



**Independent Acoustic
Consultancy Practice**

Environmental Noise Assessment

**Apartments above 'Barcode'
Merthyr Tydfil**

6048/ENA1_Rev1

Environmental Noise Assessment

Project:	Apartments above 'Barcode'
Site Address:	92-94 High Street Merthyr Tydfil CF47 8UP
HA Reference:	6048/ENA1_Rev1
Date:	03/08/2021
Client:	G & B INVESTMENTS LTD. c/o: XL PROPERTY INVESTMENTS LTD Belvoir Lodge Upper Oldfield Park Bath BA2 3JX
Contact:	louise@xlproperty.co.uk

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		Name	Rhodri Owen BSc(Hons) MIOA	Meirion Townsend BSc(Hons) MIOA
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			Prepared by:	Checked by:
		Name	Rhodri Owen BSc(Hons) MIOA	Meirion Townsend BSc(Hons) MIOA
		Signature		

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1. INTRODUCTION

We understand a residential development consisting of 6no studio apartments and 6no holiday lets is proposed above 'Barcode' bar, 92-94 High Street, Merthyr Tydfil, CF47 8UP.

The Local Planning Authority have requested a noise impact assessment is submitted to accompany the planning application.

This report has therefore been commissioned to assess existing ambient and background noise levels impinging the proposed residential units from both; external noise sources; and, from internal noise intrusion (i.e. noise transfer from the ground floor bar through the separating floors to above).

Survey results have been used for comparison with typical Local Authority Planning conditions and current planning guidance.

1.1 COVID-19

At the time of undertaking the noise assessment and survey detailed in this report, restrictions were still in place by Welsh Government to limit the spread of COVID-19 with regards to operation of bars and restaurants.

Our understanding was that the bar at ground floor was open to customers over the bank holiday weekend however a reduction on numbers was in place and only low level background music was allowed.

Audio recordings of street noise outside the building during the night-time periods over the bank holiday suggests it was busy with night-life and is therefore assumed typical of normal weekend trading (in terms of $L_{Amax,F}$ events of singing/shouting outside).

Separate breakout tests were conducted during the daytime hours when the bar was closed where the sound system could be run at typical operating levels to allow us to carry out our investigations.

2. CRITERIA

2.1 Planning Policy Wales

The Welsh Government's Planning Policy Wales (Edition 11) dated February 2021, states the following;

"6.7.20 Where sensitive developments need to be located close to existing transportation infrastructure for sustainable movement and access they should be designed, as far as practicable, to limit harmful substances and noise levels within and around those developments both now and in the future. This may include employing the principles of good acoustic design and the inclusion of active travel or travel management measures as part of development proposals. Such development, however, should preferably be located away from existing sources of significant noise, which may include aircraft noise or roads, particularly new roads or those with programmed route improvements."

The document states *"For more information on the principles of good acoustic design, readers are referred to Professional Planning Guidance (ProPG) Supplementary Document 2, produced by the Association of Noise Consultants, the Institute of Acoustics and the Chartered Institute of Environmental Health (<http://www.association-of-noise-consultants.co.uk/propg/>). ProPG has been written principally to assist with the planning process in England, but the design principles put forward in Supplementary Document 2 may also be adopted in Wales.*

On the subject of 'Noise from Existing Development', the document states;

"6.7.5 ...The agent of change principle says that a business or person responsible for introducing a change is responsible for managing that change. In practice, for example, this means a developer would have to ensure that solutions to address air quality or noise from nearby pre-existing infrastructure, businesses or venues can be found and implemented as part of ensuring development is acceptable."

"6.7.24 The potential impacts of noise pollution arising from existing development, be this commercial, industrial, transport-related or cultural venues (such as music venues, theatres or arts centres), must be fully considered to ensure the effects on new development can be adequately controlled to safeguard amenity and any necessary measures and controls should be incorporated as part of the proposed new development. This will help to prevent the risk of restrictions or possible closure of existing premises or adverse impacts on transport infrastructure due to noise and other complaints from occupiers of new developments. It will be important that the most appropriate level of information is provided and assessment undertaken."

The Welsh Government adds: *“Under the agent of change principle, if new developments or uses are to be introduced near a pre-existing business, such as a live music venue, it is the responsibility of the developer to ensure solutions to address and mitigate noise are put forward as part of proposals and are capable of being implemented.”*

2.2 ProPG Supplementary Document 2

Professional Practice Guidance on Planning & Noise, New Residential Development 'Supplementary Document 2 – Good Acoustic Design' produced by the ANC, IOA and CIEH discusses the general principles of Good Acoustic Design, including the following hierarchy of noise management measures in descending order of preference;

- i) *Maximising the spatial separation of noise source(s) and receptor(s).*
- ii) *Investigating the necessity and feasibility of reducing existing noise levels and relocating existing noise sources.*
- iii) *Using existing topography and existing structures (that are likely to last the expected life of the noise-sensitive scheme) to screen the proposed development site from significant sources of noise.*
- iv) *Incorporating noise barriers as part of the scheme to screen the proposed development site from significant sources of noise.*
- v) *Using the layout of the scheme to reduce noise propagation across the site.*
- vi) *Using the orientation of the buildings to reduce the noise exposure of noise-sensitive rooms.*
- vii) *Using the building envelope to mitigate noise to acceptable levels.*

“It should be remembered that good acoustic design is a process that begins as soon as land is under consideration for development. The timeline for good acoustic design stretches from the conceptual design stage, through quality control during construction, and beyond to post construction performance testing.

Both internal and external spaces should be considered in the acoustic design process. Care should be taken to ensure that acoustic mitigation measures do not result in an otherwise unsatisfactory development. Good acoustic design must be regarded as an integrated part of the overall design process”.

2.3 Technical Advice Note (Wales) 11

Noise bands defining categories A-D of TAN 11 are set in terms of $L_{Aeq,16hr}$ daytime and $L_{Aeq,8hr}$ night time levels for road traffic noise and mixed sources, free field 1.2-1.5m above ground level as follows;

Table 2.1 – TAN11 Noise Exposure Categories

Recommended noise exposure categories for new dwellings near existing noise sources (ref Table 2 of TAN 11 (Wales) October 1997)					
Noise Source	Time	Noise Exposure Categories			
		A	B	C	D
Road Traffic	07:00-23:00	<55	55-63	63-72	>72
	23:00-07:00	<45	45-57	57-66	>66
Rail Traffic	07:00-23:00	<55	55-66	66-74	>74
	23:00-07:00	<45	45-59	59-66	>66
Air Traffic	07:00-23:00	<57	57-66	66-72	>72
	23:00-07:00	<48	48-57	57-66	>66
Mixed Sources ⁽⁴⁾	07:00-23:00	<55	55-63	63-72	>72
	23:00-07:00	<45	45-57	57-66	>66

Note: In addition, sites where individual noise events regularly exceed 82dB(A) $L_{max}(slow)$, several times in any night time hour should be treated as being in NEC C, unless the $L_{eq}(8 \text{ hour})$ already puts the site in NEC D.

(4) Mixed sources: this refers to any combination of road, rail, air and industrial noise sources. The "mixed source" values are based on the lowest numerical values of the single source limits in the table. The "mixed source" NECs should only be used where no individual noise source is dominant.

With regards to noise from the ground floor bar, paragraph B18 of TAN11 states;

"Commercial developments such as fast food restaurants, discos, night clubs and public houses pose particular difficulties, not least because associated activities are often at their peak in the evening and late at night. Local planning authorities will wish to bear in mind not only the noise that is generated within the premises but also the attendant problems of noise that may be made by customers in the vicinity. Disturbance that can be caused by traffic and associated car parking should not be underestimated."

2.4 British Standard 8233:2014

British Standard 8233:2014 'Guidance on sound insulation and noise reduction for buildings' includes internal noise criteria of habitable rooms in residential dwellings, as shown below;

Table 2.2 – BS 8233:2014 Internal Ambient Noise Criteria for Habitable Rooms

Location	Desired		Reasonable *	
	07:00 to 23:00	23:00 to 07:00	07:00 to 23:00	23:00 to 07:00
Living room	35 dB $L_{Aeq,16hr}$	-	40 dB $L_{Aeq,16hr}$	-
Dining room/area	40 dB $L_{Aeq,16hr}$	-	45 dB $L_{Aeq,16hr}$	-
Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$	40 dB $L_{Aeq,16hr}$	35 dB $L_{Aeq,8hr}$

* NOTE 7 states “Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved.

In addition BS 8233:2014 states: “Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values.”

Reference is therefore made to World Health Organisation (WHO) ‘Guidelines for Community Noise, 1999’ which states “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)”.

The above criteria in BS 8233:2014 apply for sources without specific character, previously termed “anonymous noise”. BS 8233:2014 7.7.1 advises:

“NOTE: Noise has a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has strong low-frequency content, in which case lower noise limits might be appropriate.”

2.5 British Standard 4142:2014

British Standard 4142:2014 “Methods for rating and assessing industrial and commercial sound”, provides current guidance for the assessment of industrial noise affecting residential receivers.

This standard describes a rating method comparing L_{Aeq} noise levels from the industrial source with pre-existing background L_{A90} levels at the residential receiver. It advises at a difference (industrial noise - background) of:

- +10dB or higher, likely to be an indication of a significant adverse impact, depending on the context.
- A difference of + 5dB, likely to be an indication of an adverse impact, depending on the context.
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

A sliding scale of penalties can be applied to industrial/commercial sound levels which have acoustically distinguishing characteristics, including tonality, impulsivity and intermittency.

Tonality – A penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible, and 6dB where it is highly perceptible.

Impulsivity – A penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it clearly perceptible, and 9dB where it is highly perceptible.

Other sound characteristics – Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied

Intermittency – If intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied.

BS 4142:2014 states under section 11;

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

- 1) *The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.*

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse."

2.6 Building Regulations ADE2003

Building Regulations ADE2003 separating floor sound insulation performance requirements for "Dwelling-houses and flats formed by material change of use" are quoted below. This criteria applies to separating floors between commercial and residential apartments/holiday lets above.

Table 2.3 - Building Regulations Part E Performance Requirements

Separating Construction	Airborne Sound Insulation Minimum Performance Requirement $D_{nT,w} + C_{tr}$ (dB)
Floor	43

The above quoted minimum airborne sound insulation performance values must be met to satisfy the requirements of ADE2003.

However, Building Regulations ADE2003 also states;

"The performance standards set out in [Table 2.3 above] 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 establish if a higher standard of sound insulation is required and, if so, to determine the appropriate level."

In the context of maintaining a bar (public house with background music) at ground floor level, a significantly higher sound insulation performance standard than $43 \text{ dB } D_{nT,w} + C_{tr}$ is likely to be required to control music noise transfer and noise from patrons in the bar.

2.7 Music Break-In

The Noise Council's 'Code of Practice on Environmental Noise Control at Concerts' and the draft 'Code of Practice on Control of Noise from Pubs & Clubs' Nov '99 gives guidance and noise criteria for live music

However, this applies to music events and venues being established near to existing residential receivers, and is not considered appropriate for assessing new residential development near to existing well-established venues, in line with the Agent of Change principle.

The following music criteria are proposed to demonstrate good internal acoustic conditions:

2.7.1 Subjective-Objective Method

An objective limit has been calculated based on an EHO's subjective assessment of what would constitute a statutory noise nuisance at a similar site in Cardiff.

The limit equated to around an overall $25 \text{ dB } L_{Aeq}$ inside a bedroom (with the window partially open).

The $25 \text{ dB } L_{Aeq}$ internal limit is 5 dB lower (tighter) than the $30 \text{ dB } L_{Aeq,T}$ sleep disturbance guidance figure quoted by the World Health Organisation.

