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SOUND INSULATION REPORT

5-7 Wilbraham Road, Manchester M14 6JS

MARTEC ENVIRONMENTAL CONSULTANTS LTD

ANC REGISTERED TESTERS NO.134

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Site Visit by: M A Kenyon

Site Visit date: 28th February 2022

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1.0 INTRODUCTION

Martec Environmental Consultants Ltd were instructed to carry out sound insulation tests on the separating floor between the ground floor of 5-7 Wilbraham Road, Manchester M14 6JS [currently a restaurant] and the first floor the same building [currently a disused night-club]; the purpose of the tests was to determine the sound insulation performance of the floor.

This request arose as a result of an application to convert the upper floors of the building to residential accommodation.

This report describes the tests carried out by Mel Kenyon on 28th February 2022, the equipment used, the results obtained, and draws conclusions as to the performance of the structure in comparison with the standards detailed in Annex H of BS8233:2014. The detailed result graphs appear at the rear of the report.

2.0 CONSTRUCTION

From an examination of the first floor [disused nightclub] level of the building, there appear to be two distinct constructions; the No.5 half of the building [with the pitched roof] has a timber-based floor between ground and first floor levels; whereas the No.7 half of the building [with a flat roof] appears to have a 150mm concrete slab floor between the same two levels. Also apparent from the inspection, large areas of both floors were missing, and in the 'timber section' the plasterboard ceiling was

fixed directly to the underside of the joists, it is not clear if there was a secondary ceiling below. In the 'concrete section' there was a 400mm ceiling void which appeared to be empty.

Clearly for a sound insulation test, with large areas of the floor missing, essentially only the performance of the ceiling would be being tested. Accordingly, a single test was conducted on the 'timber side' [No.5] of the building.

We are instructed that the ground floor 'Nayaab Buffet Restaurant' operates as follows:

1. Music is played at background/ambient levels only.
2. There is no live music or amplified music events
3. Operational hours are:
 - a. Monday to Sunday 16:00 to 23:00 hours

3.0 CRITERIA

3.1 Manchester City Council 'Planning & Noise – Technical Guidance'

Having looked through the local authority's guidance, there are no criteria that are relevant to the circumstances of noise breakout from a bar; Section 3.6.1.2 deals with "Entertainment Venues" however, the guidance, and the documents on which it is based, is centred on the impact of amplified music noise; here the noise would be of the background variety, i.e. the music noise would not be a prominent feature.

Section 3.6.1.3 considers 'Mixed Use Developments' and an example would be "*...a proposal for a bar or club within the same building residential properties*". Reference is made back to Section 3.6.1.2 but presumably in the context of entertainment noise being prominent. Section 3.6.1.3 then **qualitatively** considers the noise impact.

Accordingly, it is considered appropriate to use alternative, and **quantitative** criteria as set out below.

3.2 British Standard 8233

BS8233:2014 is entitled "Guidance on sound insulation and noise reduction for buildings" and Annex H contains "Examples of design criteria adopted by hotel groups".

For airborne sound insulation, Annex H sets out criteria in terms of a single number value either in terms of $D_{nT,w}$ or in terms of $D_{nT,w}+C_{tr}$; these are forms of weighted averages of performance across the range of frequencies. C_{tr} is a spectrum adaptation term designed to give more weight to the performance of separating structures at low frequencies.

In Annex H of BS.8233:2014 the nearest category to this case is a recommended sound insulation of 60 dB $D_{nT,w}$ between a bedroom and a restaurant/bar within the same hotel.

In Annex H, there is also the criteria for "Bedroom - Other tenancies" of 65 dB $D_{nT,w}$. The Association of Noise Consultants commented on Annex H of BS8233:2014. In fairness they didn't like most of the recommendations in Annex H; in particular they stated:

"The most obvious examples of flaws are the criteria for bedroom to other tenancies (which could vary from a library to a nightclub) or plant room (which could vary from a tank room to a diesel generator) or bar (which could vary from a small boutique bar or to a large one with loud music or raucous groups watching football)."

Given the proposed operational hours, the proposed character of the restaurant on the ground floor, and comments of the ANC, it is considered that the "Bedroom - Restaurant/bar" criterion of 60 dB $D_{nT,w}$ would apply.

