

Report VA5841.250409.ADR

**Grind, Number 2 St Michael's,
Manchester**

Sound Insulation Review

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Appendix A Acoustic Terminology

Report Version	Author	Approved	Changes	Date
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1. Introduction

The ground floor unit UG-002 at Number 2 St Michael's, Manchester is to be occupied by Grind, a restaurant operator.

Venta Acoustics has been commissioned by 101 Architecture+Design to undertake a review of the acoustic separation between this use, and the surrounding areas, as per the requirements of condition 35 of the planning consent, ref. 131612/JO/2021, which states:

35) Before any A1, A3, A4 or A5 use hereby approved commences, the premises shall be acoustically insulated and treated to limit the break out of noise in accordance with a noise study of that unit and a scheme of acoustic treatment that has been submitted to and approved in writing by the City Council as local planning authority. The scheme for that unit shall be implemented in full before the use commences.

Where entertainment noise is proposed the L_{Aeq} (entertainment noise) should be controlled to 10dB below the L_{A90} (without entertainment noise) at the facade of the nearest noise sensitive location, and internal noise levels at structurally adjoined residential properties in the 63Hz and 125Hz octave frequency bands should be controlled so as not to exceed (in habitable rooms) 47dB and 41dB, respectively.

Reason - To safeguard the amenities of the occupiers of the building and occupiers of nearby properties, pursuant to policies SP1 and DM1 of the Core Strategy.

2. Noise Criteria

The Landlord has provided the Mainer Associates Limited Stage 4 Acoustic Report [LAR] for the scheme, ref. 63068-MAI-ZZ-XX-RP-Y-0100.

This report provides noise limits at nearby noise sensitive receivers for the Old Nag's Head and the Radisson Edwardian Hotel, based upon the requirements of 10dB below the L_{A90} stated in the condition.

The Radisson Edwardian Hotel is located on the opposite side of Peter Street, whilst the Old Nag's Head is located on Jackson's Row, and hence is considered to be more representative of the noise levels at the nearest noise sensitive receiver to this unit, which will be the accommodation above the Sir Ralph Abercromby on Bootle Street, and so these noise limits have been used for this assessment. The requirements are replicated below.

Period	Amplified Music/Sound Limits Leq (dB) at octave band centre frequency (Hz)							
	63	125	250	500	1k	2k	4k	8k
Daytime	50	46	44	42	41	35	26	14
Night-time	47	44	43	40	38	32	24	12

Table 2.1 – Noise limits at noise sensitive receiver from Landlord acoustic report

In addition to the above, the internal noise levels in habitable rooms should be controlled to not exceed 47dB and 41dB in the 63Hz and 125Hz frequency bands, respectively.

There are no residential uses attached to the building, and so the most affected receiver would be accommodation above the Sir Ralph Abercromby.

3. Sound Insulation Review

A review of the landlord drawings and information in the accompanying LAR has been undertaken.

The information in this documentation about the constructions are described as below and will be used as the basis of this review.

3.1 Construction

The LAR provides information regarding the external façade of the new buildings, and provides the following minimum performances, which will be used as the bases for this assessment.

- External doors – R_w 35dB (LAR section 4.1.8)
- Glazed façade - EWS-03 (Schuco FWS) 10.76/16/10.76 – R_w 40dB, $R_w + C_{tr}$ 34dB (LAR section 4.2.6)

3.2 Intended Usage

The space is to be used as a restaurant, and it is intended to have ambient music during the daytime, and potential, occasional louder ambient music with a DJ during the evening.

3.3 Calculation

A composite calculation for the external façade including both the doors and the façade has been undertaken. The LAR does not provide spectral sound reduction data for the glazed façade or doors, so the spectral shape for a similar glazed unit has been used for the calculations, as well as a spectral loss for an R_w 35dB doorset.

The restaurant operator has confirmed that generally, the restaurant will have ambient music, but when they have a DJ, the music will still be at a level where customers would be able to hold a conversation without undue vocal effort.

To reflect this, a source noise level for a very lively restaurant with higher levels of ambient music has been used for the calculations, which are shown below in Table 3.1 for the noise levels with the doors closed.

Description	63	125	250	500	1k	2k	4k	8k	dB(A)
Source Level, L_p	66	68	73	75	74	70	63	54	78
Composite SRI	-20	-26	-28	-35	-42	-43	-48	-50	
Area Correction (18m x 3.5m)	18	18	18	18	18	18	18	18	
Distance Loss, 22m	-27	-27	-27	-27	-27	-27	-27	-27	
Loss of rev. component	-8	-8	-8	-8	-8	-8	-8	-8	
Radiation correction, $Q=2$	-6	-6	-6	-6	-6	-6	-6	-6	
L_p at Receiver	23	19	22	17	9	4	-8	-19	18
Daytime noise limit	50	46	44	42	41	35	26	14	
Excess over limit	N	N	N	N	N	N	N	N	

Table 3.1 – Noise level at residential receiver, doors closed

The above shows that the noise limit meets the noise requirements at the most affected receiver with the doors closed.

To ensure a pessimistic assessment, another set of calculations has been undertaken for noise breakout with the doors open. It should be noted that during the quietest parts of the day, in the late evening, it is likely that the doors would be closed except for customers entering and leaving the restaurant, and so the actual noise level from the premises would be considerably lower than predicted.

