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Roc & Rye Bar, 60 Spring Gardens, Manchester

Noise Impact Assessment

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1.0 INTRODUCTION

Fisher Acoustics has been commissioned by NPV Manchester Ltd to provide an assessment of operational noise impact from a proposed bar, Roc & Rye, in support of a Planning application for Change of Use and Listed building consent. The application site is a unit located at the ground floor of 60 Spring Gardens, Manchester.

This assessment examines potential sound transmission from the trading area of the proposed bar to offices above, to an adjacent reception area and stairwell. The assessment also considers operational noise egress to the exterior. Noise emissions from proposed mechanical building services plant and an outdoor seating area have been reviewed as part of the assessment.

To assist with the assessment, internal sound transmission tests have been carried out within the building, the sound reduction of the existing external envelope has been measured and ambient noise surveys outside the nearest sensitive buildings have been undertaken during daytime and night-time periods.

2.0 DESCRIPTION OF BUILDING AND PROPOSALS

The application site at 60 Spring Gardens comprises a ground floor unit (approximately 193m^2 GIA) located in the corner of the building flanked by Spring Gardens and Concert Lane. Figure 1 shows the location of the unit within the building.



Figure 1: Location of Proposed Bar within 60 Spring Gardens

The building comprises five floors above ground and a basement with car parking. The central area of the ground floor contains a reception area and stair/lift core. The upper floors within the building contain office accommodation. The offices within the building are normally in use until 6pm during weekdays.

The separating floor construction between the proposed commercial unit and the offices above comprises a concrete waffle slab as shown in Figure 2. The depth of the slab and thickness of any topping/screed are unknown. The separating wall between the proposed commercial unit and the adjacent reception and stairwell is masonry construction. The

external envelope of the unit is built using traditional solid masonry with dressed stone finish externally. The unit's windows are double glazed and are topped with half circle opening lights (also double glazed).



Figure 2: Exposed Waffle Slab Floor Construction above proposed Commercial Unit

The main entrance to the unit is located at the corner of Spring Gardens and Concert Lane and currently comprises a single set of glazed double doors. A fire exit to Concert Lane is also present toward the rear of the unit.

Spring Gardens is typically busy with pedestrians and traffic, however at the time of compiling this report, traffic diversions were in place due to work on the Manchester Metrolink tram system reducing the amount of traffic in the immediate area. Concert Lane is a cul-de-sac and therefore has no regular vehicles movements.

The proposed Development involves the conversion of the ground floor unit to a Roc & Rye branded bar. The fitout of the unit will include the provision of two air conditioning condenser

units on the building's roof and an internal ventilation unit with heat recovery that will draw in and discharge air from louvres mounted above the rear fire exit door. An outdoor seating area for customers on Concert Lane is also proposed

The proposed hours of trading for the bar are 7am to 3am daily.

The nearest noise sensitive premises to the proposed bar during daytime will be offices above the unit and within neighbouring buildings, the closest being The Chancery Office building on the opposite side of Concert Lane. Most of the other buildings in the immediate also contain offices. There is no residential accommodation nearby although the Gotham Hotel (100 King Street) lies approximately twenty metres to the northeast and therefore represents the nearest noise sensitive building during the evening and early hours of the morning when the bar will be trading. From a conversation held will the hotel's concierge, it is understood that the hotel's windows are sealed shut and the guestrooms fully air-conditioned. It is also understood that at the time that 100 King Street was converted to hotel use, the existing windows were not upgraded due to the building's listed status.

3.0 SOUND INSULATION MEASUREMENTS

Fisher Acoustics carried out a series of sound insulation tests in 60 Spring Gardens during the late afternoon on 14th October 2016. The purpose of the tests was to establish the existing degree of sound separation between the proposed commercial unit and the offices above, the adjacent reception area and stairwell. Additional measurements were carried out externally to establish the level of sound reduction provided by the external envelope of the unit.

The tests involved playing a broadband 'pink' noise signal at high volume within the proposed commercial unit (the 'source room'), measuring the resultant noise level therein and the noise level within the offices above, the reception area and stairwell (the 'receiving rooms'). Additional noise measurements were also taken within each receiving room while the pink noise was switched off, thereby allowing measurements to be corrected later for ambient noise. All measurements were carried out in one-third octave bands.

External noise measurements both with and without the broadband 'pink' noise signal playing in the proposed commercial unit were also carried out with the microphone located approximately 1.5m from windows in the unit's front and side elevations, the main entrance and rear fire exit door in order to assess levels of noise egress. Full details of the equipment used to carry out the tests and the test results are presented in Appendix A.

