



25-27 Dale Street

HEA 05, POL 05 and Planning Verification Acoustic Testing

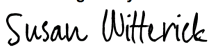
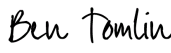
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18037 25-27 Dale Street
Client: Barnfield Construction
Date: 18/01/2022

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REVISION HISTORY

Revision	Date	Revision Details	Author	Checked
R01	18/01/2022	Original Issue	DocuSigned by:  3E69257DCFC14C6... Susan Witterick BSc MIOA	DocuSigned by:  2DD2C00AF12B454... Ben Tomlin BSc MIOA

1 INTRODUCTION

- 1.1 This report details the results of acoustic commissioning testing carried out at 25-27 Dale Street, Manchester on 14th January 2022 by Susan Witterick and Joseph Tony of dBx Acoustics Ltd.
- 1.2 The intent of acoustic commissioning testing is to demonstrate compliance with BREEAM credits HEA 05 and POL 05, and to discharge Planning Conditions 2(j) and 3 of application reference 116402/LO/2017.
- 1.3 This report has been prepared by Susan Witterick. Susan is a member of the Institute of Acoustics and has a BSc(Hons) Audio Technology from the University of Salford. She has over 20 years' experience as an acoustic consultant and is therefore considered a "*Suitably Qualified Acoustician*" (SQA) for the purposes of BREEAM assessment.

2 ASSESSMENT CRITERIA

- 2.1 The assessment criteria for BREEAM are based on the bespoke acoustic design criteria set out by dBx Acoustics Ltd in letter reference 18037 25-27 Dale Street BREEAM L01A, dated 5th October 2020.

BREEAM HEA 05 / Planning Condition 3

- 2.2 For the Offices, two credits are targeted; internal ambient noise levels, and sound insulation. The credit relating to room acoustics has not been pursued.
- 2.3 For the Retail unit, one credit relating to indoor ambient noise level is sought.
- 2.4 In addition, in terms of acoustics, the Local Authority requires in Condition 3 that post-completion verification noise measurements are carried out to confirm that noise ingress and airborne sound insulation between the commercial and office uses meet the specified acoustic design standards.

BREEAM POL 05 / Planning Condition 2j

- 2.5 In Planning Condition 2j, Manchester City Council requires that noise levels from building services plant should not exceed 5dB below the background sound level at the nearest noise sensitive receptors. Assuming that plant operates only during daytime hours, the rating noise level when assessed at the nearest noise sensitive receptors (Bunsen Street) should therefore be controlled to no higher than 44dB_{L_{Af,Tr}}.
- 2.6 Compliance with this planning condition also achieves compliance with BREEAM credit POL 05.

3 AIRBORNE SOUND INSULATION (HEA 05 FIRST CREDIT)

- 3.1 The target on-site sound insulation performance of the separating floor between the ground floor retail unit and first floor office, based on controlling noise transfer from a speculative restaurant to the office space above, was 39-43dB $D_{nT,w} + C_{tr}$.
- 3.2 The measured performance on site was 42dB $D_{nT,w} + C_{tr}$. The ground floor retail unit was in shell and core condition during testing, and it is anticipated that airborne sound insulation will increase further when the fit-out of the retail area is complete.
- 3.3 Therefore, compliance with the relevant part of planning condition 3 is demonstrated.
- 3.4 The first credit targeted against HEA 05 for the offices can be awarded.

4 INTERNAL AMBIENT NOISE LEVEL

Noise from Building Services (HEA 05 Second Credit)

- 4.1 The measured internal ambient noise levels (IANL) with building services operational are presented in Table 1 below, along with the upper limit set within the acoustic design report.

Table 1: Internal Ambient Noise Level

Space	Measured IANL, $dB_{Aeq,T}$	Upper Limit IANL, $dB_{Aeq,T}$	Pass / Fail
1 st Floor Office	48	45-50 $dB_{Aeq,T}$	Pass
2 nd Floor Office	42		
3 rd Floor Office	50		
4 th Floor Office	49		
5 th Floor Office	47		

- 4.2 The measured internal ambient noise levels meet the upper limit proposed in the acoustic design. The second credit targeted against HEA 05 for the offices can therefore be awarded.

Noise Ingress (Planning Condition 3 and HEA 05 Retail Second Credit)

- 4.3 The measured internal ambient noise levels with building services switched off are presented in Table 2 below, along with the design target set within the acoustic design report.

Table 2: Noise Ingress

Space	Measured IANL, $dB_{Aeq,T}$	Upper Limit IANL, $dB_{Aeq,T}$	Pass / Fail
1 st Floor Office	32	40	Pass
2 nd Floor Office	38	40	Pass
Retail	37	40	Pass

- 4.4 Compliance with the relevant part of planning Condition 3 is therefore demonstrated.