Description	63	125	250	500	1k	2k	4k	8k	dB(A)
Source Level, L_p	66	68	73	75	74	70	63	54	78
Composite SRI	-15	-16	-16	-17	-17	-17	-17	-17	
Area Correction (18m x 3.5m)	18	18	18	18	18	18	18	18	
Distance Loss, 22m	-27	-27	-27	-27	-27	-27	-27	-27	
Loss of rev. component	-8	-8	-8	-8	-8	-8	-8	-8	
Radiation correction, $Q=2$	-6	-6	-6	-6	-6	-6	-6	-6	
L_p at Receiver	28	29	34	35	34	30	23	14	38
Daytime noise limit	50	46	44	42	41	35	26	14	
Excess over limit	N	N	N	N	N	N	N	N	

Table 3.2 – Noise level at residential receiver, doors open

Again, the noise limits would be met at the nearby receiver. To assess internal noise levels, the external noise levels at 63Hz and 125Hz for the door open condition has been assessed, with a loss for a partially open, top hung casement window providing an overall reduction of 10dB, in line with the expected reduction discussed in BS8233.

Condition	63 Hz	125 Hz
External noise level	28 dB	29 dB
Loss for partially open window	10 dB	10 dB
Internal noise level	18 dB	19 dB
Limit	47 dB	41 dB

Table 3.3 – Internal noise levels, doors open

The results show that internal noise levels inside the habitable rooms would be significantly lower (better) than the requirement.

4. Conclusion

A review of the external building fabric and noise breakout has been undertaken by Venta Acoustics for unit UG-002 at 2 St Michael's, which is to be occupied by Grind restaurant, in the context of the requirements of condition 35 of the planning consent for the scheme.

The calculations show that the noise levels at the nearest noise sensitive receiver would meet the requirements of the planning condition, with doors to the restaurant both closed and open.

Jamie Duncan MIOA

APPENDIX A

Acoustic Terminology & Human Response to Broadband Sound

1.1 Acoustic Terminology

The human impact of sounds is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and variation in level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

Sound	Vibrations propagating through a medium (air, water, etc.) that are detectable by the auditory system.
Noise	Sound that is unwanted by or disturbing to the perceiver.
Frequency	The rate per second of vibration constituting a wave, measured in Hertz (Hz), where 1Hz = 1 vibration cycle per second. The human hearing can generally detect sound having frequencies in the range 20Hz to 20kHz. Frequency corresponds to the perception of 'pitch', with low frequencies producing low 'notes' and higher frequencies producing high 'notes'.
dB(A):	Human hearing is more susceptible to mid-frequency sounds than those at high and low frequencies. To take account of this in measurements and predictions, the 'A' weighting scale is used so that the level of sound corresponds roughly to the level as it is typically discerned by humans. The measured or calculated 'A' weighted sound level is designated as dB(A) or L_A . A notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc).
L_{eq} :	The concept of L_{eq} (equivalent continuous sound level) has primarily been used in assessing noise from industry, although its use is becoming more widespread in defining many other types of sounds, such as from amplified music and environmental sources such as aircraft and construction. Because L_{eq} is effectively a summation of a number of events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute sound limit.
L_{10} & L_{90} :	Statistical L_n indices are used to describe the level and the degree of fluctuation of non-steady sound. The term refers to the level exceeded for n% of the time. Hence, L_{10} is the level exceeded for 10% of the time and as such can be regarded as a typical maximum level. Similarly, L_{90} is the typical minimum level and is often used to describe background noise. It is common practice to use the L_{10} index to describe noise from traffic as, being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic flow.
L_{max} :	The maximum sound pressure level recorded over a given period. L_{max} is sometimes used in assessing environmental noise, where occasional loud events occur which might not be adequately represented by a time-averaged L_{eq} value.

1.2 Octave Band Frequencies

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation has agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band. In these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, e.g. 250 Hz octave band extends from 176 Hz to 353 Hz. The most commonly used octave bands are:

Octave Band Centre Frequency Hz		63		125		250		500		1000		2000		4000		8000
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APPENDIX A

Acoustic Terminology & Human Response to Broadband Sound

1.3 Human Perception of Broadband Noise

Because of the logarithmic nature of the decibel scale, it should be borne in mind that sound levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) sound level is not twice as loud as 50dB(A). It has been found experimentally that changes in the average level of fluctuating sound, such as from traffic, need to be of the order of 3dB before becoming definitely perceptible to the human ear. Data from other experiments have indicated that a change in sound level of 10dB is perceived by the average listener as a doubling or halving of loudness. Using this information, a guide to the subjective interpretation of changes in environmental sound level can be given.

Change in Sound Level dB	Subjective Impression	Human Response
0 to 2	Imperceptible change in loudness	Marginal
3 to 5	Perceptible change in loudness	Noticeable
6 to 10	Up to a doubling or halving of loudness	Significant
11 to 15	More than a doubling or halving of loudness	Substantial
16 to 20	Up to a quadrupling or quartering of loudness	Substantial
21 or more	More than a quadrupling or quartering of loudness	Very Substantial