The results of the sound insulation measurements between internal spaces were subsequently rated in accordance with BS EN ISO 717-1 *Acoustics. Rating of sound insulation in buildings and of building elements - Airborne sound insulation* in order to calculate the sound insulation performance in terms of the Weighted Level Difference parameter (D_w). The results of the measurements are summarised in Table 1 below. Full calculation sheets showing sound insulation performance in third octave bands are presented in Appendix A.

Source Room	Receiving Room	Measured Airborne Sound Insulation Performance, D_w
Ground Floor Unit	Ground Floor Reception	40dB
	Stairwell	51dB
	First Floor Office	60dB

Table 1: Measured Airborne Sound Insulation Performance

The measured airborne sound insulation performance between the ground floor unit and stairwell was 11dB higher than between the ground floor unit and the reception area. This is likely to be due to the presence of a store room that partially separates the stairwell and unit and the presence of an acoustically weak infill panel within the separating wall behind the reception desk area. The location of the infill panel is identified on a ground floor plan in Figure 3.

The internal octave band sound level differences (corrected for ambient noise) measured between the ground floor unit and the adjacent internal spaces are presented in Table 2.

The measured octave band sound level differences (corrected for external ambient noise) between the ground floor unit and external positions are presented in Table 3. Noticeable high frequency noise leakage via the opening lights above windows facing Concert Lane resulted in lower level differences measured for this facade than for the elevation facing Spring Gardens. Noticeable mid and high frequency noise leakage via the main entrance and rear fire exit doors was also noted and is due to the absence of acoustic perimeter seals on both doors.



Figure 3: Ground Floor Plan of 60 Spring Gardens

Transmission Path	Sound Level Difference (between internal spaces) at Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Ground floor Unit to 1st Floor Office	38	51	52	61	64	70	73
Ground floor Unit to Reception	23	29	34	39	42	45	51
Ground floor Unit to Stairwell	30	40	41	49	53	57	61

Table 2: Measured Sound Level Differences Between Internal Spaces

Transmission Path	Sound Level Difference (inside to outside) at Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Ground floor Unit to Spring Gardens	27	29	27	31	29	37	41
Ground floor Unit to Concert Lane	22	24	25	29	27	28	34
Ground floor Unit to Outside Main Entrance	14	19	22	23	23	25	26
Ground floor Unit to Outside Rear Fire Exit	16	22	28	28	25	24	25

Table 3: Measured Sound Level Differences, Inside to Outside

4.0 EXTERNAL AMBIENT NOISE SURVEYS

Surveys of ambient noise levels outside the nearest neighbouring office building, The Chancery, and the Gotham Hotel were carried out during a weekday afternoon on 20th October 2016 and during the early hours of the morning on the same date. The purpose of these measurements was to establish suitable noise limits for the proposed bar's building services equipment and operational noise egress from the bar's trading area affecting nearby sensitive premises. Measurements were carried out at the following locations with the microphone mounted 1.4m above ground level on a tripod:

- Positon 1: Concert Lane, 1m from the facade of The Chancery office building
- Positon 2: Pavement outside the Gotham Hotel, at the corner of Chancery Lane and Spring Gardens

The measurement positions are indicated in Figure 4.