2.8 Council Pre-Application Response

Judith Jones of Merthyr Tydfil County Borough Council made the following comments in regards to noise;

“One of the main concerns that has been raised by the Environmental Health Officer is the potential noise and disturbance to the future occupants as a result of there being a bar/nightclub at ground floor. Details would need to be provided as part of the application to demonstrate that the two uses are compatible. This may include the submission of a noise assessment to determine what noise mitigation measures can be implemented. “

3. ENVIRONMENTAL NOISE SURVEY

3.1 Procedures

Continuous noise monitoring was carried out from 1100hrs on Friday, 28 May 2021 to 0040hrs on Tuesday, 01 June 2021 at positions A and B. (Note: this was a bank holiday weekend)

Data including L_{Amax} , L_{Aeq} and background L_{A90} was logged at 1 minute intervals over the monitoring period, along with continuous audio and 100ms data to allow source identification and further detailed analysis of results if required.

Figure 3.1 – Site Plan Showing Monitoring Locations



Site plan in Figure 3.1 above shows the development site and continuous monitoring positions used, namely:

Table 3.1 – Continuous Monitoring Location Details

Position	Description
A	Outside 2 nd floor front façade window overlooking the High Street. Position approx. 7.5m above local ground height
B	Outside 1 st floor rear façade window overlooking Castle Yard. Position approx. 4.5m above local ground height

Note: Both monitoring positions were in proximity of the building façade. Therefore, a -3dB correction has been applied to the results in order to achieve 'free-field' noise levels, for comparison with planning guidance criteria.

3.2 Meteorological Conditions

Approximate weather conditions are shown in time history graph Figure B.1 of Appendix B.

To summarise, the weather conditions during the monitoring period were dry with an occasional breeze.

3.3 Measurement Equipment

The following measurement equipment was used during the surveys:

Table 3.2 – Noise Monitoring Equipment List

Make	Description	Model	Serial Number	Last Calibrated	Certificate No.
Norsonic AS	Calibrator (114.08dB @ 1kHz)	1251	31429	09 March 2021	UCRT21/1323
NTi	Type 1 - Sound Level Meter	XL2-TA	A2A-08723-E0	30 October 2019	FL-19-235
	Preamplifier	MA220	1820	30 October 2019	FL-19-235
	Microphone	Capsule	9381	30 October 2019	FL-19-235
NTi	Type 1 - Sound Level Meter	XL2-TA	A2A-10021-E0	20 August 2019	TCRT19/1651
	Preamplifier	MA220	5435	20 August 2019	TCRT19/1651
	Microphone	Capsule	8547	20 August 2019	TCRT19/1651

Measurement systems were calibrated before and after the surveys and no variation occurred.

Note: Copies of traceable calibration certificates for all equipment are available upon request.

3.4 Results

Time history graphs in Figure B.2 & Figure B.3 of Appendix B show L_{Amax} , L_{Aeq} and L_{A90} sound pressure levels measured at positions A and B. All measurement results are free-field sound pressure levels (a -3dB correction has been applied – see section 3.1).

The following $L_{Aeq,16hr}$ daytime (0700-2300hrs) and $L_{Aeq,8hr}$ night-time (2300-0700hrs) noise levels were measured;

Table 3.3 – Summary of Daytime $L_{Aeq,16hr}$ and Night-time $L_{Aeq,8hr}$ Results

Date / Time	Period	Position	
		A	B
Friday 11:00 28/05/2021 - Saturday 07:00 29/05/2021	Daytime $L_{Aeq,12hr}$ (dB)	63.0	59.7
	Night-time $L_{Aeq,8hr}$ (dB)	60.5	55.4
Saturday 07:00 29/05/2021 - Sunday 07:00 30/05/2021	Daytime $L_{Aeq,16hr}$ (dB)	61.0	52.6
	Night-time $L_{Aeq,8hr}$ (dB)	57.9	52.8
Sunday 07:00 30/05/2021 - Monday 07:00 31/05/2021 (05:05 @ Pos B)	Daytime $L_{Aeq,16hr}$ (dB)	61.9	51.7*
	Night-time $L_{Aeq,8hr}$ (dB)	68.5	53.7*
Monday 07:00 31/05/2021 - Tuesday 00:40 01/06/2021	Daytime $L_{Aeq,16hr}$ (dB)	58.2	N/A*
	Night-time $L_{Aeq,1.5hr}$ (dB)	56.3	N/A*

*Note: Pos B sound level meter lost power at 0505hrs on Monday 31/05/2021.

There were a total 5no $L_{Amax,F}$ events over 82dB measured during the three night-time periods (2300-0700hrs) at Position B.

At Position A, night-time $L_{Amax,Fast}$ and $L_{Amax,Slow}$ events ≥ 82 dB, measured over the monitoring period (bank holiday weekend), are detailed as follows;

Table 3.4 – Position A 1-minute L_{Amax} Analysis

Period	Sound Level Meter Weighting	Total No of Night- time L_{Amax} Events >82 dB =	Highest Measured L_{Amax} Level (dB) =
Friday Night	Fast	17	113
	Slow	5	105.4
Saturday Night	Fast	11	95
	Slow	0	90.8
Sunday Night	Fast	60	99.3
	Slow	29	95.2
Monday Night	Fast	1	99.4
	Slow	1	92.9

L_{Amax} events are indicated to be controlled by singing and shouting from pub-goers on High Street. The most frequent events occur between 2200-0000hrs, when people are vacating premises.

$L_{Amax,F}$ events at 80-110dB occurring regularly during the night-time period is considered significant.

Graphs in Appendix B show statistical analysis of background sound levels measured at positions A & B.

The following minimum consistent daytime and night-time background L_{A90} sound levels have been determined;

Table 3.5 – Minimum Consistent Daytime and Night-time Background L_{A90} Results

Period	Position	
	A	B
Daytime (0700-2300hrs) L_{A90} (dB)	44	49
Night-time (2300-0700hrs) L_{A90} (dB)	33	48

The ambient and background sound climate at Positions A & B was controlled by;

- Position A – Pub-goers / pedestrians on High Street, Road traffic on High Street.
- Position B – existing plant operating in the Castle Yard vicinity.

4. NOISE BREAKOUT TEST FROM GROUND FLOOR BAR

A noise breakout assessment was carried out on Friday 28th May 2021 to assess the noise break-out from the ground floor Barcode Bar to floors directly above and to outside.

This was carried out when the bar was closed to the public to allow higher levels of noise to be generated during the test.

4.1 Personnel & Equipment

Personnel present: Rhodri Owen of Hunter Acoustics
Meirion Townsend of Hunter Acoustics

Test date: 28 May 2021

The following test equipment was used during our sound insulation tests;

Table 4.1 – Equipment List

Make	Description	Model	Serial Number	Last Calibrated	Certificate No.
Norsonic AS	Type 1 - Integrating - averaging Sound Level Meter	140	1403003	04 October 2019	U33025
	Preamplifier	1209	12403	04 October 2019	Included
	Microphone	1225	91797	04 October 2019	33024
Norsonic AS	Calibrator (114.08dB @ 1kHz)	1251	31429	09 March 2021	UCRT20/1323
Sennheiser	Bodypack Transmitter 606-648 MHz	SK100	1427385553	-	-
Sennheiser	Bodypack Receiver 606-648 MHz	EK100	1427312753	-	-
RCF	Amplifier & Loudspeaker	ART310A			
	Loudspeaker Tripod				
Electro-Voice	Active subwoofer	ELX200	-	-	-

Equipment calibration certificates are available upon request.

In addition to pink noise breakout tests carried out through our equipment, music was also played through the in-house system which consisted of a large sub-woofer in the dance floor area and one near the entrance doors on High Street, along with a number of smaller speakers hung at high level spaced around the entire ground floor bar.

4.2 Procedure

Broadband pink noise was generated in the front, rear and middle sections of the bar using a pink noise generator and a high performance amplifier/loudspeaker system with active sub-woofer.

The sound insulation tests have been carried out in accordance with ISO140-4.

Measurements were undertaken at ground floor level (source levels), at first and second floor levels and also at 5m from the facades on both High Street out the front, and Castle Yard to the rear.

Additional sample measurements were then undertaken across the building with the built-in PA system.

This part of the assessment was carried out in order to measure typical music noise levels in the bar during normal trading (pre-pandemic) and quiet (current COVID-19 regulations) periods. Observations were then made upstairs, at first and second floor levels, to measure music noise levels in proposed residential apartments.

4.3 Results

4.3.1 Airborne Sound Insulation Tests to Floors above (Pink Noise)

The following table summarises test results and compares them with the airborne sound insulation performance requirements of Building Regulations (ADE2003) for "Dwelling-houses and flats formed by material change of use" as appropriate. Appendix C includes test forms.

Table 4.2 – Floor Airborne Sound Insulation Test Results

Test Reference	Room	Description	Measured
6048/ASIF01	Source Receiver	Ground Floor - Bar 1st Floor - Front	46 dB $D_{nT,w}+C_{tr}$
6048/ASIF02	Source Receiver	Ground Floor - Bar 2nd Floor - Front	56 dB $D_{nT,w}+C_{tr}$ *
6048/ASIF03	Source Receiver	Ground Floor - Bar 1st Floor - Middle	47 dB $D_{nT,w}+C_{tr}$
6048/ASIF04	Source Receiver	Ground Floor - Bar 2nd Floor - Middle	56 dB $D_{nT,w}+C_{tr}$ *
6048/ASIF05	Source Receiver	Ground Floor - Bar 1st Floor - Rear	47 dB $D_{nT,w}+C_{tr}$
6048/ASIF06	Source Receiver	Ground Floor - Bar 2nd Floor - Rear	57 dB $D_{nT,w}+C_{tr}$ *

* For information only to show reduction between ground and second floor level.

4.3.2 Music/Bar Noise Intrusion to Apartments

Graph in Figure B.6 in Appendix B shows source music noise levels (MNL) in the bar through the in-house PA system, set by the operator at a level deemed representative of pre-pandemic Friday/Saturday night levels. Receive levels at first and second floors are also then plotted compared with the background (music off).

Results are summarised below;

Table 4.3 – Music Noise Level (Set at Pre-pandemic Levels) to Above

	Location	Music Noise Level (MNL) L_{Aeq}
Source	Average in ground floor bar area	86
Receiver 1	First Floor Level	46
Receiver 2	Second Floor Level	39

Music was clearly audible at both first and second floors.

For reference, when set to the current pandemic operating levels, the music ranged from 66-71dB L_{Aeq} throughout the ground floor bar.

4.3.3 Airborne Sound Insulation Tests to Outside (Music Noise)

Graphs in Figure B.7 and Figure B.8 in Appendix B shows results of music noise breakout tests through the front and rear facades respectively to 5m distances.

Results are summarised below;

Table 4.4 – Music Noise Level (Set at Pre-pandemic Levels) to Above

	Location	Music Noise Level (MNL) L_{Aeq}
Source	Average in ground floor front bar area	86
Receiver 1	5m from Front Façade	59
Source	Average in ground floor rear bar area	86
Receiver 2	5m from Rear Façade	54

4.4 Existing Constructions

4.4.1 *Separating Floors*

The existing separating floor between ground and first floor level and first and second floor level appeared to be of concrete 'beam & block' construction; with a timber board or lay-in grid ceiling in the ground floor bar directly fixed to the underside the beam and block floor (small void ~25-50mm).

There is a concrete blockwork lift shaft which runs from the ground floor all the way up the through the building to second floor level.

4.4.2 *External Walls*

External walls appeared to be cavity masonry / brickwork, (>300mm).

4.4.3 *Glazing*

To the front, there were large shop front style single glazed window the bar and sliding sash windows to the proposed flats at first and second floor level. Windows to the rear of the ground floor bar had been painted black/boarded.

