets internal noise criteria for 'noise without specific character'. This would apply to general road traffic noise affecting the development.
- 2.2.3 The standard states that for noise with specific character, lower limits may be appropriate, depending on the noise source. Entertainment noise from the 'The Blind Tiger' venue next-door would constitute entertainment noise (amplified music and live music) and patron noise, which does have specific character.
- 2.2.4 There is no British Standard for entertainment noise, however technical notes and studies have been published. We have outlined the assessment criteria utilised within this report below.

British Standard 8233:2014 (BS 8233:2014)

- 2.2.5 British Standard 8233:2014 – *Guidance on sound insulation and noise reduction for buildings* (BS 8233) provides guidance on internal ambient noise levels, resulting from break-in of external environmental noise that should not be exceeded in various locations within dwellings.
- 2.2.6 Guidelines for buildings in terms of internal noise level are reported in TABLE.

Table 2: Summary of internal noise guidelines.			
Activity	Location	0700 – 2300 hours	2300 – 0700 hours
Resting	Living Room	35 dB L _{Aeq,16hour}	-
Dining	Dining room / area	40 dB L _{Aeq,16hour}	-
Sleeping (daytime resting)	Bedroom	35 dB L _{Aeq,16hour}	30 dB L _{Aeq,8hour}

- 2.2.7 The standard clarifies that these values are based on the existing guidelines issued by the World Health Organisation (WHO). In addition, it states that the internal noise levels may be relaxed by up to 5 dB whilst maintaining a reasonable living condition. Conversely, in terms of internal maximum levels to be achieved during the night, the standard does not recommend any limits for individual noise events. However, a guideline value may be set in terms of SEL or L_{AFmax}, depending on the type and the number of events per night.

- 2.2.8 Furthermore, BS 8233:2014 provides guidance on desirable noise levels in areas that are intended to be used for external amenity space, such as gardens, balconies and roof gardens which are intended to be used for relaxation. For these spaces it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$ up to a level of 55 dB $L_{Aeq,T}$ for noisier environments.

2.3 Entertainment Noise Criteria

- 2.3.1 Studies show that people have a much lower level of tolerance for music and entertainment noise compared to other noise sources (e.g., road traffic noise). Notable sources of complaint often include low frequency 'bass' noise, particularly during the night-time when residents are trying to sleep.
- 2.3.2 For this reason, the general consensus among local authorities and consultants is that music noise from night clubs/ entertainment venues should be 'inaudible' or 'virtually inaudible' internally at the receptor location (e.g., within a bedroom at night).
- 2.3.3 The difficulty presented by the lack of a British Standard in this area is how to objectively quantify 'inaudibility' or 'virtual inaudibility'.
- 2.3.4 A DEFRA report on noise from pubs and clubs recommends 1/3 octave band limits, however, this can make assessment difficult since 1/3 octave band sound reduction data for building materials, glazing, façade elements, etc. is not typically available.
- 2.3.5 It is also clear that retrospectively deriving methods based on other standards (e.g., BS 4142) is not appropriate, not only because these standards specifically state that music/ entertainment noise is outside the scope of the document, but because they rely on broadband a-weighted noise levels for analysis, which do not sufficiently account for low frequency noise.
- 2.3.6 A study by Manchester City Council explored setting assessment criteria based on NR curves concluded that an NR curve would be too stringent and mid and higher frequencies. Reviewing studies of low frequency noise, the document concludes that limits of 47 dB $L_{eq,5min}$ at 63 Hz and 41 dB $L_{eq,5min}$ at 125 Hz should be set within dwellings that are structurally connected to the entertainment venue in question.
- 2.3.7 Where dwellings are not structurally connected, criteria of 10 dB below the L_{90} in octave bands at the façade is identified as suitable.
- 2.3.8 This report opts to utilise the criteria above.

3 ACOUSTIC SURVEY

3.1 Unattended Noise Monitoring

- 3.1.1 External and internal unattended noise monitoring was undertaken at the proposed development site.
- 3.1.2 Unattended noise monitoring was undertaken out of the 1F windows to the front and rear of property, and a monitoring position was also utilised inside the proposed development.
- 3.1.3 The monitoring equipment consisted of two NOR140 Class 1 sound level meters (SLMs) with enhanced windshields and calibrated to traceable standards.
- 3.1.4 Details of the SLMs and associated field calibrations can be found in **Table 3** below:

Table 3: Summary of SLM used for survey and associated field calibration						
SLM (Serial Number)	Preamp (Serial Number)	Microphone (Serial Number)	Calibrator (Serial Number)	Start Calibr ation	End Calibr ation	Drift
NOR140 (1402867)	NOR1209 (112113)	G.R.A.S. 40AF (102533)	SVAN SV30A (10818)	-26.1	-26.3	0.2
NOR140 (1403057)	NOR1209 (12320)	NOR1225 (79633)	SVAN SV30A (10818)	-25.7	-25.4	0.3

- 3.1.5 The monitoring periods covered a weekend when the Blind Tiger venue operated at typical weekend capacity.
- **ML1:** located out of a 1F window overlooking Bolton Street.
 - **ML2:** located out of a 1F window overlooking the rear of the site.
 - **ML3:** Located internally within a 1F room within the proposed development site.



