Technical Note

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Condition 8 Discharge Report

1 Introduction

Sweco UK have been appointed by MY Construction Limited to undertake post-completion noise measurements of the façade sound insulation properties at Tribe Hotel, Chicago Avenue, Manchester Airport, Manchester, M90 3RA.

This report presents the results of the façade sound insulation investigations in order to discharge Condition 8 of the Planning Permissions for the development (Manchester City Council application reference 125848/FO/2020), which relates to the control of noise break out.

Noise breakout from hotel premises typically occurs from one, or both, of the following sources:

- Patron activity within the hotel, in areas such as restaurants, bars and gyms; and
- Plant noise emissions from building services systems.

Given that Condition 9 of the permissions relates specifically to plant noise emissions (and is assessed specifically in the below referenced report[1]), it is considered that Condition 8 may be discharged where it is demonstrated that the building façade in areas of the hotel where noisy patron activity may occur are acoustically robust.

As such, this report summarises the outcomes and recommendations made in the design-stage acoustic reports for the development with relation to noise break out, the results of the façade sound insulation investigations, and presents a summary statement demonstrating compliance with Condition 8.

Whilst every effort has been made to ensure that this report is easily understood, it is technical in nature; a Glossary of Terms is included in Appendix A to assist the reader.

[1] 65204120-SWE-XX-XX-T-U-0003 *POL05 & Condition 9 Discharge*, 2024, Sweco UK

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2 Planning Requirements

Condition 8 of the Planning Permissions states:

“8) The premises shall be acoustically insulated and treated to limit the break out of noise in accordance with a noise study of the premises 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 shall be implemented in full before the use commences or as otherwise agreed in writing by the City Council as local planning authority.

Upon completion of the development a verification report will be required to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic consultant's report. The report shall also undertake post completion testing to confirm that acceptable criteria has been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria.

Reason - To safeguard the amenities of the occupiers of the building and occupiers of nearby properties, pursuant to Policy DM1 in the Manchester Core Strategy and saved UDP Policy DC26.”

3 Design Requirements

The overarching acoustic design requirements for the Tribe Hotel development are set out in the planning stage Noise Impact Assessment[2], submitted to Manchester City Council (MCC) as part of the original application, and the subsequent RIBA design reports up to RIBA Stage 4[3], which we understand has also been submitted to MCC in support of the Condition 8 discharge.

Section 3.4 of the RIBA Stage 4 acoustic design report provides the minimum sound reduction requirements for the areas of the hotel where noise breakout may occur due to patron activity. The areas of potential noise breakout are identified as the restaurant/bar/lobby and gym. Both areas, located at ground level, have external walls formed entirely from full-height glazing.

Table 1 presents the minimum sound reduction requirements for these external facades.

Table 1: Minimum Performance Requirements for External Glazing [taken from Table 12 of the RIBA Stage 4 report]

Room type	Sound Reduction Performance, dB R							$R_w + C_{tr}$, dB
	63	125	250	500	1k	2k	4k	
Restaurant, bar, reception, [gym]	19	24	20	25	34	37	35	27

The above sound insulation requirements are set out using the laboratory measured metric of R_w. It is not possible to measure an R_w acoustic performance in-situ given the physical interaction and sound flanking resulting from the as-built structures.

As such, and to allow for comparisons to be made, the assessment presented herein utilises the commonly accepted correction for light-weight structures between laboratory and in-situ sound insulation performances of: $D_w \approx R_w - 7\ dB$.

Whilst the RIBA Stage 4 report focusses on minimum façade sound insulation requirements to control external noise ingress, it is considered that the given design requirements will be appropriate to control patron noise break out from the premises; there are no areas of the Tribe hotel that are expected to generate unusually high levels of activity noise or of low frequency noise, with speech noise being the primary activity noise source.

Based on noise levels measured at similar sites, from gym and lobby/restaurant activity, a typical maximum internal reverberant Sound Pressure Level not exceeding 80 dB $L_{Aeq,T}$ is considered to allow for a worst-case scenario.