Table 4.5 – Large Windows in Ground Floor Bar onto High Street

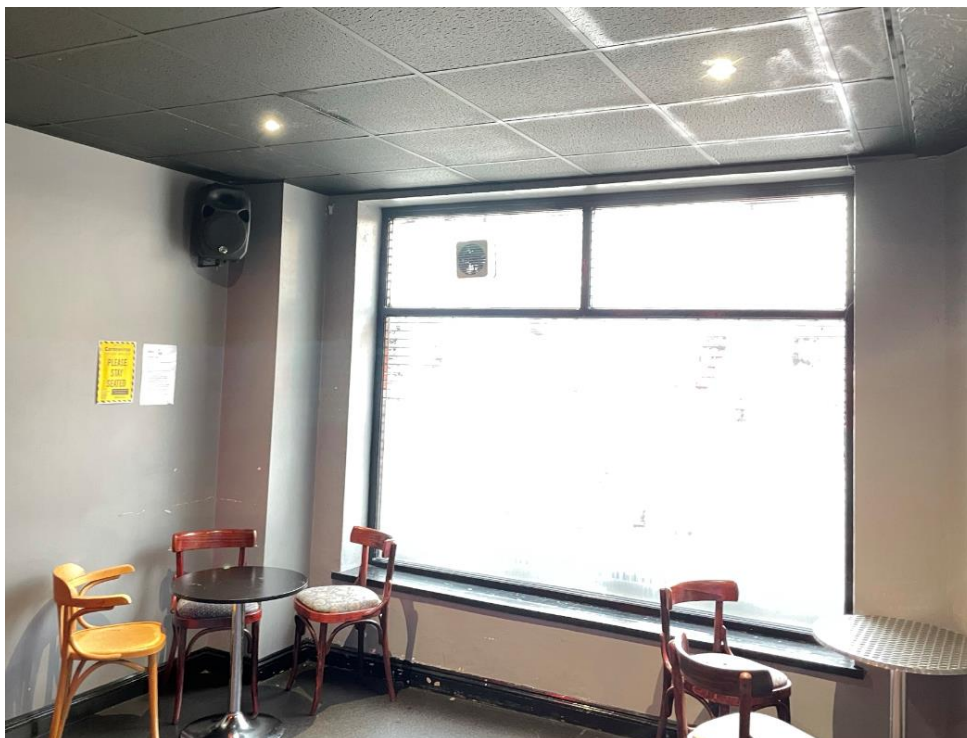


Table 4.6 – Windows Blacked Out at Rear of Ground Floor Bar

4.4.4 Doors

Lobbied double door sets were located to the front of the bar onto High Street, with lobbied fire doors to the rear.

We understand that fire doors to the rear are generally kept shut however front doors onto High Street are regularly open with people in and out.

4.4.5 Roof

The existing roof is a pitched slate roof.

5. PRELIMINARY SOURCE MUSIC NOISE LIMITS

Based on results of our surveys, music noise limits are indicated to be required in the ground floor bar in order to prevent excessive breakout to the proposed flats above (via external breakout and back through windows and transfer through the separating floor).

The operator was made aware prior to undertaking this work that music noise levels would likely need reducing to background levels.

We would suggest the following are set as preliminary limits;

Table 5.1 - Proposed Limits inside Bar

$L_{Aeq,5mins}$ (dB)	L_{eq} at Octave Band Centre Frequencies, Hz (dB)						
	63	125	250	500	1000	2000	4000
75	60	67	68	71	72	68	62

For reference, these are roughly in line with the current levels the operator confirmed were being used when trading under current COVID-19 restrictions.

We would therefore suggest these operating limits are confirmed suitable for the operator to continue trading under as all of the subsequent mitigation measures discussed in this report are based on the above operational limits being met.

The above are marked as 'preliminary' music noise limits as these would need to be confirmed with a new breakout test once all building work was complete to set final operating limits to control noise intrusion to the proposed flats above.

5.1 Singing/Shouting

Music noise levels can be limited however it is more difficult to control the noise level of large groups of customers in the bar.

Levels of singing and shouting measured outside the bar on High Street over the bank holiday weekend, if occurring inside the bar, have the potential to cause disturbance to occupants in the proposed first floor flats above, even with mitigation measures installed.

This would need careful management in order to prevent excessive noise from customers within the bar.

5.2 Monitoring of Levels

A suitably calibrated system for checking $L_{eq,5mins}$ levels inside the bar (both overall and at individual octave bands) should be available to allow the operator to ensure limits are met at all times during amplified music.

A fixed limiter should be installed to ensure final commissioned limits are not exceeded.

6. EXTERNAL BUILDING FABRIC ASSESSMENT

Holiday lets are proposed at first floor level with residential studio flats at second floor level. External building fabric shall control noise intrusion to habitable rooms to meet:

- 35dB $L_{Aeq,16hr}$ daytime
- 30dB $L_{Aeq,8hr}$ night-time / (25dB from music noise intrusion in 2nd floor studios)
- 45dB $L_{Amax,F}$ in bedrooms during the night

These are in line with the desirable internal ambient noise values quoted in BS 8233:2014 (see section 0 of this report).

Critical façades are shown on site plan in Figure 6.1 below, marked up with **MAGENTA** and **BLUE** lines.

Figure 6.1 – Façades Requiring Additional Sound Insulation Measures



Note: Habitable rooms include bedrooms, lounges, dining rooms and kitchen/diners but not kitchens or bathrooms.

All habitable rooms (at all floor levels) on façades highlighted above require up-rated acoustic glazing, roof and ventilation as specified below.

Survey results indicate $L_{Amax,F}$ events impinging the front façade of the building are the most critical aspect of controlling noise intrusion to meet 'desirable' internal conditions.

The minimum specifications outlined in this report, outlined for the walls, roof, glazing and ventilation, are shown to control $L_{Amax,F}$ events internally to not exceed 45dB more than 10-15 times during a worst-case bank-holiday night-time period.

The following mitigation measures are to be incorporated in conjunction with noise limits set out in Table 5.1 above.

6.1 External Walls

The following external wall constructions have been used in our analysis;

- Brick / 50mm cavity / Brick

The following SRI performance figures are taken from BS 8233:2014 for 'Brick and block external wall'. The proposed constructions should be capable of achieving these figures as a minimum;

Table 6.1 – External Wall Sound Reduction Index Figures

Element	Description	Sound Reduction Index, R (SRI: BS EN ISO 140) at Octave Band Centre Frequency (Hz)				
		125	250	500	1k	2k
External Wall	Brick/Block Cavity Wall	40	44	45	51	56

The successful tenderer must provide independent laboratory test data showing their wall systems meet the above performance requirements.

6.2 Roof

The following roof constructions have been used in our analysis;

- Pitched tiles on felt roof, 9mm plasterboard ceiling + 400mm insulation

The following minimum SRI performance figures are taken from BS 8233:2014: "tiles on felt roof with 100mm mineral wool on plasterboard ceiling";

Table 6.2 – Roof Sound Reduction Index Figures

Element	Description	Sound Reduction Index, R (SRI: BS EN ISO 140) at Octave Band Centre Frequency (Hz)				
		125	250	500	1k	2k
Pitched Roof	Tiles on felt, 9mm plasterboard ceiling, 100mm mineral wool insulation	28	34	40	45	49

There should be no rooms in roof/mansard sections.

6.3 Glazing

The housing layout plan in Figure 6.1 shows façades where windows require up-rating. The following sound reduction index figures shall be met for glazing on these critical façades:

Table 6.3 - Glazing Sound Reduction Index Figures

Element	Description	Sound Reduction Index, <i>R</i> (SRI: BS EN ISO 140) at Octave Band Centre Frequency (Hz)				
		125	250	500	1k	2k
Front Façade Windows highlighted MAGENTA	For budgetary guidance: based on Selectagaze 6mm / 150mm / 10mm Secondary (S40 SHC)	33	42	45	50	50
Rear Façade Windows highlighted BLUE	For budgetary guidance: based on Pilkington 10mm / 6 – 16mm / 6mm	24	24	32	37	37

A typical glazing system that should be capable of achieving the quoted SRI figures (based on Selectagaze and Pilkington test data) is included in the table for initial budgetary guidance, however;

The successful glazing suppliers shall provide independent laboratory test data confirming their proposed systems (including frames/seals) meet the quoted octave band sound reduction performance figures above.

6.4 Ventilation

All habitable rooms on critical façades highlighted **MAGENTA** require a ventilation strategy that does not rely on opening windows or trickle ventilators in the façade to achieve 'whole building' and 'extract' ventilation rates as required by Building Regulations Part F;

System 4: *Continuous mechanical supply and extract with heat recovery. Guidance on minimum provisions for extract and whole building ventilation is set out in Table 1.2d of Building Regulations Part F..*

For façades at the rear of the building highlighted **BLUE**, if music source levels in the ground floor bar remain at 86dB L_{Aeq} or lower and the rear of the bar is not used as a

smoking area, then it is possible to use acoustic trickle ventilators as part of a System 3 (MEV) as per specifications below;

Table 6.4 – Acoustic Trickle Ventilator Specifications

Element	Description	$D_{n,e}$ at Octave Band Centre Frequency (Hz)				
		125	250	500	1k	2k
Rear Façade Ventilators highlighted BLUE	For budgetary guidance: based on Greenwood EAR 42W	41	42	37	44	46

The calculation has allowed for a maximum of 2no acoustic trickle ventilators per room.

For budgetary guidance the above ventilator figures are based on Greenwood EAR 42W ventilators. The successful tenderer shall provide independent laboratory test data showing their vent meets the above performance requirements.

All ventilation systems shall meet the requirements of the Domestic Ventilation Compliance Guide 2010.

The final proposed ventilation strategy should be confirmed acceptable with planners/ EHO and Building Control.

6.5 Overheating

Our assessment recommends acoustic glazing and mechanical ventilation on critical facades, to control noise intrusion. This is based on windows normally being closed (excluding purge ventilation).

If there is a risk of overheating on any of the facades, requiring windows to be opened more frequently, a more detailed assessment would be required – please advise.

7. SEPARATING FLOOR MITIGATION MEASURES

The existing separating floor construction currently meets the minimum requirement under Building Regulations Approved Document Part E however significant upgrades to the separating floor and flanking paths are required to control music noise transfer (when limited to 75dB L_{Aeq} as per limits outlined in Table 5.1 above) and noise from people in the bar.

The following represents a 'Best Available Techniques not entailing excessive costs' (BATNEEC) approach to deal with airborne sound transfer.

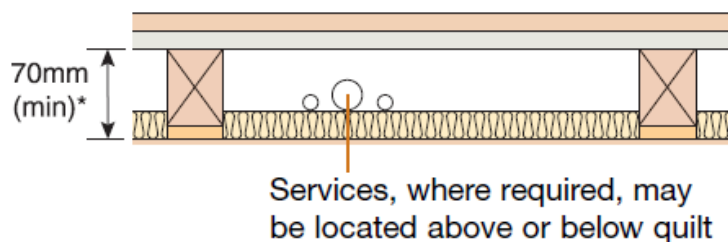
7.1 Separating Floor Upgrades

The existing beam and block floor is currently achieving 46-47dB $D_{nT,w}+C_{tr}$ as outlined in Section 4.3.1 above.

To maximise the performance of this floor, we would advise including 3no layers of 15mm acoustic plasterboard (min. 12kg/m² per layer) on acoustic hangers to create a minimum 100mm void with minimum 50mm mineral wool insulation (10-33kg/m³ density).

On top of the first floor, include an FFT1 deep batten resilient floating floor as detailed below;

Table 7.1 – FFT1 Floating Floor



- 18 mm (min) t&g flooring board
- gypsum-based board nominal 13.5 kg/m²
- FFT1 resilient composite deep battens
- resilient layer must be continuous and pre-bonded to batten
- battens may have the resilient layer at the top or the bottom
- mineral wool quilt laid between battens
 - 13mm (min) 33-36 kg/m³, or
 - 25mm (min) 10-36 kg/m³
 or Collecta MICRO 15
- ensure any services do not bridge the resilient layer

Include resilient flanking strips around the perimeter of the flooring board to isolate floor from walls and skirting.