Figure 4: Noise Monitoring Locations

3.1.6 The broadband noise monitoring results are shown in **Tables 4-6** and shown graphically in **Charts 1-3**.

Table 4: Summary of Noise Monitoring Results at ML1				
Time Period Monitored		Measured Noise Level		
Start	End	$L_{Aeq,T}$ (dB)	Mode $L_{AF90,15min}$ (dB)	L_{AFmax} Range (dB)
Fri 27/10/2023 18:30	Fri 27/10/2023 23:00	70.7	58	84.7-107.7
Fri 27/10/2023 23:00	Sat 28/10/2023 07:00	73.3	64	79.9-104.3
Sat 28/10/2023 07:00	Sat 28/10/2023 23:00	69.7	56	81-102.9
Sat 28/10/2023 23:00	Sun 29/10/2023 07:00	78.2	70	75.1-106.7
Sun 29/10/2023 07:00	Sun 29/10/2023 21:45	70.7	52	77.2-112.4

Table 5: Summary of Noise Monitoring Results at ML2

Time Period Monitored		Measured Noise Level		
Start	End	$L_{Aeq,T}$ (dB)	Mode $L_{AF90,15min}$ (dB)	L_{AFmax} Range (dB)
Fri 27/10/2023 18:30	Fri 27/10/2023 23:00	43.1	40	50.1-73.6
Fri 27/10/2023 23:00	Sat 28/10/2023 07:00	39.4	37	45.0-66.9
Sat 28/10/2023 07:00	Sat 28/10/2023 15:00	53.7	40	46.6-75.5

Table 6: Summary of Noise Monitoring Results at ML3 (internal)

Time Period Monitored		Measured Noise Level		
Start	End	$L_{Aeq,T}$ (dB)	Mode $L_{AF90,15min}$ (dB)	L_{AFmax} Range (dB)
Fri 20/10/2023 10:00	Fri 20/10/2023 23:00	42.3	32	52.8-72.6
Fri 20/10/2023 23:00	Sat 21/10/2023 07:00	43.4	40	46.4-69.9
Sat 21/10/2023 07:00	Sat 21/10/2023 23:00	46.4	30	50.6-92.3
Sat 21/10/2023 23:00	Sun 22/10/2023 07:00	42.6	40	45.6-73.1
Sun 22/10/2023 07:00	Sun 22/10/2023 23:00	40.8	29	47.9-81.2
Sun 22/10/2023 23:00	Mon 23/10/2023 07:00	36	25	35.4-65.3
Mon 23/10/2023 07:00	Mon 23/10/2023 23:00	40.4	29	50.4-70.7
Mon 23/10/2023 23:00	Tue 24/10/2023 07:00	33.5	21	23.5-65.2
Tue 24/10/2023 07:00	Tue 24/10/2023 23:00	41.9	29	49.2-79.8
Tue 24/10/2023 23:00	Wed 25/10/2023 07:00	35.5	23	23.7-77.7

Table 6: Summary of Noise Monitoring Results at ML3 (internal)

Time Period Monitored		Measured Noise Level		
Start	End	$L_{Aeq,T}$ (dB)	Mode $L_{AF90,15min}$ (dB)	L_{AFmax} Range (dB)
Wed 25/10/2023 07:00	Wed 25/10/2023 23:00	41.9	29	49.2-79.8
Wed 25/10/2023 23:00	Thu 26/10/2023 01:45	39.6	26	50.4-70.9

- 3.1.7 During the installation of all monitoring positions the Blind Tiger venue was in operation. Amplified music noise was clearly audible on Bolton Street, such that lyrics could clearly be discerned, and songs identified.
- 3.1.8 The entrance door to the Blind Tiger venue was open, and inside the entrance door was a large speaker system, pointing out into the street. This was the dominant noise source both internally and externally at the proposed development site during installation of all monitoring equipment.
- 3.1.9 Clear periods of entertainment noise originating from the Blind Tiger are marked in the charts.