[2] 102945-MLM-ZZ-XX-RP-YA-0001 C03 *Noise Impact Assessment (RIBA Stage 2)*, 2019, MLM Consulting Engineers Ltd

[3] 102945-MLM-ZZ-XX-RP-YA-0007 C02 Stage 4 Acoustic Technical Design, 2020, MLM Consulting Engineers Ltd

4 Post-Completion Sound Insulation Measurements

4.1 Methodology

Measurements of façade sound insulation (internal to external) were undertaken generally in accordance with the process set out in BS EN ISO 140-4:1998[4], consisting of 2 No. loudspeaker positions internally, 4 No. measurements of internal Sound Pressure Level using a handheld sweep to produce a spatial average, 4 No. measurements of external Sound Pressure Level using a handheld sweep to produce a spatial average, and a measurement of the underlying background (ambient $L_{Aeq,T}$) noise level.

Whilst it is recognised that this Standard does not apply to internal to external noise transmission, it was deemed an appropriate and repeatable methodology in the absence of any identified dedicated Standard for this purpose.

The sound reduction offered by the façade was then categorised in accordance with BS EN ISO 717-1:1997[5] to present the octave-band, dB D, and overall weighted level difference, dB D_w. This Standard also allows for the determination of the appropriate corrections for low frequency noise (C, C_{tr}).

Measurements of façade level difference were undertaken in the gym and lobby/reception/restaurant areas.

4.2 Equipment

All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672[6]. Details of the noise measurement instrumentation used are shown in Table 2.

Each meter had been calibrated by a UKAS accredited laboratory within the previous 24 months. The calibration level was also checked at the start and end of the survey using field calibrators (which had been suitably calibrated by an accredited laboratory). No significant drift was noted in the calibration over the course of the testing. The calibrator used had itself been calibrated by a UKAS accredited calibration laboratory within the twelve months preceding the measurements.

The microphones were fitted with protective windshields for the measurements.

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[4] British Standard EN ISO 140-4:1998: *Acoustics – Measurement of sound insulation in buildings and of building elements – Part 4: Field measurements of airborne sound insulation between rooms, 1998, British Standards Institution (BSI)*

[5] British Standard EN ISO 717-1:1997: *Acoustics – Rating of sound insulation in buildings and of building elements – Part 1: Airborne sound insulation*, 1997, British Standards Institution (BSI)

[6] British Standard (BS) 61672:2013: *Electroacoustics. Sound level meters. Part 1 Specifications, 2013,* British Standards Institution (BSI).

Table 2: Inventory of Acoustic Measurement Equipment				
Item	Manufacturer/Model Type	Serial Number	Calibration	
			Certificate Number	Expiry Date
Sound Level Meter	01dB Fusion	12825	TR-REP-10813	31 May 2026
Preamplifier	01dB PRE-22N°	2004246		
Microphone	GRAS 40CD	292431		
Calibrator	Rion NC-74	34662223	TCRT24/1470	27 June 2025
01dB Dodecahedron Sound Source	LS02	D1.14051	D1.14051/08/15	-

4.3 Results

The results of the façade sound insulation testing are presented below in Table 3 and presented graphically in Appendix B.

Table 3: Measured Façade Level Difference, Internal to External						
Test Location	Level Difference, dB D					$D_w + C_{tr}$, dB
	125	250	500	1k	2k	
Lobby/reception/restaurant	18	26	27	26	32	31
Gym	20	26	29	27	33	32

The lobby/reception/restaurant and gym test areas recorded a weighted level difference of 31 dB and 32 dB $D_w + C_{tr}$ respectively. Using the commonly accepted corrections for flanking, this is approximately equivalent to 38 – 39 dB $R_w + C_{tr}$.

It is understood that the glazing system used for both areas was identical. This is reflected in the results above which show close correlation in the level difference measured for each façade.