7.2 Flanking Paths

7.2.1 External Walls

In order to minimise flanking via the external walls, we would advise including an independent timber or metal frame lining system consisting of 2no layers of 15mm acoustic plasterboard (min. 12kg/m² per layer) with 50mm mineral wool (10-33kg/m³) both sides of the separating floor.

7.2.2 Lift Shaft

The existing lift shaft is indicated to be removed on the proposed floor plans. Ensure the floor section is filled in, in line with the existing separating floor and floor upgrades proposed in Section 7.1 above.

7.3 Commissioning

Once the above works are complete, a suitably qualified acoustician (SQA) should be employed to undertake new sound insulation tests between the ground and first floors in order for final music noise level (MNL) limits to be set to ensure proposed criteria in flats are met (refer to Section 2).

8. CONCLUSION

An environmental noise assessment and noise breakout assessment has been carried out for the proposed Apartments above 'Barcode', 92-94 High Street, Merthyr Tydfil, CF47 8UP.

Significant night-time $L_{Amax,F}$ events from people shouting/singing out on the street have been measured.

Assessments of the sound insulation performance of the separating floor have been carried out. As advised prior to commencing the works, music noise levels in the bar need to be limited to background levels (limits set out in Table 5.1 of this report) in conjunction with upgrades to the constructions.

To help gauge these levels, we can advise these are in line with the current low music levels being used during COVID-19 opening restrictions (as played to us by the operator during our tests).

The operator should confirm they are happy to trade at these levels going forward.

An external building fabric assessment has been carried out. Critical facades requiring additional sound insulation measures have been highlighted and specifications for external wall, roof, ventilation and glazing are included.

Noise intrusion from night-life on the street outside is indicated to be significant and high performance secondary glazing and mechanical ventilation is required to control night-time $L_{Amax,F}$ events.

APPENDIX A - ACOUSTIC TERMINOLOGY

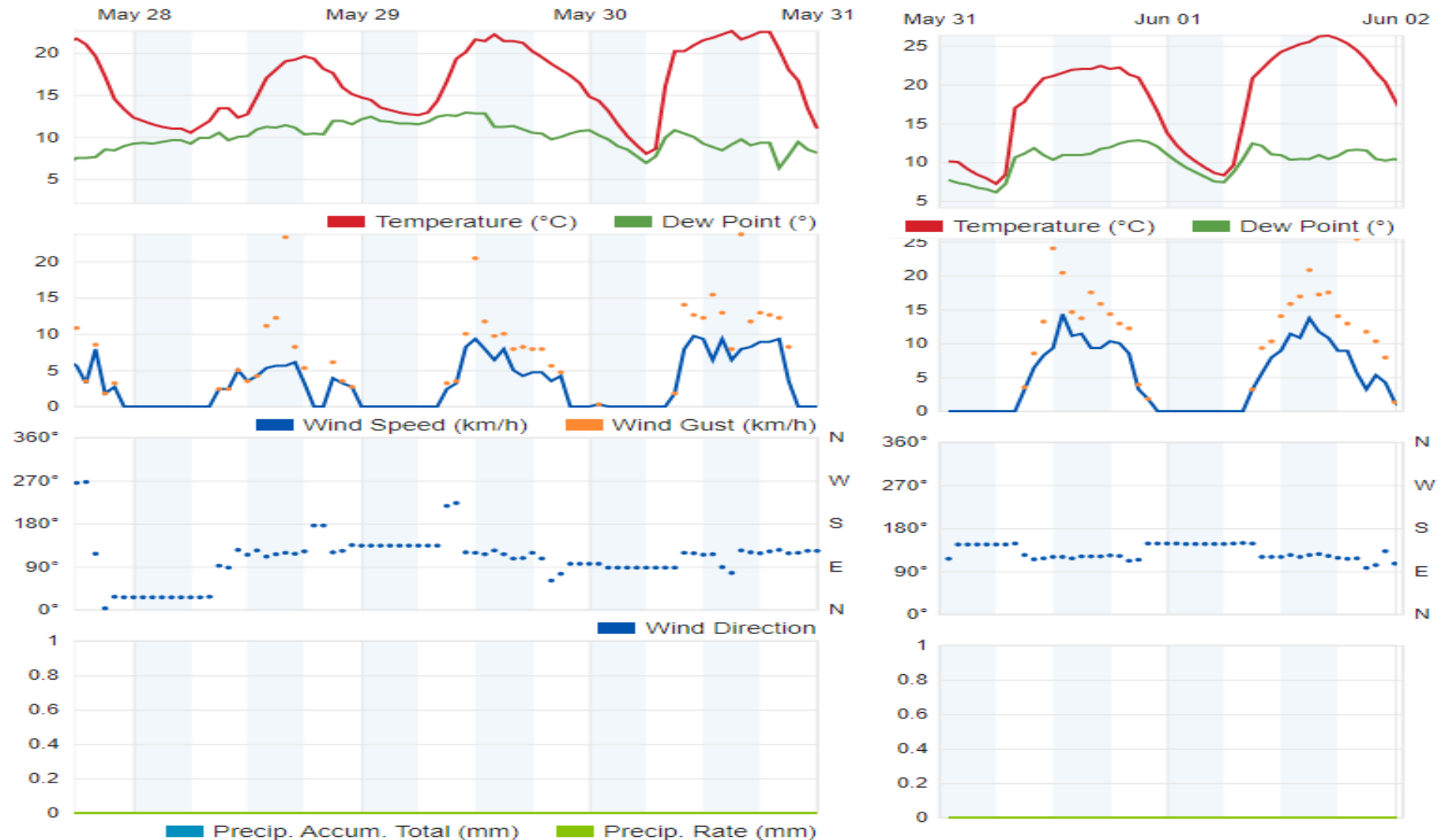
Human response to noise depends on a number of factors including loudness, frequency content and variations in level with time. Various frequency weightings and statistical indices have been developed in order to objectively quantify 'annoyance'.

The following units have been used in this report:

dB(A)	The sound pressure level A-weighted to correspond with the frequency response of the human ear and therefore a persons' subjective response to frequency content.
L_{eq}	The equivalent continuous sound level is a notional steady state level which over a quoted time period would have the same acoustic energy content as the actual fluctuating noise measured over that period.
L_{max}	The highest instantaneous sound level recorded during the measurement period.
L_{10}	The sound level which is exceeded for 10% of the measurement period. i.e. The level exceeded for 6 minutes of a 1 hour measurement - used as a measure of background noise.
L_{90}	The sound level which is exceeded for 90% of the measurement period. i.e. The level exceeded for 54 minutes of a 1 hour measurement - used as a measure of background noise.
MNL	'Music Noise Level', the L_{Aeq} of the music measured at a particular location.
Pink Noise	A random signal of every frequency in which each higher octave drops off 3 dB. The lower octaves have more power, and the higher octaves have less power. Pink noise is used to test loudspeakers and "tune" a room for optimum audio reproduction or masking systems.
SSR	Sound sensitive receiver

APPENDIX B - DIAGRAMS, GRAPHS AND TABLES

Figure B.1 – Approximate Weather History for Friday, 28 May - Tuesday, 01 June 2021



Note: Taken from www.wunderground.com - weather station IABERD38 located in Aberdare [Elev 49 m, 51.706° N, 3.424° W]

Figure B.2 – Time History at Position A (Friday, 28 May 2021 to Tuesday, 01 June 2021)

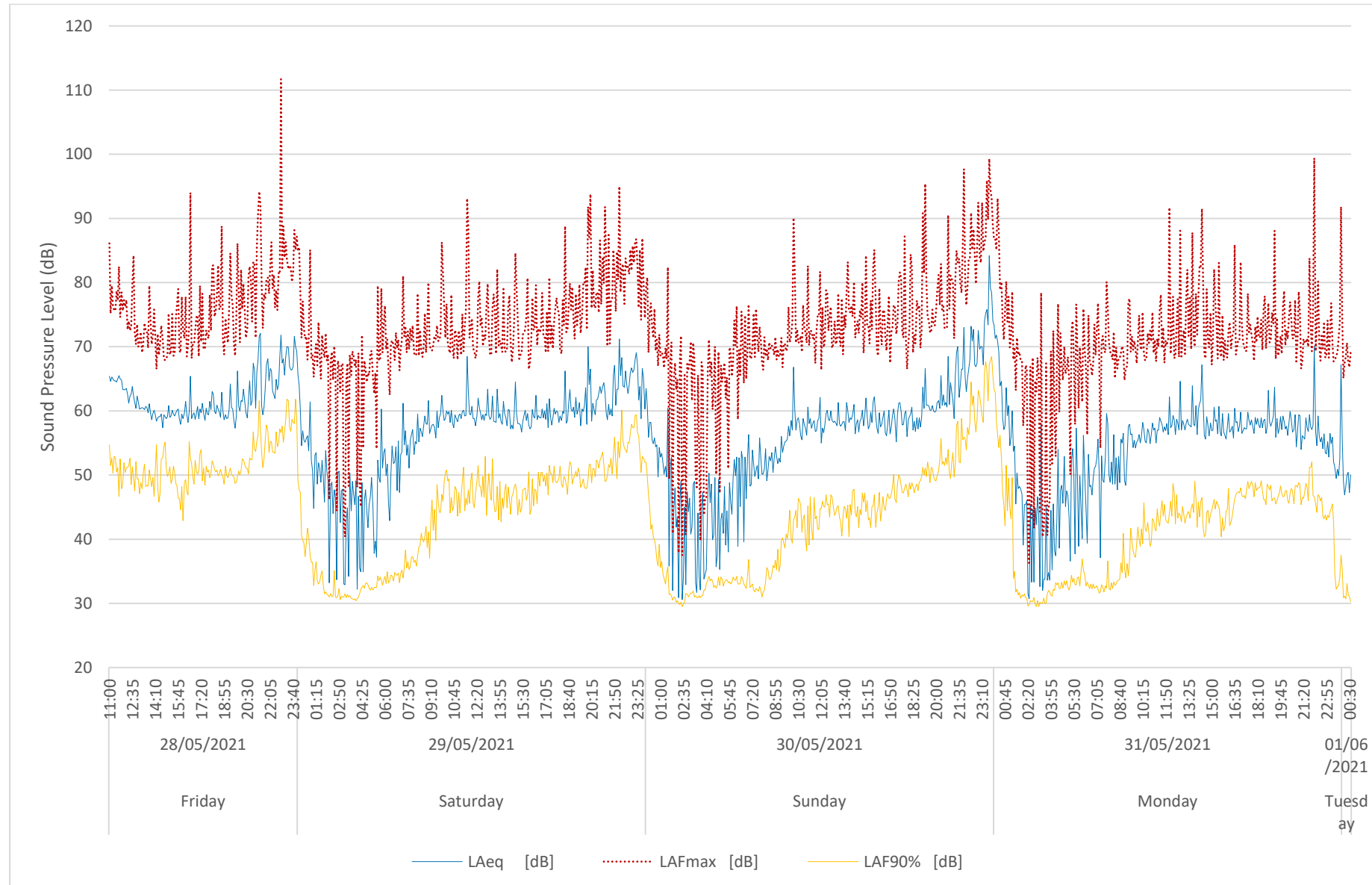


Figure B.3 – Time History at Position B (Friday, 28 May 2021 to Monday, 31 May 2021)