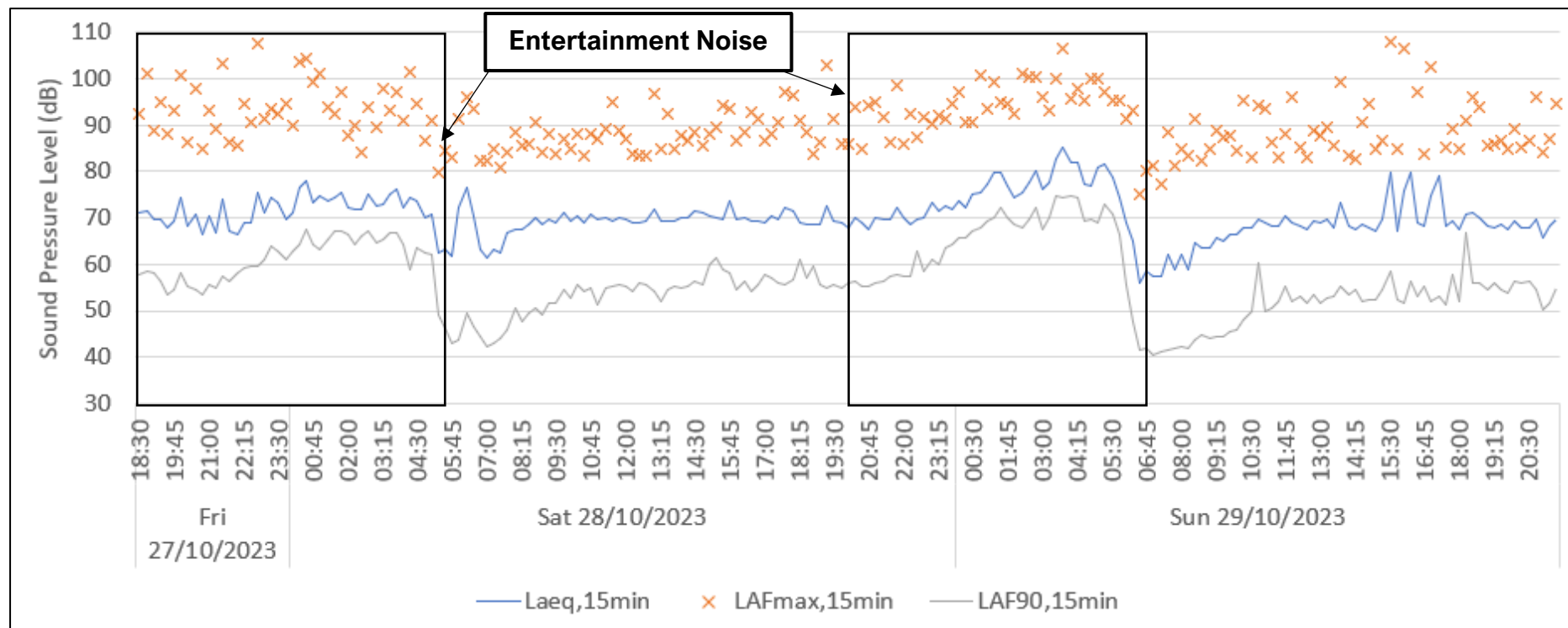


Chart 1: Noise Monitoring Results at ML1

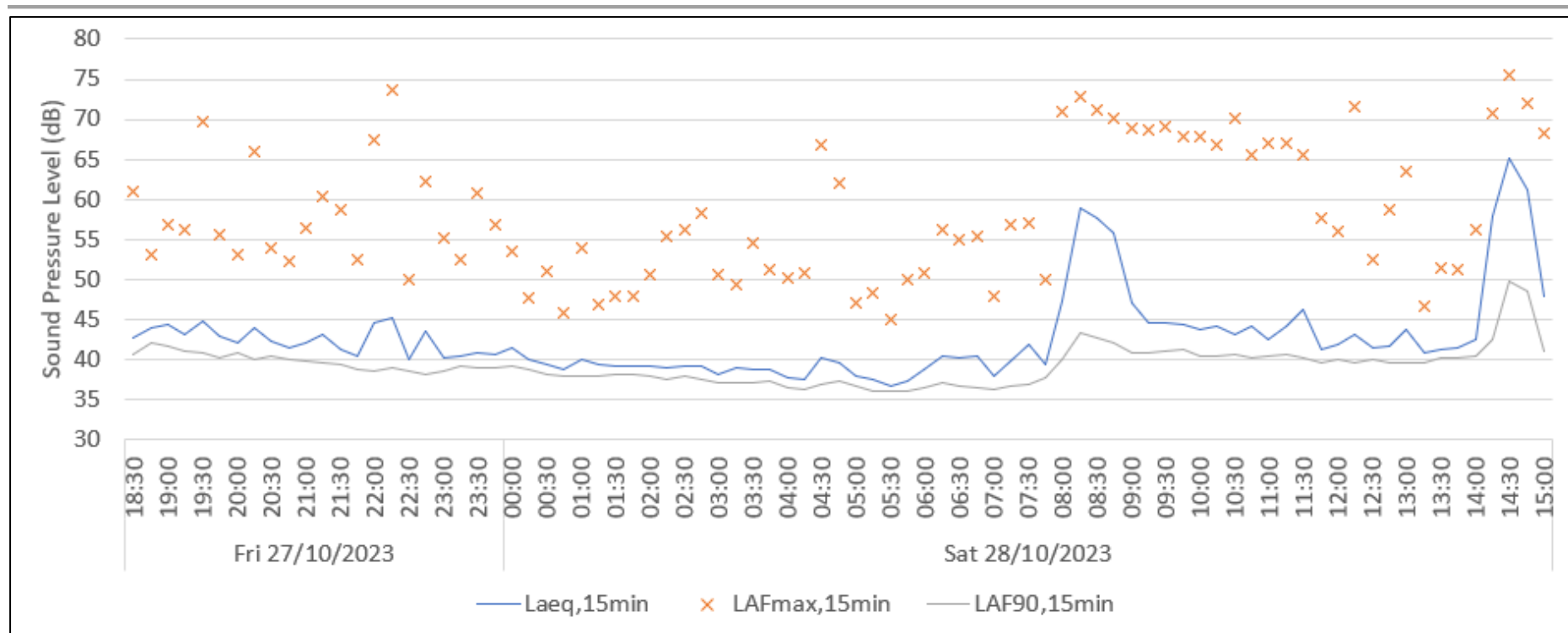


Chart 2: Noise Monitoring Results at ML2

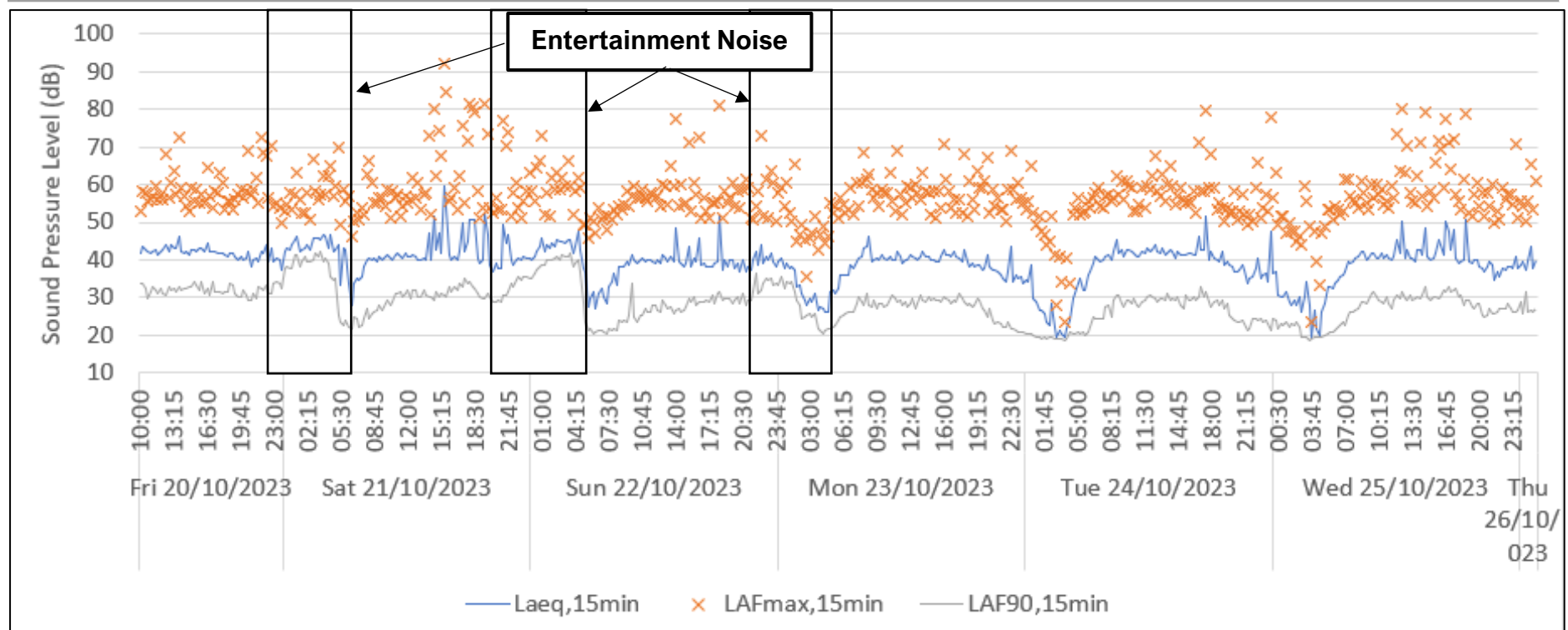


Chart 3: Noise Monitoring Results at ML3 (internal)

4 NOISE IMPACT ASSESSMENT

4.1 Entertainment Noise from Blind Tiger Venue – Cumulative Internal Noise

- 4.1.1 Entertainment noise has been assessed first within this report, since this is the most significant noise source affecting the site and would therefore be the primary factor affecting mitigation.
- 4.1.2 Under the agent of change principle of the NPPF, responsibility lies with the applicant to incorporate any mitigation required to achieve acceptable noise levels.
- 4.1.3 The main part of the Blind Tiger venue is located at basement level, with amplified music also present on the ground floor. Since the proposed development is structurally connected to the Blind Tiger venue, the criteria for structurally connected dwellings have been adopted.
- 4.1.4 Entertainment noise from the venue was measured to be typically between 21:00-04:30 on Friday's, Saturday's and Sunday's.
- 4.1.5 **Table 7** below presents the measured noise levels at ML3 inside the proposed the development between Saturday 21/10/2023 21:00 – Sun 22/10/2023 04:30.

Table 7: Entertainment Noise Levels at ML3 – Sat 21/10/2023 21:00 – Sun 22/10/2023 04:30									
Monitoring Location	Octave L_{eq} Sound Pressure Level in centre frequency (dB)								L_{Aeq} Sound Pressure Level
	63	125	250	500	1000	2000	4000	8000	dB(A)
ML3	57.7	50.7	44.6	42.6	37.6	32.5	23.1	57.7	44