5 Discussion & Conclusion

On the basis of the results presented in Table 3, it can clearly be seen that the installed façade at Tribe hotel meets and exceeds the minimum sound insulation performance requirements set out in the supporting design-stage acoustic assessments.

An in-situ noise level difference of 31 to 32 dB $D_w + C_{tr}$ was measured, compared to the minimum design requirement of 27 dB $R_w + C_{tr}$, (approximately equivalent to 20 dB $D_w + C_{tr}$) indicating that the installed facades improve upon the minimum requirements by circa 10 dB.

Given that the Tribe hotel does not contain any specific event spaces or areas where unusually high activity noise is expected, and on the reasonable assumption that worst-case speech-based noise levels within the reception/lobby and gym areas will rarely exceed 80 dB $L_{Aeq,T}$, initial calculations indicate that the speech-based noise break out from the hotel premises will rarely exceed 45 dB $L_{Aeq,T}$ immediately external to the façade.

The site is located in an area of Manchester with relatively high ambient noise levels in the magnitude of 60 – 65 dB $L_{Aeq,T}$ during both daytime and night-time hours (refer to the planning stage Noise Impact Assessment). The existing acoustic environment is controlled by the nearby M56 motorway to the north, and Manchester Airport to the south. As such, the expected noise breakout levels from Tribe hotel will be approximately 15 - 20 dB below the pre-existing ambient noise levels before even accounting for propagation losses to the neighbouring premises.

Therefore, it is deemed highly unlikely that speech-based activity noise break out will result in adverse impacts at neighbouring properties. It is considered that the site complies with the requirements of Condition 8, and that this Condition may be discharged.

Appendix A – Glossary of Acoustic Terminology

Sound is the vibration of particles in a medium, such as air, which may be detected by the human ear. This sound is defined as noise when it is audible and unwanted or undesirable to a listener.

The vibration, or oscillation, of particles about an equilibrium position results in local pressure fluctuations from the normal pressure. These local pressure fluctuations are described as sound pressure, and the number of oscillations per second is described as the frequency.

The human ear responds to an incredibly large range of sound pressure, from 0.00002 Pa to 200 Pa, and the perceived loudness is proportional to the logarithm of the sound pressure squared. For this reason, sound is measured in terms of a logarithmic parameter, the sound pressure level, to approximate the response of the ear. Sound pressure levels are quantified in decibels (dB) relative to the threshold of hearing.

The human ear responds to a wide range of sound frequencies, from the lowest perceptible bass note, around 20 Hz, to the highest perceptible treble note, around 20,000 Hz. The ear does not respond equally to each frequency and is most sensitive to sound within the mid-frequency range of around 600 to 8000 Hz.

The response of the ear to each frequency also varies with the sound pressure level. For very loud sounds the difference in perceived loudness between each frequency is less pronounced than for low level sound.

Acousticians measure sound pressure levels using sound level meters, which incorporate a microphone.

A sound level meter approximates the response of the human ear to sound by using frequency filters. For typical environment sounds, the A-weighting filter is used to approximate the response of the ear at typical sound pressure levels. The sound pressure level, adjusted to approximate the response of the ear, is quantified in A-weighted decibels, dB(A) or dB L_{pA}.

In a typical environment, the A-weighted sound pressure level will vary with time. For this reason, acousticians use statistical measurement parameters to describe the sound environment. The most common measurement parameters are as follows:

- dB $L_{Aeq,T}$: Equivalent continuous A-weighted sound pressure level. This is the energy-average sound pressure level during a measurement period, T.
- dB LAFmax,T: Maximum A-weighted sound pressure level. This is the maximum sound pressure level during a measurement period, T, and measured in a way that approximates the time-response of the ear.
- dB $L_{A90,T}$: 90th percentile A-weighted sound pressure level. This is the sound pressure level exceeded for 90% of the measurement period, T, commonly referred to as the background sound level.

Sound pressure levels in typical environments are presented in Table A1. Further definitions of acoustic parameters are presented in Table A2.