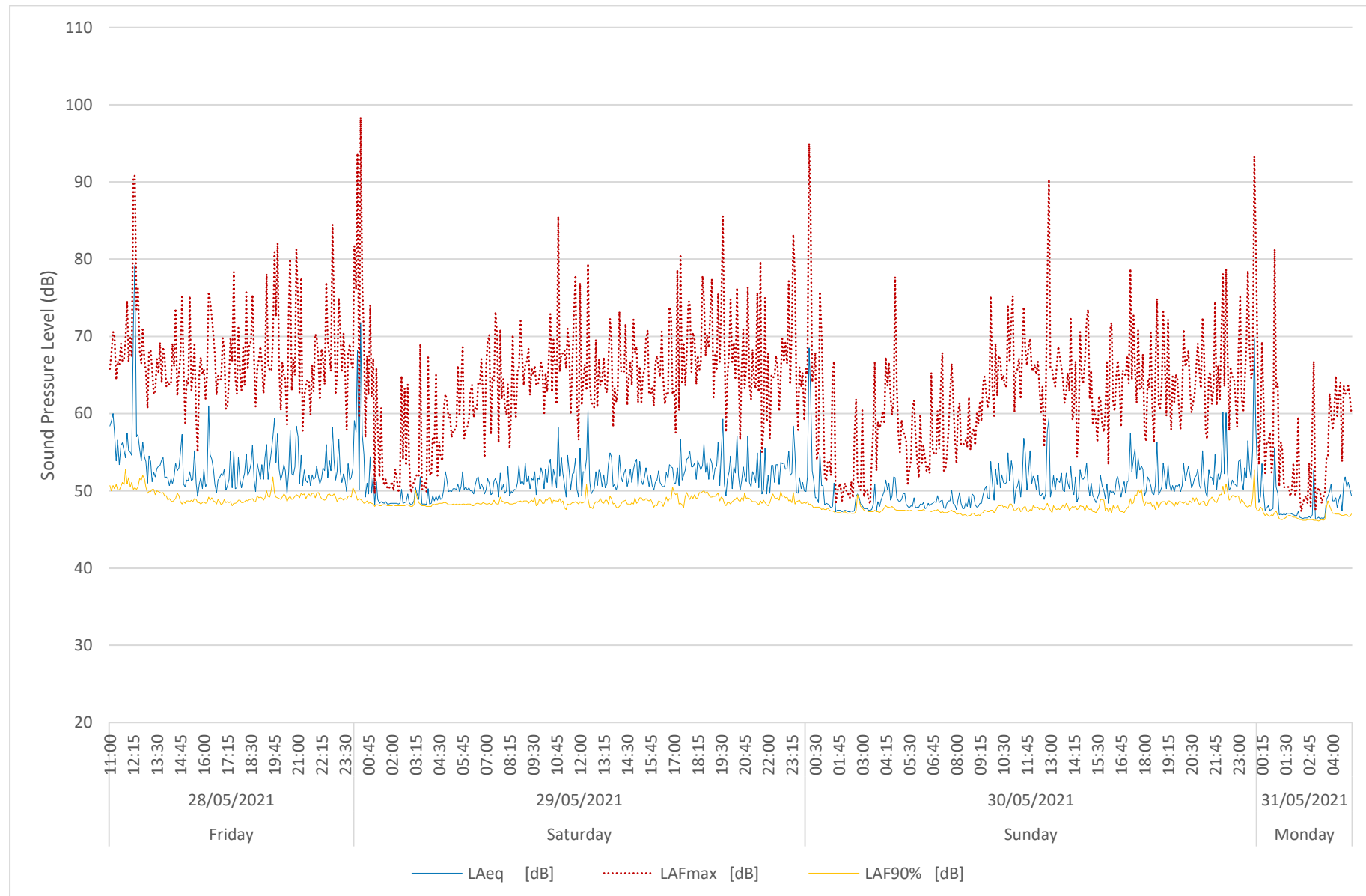


Figure B.4 – Statistical Analysis of Background Sound Levels Measured at Position A (Friday, 28 May - Monday, 31 May 2021)

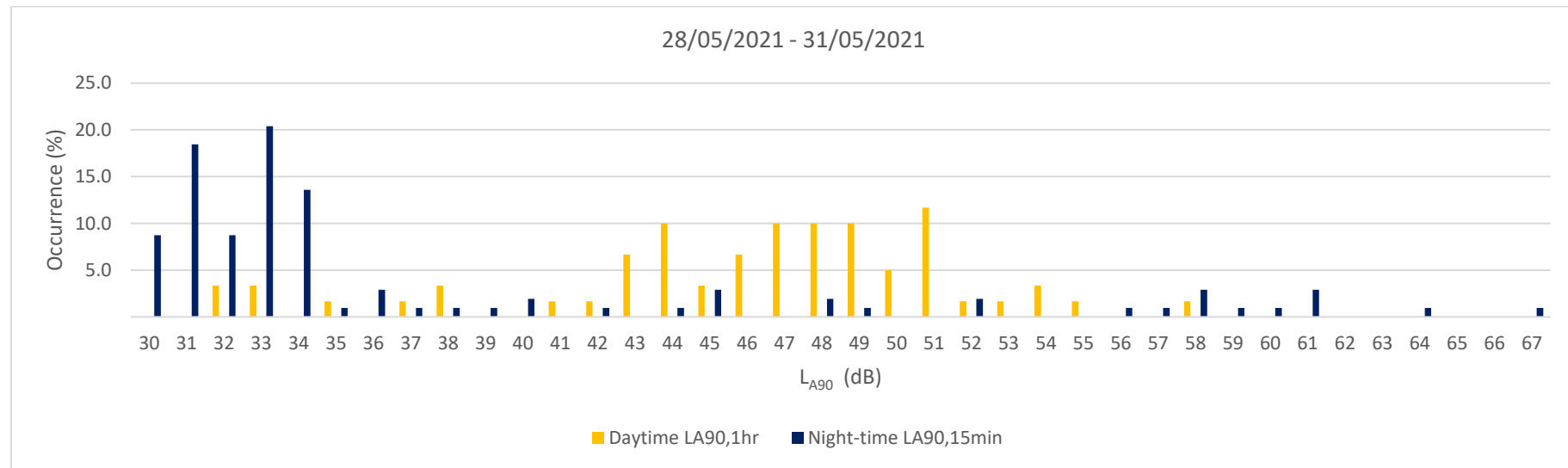


Figure B.5 – Statistical Analysis of Background Sound Levels Measured at Position B (Friday, 28 May - Sunday, 30 May 2021)

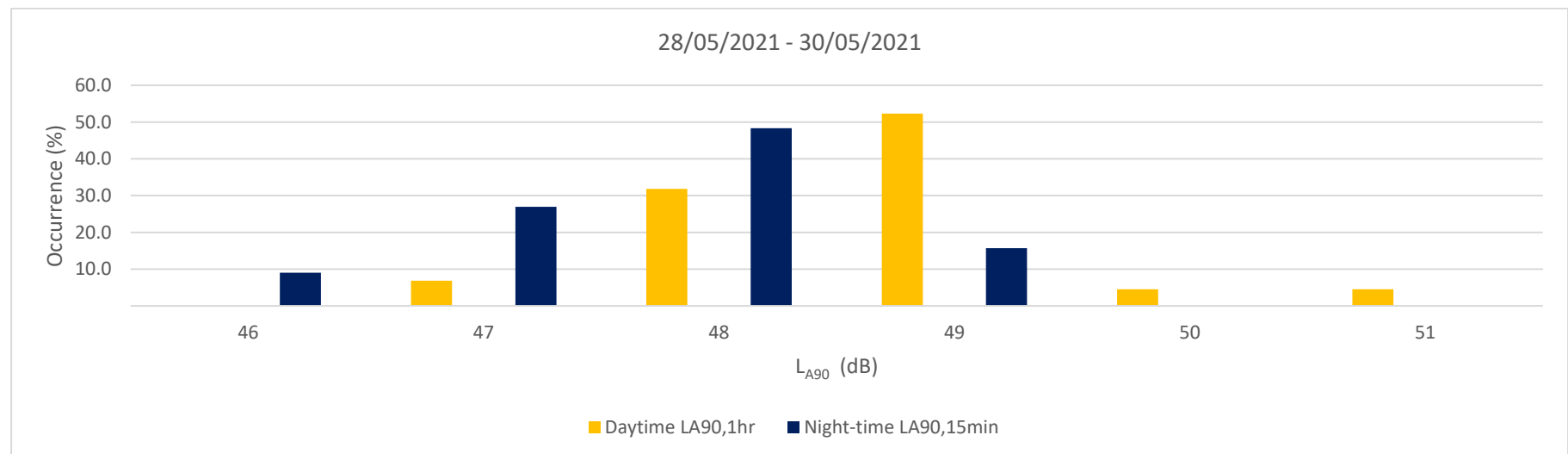


Figure B.6 – Barcode Music Breakout Test to First and Second Floors (Typical Pre-Pandemic Levels Set by Operator)

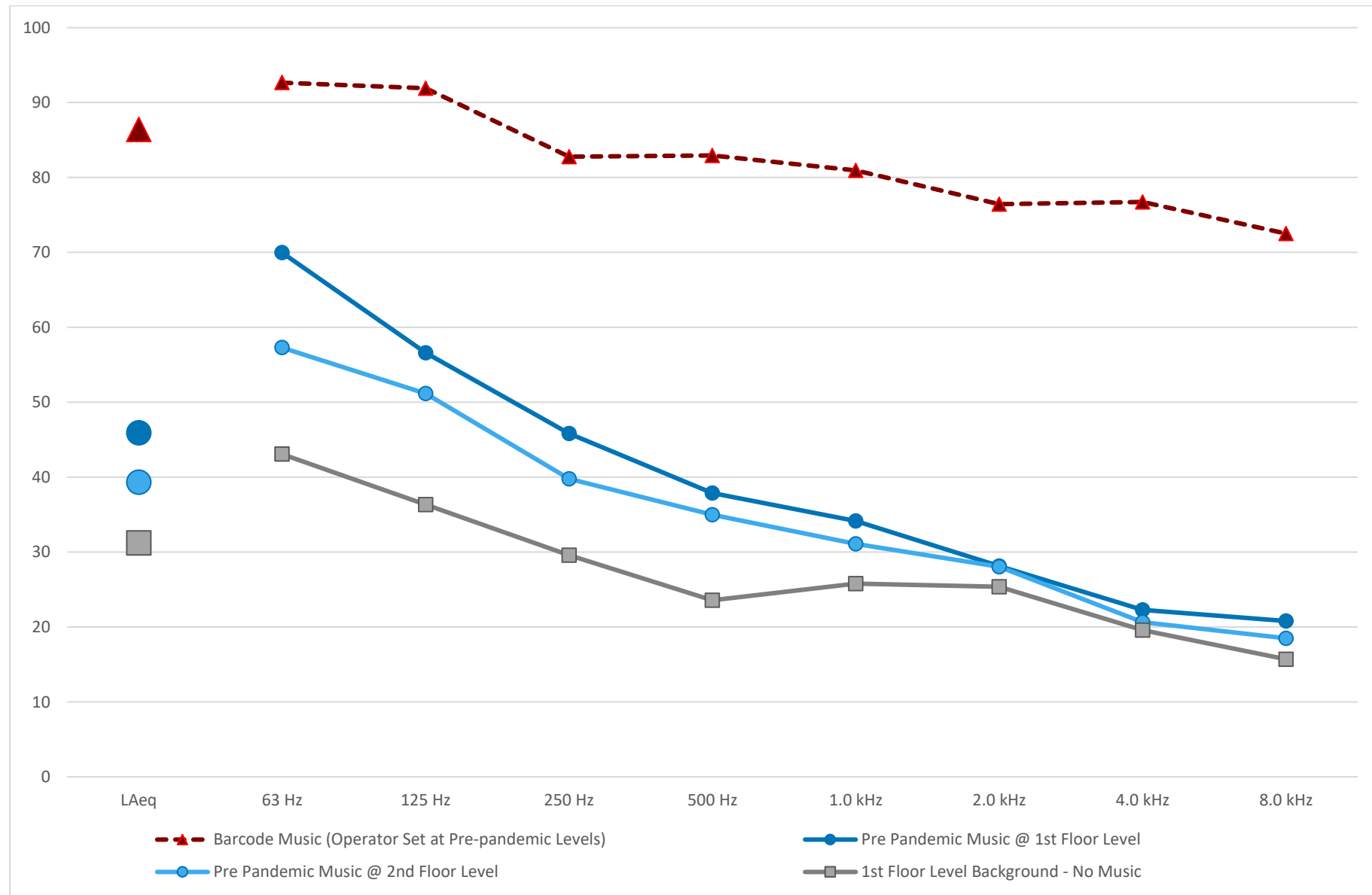


Figure B.7 – Barcode Music Breakout Test to External Front (Typical Pre-Pandemic Levels Set by Operator)