- 4.1.6 The proposed limits internally are 47 dB $L_{eq,5min}$ at 63 Hz, 41 dB $L_{eq,5min}$ and 125 Hz. The noise levels above are in excess of the criteria and would be therefore unlikely to be suitable within a bedroom at night in an unmitigated scenario.
- 4.1.7 The survey was also undertaken with the windows closed, and the property does not currently have an alternative means of ventilation to open windows. However, it was noted that the existing windows did not provide a high level of acoustic sealing to the external street scene and, with the current level of investigation, it is not possible to categorically determine the transmission pathways of the source noise investigated.

4.2 Entertainment Noise from Blind Tiger Venue – External Noise

4.2.1 Entertainment noise also impacts the property externally on the front façade. **Table 8** below presents the design spectrum adopted for the front façade at the development site.

Table 8: Entertainment Noise Levels at ML1 – Sat 21/10/2023 21:00 – Sun 22/10/2023 04:30									
Monitoring Location	Octave L_{eq} Sound Pressure Level in centre frequency (dB)								L_{Aeq} Sound Pressure Level
	63	125	250	500	1000	2000	4000	8000	dB(A)
ML1	79	77.3	73.2	77.1	73.8	64.5	56.5	51.3	77.6

4.2.2 The existing façade noise levels mean that with a partially open window, an occupant would be exposed to approximately 63 dB of music noise internally between 21:00-04:30 on a typical weekend night-time period.

4.2.3 The internal criteria is unlikely to be achieved through an open window. Therefore, enhanced glazing and ventilation options are discussed in the following section of this report to mitigate music noise break-in.