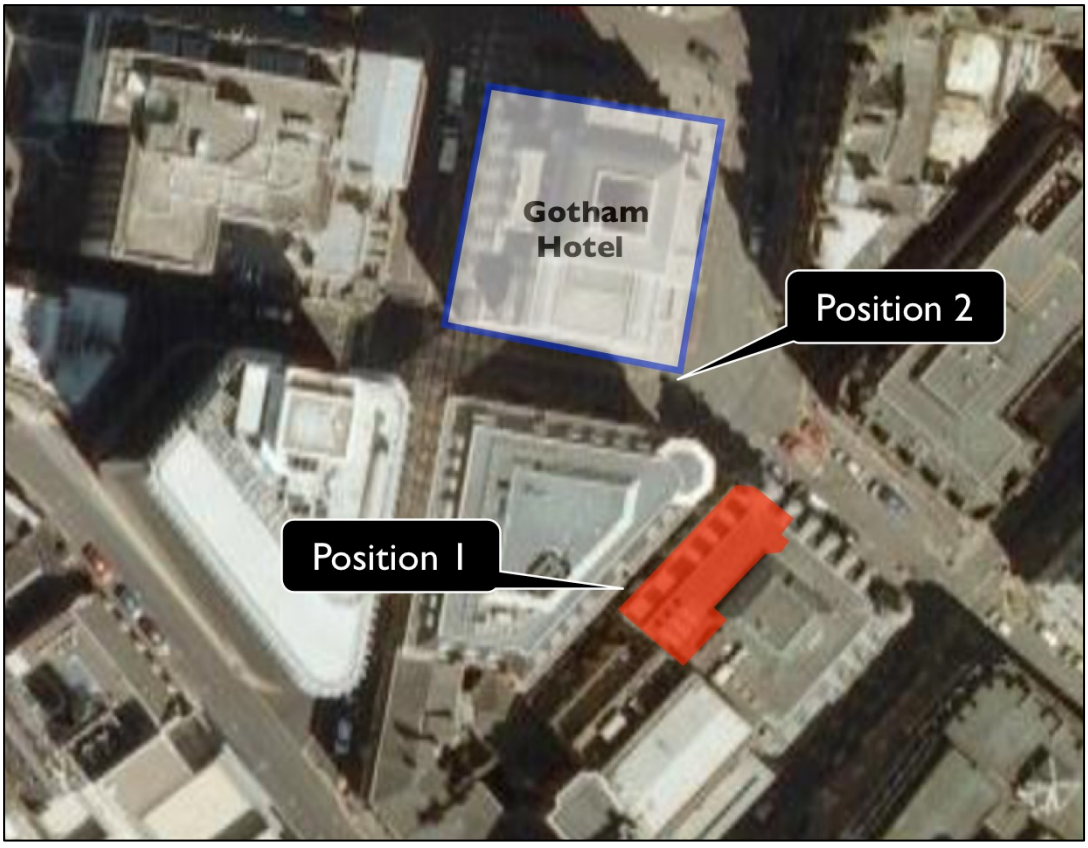


Figure 4: Ambient Noise Measurement Positions

The ambient noise survey results are summarised in Table 4 and presented in full in Appendix B.

Measurement Location	Daytime Noise Levels, dB			Night-time Noise Levels		
	L_{Aeq}	L_{Amax}	L_{A90}	L_{Aeq}	L_{Amax}	L_{A90}
Position 1	57	62 to 72	53 to 56	50	53 to 66	47
Position 2	64	74 to 83	57 to 61	54	57 to 67	50 to 51

Table 4: Summary of Ambient Noise Survey Results

The noise climate at Position 1 (Concert Lane) comprises steady background noise from building services equipment associated with the surrounding buildings and intermittent higher noise levels produced by vehicles passing by on Spring Gardens. The daytime noise climate outside the Gotham Hotel is dominated by intermittent traffic noise from Spring Gardens and Chancery Lane. During the night-time survey, few vehicle movements were observed along these roads (less than one per minute) and the noise climate outside the hotel was dominated by steady building services noise from the direction of Chancery Place to the west.

5.0 ASSESSMENT OF INTERNAL SOUND TRANSMISSION

Manchester City Council requires operational noise from licensed premises to be inaudible within sensitive adjacent premises. Inaudibility is a subjective concept and will differ between respondents. Although there are no widely accepted acoustical standards for determining inaudibility it is generally accepted that if octave band operational noise levels from a bar (in terms L_{eq}) are limited to a level no higher than the octave band background noise levels (in terms of L_{90}) minus 10dB in the receiving space the noise will be effectively masked by the background noise and expected to be inaudible.

'Planning & Noise, Technical Guidance' issued by Manchester City Council gives guidance on the preferred approach to environmental noise assessments. With regard to entertainment venues, Section 3.6.1.2 of the document states:

- 'When considering the potential impact of a proposal for an entertainment venue consultants should consider the overall noise level (LAeq) and the 63 Hz and 125 Hz octave band noise levels (Leq). Music noise in the 63 Hz and 125 Hz octave bands, which is often described as "bass noise", is particularly difficult to contain and the impulsive character of this low frequency music noise is particularly disturbing for local residents exposed to it.

- A planning application for a new entertainment venue that is structurally detached from other building uses should demonstrate that music noise from the proposal will not be 'audible' in nearby residential properties, assuming that the residential properties in question have their windows open. The criterion here is:

  > 'Entertainment noise (LAeq) should be controlled to 10dB below the background noise level (LA90) without the entertainment noise present, in each octave band at the nearest noise sensitive location'.

In the case of the proposed Development, the nearest noise sensitive space within 60 Spring Gardens is the first floor office located directly above. The office is only in operation during daytime and therefore would not be subject to noise arising during evening trading when music noise levels within the proposed bar could be higher.

A maximum daytime music noise spectrum that may be used within the trading area of the proposed bar has been derived using the sound level differences measured between the ground floor unit and first floor office and the background noise spectrum measured within the office. The calculation presented in Table 5 confirms the maximum recommended octave band sound levels due to music replay within the trading area whilst maintaining inaudibility if music noise within the office.

	Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Measured Level Difference Between Ground floor Unit and 1st Floor Office	38	51	52	61	64	70	73
Daytime Background Noise Level in Office (L_{90})	40	34	30	27	21	19	16
Background Noise Level -10dB (inaudibility threshold)	30	24	20	17	11	9	6
Permissible Noise Level in Proposed Bar	**68**	**75**	**72**	**78**	**75**	**79**	**79**

Table 5: Daytime Noise Limits (L_{eq}) Within Proposed Bar to Achieve Inaudibility in 1st Floor Office

The octave band noise limits presented in Table 5 correspond to an overall A-weighted noise limit of 84dB L_{Aeq} which would be compatible with busy daytime trading using background music. It should also be noted that the installation of a solid suspended ceiling within the proposed commercial unit would allow higher operational noise levels than those in Table 5 within the proposed trading area without exceeding the adopted criterion for achieving inaudibility of music noise in the office. The permissible noise levels in Table 5 can therefore be seen as a 'worst-case'.

If the noise limits shown in Table 5 are met, the resultant noise level within reception area is calculated to be 41dB L_{Aeq} and 4dB above the background noise level measured therein (37dB L_{A90}). However, the reception area is arguably less sensitive to noise than the office and is regularly subject to intermittent loud noise events from vehicles passing on Spring Gardens. Nevertheless, the noise mitigation scheme recommended in Section 9 includes the provision of a lining to the separating wall between the reception and proposed bar that will reduce sound transmission to the former space.

6.0 ASSESSMENT OF OPERATIONAL NOISE EGRESS

In order to protect the amenity of adjacent noise sensitive buildings, a similar design criterion for inaudibility has been adopted, specifically noise egress from the proposed bar (in terms of L_{eq}) must not exceed the octave band background noise levels (in terms of L_{90}) minus 10dB immediately outside residential premises.

The nearest residential building to the proposed bar is the Gotham Hotel, which can be considered to be noise sensitive during daytime and night time periods.

It is known that The Chancery is a fully air-conditioned office building that does not include opening windows. Therefore, it is only considered necessary to assess the potential internal noise level within The Chancery due to the operation of the proposed bar.

Calculations to determine the maximum operational noise limits for the proposed bar have been undertaken using the measured internal to external sound level differences and background noise spectra measured during the ambient noise surveys.

The calculation presented in Table 6 confirms the octave band noise limits within the bar that must not be exceeded during daytime trading in order achieve inaudibility inside The Chancery office building. The calculation employs the sound level difference measured between the existing unit and Chancery Lane. A similar calculation, instead using the sound level difference measured between the existing unit and the exterior via the rear fire exit, is presented in Table 7. The calculated noise limits in Tables 6 and 7 are broadly similar to those presented in Table 5 and correspond to overall internal levels of 82dB L_{Aeq} and 79dB L_{Aeq} respectively. These limits would typically be considered compatible with normal daytime trading operations.

	Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Measured Level Difference Between ground floor Unit and Concert Lane	22	24	25	29	27	28	34
Daytime Background Noise Level on Chancery Lane	62	55	54	50	48	45	40
Permissible Noise Limit in Proposed Bar	**84**	**79**	**79**	**79**	**75**	**73**	**74**

Table 6: Permissible Daytime Noise Limits (L_{eq}) Based on Level Difference Via Concert Lane Facade

	Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Measured Level Difference Between Ground floor Unit and Concert Lane, via Rear Fire Exit Door	16	22	28	28	25	24	25
Daytime Background Noise Level on Chancery Lane	62	55	54	50	48	45	40
Permissible Noise Limit in Proposed Bar	**78**	**77**	**82**	**78**	**73**	**69**	**65**

Table 7: Permissible Daytime Noise Limits (L_{eq}) Based on Level Difference Via Rear Fire Exit Door

Table 8 contains a calculation examining daytime operational noise egress affecting the Gotham Hotel. The calculation confirms that far higher operational noise limits can be utilised within the bar during daytime without exceeding the inaudibility criterion outside the hotel.

	Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Measured Level Difference Between Ground floor Unit and Spring Gardens	27	29	27	31	29	37	41
Daytime Background Noise Level Outside Gotham Hotel	65	61	58	55	52	49	43
Background Noise Level -10dB (inaudibility threshold)	55	51	48	45	42	39	33
Additional Attenuation Due to 25m Propagation Distance to Hotel	14	14	14	14	14	14	14
Permissible Noise Limit in Proposed Bar	**96**	**94**	**89**	**90**	**85**	**90**	**88**

Table 8: Permissible Daytime Noise Limits (L_{eq}) Based on Level Difference via Spring Gardens Façade

Table 9 contains the calculated noise limits for the proposed bar during trading in the evening and early hours of the morning. In order to facilitate a 'worst case' assessment, the predicted levels of noise have been compared with background noise levels measured outside the Gotham Hotel during the latest proposed hours of trading (2am to 3am). The octave band noise limits contained in the table correspond to an overall noise level of 85dB L_{Aeq}.