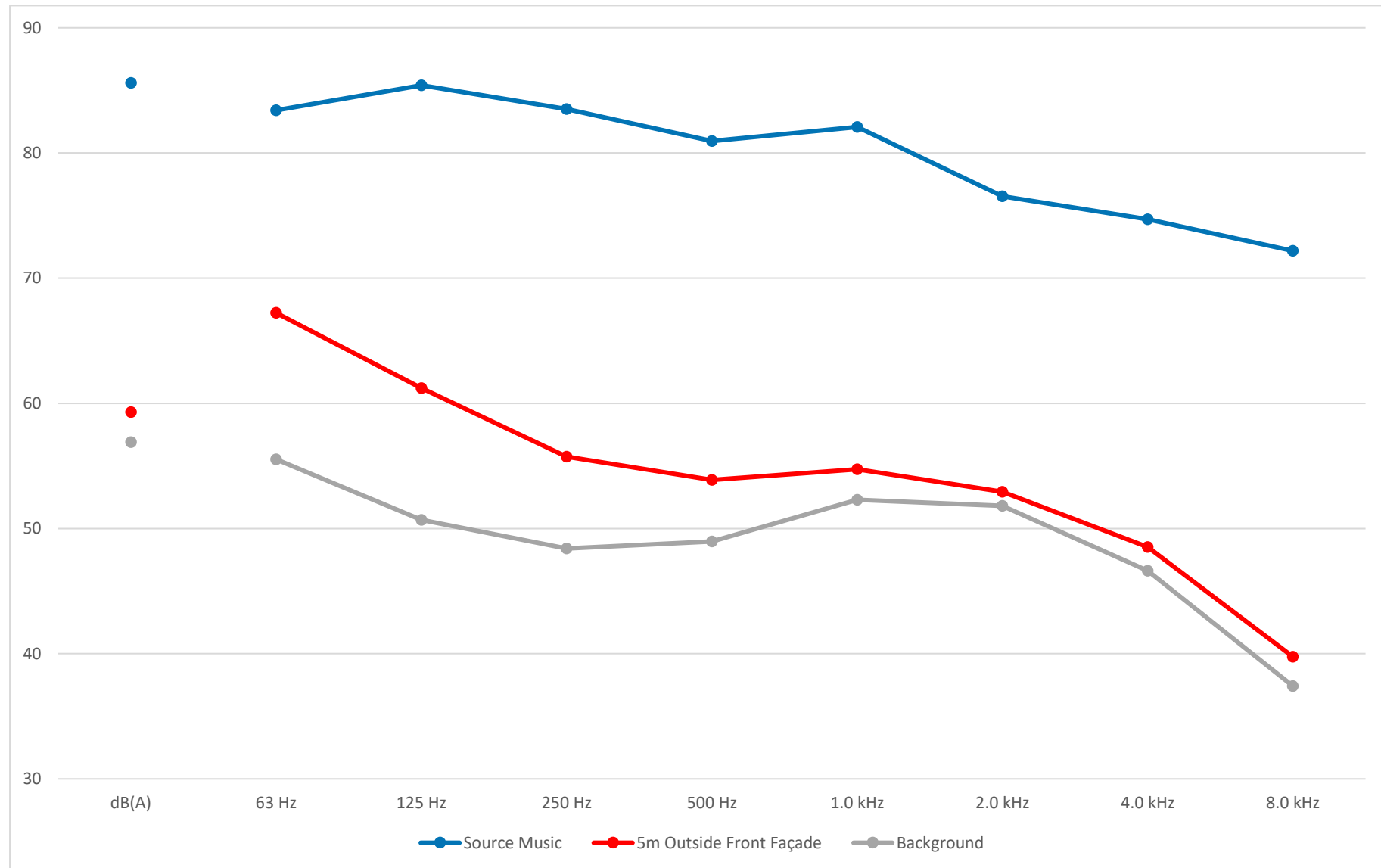
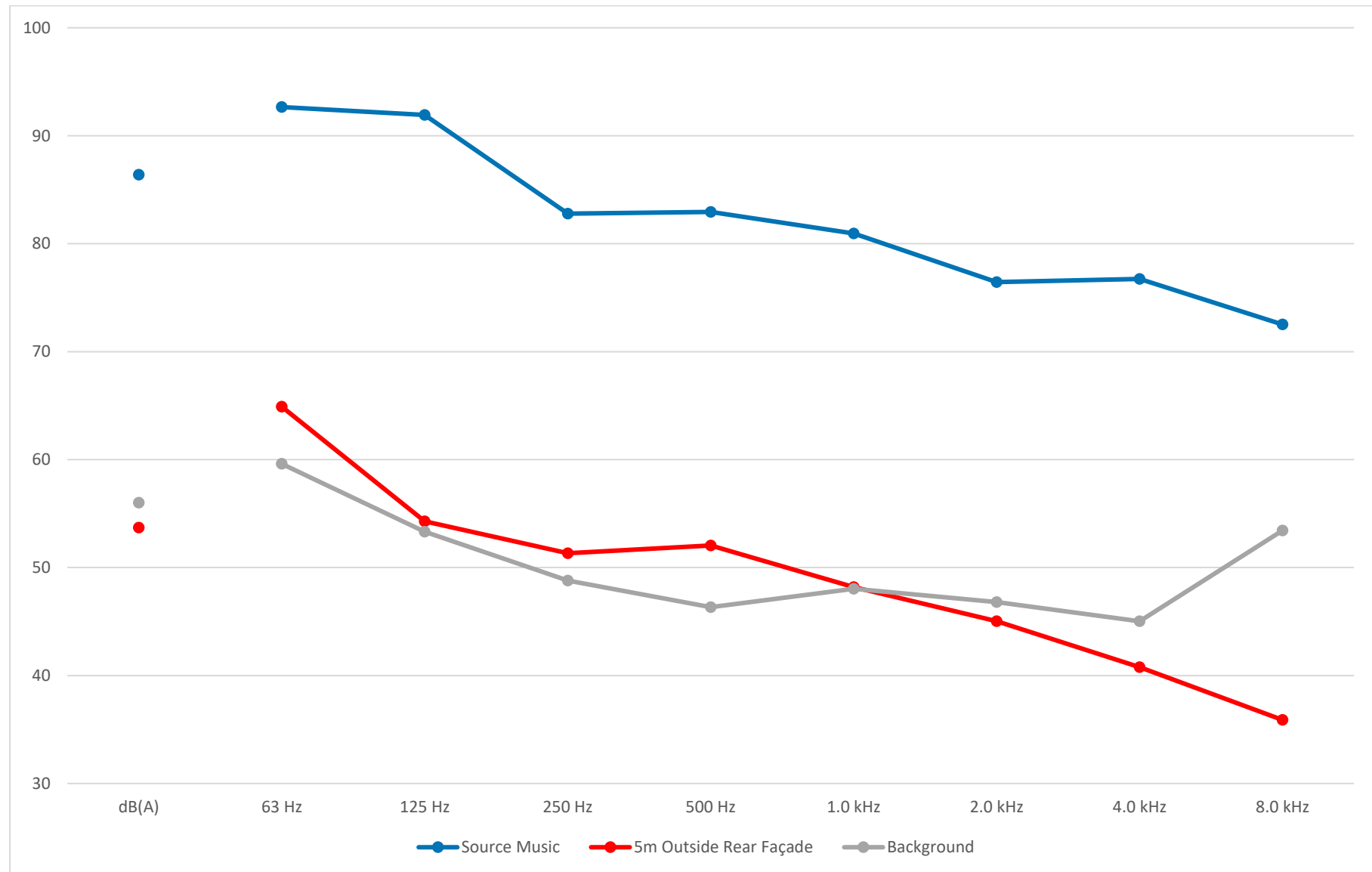


Figure B.8 – Barcode Music Breakout Test to External Rear (Typical Pre-Pandemic Levels Set by Operator)



APPENDIX C – SOUND INSULATION TEST FORMS

Standardized level difference according to ISO 140: Part 4 - 1998; Rating according to ISO 717: Part 1 - 1997

Client:	G & B INVESTMENTS LTD	Date of Test:	28/05/2021	Source room volume:	720 m ³
Project:	Barcode, 92-94 High Street, Merthyr Tydfil, CF47 8UP			Receiving room volume:	720 m ³
Test Description:	Ground Floor - Bar to 1st Floor - Front			Partition area:	240 m ²

Details of Construction: Existing 'beam & block' concrete floor with ceiling below , directly fixed to underside of the floor.

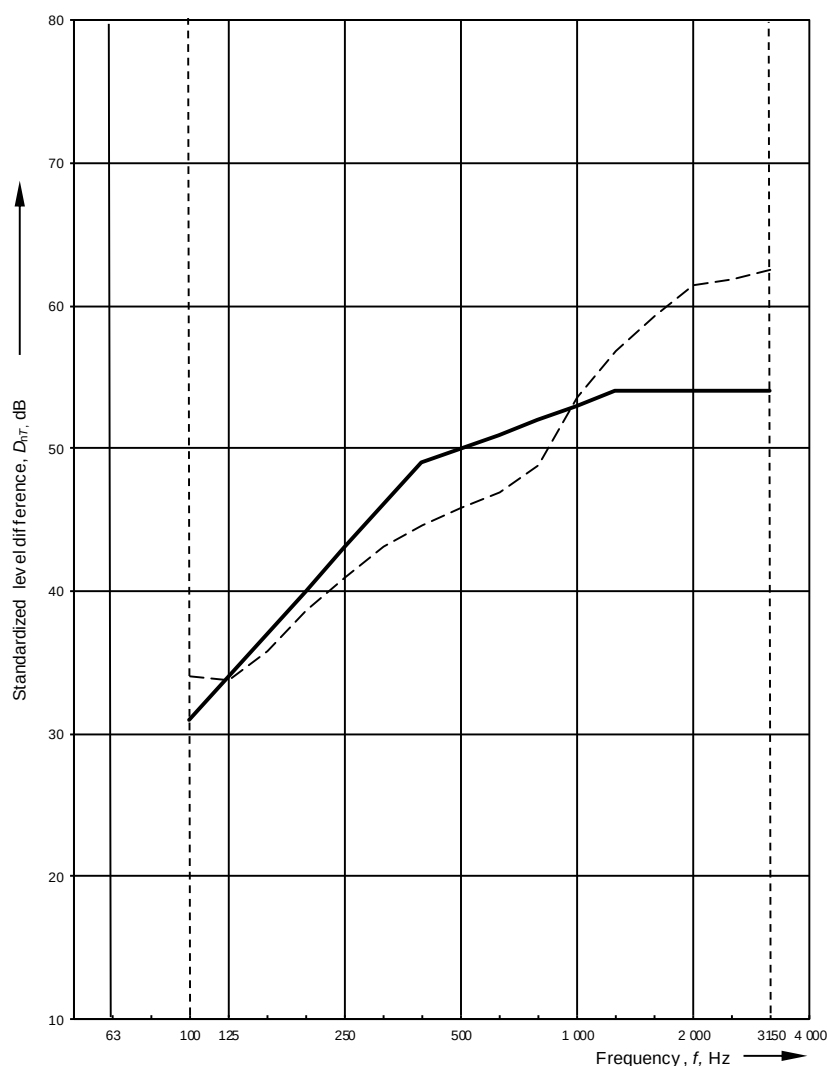
Figure : 6048/ASIF01

----- Frequency range according to the
 ———— curve of reference values (ISO 717: Part 1)

$$D_{nT,w} + C_{tr} = 46\text{dB}$$

Frequency f Hz	D_{nT} (one-third octave) dB
50	
63	
80	
100	34.0
125	33.7
160	35.8
200	38.6
250	41.0
315	43.1
400	44.6
500	45.9
630	46.9
800	48.8
1 000	53.6
1 250	≥56.9
1 600	≥59.3
2 000	≥61.4
2 500	≥61.9
3 150	≥62.5
4 000	
5 000	

* indicates the limit of measurement due to background noise.