5 SOUND INSULATION SCHEME

5.1 Front Façade

- 5.1.1 Noise ingress calculations have been undertaken to determine a minimum specification to achieve the design target criteria. This is based on ProPG:2017/ BS 8233:2014 criteria and the music noise limits adopted within this report (47 dB $L_{eq,5min}$ at 63 Hz and 41 dB $L_{eq,5min}$ at 125 Hz).
- 5.1.2 This exercise demonstrates the feasibility of reducing the external noise entering the proposed development building at 1F level at the front and rear facades in order to demonstrate the level of reduction that would be required.
- 5.1.3 Upgrades would also be required within the building to mitigate the structure-borne transmission contributing to internal noise levels. This would require a more-detailed investigation into the construction of the building, including sound insulation tests on the existing building structure and would be appropriate at a detailed design stage.
- 5.1.4 In the calculations below, the entertainment noise assessment period of Sat 29/10/2023 21:00-Sun 30/10/2023 04:30 are utilised for the front and rear facades. The 11th highest L_{AFmax} events at ML1 and ML2 during this assessment period have been utilised within the calculations.
- 5.1.5 Façade corrections of -3 dB were applied to data from ML1 and ML3 for the purposes of the calculations.

Term	Description	Value	Project:	12 Bolton Street, Bury
S_{fa}	Total facade area (m ²)	7.20	Description:	ML1 - Front Façade
S_{w}	Window area (m ²)	2.00	by:	Field Malster
S_{ext}	External wall area ($S_{fa} - S_{w}$) (m ²)	5.20	Date:	
S_{ce}	Area of the ceiling (m ²)	10.50	Room Assessed:	
S	Total area exposed to noise ingress ($S_{fa} + S_{ce}$)	17.70	Night/Day:	
x	Room dimension x	3.00	Results:	25 dB L_{Aeq} NR 19
y	Room dimension y	3.50		42 dB L_{Aeq}
z	Room dimension z	2.40		
V	Volume of receiving room (m ³)	25.20		
K	Facade Measurement Correction	0.00		
A_0	Ref. qbc area (m ²)	10.00		
k	$k=3$ in BS 8233:2014 + Tolerance	3.00		
	No. of vents in external wall	1.00		
r	Distance to window / vent (m)	0.00		

Term	Description	Description of noise level	Octave Band Centre Frequency (Hz)								Broadband	
			63	125	250	500	1000	2000	4000	8000	dB(A) 63-8k	dB(A) 125-2k
$L_{Aeq,H}$	Free-field		76	74	70	74	71	62	54	48	75	75
$L_{Aeq,H}$	Free-field outside room		76	74	70	74	71	62	54	48	75	75
$L_{Aeq,H}$	Free-field		76	74	70	74	71	62	54	48	75	75
$L_{Aeq,H}$	Free-field outside		76	74	70	74	71	62	54	48	75	75

Term	Description	Specification	$D_{nT,w}$								$D_{nT,w}$	R_w	C	C_{tr}	$R_w + C_{tr}$	Comments		
$D_{nT,w}$	of each ventilator	Ignore trickle vent (System 4 MVHR ducted from quiet façade)	130	130	130	130	130	130	130	130	-	-	0	-	-	0	Dn _{ref} (C/C _{tr}) = 66 (66/66), Free Area = +1	
	Cumulative $D_{nT,w}$ for all ventilators		130	130	130	130	130	130	130	130								
R_w	SFI of glazing/window	48 dB R_w + C _{tr} 10:12:8mm Laminated + 150mm air gap + 10mm	30	36	47	50	55	60	68	68	-	-	-	54	-2	-6	48	0
	SFI of external wall	Cavity masonry with Rock Wall Lining System	36	55	55	58	67	70	74	74	-	-	-	85	0	15		0.0
R_w	Reverberation time		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5								
	All Vents		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000								
	Glazing		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000								
	Wall		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000								
	Floor		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000								
	10LOG(S ₀ +C ₀ +D ₀)		-37.3	-45.3	-55.0	-58.0	-63.8	-68.5	-75.3	-75.3								
	A ₀ - Equivalent Abs. Area		8	8	8	8	8	8	8	8								
	10LOG(S ₀)		3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4								
Term	Description	Type / Comment / Source									dB(A) 63-8k	dB(A) 125-2k						
L_{Aeq}	Internal L_{Aeq}		45	35	22	23	13	-1	-15	-21	25	23						
L_{Aeq}	Internal L_{Aeq}		59	50	39	41	37	23	-2	-7	42	42						
Leq	via Vent		-52	-53	-57	-53	-57	-66	-74	-78	-53	-53						
	via Window		43	35	20	21	13	-2	-18	-23	23	22						
	via Wall		41	20	16	17	5	-7	-19	-25	18	16						
	via All		45	35	22	23	13	-1	-15	-21	25	23						

Figure 5: Noise Ingress Calculation – ML1 Front Façade

- 5.1.6 It can be seen from the calculation above that with appropriately specified mitigation, the external noise levels can be mitigated to achieve the internal criteria.
- 5.1.7 The above calculation is based on the external wall being lined internally with high mass plasterboard on resilient bars and insulation to improve the performance of the façade. The system essentially consists of high mass plasterboard fixed to resilient bars internally, with insulation. Hush Acoustics cite a typical performance of 58 dB $D_{nT,w}$ when installing the system to an existing wall.
- 5.1.8 The above calculation is also based on a triple glazing configuration, formed by a 10:12:8 double glazing configuration, a 150 mm air gap, and a secondary glazed 10 mm pane, achieving 48 dB R_w +C_{tr}.
- 5.1.9 External noise levels were elevated such that façade penetrations for passive background ventilation (e.g. trickle or wall ventilators) would not be appropriate, and the calculation was therefore undertaken on the basis of full System 4 MVHR installed, ducted from the quieter, rear façade.
- 5.1.10 This specification does not form a final detailed design, nor a final specification of the development, but rather demonstrates the level of sound reduction performance required for planning purposes and a specialist sound insulation system that exhibits the claimed potential to achieve the anticipated performance. The systems and configurations presented therefore demonstrate the reduction may be feasible on-site.