3.3 Building Regulations

For airborne sound insulation, Part E of The Building Regulations relies on a single number value for assessment of sound insulation; this term is known as $D_{nT,w}+C_{tr}$; $D_{nT,w}$ was the previous single figure term and C_{tr} is a spectrum adaptation term designed to give more weight to the performance of separating structures at low frequencies. For dwellings and rooms for residential purposes formed by a material change of use, the airborne sound insulation of both separating walls and floors should achieve a value of 43 dB $D_{nT,w}+C_{tr}$ or higher. The larger the $D_{nT,w}+C_{tr}$ the better the airborne sound insulation.

For comparison 43 dB $D_{nT,w}+C_{tr}$ approximately equates to 47 to 53 dB $D_{nT,w}+C_{tr}$ depending on the construction, i.e. a significantly lower performance standard than the 60 dB $D_{nT,w}$ criterion from BS8233 Annex H. Although not strictly relevant to the current circumstances, it is worth noting that the Building Regulations specify this degree of sound insulation for structures separating residential from commercial spaces.

4.0 MEASUREMENTS

4.1 Sound Insulation Tests

The airborne sound insulation of the separating structures was tested in broad accordance with the methodology of ISO 140:1998 Part 4 and single number values for $D_{nT,w}$ & $D_{nT,w}+C_{tr}$ were calculated using the methodology of ISO 717: 1996 part 1.

The source level for each room was determined according to the following method. The sound sources were placed on stands in the ground floor restaurant and the second source position was at least 1.4m from the first; the minimum distance from each speaker to any room boundary was at least 500mm and the minimum difference in those distances was 100mm. The speakers operated simultaneously using separate, uncorrelated, pink noise sources.

A manual sweep measurement was made over the course of 30 seconds and any differences between adjacent 1/3 octaves, greater than 6 dB, were eliminated by a combination of adjusting the source settings, moving the loudspeakers or by moving diffusers (or furniture). Similar measurements were made in the receiver space for both the received levels and background.

No part of the microphone swept path was closer than 0.5m from the room boundaries.

4.1.1 Instrumentation

Details of the measuring instrumentation are shown in Table 0 below:

Model	Instrument	Serial No.	Lab Cal Certificate	Re-Calibration Due
E Svan 957	Sound Level Meter	23202	00001202-3	31/03/2023
Svan SV12L	Preamplifier	33542	00001202-3	31/03/2023
MTG MK255	Microphone	15795	00001202-3	31/03/2023
B&K 4231	Calibrator	2084928	00001202-1	31/03/2023
Behringer Eurolive B115	Speakers	S181100088AEA	n/a	n/a
Stereo recording of pink noise played on in-built MP3 player			n/a	n/a

Table 0: Instrumentation Used On-Site

4.1.2 Reverberation Time Measurements

The reverberation times were determined by using the sound level meter and its internal software or external PC software. The average value of T20 for six starting pistol impulses at six different source and receiver positions was used. Reverberation time calculations were made using the “reverse-Schroeder integration method”.

5.0 RESULTS

5.1 Sound Insulation Test Results

The detailed results appear in the Charts towards the rear of the report; the summary results are within Table 1 below:

Table 1: Airborne Sound Insulation Results [dB] - 28/02/2022						Criterion	Results		
ANC Test	Source	Vol Receiver (m3)	Vol Element (m3)	Element		D _{nT,w} (dB)	D _{nT,w} (dB)	C _{tr} (dB)	D _{nT,w} +C _{tr}
N/A	GF Restaurant LH side	>200	FF Nightclub LH Side	>200	Floor	≥60	38	-4	34

6.0 DISCUSSION OF RESULTS

6.1 British Standard 8233:2014

From Table 1, it can be seen that the measured sound insulation at 38 dB $D_{n,TW}$ was short of the BS8233 Annex H standard [≥ 60 dB $D_{n,TW}$]; therefore, additional works will be required to improve the sound insulation; however, the test essentially was only of the ceiling performance, given the substantial areas of the floor [both timber and concrete] that were missing.

It is considered that the measured performance is very good for the ceiling alone.

7.0 DISCUSSION AND CONCLUSIONS

Based on the above measurements, the current performance of the separating floor does not meet the criteria of Annex H of BS8233:2014, which given the missing floor areas is probably not surprising.