Table A1: Sound pressure levels within typical environments	
Sound Pressure Level, dB	Typical Environment or Description
0	Threshold of hearing
15 to 25	A recording studio
25 to 35	A hotel bedroom at night
35 to 45	An unoccupied office
45 to 55	Quiet residential street
55 to 65	Normal conversation, 1 m away TV programme, listener position
65 to 75	Raised voices, 1 m away Urban high street traffic
75 to 85	Busy motorway traffic, on hard shoulder Typical small plant room
85 to 95	High-speed hand-dryer, operator position Inside London underground (average)
95 to 105	Pneumatic hammer, operator position Concert orchestra
105 to 115	Typical nightclub Untreated generator plantroom
115 to 140	Aircraft take-off, close proximity Threshold of pain

Table A2: Definitions of Acoustic Terminology and Parameters	
Wording	Description
Ambient sound level	The total sound pressure level in a given position from all surrounding sources of noise, both near and far. Normally expressed as an equivalent continuous A-weighted sound pressure level, dB $L_{Aeq,T}$.
A-weighting	The process of weighting the observed sound pressure level at each frequency band, to approximate the sensitivity of the human ear to sounds of different frequencies. A-weighted sound pressure levels are expressed as dB(A) or dB L_{Ap}.
C_{tr}	Spectrum adaptation term No. 2 as defined in BS EN ISO 717-1. This term is a correction that applies to the weighted standardised level difference to account for how well a partition insulates against sound which has mainly low and medium frequency content (e.g. road traffic noise, amplified disco music).
Decibel	A logarithmic value quantifying the sound pressure at a specified position or sound power. relative to a reference sound pressure or sound power (20 µPa for sound pressure, 10-12 W for sound power).
D	Sound level difference. The difference in energy-average sound pressure levels between a “source” room containing a loudspeaker and an adjacent “receiving” room. D = L(source) – L(receiving).
$D_{ne,w}$	Weighted element normalised sound level difference. The single-figure rating of the difference in sound level between rooms when sound is transmitted only through a small technical element only, such as a vent or grille, and normalised to a reference absorption area A0 of 10 m^2. Measured in a laboratory in accordance with BS EN ISO 10140, with single figure rating determined in accordance with BS EN ISO 717-1.
$D_{nF,w}$	Weighted normalised flanking sound level difference. A single-figure rating of the difference in sound level between rooms when sound is transmitted only via a specified flanking path, such a via a flanking curtain wall system. Measured in a laboratory in accordance with BS EN ISO 10848, with single figure rating determined in accordance with BS EN ISO 717-1.