- 5.1.11 The calculations below are targeted for planning purposes. Further consideration would need to be given afterwards to structure-borne transmission. Any additional investigation should be designed to ensure that the noise source transmission pathways are fully understood and that the sound insulation performance of the existing separating wall between the development site and neighbouring night-club is fully understood to enable an enhancements to be appropriately specified.
- 5.1.12 However, the implementation of such systems is subject to specialist manufacturer's advice and correct installation.
- 5.1.13 It can be seen from **Figure 5** that with the specification above, external noise levels can be controlled to design targets through the façade. The ProPG:2017/ BS 8233:2014 requirement for L_{Aeq} levels is achieved by 5 dB and the L_{AFmax} criteria by 3 dB. The 63 Hz criteria is exceeded by 2 dB and the 125
- 5.1.14

5.2 Rear Façade

- 5.2.1 The noise monitoring at ML2 did not cover the period assessed at ML1. The period of Fri 27/10/2023 21:00 – Sat 28/10/2023 04:30 was assessed instead, as data and audio recording at ML1 demonstrate that the venue was in operation during that time.

BS 8233:2014 - Noise Ingress Calculation

Term	Description	Value	Project: 12 Bolton Street, Bury Description: ML2 - Rear Façade by: Reid Malster Date: Room Assessed: Night/Day: Results: 16 dBA_{eq} NR 7 35 dBA_{eq}
S _t	Total facade area (m ²)	7.28	
S _w	Window area (m ²)	2.08	
S _{ext}	External wall area (Sf - Sw) (m ²)	5.20	
S _c	Area of the ceiling (m ²)	10.50	
S	Total area exposed to noise ingress (Sf + Srr)	17.70	
x	Room dimension x	3.00	
y	Room dimension y	3.50	
z	Room dimension z	2.40	
V	Volume of receiving room (m ³)	25.20	
K	Facade Measurement Correction	0.00	
AD	Ref. qbs area (m ²)	10.00	
k	k=3 in BS 8233:2014 + Tolerance	3.00	
r	No. of vents in external wall	1.00	
r	Distance to window / vent (m)	0.00	

Term	Description	Description of noise level	Octave Band Centre Frequency (Hz)								Broadband	
			63	125	250	500	1000	2000	4000	8000	dB(A) 63-8k	dB(A) 125-2k
L _{eq,T}	Free-field		49	46	39	36	32	26	22	14	38	38
L _{eq,T}	L _{eq} outside room		72	66	53	51	51	43	40	31	56	55

Term	Description	Specification									D _{ref,w}	R _w	C	C _{tr}	R _w + C _{tr}	Comments	
											D _{ref,w}	R _w	C	C _{tr}		Comments	
D _{ref}	D _{ref} of each ventilator	29 dB D _{ref,w} +C _{tr} Standard trickle vent in window	20	23	26	29	30	33	33	33	-	-	31	-	-	-2	D _{ref,w} (C _{tr}) = 31 (R _w -2). Free Area = ?
	Cumulative D _{ref} for all ventilators		20	23	26	29	30	33	33	33							
R _w	SRI of glazing/window	32 dB R _w +C _{tr} 6:12:6.4 mm Stadip Silence	18	24	25	31	42	44	49	49	-	-	36	-1	-4	32	0
	SRI of external wall	46 dB R _w +C _{tr} Double leaf, 112mm brickwork, 50mm cavity, rigid wall ties	31	37	42	52	60	63	68	68	-	-	54	-2	-6		0.0
R _{tr}	Reverberation time		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5							
	All Vents		0.006	0.003	0.001	0.001	0.001	0.000	0.000	0.000							
	Glazing		0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000							
	Wall		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000							
	Roof		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000							
	10LOG(B+C+D+E)		-211	-248	-275	-310	-324	-354	-365	-365							
	A - Equivalent Abs. Area		8	8	8	8	8	8	8	8							
	10LOG(S/A)		3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4							
Term	Description	Type / Comment / Source									dB(A) 63-8k	dB(A) 125-2k					
L _{eq,T}	Internal L _{eq}		35	27	16	11	6	-3	-7	-15	16	15					
L _{eq,T}	Internal L _{eq}		57	47	32	27	25	12	11	2	35	32					

L _{eq}	via Vent		32	26	16	9	4	-5	-8	-17	14	13
	via Window		28	18	11	2	-10	-21	-20	-28	8	6
	via Wall		19	10	-2	-15	-27	-36	-45	-53	-3	-5
	via All		34	26	16	10	4	-5	-8	-17	15	14

Figure 6: Noise Ingress Calculation – ML2 Rear Façade

5.2.2 In the calculation above, a standard trickle ventilator was assumed, with a 6/12/6.4 double glazing specification.

5.2.3 ProPG:2017/ BS 8233:2014 criteria were achieved in the calculation, with results being 14 dB below the L_{Aeq} requirement and 10 dB below the L_{AFmax} requirement. The 63 Hz requirement was achieved by 13 dB and the 125 Hz requirement was achieved by 15 dB.