Comparison of these limits to those presented in Table 5 also confirms that significantly higher levels of low frequency music noise could be accommodated within the premises at night whilst satisfying the inaudibility criterion outside the hotel.

	Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Measured Level Difference Between Ground floor Unit and Spring Gardens	27	29	27	31	29	37	41
Night-time Background Noise Level Outside Gotham Hotel	58	56	54	47	44	38	30
Background Noise Level -10dB (inaudibility threshold)	48	46	44	37	34	28	20
Additional Attenuation Due to 25m Propagation Distance to Hotel	14	14	14	14	14	14	14
Permissible Noise Limit in Proposed Bar	**89**	**89**	**85**	**82**	**77**	**79**	**75**

Table 9: Permissible Night-Time Noise Limits (L_{eq}) Based on Level Difference Via Spring Gardens Façade

As the main entrance to the proposed commercial unit does not contain a lobby, there will be the potential for intermittent increases in noise egress as customers enter or leave the premises. The resultant noise levels affecting the adjacent sensitive buildings when the doors are open have been calculated and are presented in Table 10.

Noise levels within the proposed trading area during daytime and night-time periods have been assumed to be in line with the limiting values shown in Tables 5 and 8 respectively. The calculations confirm that noise egress will increase significantly while the entrance door is open, with overall A-weighted noise levels increasing outside the nearest noise sensitive premises by approximately 20dB, or to a level of around 10dB above background noise. This confirms that an acoustic lobby should be provided to the main entrance as described in Section 9.

	Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
DAYTIME NOISE EGRESS LEVELS AT THE CHANCERY							
Entrance Door Closed (Inaudibility)	52	45	44	40	38	35	30
Entrance Door Open	55	53	50	56	53	57	57
NIGHT-TIME NOISE EGRESS LEVELS AT GOTHAM HOTEL							
Entrance Door Closed (Inaudibility)	48	46	44	37	34	28	20
Entrance Door Open	60	58	53	54	49	54	52

Table 10: Assessment of Noise Egress with Entrance Door Open

7.0 ASSESSMENT OF BUILDING SERVICES NOISE

The proposed bar will utilise the following items of building services equipment:

- 2 no. roof mounted Mitsubishi PUHZ-RP140VKA air conditioning units
- 1 no. internally mounted Mitsubishi LGH150RVX-E Lossnay heat recovery unit

The proposed location of the roof mounted air conditioning units is shown in Figure 5 and the internal ventilation drawing shown in Figure 6 indicates the proposed location of the heat recovery unit within the bar's trading area.