Table A2: Definitions of Acoustic Terminology and Parameters	
Wording	Description
$D_{nT,w}$	Weighted standardised sound level difference. A single-figure rating of the sound insulation between adjacent rooms or spaces in real-world conditions in completed buildings. The rating is determined over a range of frequencies and normalised to a reference reverberation time of 0.5 seconds for dwellings. Measured in-situ in accordance with BS EN ISO 140-4, with single figure rating determined in accordance with BS EN ISO 717-1. The measurement includes the effects of sound transmission via flanking routes and weak points at junctions, interfaces, and penetrations.
Façade	A sound monitoring position is a "façade" position when it includes a strong reflection from an adjacent building or structure. This corresponds with a position that is between 1 and 2 metres away from a reflecting building or structure.
Flanking sound transmission	The transmission of sound between two spaces via an indirect path rather than via the separating element. Example would be sound transmission via a flanking corridor, or sound transmission via a flanking curtain wall.
Free-field	A sound monitoring position is a "free-field" position when it is not affected by sound reflections from surrounding buildings and structures. This corresponds with a position at least 3.5 metres away from reflecting buildings or structures.
Frequency	The number of oscillations per second of a vibrating particle in a medium, measured in Hertz (Hz) or cycles per second.
Impact sound	Sound due to impacts on a floor, such as due to footfall, as observed in the room below the floor.
$L_{A10,18hr}$	The A-weighted sound pressure level exceeded during 10% of the 18-hour time interval between 06:00 and 24:00. This is the UK Road Traffic Noise Index, as defined in the Calculation of Road Traffic Noise (CRTN, HMSO, 1988).
$L_{A90,T}$	The A-weighted sound pressure level exceeded during 90% of the time interval, T. Typically used to quantify the background sound level at a specified position.
$L_{Aeq,T}$	The equivalent continuous A-weighted sound pressure level over a time interval, T. This is an energy-average sound pressure level over the specified time period.
$L_{AFmax,T}$	The maximum A-weight sound pressure level during a specified time interval, T. Measured with "fast" time-weighting (which approximates the time-response of the human ear).
Noise	Unwanted or undesirable sounds observed by a listener.
Octave band	A frequency band used in acoustical measurements. An octave is a frequency interval between two sounds where the frequency of the lower sound is half the frequency of the upper sound. The human hearing range is divided into ten logarithmically equal frequency divisions called octave bands, with centre-band frequencies as follows: (16 Hz, 32 Hz,) 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, 16000 Hz.
Reverberation	The reflection of sound from room surfaces, resulting in the prolongation or persistence of a sound in a room.
Reverberation time	Time, in seconds, required for the sound pressure level in a room to decrease by 60 dB after a sound source has stopped. Long reverberation times are present in large empty rooms with hard surfaces (e.g. a cathedral); short reverberation times are present in smaller rooms with soft furnishing (e.g. typical living room, a recording studio).
R_w	The weighted sound reduction index of an architectural element. A single-figure rating of the sound insulation provided by the architectural element in idealised conditions over a range of frequencies. Measured in a laboratory in accordance with BS EN ISO 140-3 (or BS EN ISO 10140-2), with single figure rating determined in accordance with BS EN ISO 717-1.
Sound	The vibration, or oscillation, of particles in a medium, such as air, which may be detected by the human ear.
Sound absorption	The reduction of sound energy by transmission through an absorbing medium such an "acoustically soft" material or surface which results in a reduced reflection of incident sound.

Table A2: Definitions of Acoustic Terminology and Parameters	
Wording	Description
Sound absorption class.	A classification system describing the ability of a specified material or surface to absorb sound. Typically measured in a laboratory in accordance with BS EN ISO 354, with class determined in accordance with BS EN ISO 11654.
Sound absorption coefficient, α	A fractional measure of the ability of a material or surface to absorb incident sound. Expressed as a value between 1.0 (total absorption of incident sound, no reflection) and 0.0 (no absorption, 100% reflection).
Sound insulation	The ability of architectural elements or structures to reduce the transmission of sound, predominantly due to the reflection of sound incident on the element or structure. Typically measured as the difference in sound pressure levels between a “source” room containing a loudspeaker and an adjacent “receiving” room.
Sound power level	A logarithmic measurement that quantifies the total sound power of a source emitted in all directions relative to a reference sound power (Wref = 1 pW or 10-12 W). Equal to 10 log10 (W / Wref) and expressed in decibels.
Sound pressure level (SPL)	A logarithmic measurement that quantifies the sound pressure at a specified position relative to a reference sound pressure (pref = 20 µPa). Equal to 20 log10 (p / pref) and expressed in decibels.
Third-octave band	A higher-resolution frequency band used in acoustical measurements. A third-octave band is equal to one of three logarithmically equal parts of the corresponding octave frequency band. The upper band edge frequency is equal to the lower band-edge frequency multiplied by 21/3.