5 BUILDING SERVICES NOISE EMISSIONS (POL05 / PLANNING CONDITION 2J)

- 5.1 In accordance with the noise impact assessment submitted for planning, plant noise emissions when assessed at the nearest noise sensitive receptors (Bunsen Street) should be no higher than $44\text{dBL}_{\text{Ar,Tr}}$ in the period 07:00-23:00h. It is understood that the plant does not operate at night.
- 5.2 Plant noise associated with the development was not audible or perceptible at street level.
- 5.3 Noise measurements were made at roof level at 25-27 Dale Street with all roof plant operating at normal capacity. It was observed that the plant is fully enclosed by a solid metal screen and that there is no line of sight between the plant and the noise sensitive receptors.
- 5.4 A specific noise level of $66\text{dBL}_{\text{Aeq,T}}$ was measured at a distance of approximately 2m from the roof plant, at the centre of the roof.
- 5.5 The rating noise level arising at the Bunsen Street façade is calculated as follows;

Calculation 1: Specific Noise Level at Bunsen Street

Unit	Location	Unit Noise Level (SPL dBA)	Approximate Distance to NSR A	Distance Attenuation (dB)	Screening Attenuation (dB)	Tonality Correction (dB)	Predicted Noise Level at Nearest Noise Sensitive Property (dB)
All plant in operation	Roof	66 2	14	17	10	0	39
Rating Level (dB)							39

- 5.6 The rating noise level calculated at Bunsen Street, based on the measurements made at the roof of 25-27 Dale Street with all plant operational, is $39\text{dB L}_{\text{ArTr}}$. This is 5dB lower than the limit of $44\text{dBL}_{\text{Ar,Tr}}$.
- 5.7 Compliance with POL 05 and Planning Condition 2J is therefore demonstrated.

6 CONCLUSION

- 6.1 dBx Acoustics Ltd attended 25-27 Dale Street, Manchester on 14th January 2022 to carry out verification acoustic testing to demonstrate compliance with BREEAM credits HEA 05 and POL 05, and with Planning Conditions 2J and 3.
- 6.2 All four credits targeted under BREEAM for this scheme can be awarded.
- 6.3 The measured sound insulation between the retail units and offices, and the noise intrusion to the building, are compliant with the acoustic design and therefore Planning Condition 3 can be discharged.
- 6.4 Noise from building services plant has a rating level 10dB below the typical background sound level at the nearest noise sensitive receptors during the periods of operation and Planning Condition 2j can therefore be discharged.

APPENDIX A – GLOSSARY OF ACOUSTIC TERMINOLOGY

Decibel, dB	A unit of level derived from the logarithm of the ratio between the value of a quantity and a reference value. For sound pressure level (L_p) the reference quantity is 2×10^{-5} N/m ² . The sound pressure level existing when microphone measured pressure is 2×10^{-5} N/m ² is 0 dB, the threshold of hearing.
L	Instantaneous value of Sound Pressure Level (L_p) or Sound Power Level (L_w).
Frequency	Number of cycles per second, measured in hertz (Hz), related to sound pitch.
A-weighting	Arithmetic corrections applied to values of L_p according to frequency. When logarithmically summed for all frequencies, the resulting single "A weighted value" becomes comparable with other such values from which a comparative loudness judgement can be made, then, without knowledge of frequency content of the source.
$L_{eq,T}$	Equivalent continuous level of sound pressure which, if it actually existed for the integration time period T of the measurement, would possess the same energy as the constantly varying values of L_p actually measured.
$L_{Aeq,T}$	Equivalent continuous level of A weighted sound pressure which, if it actually existed for the integration time period, T, of the measurement would possess the same energy as the constantly varying values of L_p actually measured.
$L_{n,T}$	L_p which was exceeded for n% of time, T.
$L_{An,T}$	Level in dBA which was exceeded for n% of time, T.
L_{Fmax}	The instantaneous maximum sound pressure level which occurred during the measurement. F indicates that the fast time-weighting is used.
L_{AFmax}	The instantaneous maximum A weighted sound pressure level which occurred during the measurement. F indicates that the fast time-weighting is used.
$L_{Ar,Tr}$	The rating level: the equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise.
Reverberation Time, T	The time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped. The descriptor T, often includes other nomenclature to describe the type of reverberation time measurement or if the reverberation time is an average taken for specific frequencies. For example, a T_{mf} is the mid-frequency reverberation time.
Absorption Coefficient, α	The fraction of reverberant sound energy absorbed by a material. It is expressed as a value between 1.0 which equates to perfect absorption and 0 which equates to zero absorption.
Acoustic Class, A - E	Classification of sound absorbers into Sound Absorption Classes A-E, according to BS EN ISO 11654, including frequencies 200-5000 Hz
NRC	A single-number rating system used to compare the sound-absorbing characteristics of building materials. A measurement of the acoustical absorption performance of a material, calculated by averaging its Sound Absorption Coefficients at 250, 500, 1000 and 2000 Hz
STI	Speech Transmission Index , Metric ranging between 0 and 1 representing the transmission quality of speech with respect to intelligibility by a speech transmission channel
R	Sound Reduction Index , the laboratory measured sound insulation properties of a material or building element in octave or third octave bands.
R_w	Weighted Sound Reduction Index , a single number which represents the sound reduction of a material. It is derived by plotting the sound reduction index against a set of reference curves. The curves are shifted until a best-fit is established and the curve which best fits the sound reduction spectrum is used to represent the single figure value.
D_w	Weighted Level Difference , the weighted level difference between a pair of rooms, stated as a single figure.