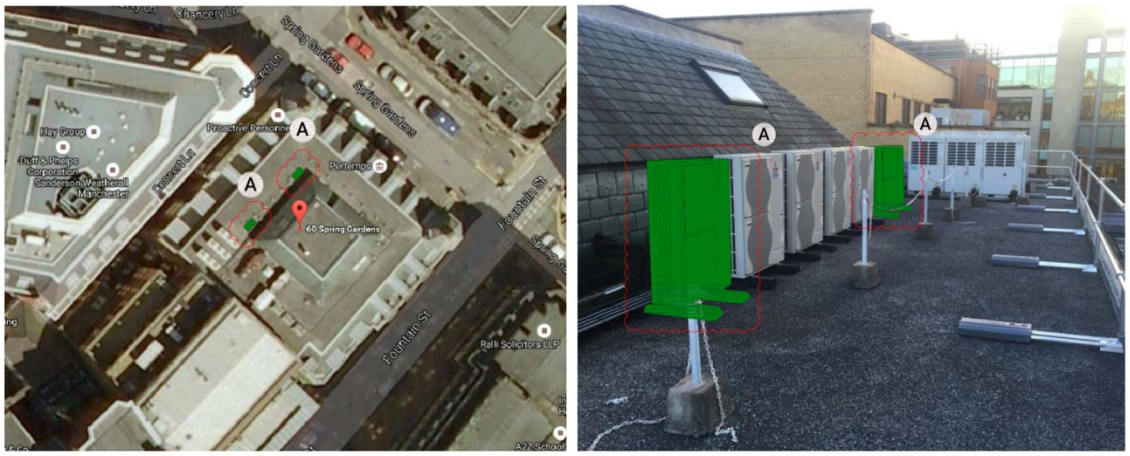


Figure 5: Location of Roof Mounted Air Conditioning Units

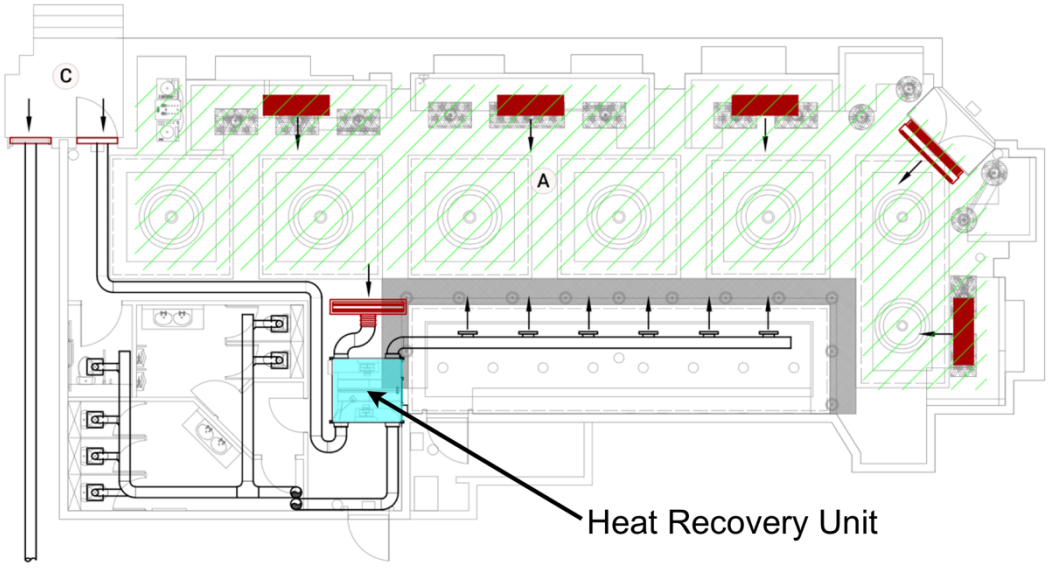


Figure 6: Location of Internal Heat Recovery Unit

'Planning & Noise, Technical Guidance' issued by Manchester City Council gives guidance on acceptable external noise levels due to building services plant. Section 3.6.1.5.1 of the document states:

- 'Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location'.

Mitsubishi's datasheet for the roof mounted air conditioning units provides the sound pressure levels shown in Figure 7 measured one metre horizontally from the front of the units when operating on cooling and heating cycles. For the purposes of this assessment the marginally higher sound pressure levels produced during the heating cycle have been used to calculate the resultant noise levels outside the nearest sensitive buildings.

Calculations to determine the roof mounted units' noise levels outside The Chancery office building during daytime and outside the Gotham Hotel at night are presented in Tables 11 and 12 respectively. Both calculations compare the predicted noise levels with the measured background noise spectra minus 5dB outside these buildings during the corresponding periods and confirm that in both cases noise from the equipment will fall well within Manchester City Council's requirements. No additional mitigation is therefore deemed necessary to reduce noise produced by the units.

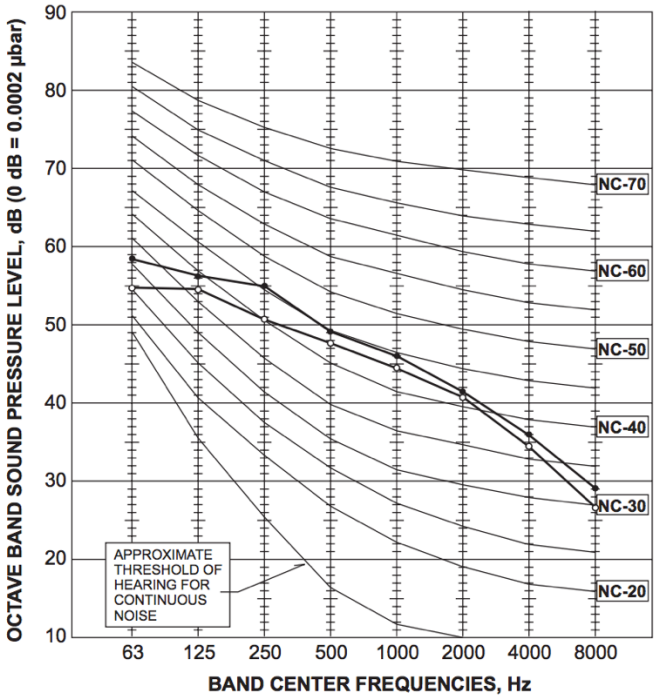


Figure 7: Manufacturer's Sound Pressure Level Data For Air Conditioning Units

	Sound Level @ Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Air Conditioning Unit Sound Pressure Level @ 1m	58	56	55	49	46	41	36
Correction for Number of Units (2 off)	+3	+3	+3	+3	+3	+3	+3
Correction For Propagation Distance to The Chancery (10m)	-20	-20	-20	-20	-20	-20	-20
Noise Level Outside The Chancery	41	39	38	32	29	24	19
Daytime Background Noise Spectrum Outside The Chancery Minus 5dB	57	50	49	45	43	40	35
Complies with MCC criterion?	✓	✓	✓	✓	✓	✓	✓