The measured performance, essentially of the ceiling alone, was reasonably good, indicating it should be possible to achieve significant improvements. For example Table E.2B of BS8233:2014 states that there are concrete and timber floor systems which can achieve performances of ≥ 60 dB $D_{n,TW}$, e.g. E-FT-1, E-FT-2 and E-FC-2.

It is recommended that a thorough investigation of the floor and ceiling constructions be conducted to assist with the design of suitable systems designed to achieve the BS8233 Annex H criterion.

It is considered that planning consent could be granted subject to a suitably worded condition governing the future sound insulation performance of the floors/ceilings separating the ground floor restaurant from the proposed first floor dwellings.

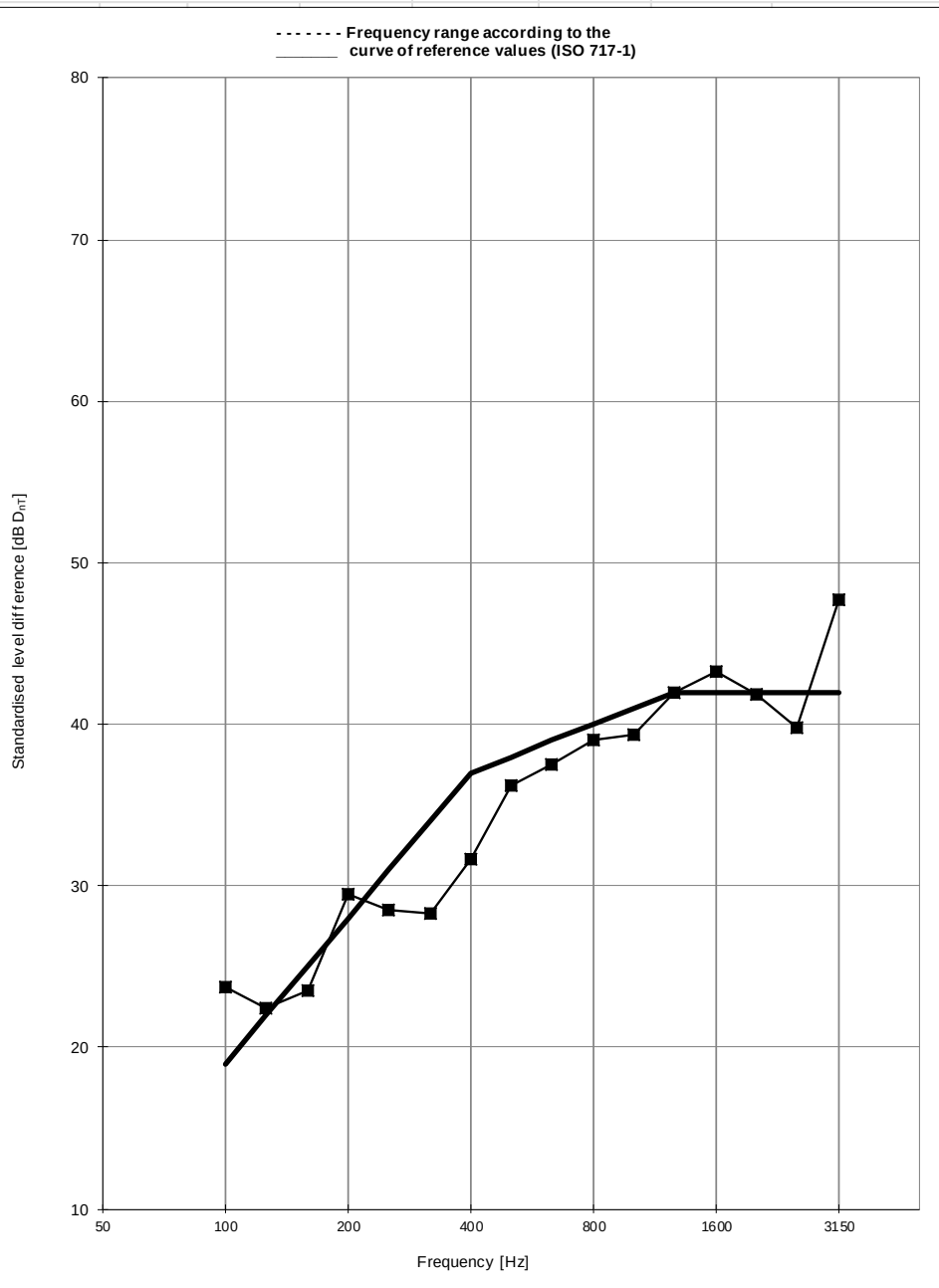
ISO 140-4:Part 4 - Standardised level Difference
Field measurements of airborne sound insulation between rooms