5.3 Structure-borne Transmission – Internal Noise Control

5.3.1 Internal acoustic works to the construction will be required to mitigate internal transmission contributing to internal noise levels in the rooms.

5.3.2 The first measure implemented into the design is that the retail use of the GF of the proposed development site is retained, providing a buffer zone between the basement venue next door and the proposed 1F dwellings.

5.3.3 The noise levels at ML3 indicated that a reduction of 11 dB was required at 63 Hz and a reduction of 10 dB was required at 125 Hz. Based on the available dataset, it is not possible to determine how much of this originated from external noise break-in from the front façade and internal noise transmission through the building structure.

5.3.4 Appropriate reduction of structure-borne transmission may be possible with the use of the Hush HD1041 Acoustic Wall Lining system from Hush Acoustics, which has a typical stated $D_{nT,w}$ performance of 58 dB.



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and we would recommend that consultation with the system manufacturer at detailed design stage should be employed to ensure that the claimed system performance is achieved,

5.4 Entertainment Noise – Conclusions and Recommendations

- 5.4.1 Based on the noise levels measured, and the character of the noise measured (music/entertainment noise), the internal criteria required are unlikely to be achieved in an unmitigated scenario.
- 5.4.2 Noise ingress calculations based on the measured data demonstrated that with appropriate mitigation measures, it would be feasible to achieve the internal criteria.
- 5.4.3 This report is provided for planning purposes only. Specialist advice should be sought from manufacturers and suppliers regarding the mitigation recommended in this report, it's implementation and its performance with respect to the development site at the detailed design stage.

6 CONCLUSIONS

- 6.1.1 By instruction from Radelan Estates Ltd (the client'), NoiseAir was commissioned to undertake a noise impact assessment for the proposed conversion of 12 Bolton Street, Bury to two residential first-floor units, with ground floor retail use retained.
- 6.1.2 The development is directly adjacent and structurally connected to a live music venue, 'The White Tiger'. The development application is currently opposed by Bury Council Environmental Health due to concerns about noise from the White Tiger venue impacting the proposed residential units.
- 6.1.3 A noise survey was undertaken at three monitoring locations. The results of the noise survey prompted recommendations for mitigation. Calculations demonstrated that it was possible to reduce the internal noise levels to achieve design criteria.
- 6.1.4 It is considered that with appropriately specified specialist mitigation, as presented in Section 5, the external noise levels can be mitigated to achieve the internal criteria.
- 6.1.5 Internal noise levels and associated noise transfer from the neighbouring nightclub are to be carefully considered, while it is considered that further investigation and assessment is required at a detailed design stage, it is likely that a specialist acoustic wall system (such as that provided by Hush Acoustics) can be implemented to sufficiently reduce noise levels based on the claimed performance, this should however be verified by the manufacturer/supplier.
- 6.1.6 This report is provided for planning purposes and does not constitute detailed design. Advice should be sought from specialist manufacturer's regarding the performance and implementation of any mitigation selected as a result of the recommendations of this report.

APPENDIX A - REPORT LIMITATIONS

This Report is presented to Radelan Estates Ltd and may not be used or relied on by any other person or by the client in relation to any other matters not covered specifically by the scope of this report.

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APPENDIX B - GLOSSARY

A-weighted sound pressure, p_A	Value of overall sound pressure, measured in pascals (Pa), after the electrical signal derived from a microphone has been passed through an A-weighting network. <i>NOTE: The A-weighting network modifies the electrical response of a sound level meter with frequency in approximately the same way as the sensitivity of the human hearing system.</i>
A-weighted sound pressure level, L_{pA}	Quantity of A-weighted sound pressure in decibels (dBA).
Acoustic environment	Sound from all sound sources as modified by the environment [BS ISO 12913-1:2013].
Ambient sound	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far. <i>NOTE: The ambient sound comprises the residual sound and the specific sound when present.</i>
Ambient sound level, $L_a = L_{Aeq,T}$ (BS 4142:2014)	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T <i>NOTE: The ambient sound level is a measure of the residual sound and the specific sound when present.</i>
Background sound	Underlying level of sound over a period, T, which might in part be an indication of relative quietness at a given location.
Background sound level, $L_{A90,T}$ (BS 4142:2014)	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
Break-in	Noise transmission into a structure from outside.
Break-out	Noise transmission from inside a structure to the outside.
Cross-talk	Noise transmission between one room and another room or space via a duct or other path.
C_{tr}	Correction term applied against the sound insulation single-number values (R_w , D_{w1} and $D_{nT,w}$) to provide a weighting against low frequency performance. <i>NOTE: The reference values used within the C_{tr} calculation are based on urban traffic noise.</i>
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels (dB) of a continuous, steady sound that, within a specified time interval, T, has the same mean-squared sound pressure as the sound under consideration that varies with time.
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$ (BS 4142:2014)	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time.
Equivalent sound absorption area of a room, A	Hypothetical area of a totally absorbing surface without diffraction effects, expressed in square metres (m ²), which, if it were the only absorbing element in the room, would give the same reverberation time as the room under consideration
Facade level	Sound pressure level 1 m in front of the façade. <i>NOTE: Facade level measurements of L_{pA} are typically 1 dB to 2 dB higher than corresponding free-field measurements because of the reflection from the facade.</i>
Free-field level	Sound pressure level away from reflecting surfaces. <i>NOTE: Measurements made 1.2 m to 1.5 m above the ground and at least 3.5 m away from other reflecting surfaces are usually regarded as free-field. To minimize the effect of reflections the measuring position has to be at least 3.5 m to the side of the reflecting surface (i.e. not 3.5 m from the reflecting surface in the direction of the source). Estimates of noise from aircraft overhead usually include a correction of 2 dB to allow for reflections from the ground.</i>