Table 11: Assessment of Roof Mounted Plant Noise Affecting The Chancery During Daytime

	Sound Level @ Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Air Conditioning Unit Sound Pressure Level @ 1m	58	56	55	49	46	41	36
Correction for Number of Units (2 off)	+3	+3	+3	+3	+3	+3	+3
Correction For Propagation Distance to Gotham Hotel (25m)	-28	-28	-28	-28	-28	-28	-28
Noise Level Outside Gotham Hotel	33	31	30	24	21	16	11
Daytime Background Noise Spectrum Outside Gotham Hotel Minus 5dB	53	51	49	42	39	33	25
Complies with MCC criterion?	✓	✓	✓	✓	✓	✓	✓

Table 12: Assessment Of Roof Mounted Plant Noise Affecting Gotham Hotel During Night-time

The heat recovery unit will be mounted internally but will be connected via cylindrical ductwork to intake and exhaust terminations within the external envelope above the rear fire exit door. Ductborne noise transfer from the unit to the exterior of the building has therefore been calculated by applying appropriate ductwork and end reflection attenuation losses to the sound power level radiated from the unit's connection spigots.

The level of noise radiated externally from the ductwork terminations has then been calculated one metre from the nearest facade of The Chancery office building and compared with the background noise spectrum. The calculation is presented in Table 13 and confirms that ductborne noise from the heat recovery unit will fall within Manchester City Council's requirements, thereby requiring no further attenuation.

	Sound Level @ Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Heat Recovery Unit Sound Power Level	66	62	58	51	51	44	37
Attenuation from 10m of 250mm diameter cylindrical duct	-1	-1	-1	-2	-2	-2	-2
Attenuation from 2x radius bends within 250mm diameter cylindrical duct	0	0	0	0	-2	-4	-6
Attenuation from end reflection of 250mm diameter duct	-12	-8	-4	-1	0	0	0
Sound power level leaving duct terminations	53	53	53	48	47	38	29
Attenuation due to propagation distance to Chancery (3m)	-10	-10	-10	-10	-10	-10	-10
Correction for Number of Units (2 off)	+3	+3	+3	+3	+3	+3	+3
Noise Level Outside The Chancery	46	46	46	41	40	31	22
Daytime Background Noise Spectrum Outside The Chancery Minus 5dB	57	50	49	45	43	40	35
Complies with MCC criterion?	✓	✓	✓	✓	✓	✓	✓

Table 13: Assessment of Noise Radiated From Ductwork Terminations Facing The Chancery

8.0 ASSESSMENT OF NOISE FROM OUTDOOR SEATING AREA

The outdoor seating area for the proposed bar will be located along Concert Lane as indicated in Figure 8. Noise in this area will only comprise customers' voices as no external loudspeakers are proposed.



Figure 8: Proposed Outdoor Seating Area

Overall noise levels produced in the seating area may be estimated by assuming a normal adult speech level of 60dB(A) at a distance of one metre and multiplying this by the anticipated number of customers.

In order to estimate the number of people talking at any one time, reference can be made to recent research, which indicates that at any one time, less than one-third of patrons of a restaurant would be expected to be talking simultaneously (ref J.H. Rindel 'Acoustical capacity as a means of noise control in eating establishments', *Proc of Joint Baltic-Nordic Acoustics Meeting*, 2012).

Assuming a full occupancy of sixteen customers (four seated customers at each of four tables) with six people talking in total, the noise level expected to impact upon the nearest façade of The Chancery office building is 65dB L_{Aeq}.

Whilst it is noted that this potential noise level is approximately 5dB(A) greater than the pre-existing typical ambient (L_{Aeq}) noise level at the office façade, it is known that The Chancery is a fully air-conditioned building that does not include opening windows. Therefore, the level of noise ingress to the nearest offices in The Chancery due to the proposed seating areas is estimated to be approximately 30dB L_{Aeq}. This noise level is 10dB(A) lower than the recommended minimum noise level in general offices and is also expected to be approximately 10dB(A) lower than the ambient noise level in the office areas due to background noise from typical building services systems.

Similarly, the noise level expected to impact upon the nearest façade of The Gotham hotel is no more than 46dB L_{Aeq}. This noise level is 8dB(A) lower than the pre-existing late night ambient (L_{Aeq}) noise level and 4dB(A) lower than the pre-existing late night background (L_{A90}) noise level at the Hotel.

It is therefore considered that there would be no loss of amenity to the surrounding buildings due to the proposed external seating area.

It should be noted that this result assumes that the conduct and hence noise level of the patrons in the external seating areas is in keeping with the proposed use of the seating. It is understood that the proposed bar will operate a policy that ensures that the proposed outdoor seating area is regularly supervised, and therefore the chance for unruly behaviour to develop will be greatly reduced.