Rating according to ISO 717 : Part 1 - 1997

$$D_{nT,w}(C;C_{tr}) = 50 \quad (-1 \ ; \ -4 \)\text{dB};$$

Total Deviation = 23.6

Evaluation based on field measurement
results obtained by engineering method

Maximum Deviation = 4.4

No. of test report:	6048/ASIF01
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Date: 28/05/2021

Hunter Acoustics

Signature:

Ph. Owen

Standardized level difference according to ISO 140: Part 4 - 1998; Rating according to ISO 717: Part 1 - 1997
Field measurement of airborne sound insulation between rooms

Client: G & B INVESTMENTS LTD Date of Test: 28/05/2021 Source room volume: 720 m³
 Project: Barcode, 92-94 High Street, Merthyr Tydfil, CF47 8UP Receiving room volume: 720 m³
 Test Description: Ground Floor - Bar to 2nd Floor - Front Partition area: 240 m²

Details of Construction: Existing 'beam & block' concrete floor with ceiling below, directly fixed to underside of the floor.

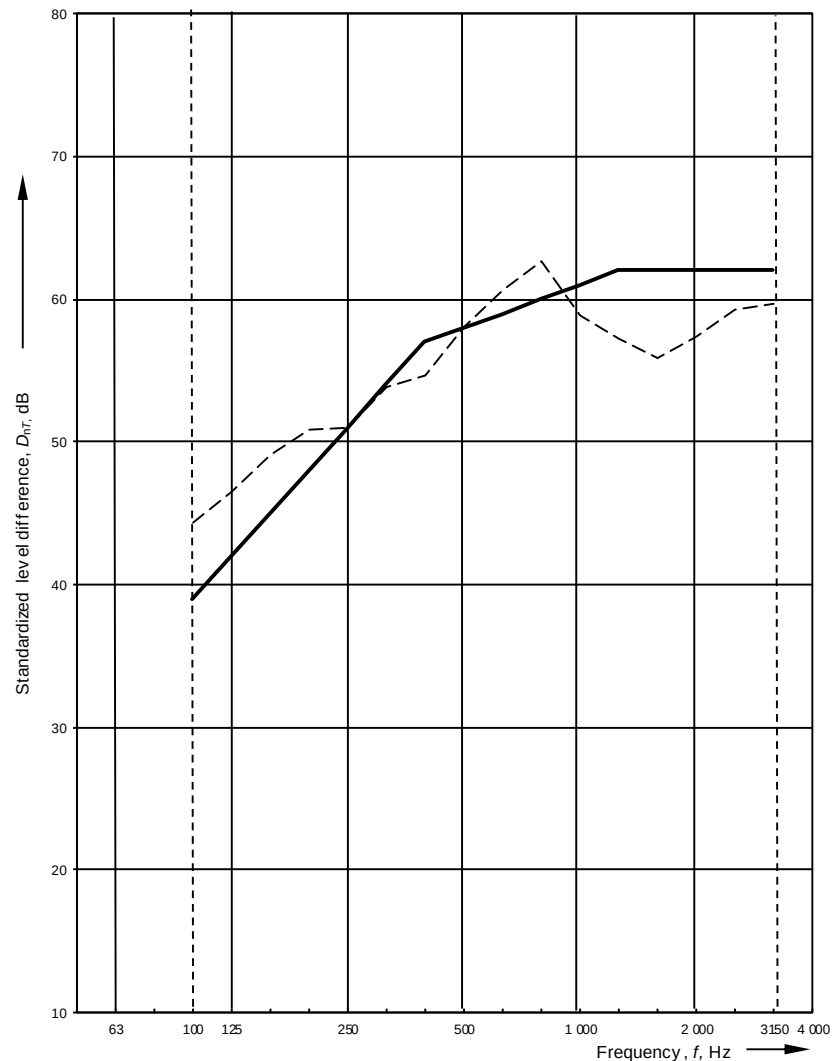
Figure : 6048/ASIF02

----- Frequency range according to the
 ——— curve of reference values (ISO 717: Part 1)

$$D_{nT,w} + C_{tr} = 56 \text{ dB}$$

Frequency <i>f</i> Hz	<i>D</i> _{nT} (one-third octave) dB
50	
63	
80	
100	44.3
125	46.5
160	49.1
200	50.9
250	51.0
315	53.9
400	54.7
500	58.1
630	60.7
800	≥62.7
1 000	≥58.9
1 250	57.2
1 600	55.9
2 000	57.4
2 500	59.3
3 150	≥59.7
4 000	
5 000	

* indicates the limit of measurement due to background noise.



Rating according to ISO 717 : Part 1 - 1997

$$D_{nT,w}(C;C_{tr}) = 58 \quad (-1 ; -2) \text{ dB};$$

Total Deviation = 25

Evaluation based on field measurement results obtained by engineering method

Maximum Deviation = 6.1

No. of test report: 6048/ASIF02

Date: 28/05/2021

Hunter Acoustics

Signature:

Ph. Owen

Standardized level difference according to ISO 140: Part 4 - 1998; Rating according to ISO 717: Part 1 - 1997
Field measurement of airborne sound insulation between rooms

Client: G & B INVESTMENTS LTD Date of Test: 28/05/2021 Source room volume: 720 m³
 Project: Barcode, 92-94 High Street, Merthyr Tydfil, CF47 8UP Receiving room volume: 720 m³
 Test Description: Ground Floor - Bar to 1st Floor - Middle Partition area: 240 m²

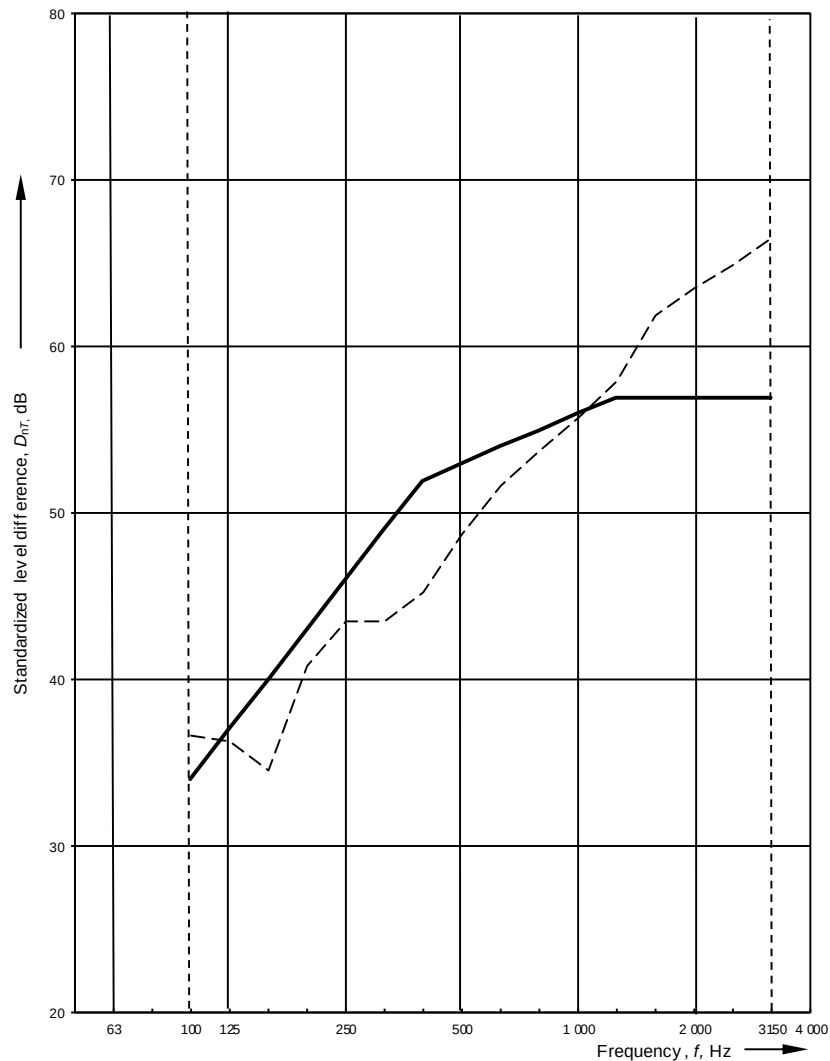
Details of Construction: Existing 'beam & block' concrete floor with ceiling below, directly fixed to underside of the floor.

Figure : 6048/ASIF03

----- Frequency range according to the
 ——— curve of reference values (ISO 717: Part 1)

$$D_{nT,w} + C_{tr} = 47 \text{ dB}$$

Frequency <i>f</i> Hz	<i>D</i> _{nT} (one-third octave) dB
50	
63	
80	
100	36.7
125	36.3
160	34.5
200	40.8
250	43.5
315	43.5
400	45.3
500	48.8
630	51.7
800	53.8
1 000	55.7
1 250	57.9
1 600	61.9
2 000	63.5
2 500	64.9
3 150	66.6
4 000	
5 000	



Rating according to ISO 717 : Part 1 - 1997

$$D_{nT,w}(C;C_{tr}) = 53 \quad (-2 \ ; \ -6) \text{ dB};$$

Total Deviation = 31.1

Evaluation based on field measurement
 results obtained by engineering method

Maximum Deviation = 6.7

No. of test report: 6048/ASIF03

Date: 28/05/2021

Hunter Acoustics

Signature:

Ph. Owen

Standardized level difference according to ISO 140: Part 4 - 1998; Rating according to ISO 717: Part 1 - 1997
Field measurement of airborne sound insulation between rooms

Client: G & B INVESTMENTS LTD Date of Test: 28/05/2021 Source room volume: 720 m³
 Project: Barcode, 92-94 High Street, Merthyr Tydfil, CF47 8UP Receiving room volume: 720 m³
 Test Description: Ground Floor - Bar to 2nd Floor - Middle Partition area: 240 m²

Details of Construction: Existing 'beam & block' concrete floor with ceiling below, directly fixed to underside of the floor.