Impact sound pressure level, L_i	Average sound pressure level in a specific frequency band in a room below a floor when it is excited by a standard tapping machine or equivalent.
Indoor ambient noise	Noise in a given situation at a given time, usually composed of noise from many sources, inside and outside the building, but excluding noise from activities of the occupants. <i>NOTE: The location(s) within the room at which the ambient indoor noise is to be measured or calculated ought to be considered.</i>
Measurement time interval, T_m (BS 4142:2014)	Total time over which measurements are taken. <i>NOTE: This may consist of the sum of a number of non-contiguous, short-term measurement time intervals.</i>
Noise criteria	Numerical indices used to define design goals in a given space.
Noise rating, NR	Graphical method for rating a noise by comparing the noise spectrum with a family of noise rating curves.
Normalised impact sound pressure level, L_n	Impact sound pressure level normalized for a standard absorption area in the receiving room. <i>NOTE: Normalised impact sound pressure level is usually used to characterize the insulation of a floor in a laboratory against impact sound in a stated frequency band.</i>
Octave band	Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit.
Percentile level, $L_{AN,T}$	A-weighted sound pressure level obtained using time-weighting "F", which is exceeded for $N\%$ of a specified time interval.
Reference time interval, T_r (BS 4142:2014)	Specified interval over which the specific sound level is determined. <i>NOTE: This is 1 h during the day from 07:00 h to 23:00 h and a shorter period of 15 min at night from 23:00 h to 07:00 h.</i>
Residual sound (BS 4142:2014)	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Residual sound level, $L_r = L_{Aeq,T}$ (BS 4142:2014)	Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T .
Rating level, L_{Ar,T_r}	Equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise. <i>NOTE: This is used in BS 7445 and BS 4142 for rating industrial noise, where the noise is the specific noise from the source under investigation.</i>
Reverberation time, T	Time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped.
Sound exposure level, L_{AE}	Level of a sound, of 1 s duration, that has the same sound energy as the actual noise event considered.
Sound level difference, D	Difference between the sound pressure level in the source room and the sound pressure level in the receiving room.
Sound pressure, p	Root-mean-square value of the variation in air pressure, measured in pascals (Pa) above and below atmospheric pressure, caused by the sound.
Sound pressure level, L_p	Quantity of sound pressure, in decibels (dB).
Sound reduction index, R	Laboratory measure of the sound insulating properties of a material or building element in a stated frequency band.

Specific sound level, $L_s = L_{Aeq,T_r}$ (BS 4142:2014)	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r .
Specific sound source (BS 4142:2014)	Sound source being assessed.
Standardised impact sound pressure level, L'_{nT}	Impact sound pressure level normalized to a reverberation time in the receiving room of 0.5 s.
Standardised level difference, D_{nT}	Difference in sound level between a pair of rooms, in a stated frequency band, normalized to a reference reverberation time of 0.5 s for dwellings.
Groundborne noise	Audible noise caused by the vibration of elements of a structure, for which the vibration propagation path from the source is partially or wholly through the ground. <i>NOTE Common sources of ground-borne noise include railways and heavy construction work on adjacent construction sites.</i>
Structure-borne noise	Audible noise caused by the vibration of elements of a structure, the source of which is within a building or structure with common elements. <i>NOTE Common sources of structure-borne noise include building services plant, manufacturing machinery and construction or demolition of the structure.</i>
Third octave band	Band of frequencies in which the upper limit of the band is 2% times the frequency of the lower limit.
Weighted level difference, D_w	Single-number quantity that characterizes airborne sound insulation between rooms, but which is not adjusted to reference conditions. <i>NOTE Weighted level difference is used to characterize the insulation between rooms in a building as they are. Values cannot normally be compared with measurements made under other conditions (see BS EN ISO 717-1).</i>
Weighted normalised impact sound pressure level, $L'_{n,w}$	Single-number quantity used to characterize the impact sound insulation of floors over a range of frequencies.
Weighted sound reduction index, R_w	Single-number quantity which characterizes the airborne sound insulating properties of a material or
Weighted standardised impact sound pressure level $L'_{nT,w}$	Single-number quantity used to characterize the impact sound insulation of floors over a range of frequencies.
Weighted standardised level difference, $D_{nT,w}$	Single-number quantity that characterizes the airborne sound insulation between rooms.

Symbols

D_w	Weighted level difference (dB)
D_{nT}	Standardized level difference (dB)
$D_{nT,w}$	Weighted standardized level difference (dB)
L_{Amax}	Maximum noise level (dB)
$L_{Ar,Tr}$	Rating level (dB)
L_n	Normalised impact sound pressure level (dB)
L'_{nT}	Standardised impact sound pressure level (dB)
$L'_{nT,w}$	Weighted standardised impact sound pressure level (dB)
$L'_{n,w}$	Weighted normalised impact sound pressure level (dB)
L_p	Sound pressure level (dB)
L_{pA}	A-weighted sound pressure level (dB)
$L_{AN,T}$	Percentile level (dB)
L_{AE}	Sound exposure level (dB)
$L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level (dB)
p	Sound pressure (Pa)
p_A	A-weighted sound pressure (dB)
$p_{A(t)}$	Instantaneous A-weighted sound pressure (Pa)

R	Sound reduction index (dB)
R_w	Weighted sound reduction index (dB)
T	Time interval (also used for reverberation time) (s)
t_0	Reference time interval (s)

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