Client:	Tahir Ahmed				Test Date		28/02/2022	
Type	Floor				Version		2.48	
Site	5-7 Wilbraham Rd, Manchester M14 6JZ				Source Rm		GF Restaurant LH side	
Cnstrn	Essentially ceiling only - large sections of floor missing				Receiver Rm		FF Nightclub LH Side	

Source	>200
Rec	>200

Freq Hz	D _{IT} [1/3 oct] dB
50	--
63	--
80	--
100	23.7
125	22.4
160	23.5
200	29.5
250	28.5
315	28.3
400	31.7
500	36.2
630	37.5
800	39.0
1000	39.4
1250	42.0
1600	43.3
2000	41.9
2500	39.8
3150	47.7
4000	--
5000	--

Background noise
Extract Fan -C



Rating According to ISO 717-1

$D_{nT,w}(C; C_{tr})$	$= 38 (-1; -4) \text{ dB}$	$D_{nT,w} + C_{tr}$	$= 34 \text{ dB}$
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Evaluation based on field measurement results obtained in one-third octave bands by an engineering method

Test No.	9203	-A1	Test Institute: Martec Environmental Consultants Ltd
ANC Test	1340000001		
Date of Report	00-Jan-00		

APPENDIX 1

EXPLANATION OF ACOUSTIC TERMS

The **dB** or the decibel, is the unit of noise. The number of decibels or the level, is measured using a sound level meter. It is common for the sound level meter to filter or 'weight' the incoming sound so as to mimic the frequency response of the human ear. Such measurements are designated dB(A) or **dBA**.

A doubling of the sound is perceived, by most people, when the level has increased by 10 dB(A). The least discernible difference is 2 dB(A). Thus most people cannot distinguish between, say 30 and 31 dB(A).

If a noise varies over time then the equivalent continuous level, or **LAeq**, is the notional constant level of noise which would contain the same amount of acoustic energy as the time varying noise.

T_{mf} is a measure of the average reverberation time (echoiness) in mid frequencies for a space. The larger (longer) the T_{mf} the more echoy or "live" the space.

The **R_w** is a laboratory measure of the intrinsic airborne sound insulation capabilities of a structure. The **D_{nT,w}** is a measurement (or prediction) of the overall airborne sound insulation in situ and as such will depend flanking conditions, the proportion of the separating structure's area to the receiving room volume, and well as the maximum permissible reverberation time of the receiver room. The larger the R_w or D_{nT,w} the better the sound insulation.

L_{nw} and **L_{nT,w}** are the corresponding terms to R_w and D_{nT,w} respectively for impact sound (footfalls) measurements and values, but in this case the smaller the L_{nw} and L_{nT,w} the better the impact sound insulation.

APPENDIX 2

QUALIFICATIONS AND EXPERIENCE OF M.A. KENYON

My full name is Melville Alexander Kenyon. I am the principal of the firm of Martec Environmental Consultants Ltd, a consultancy company that specialises in environmental noise assessment and control. I graduated in 1982 with a Bachelor's degree in Engineering and subsequently a Master's degree in Environmental Acoustics. I have been a corporate member of the professional body for noise and vibration specialists, the Institute of Acoustics, since 1988, and have sat on the British Standards Committee dealing with noise in buildings [BS.8233:1999].

I have lectured at Liverpool John Moores University on the Diploma of Acoustics course and at Manchester Metropolitan University on their Environmental Health degree course. I am currently an MSc Supervisor at The University of Manchester.

Martec was formed in the 1970's and joined The Association of Noise Consultants in 1996 becoming accredited for sound insulation testing in 2005 [ANC Accredited Testers No.134].

Since its formation, Martec has advised many groups of both residents and developers about the problems of noise and vibration in the environment.