Appendix B – Sound Insulation Test Graphs

Accor Tribe Hotel, Chigaco Avenue, Manchester, M90 3PD

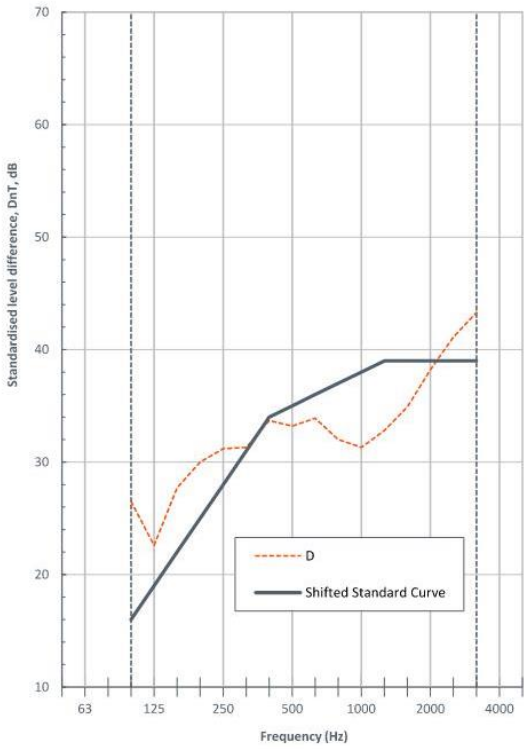
Gym to External - Façade Breakout

Weighted Level Difference According to BS EN ISO 140-4 and 717-1

Field Measurement of Airborne Sound Insulation Between Rooms

Test Construction: Gym to External - Façade Breakout

Freq (Hz)	D (dB)
50	
63	
80	
100	26.5
125	22.6
160	27.7
200	30.0
250	31.2
315	31.3
400	33.7
500	33.2
630	33.9
800	32.0
1000	31.3
1250	32.8
1600	34.9
2000	38.2
2500	41.1
3150	43.3
4000	
5000	
6300	
8000	
10000	



Rating according to BS EN ISO 717-1 $D_w\ (C; C_{tr}) =$ 35 (-1 ; -3) dB

Evaluation based on field measurement results obtained in one-third-octave bands by an engineering method

Test Date: 11/09/2024

Test undertaken by: Adam Ford

Tester Signature:

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Accor Tribe Hotel, Chigaco Avenue, Manchester, M90 3PD

Lobby to External - Façade Breakout

Weighted Level Difference According to BS EN ISO 140-4 and 717-1

Field Measurement of Airborne Sound Insulation Between Rooms

Test Construction: Lobby to External - Façade Breakout

Freq (Hz)	D (dB)
50	
63	
80	
100	22.9
125	23.5
160	22.9
200	27.9
250	31.9
315	34.0
400	32.7
500	30.2
630	32.4
800	30.0
1000	31.0
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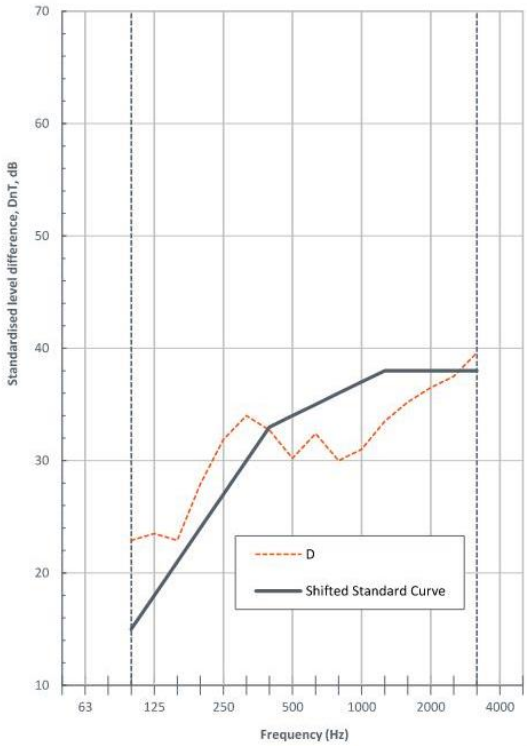
4000	
5000	
6300	
8000	
10000	



Rating according to BS EN ISO 717-1 $D_w\ (C; C_{tr}) =$ 34 (-1 ; -3) dB

Evaluation based on field measurement results obtained in one-third-octave bands by an engineering method

Test Date: 11/09/2024

Test undertaken by: Adam Ford

Tester Signature:

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