D_{nT}	Standardised Level Difference, a frequency-dependent measurement of airborne sound insulation, calculated using the following formula: $D_{nT} = L_1 - L_2 + 10\log(T/T_0)$ dB Where: L_1 is the energy-averaged sound pressure level due to the pink noise source measured in the source room using a sweep technique. L_2 is the energy-averaged sound pressure level measured in the receiving room using a sweep technique. T is the mean receiving room reverberation time (derived from T_{30} measured in seconds). T_0 is the reference reverberation time (= 0.5s for dwellings).
$D_{nT,w}$	Weighted Standardised Level Difference, a single-figure value of airborne sound insulation performance, derived according to procedures in BS EN ISO 717-1, based on the D_{nT} values at different frequencies (100-3150 Hz third octave bands).
$D_{nF,w}$	Weighted, Normalised Flanking Level Difference, the normalised, weighted difference in sound level between a pair of rooms via a flanking element, such as mullion or ceiling detail. The level difference in octave bands is first normalized to a reference amount of absorption and then plotted against a set of reference curves to establish a single figure value.
$D_{n,e}$	Normalised Element Level Difference, the normalised difference in sound level between two spaces via a small element such as a trickle ventilator. The level difference in octave bands is normalized to a reference amount of absorption.
$D_{n,e,w}$	Weighted, Normalised Element Level Difference, The normalised, weighted difference in sound level between two spaces via a small element such as a trickle ventilator, stated as a single figure. The level difference in octave bands is normalized to a reference amount of absorption and then plotted against a set of reference curves to establish a single figure value.
C_{tr}	Spectrum Adaptation Term, a correction term applied to the sound insulation single-number values (R_w, D_w, and $D_{nT,w}$) in accordance with BS EN ISO 717-1. Applying the C_{tr} penalises a construction's performance if its low frequency performance is poor in relation its performance at higher frequencies.
Impact Sound	The noise generated by an impact on a structure. This is normally used to describe the noise created by people walking or moving furniture on a floor structure.
L_{nT}	Standardised Impact Sound Pressure Level, a frequency dependent measurement of impact sound insulation, calculated using the following formula: $L_{nT} = L_1 + 10\log(T/T_0)$ dB Where: L_1 is the mean sound pressure level due to the tapping machine measured in the receiving room using a sweep technique. T is the mean receiving room reverberation time (derived from T_{30} measured in seconds). T_0 is the reference reverberation time (0.5s for dwellings)
$L'_{nT,w}$	Weighted Standardised Impact Sound Pressure Level, a single-figure value (@ 500 Hz) of impact sound insulation, performance, derived according to BS EN ISO 717-2, based on the L_{nT} values at different frequencies (100Hz- 3150 Hz third octave bands).
Insertion Loss, IL	The reduction of noise level due to the presence of a noise control device such as an attenuator, excluding any regeneration noise created by its presence.
NR	The Noise Rating level. This is a single figure value derived by plotting a noise spectrum against a set of curves. The curve under which the spectrum fits is the resulting NR level.

APPENDIX B - EQUIPMENT USED

Equipment	Manufacturer / Model	Serial Number
Sound Level Meter	Norsonic NOR140	1405619
Microphone	Norsonic NOR1225	168247
Calibrator	Norsonic NOR1251	33827
Sound Source	NTI MR2 Minirator	n/a

The sound level meter was calibrated before and after the measurements with no significant drift recorded. An accredited laboratory calibrated the equipment not more than two years prior to the measurements being made, with the exception of the calibrator, which had been calibrated not more than one year prior to the survey.