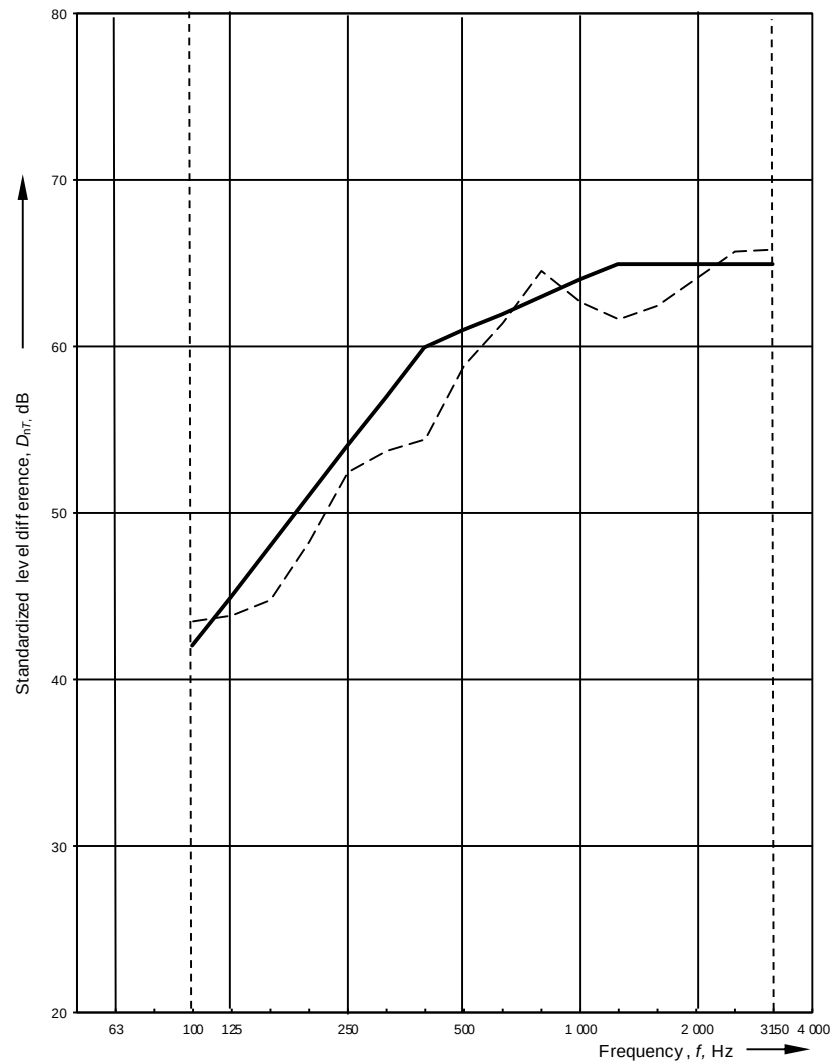
Figure : 6048/ASIF04

----- Frequency range according to the
 ——— curve of reference values (ISO 717: Part 1)

$D_{nT,w} + C_{tr} = 56\text{dB}$

Frequency f Hz	D_{nT} (one-third octave) dB
50	
63	
80	
100	43.5
125	43.9
160	44.8
200	48.3
250	52.5
315	53.8
400	54.5
500	58.9
630	61.4
800	64.6
1 000	≥62.7
1 250	≥61.7
1 600	≥62.5
2 000	≥64.1
2 500	≥65.7
3 150	≥65.8
4 000	
5 000	

* indicates the limit of measurement due to background noise.



Rating according to ISO 717 : Part 1 - 1997

$D_{nT,w}(C;C_{tr}) = 61 \quad (-2 \ ; \ -5) \text{ dB};$

Total Deviation = 27.9

Evaluation based on field measurement results obtained by engineering method

Maximum Deviation = 5.5

No. of test report: 6048/ASIF04

Date: 28/05/2021

Hunter Acoustics

Signature:

Ph. Owen

Standardized level difference according to ISO 140: Part 4 - 1998; Rating according to ISO 717: Part 1 - 1997
Field measurement of airborne sound insulation between rooms

Client: G & B INVESTMENTS LTD Date of Test: 28/05/2021 Source room volume: 720 m³
 Project: Barcode, 92-94 High Street, Merthyr Tydfil, CF47 8UP Receiving room volume: 720 m³
 Test Description: Ground Floor - Bar to 1st Floor - Rear Partition area: 240 m²

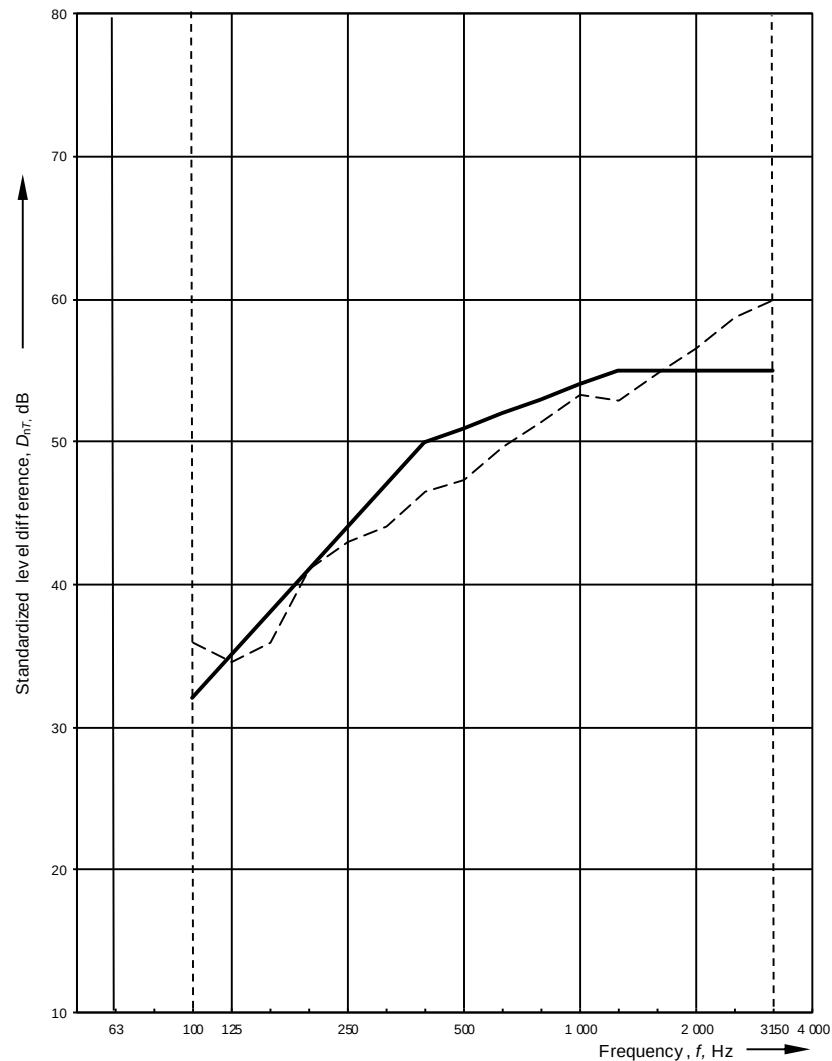
Details of Construction: Existing 'beam & block' concrete floor with ceiling below, directly fixed to underside of the floor.

Figure : 6048/ASIF05

----- Frequency range according to the
 ——— curve of reference values (ISO 717: Part 1)

$$D_{nT,w} + C_{tr} = 47 \text{ dB}$$

Frequency <i>f</i> Hz	<i>D</i> _{nT} (one-third octave) dB
50	
63	
80	
100	36.0
125	34.6
160	36.0
200	41.1
250	43.0
315	44.1
400	46.5
500	47.4
630	49.6
800	51.4
1 000	53.3
1 250	52.9
1 600	54.8
2 000	56.6
2 500	58.7
3 150	59.9
4 000	
5 000	



Rating according to ISO 717 : Part 1 - 1997

$$D_{nT,w}(C;C_{tr}) = 51 \quad (-1 \ ; \ -4) \text{ dB};$$

Total Deviation = 20.4

Evaluation based on field measurement
 results obtained by engineering method

Maximum Deviation = 3.6

No. of test report: 6048/ASIF05

Date: 28/05/2021

Hunter Acoustics

Signature:

Ph. Owen

Standardized level difference according to ISO 140: Part 4 - 1998; Rating according to ISO 717: Part 1 - 1997
Field measurement of airborne sound insulation between rooms

Client: G & B INVESTMENTS LTD Date of Test: 28/05/2021 Source room volume: 720 m³
 Project: Barcode, 92-94 High Street, Merthyr Tydfil, CF47 8UP Receiving room volume: 720 m³
 Test Description: Ground Floor - Bar to 2nd Floor - Rear Partition area: 240 m²

Details of Construction: Existing 'beam & block' concrete floor with ceiling below, directly fixed to underside of the floor.

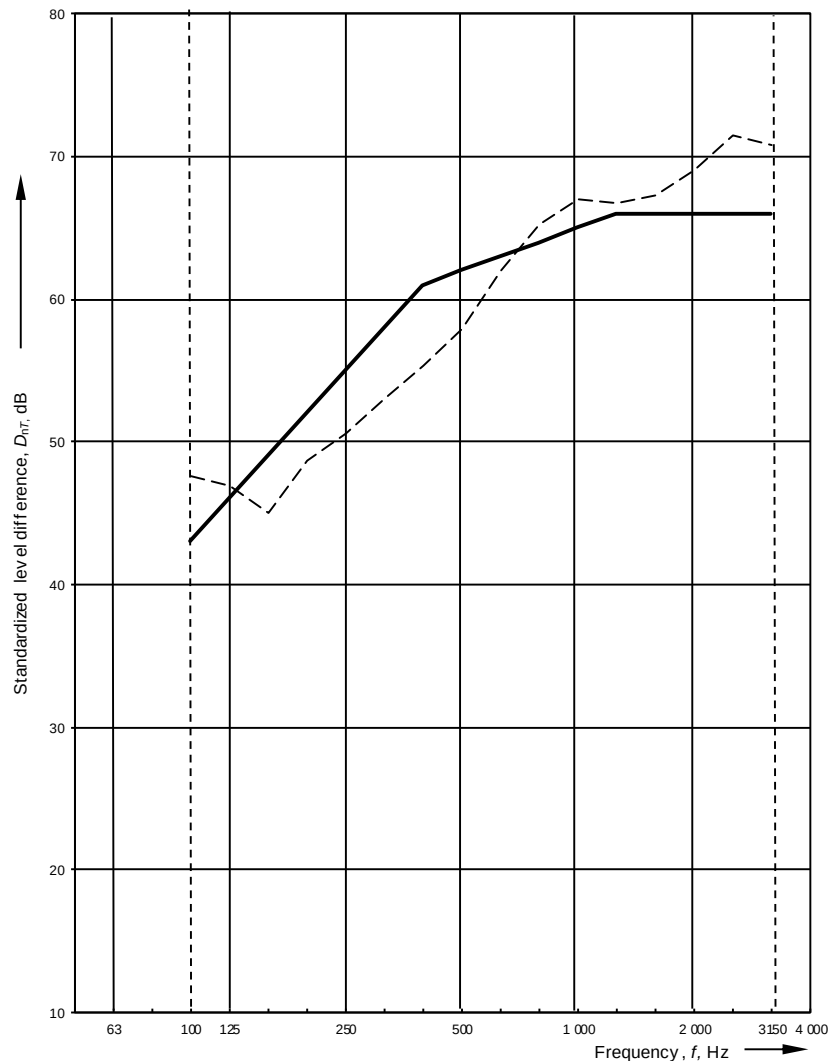
Figure : 6048/ASIF06

----- Frequency range according to the
 ——— curve of reference values (ISO 717: Part 1)

$$D_{nT,w} + C_{tr} = 57 \text{ dB}$$

Frequency <i>f</i> Hz	<i>D</i> _{nT} (one-third octave) dB
50	
63	
80	
100	47.6
125	46.9
160	45.0
200	48.7
250	50.6
315	53.1
400	55.4
500	57.9
630	62.0
800	65.2
1 000	≥67 *
1 250	≥66.8 *
1 600	≥67.3 *
2 000	≥69 *
2 500	≥71.5 *
3 150	≥70.8 *
4 000	
5 000	

* indicates the limit of measurement due to background noise.



Rating according to ISO 717 : Part 1 - 1997

$$D_{nT,w}(C;C_{tr}) = 62 \quad (-1 ; -5) \text{ dB};$$

Total Deviation = 27.3

Evaluation based on field measurement results obtained by engineering method

Maximum Deviation = 5.6

No. of test report: 6048/ASIF06

Date: 28/05/2021

Hunter Acoustics

Signature:

Ph. Owen

APPENDIX D - DRAWING LISTS

The following DRY Architects Limited drawings and documents have been used in our assessment;

Table D.1 – Drawing List

Drawing Title	Drawing Number	Rev	Date
LOCATION AND SITE PLAN	9435-101	P2	06/2021
PROPOSED PLANS	9435-103	P2	06/2021
EXISTING AND PROPOSED SECTIONS	9435-104	P2	06/2021
EXISTING AND PROPOSED ELEVATIONS	9435-105	P2	06/2021