9.0 NOISE MITIGATION SCHEME

The previous sections of this report have confirmed that noise from the proposed bar's building services equipment will meet Manchester City Council's noise criteria without additional mitigation. It has also been demonstrated that the bar's trading area can operate with reasonable levels of operational noise during daytime without causing disturbance to occupants of the office above. However, the level of noise reduction provided by the external envelope of the proposed commercial unit in its current condition will impose internal noise limits to ensure that noise egress affecting adjacent sensitive buildings is controlled the satisfaction of Manchester City Council.

The following noise mitigation measures are recommended in order to permit increased levels of operational noise to be generated within the bar that are compatible with busy daytime trading using background music and late evening trading with louder foreground music.

Recommendation 1 – Windows

Seal the opening lights located above the trading area's windows. This may be achieved by replacing the existing seals with fully compressible neoprene seals or by applying a bead of non-hardening clear sealant around the full perimeter of the opening lights such that the windows are non-openable.

Recommendation 2 – Main Entrance

Install a sound lobby at the main entrance to the bar. The minimum distance between lobby doors should be 2.5m in order reduce the risk of both sets of doors being open simultaneously leading to high levels of noise egress. If the existing entrance doors are to be retained, they must be fitted with effective acoustic perimeter seals.

New lobby doors must also be fitted with effective acoustic perimeter seals. The recommended minimum mass of any new doors is 20 kg/m^2. Vision panels in new lobby doors must comprise either double glazing units with 10mm and 6mm panes of glass or a single pane of acoustic laminated glass with a thickness of at least 10.8mm. Both sets of lobby doors should be fitted with self-closing mechanisms. The lobby walls and ceiling should be designed to provide an airborne sound insulation performance of at least 45dB R_w.

Recommendation 3 – Rear Fire Exit

Fit neoprene acoustic seals to the full perimeter of the rear fire exit door.

Recommendation 4 – Lining For Reception/Stairwell Wall

Install an independent plasterboard lining to the wall separating the bar from the adjacent reception area and stairwell. The lining should comprise two layers of 15mm thick high density plasterboard (e.g. SoundBloc from British Gypsum) fixed to an independent timber or metal stud frame (i.e. the new frame should only be fixed at the head and base and should not be ties back to the existing wall). Plywood of minimum thickness 15 mm may be used in lieu of one layer of plasterboard in areas where a pattress is required to support fixings into the wall lining. The cavity formed between the new drylining and the existing wall should be at least 75mm deep and contain 50mm thick mineral fibre insulation. The perimeter of the lining should be sealed with a continuous bead of non-hardening sealant.

The location of the independent wall lining is indicated in Figure 9.

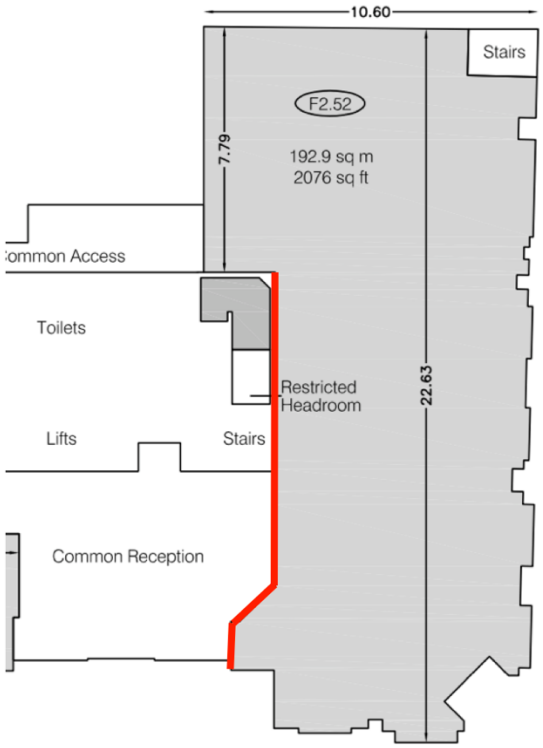


Figure 9: Required Location of Independent Wall Lining

The above mitigation measures will permit the use of operational noise levels in the trading area up to the limits shown in Table 14. The overall daytime and night-time noise levels corresponding to the octave band values shown in Table 14 are 81dB L_{Aeq} and 85dB L_{Aeq}.

	Noise Limit @ Octave Band Centre Frequency (Hz)						
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**
Daytime Trading Noise Limit (10am – 7pm)	68	75	72	78	74	74	73
Night-time Trading Noise Limit (7pm – 3am)	89	89	85	82	77	79	75

Table 14: Revised Operational Noise Limits (L_{eq}) With Mitigation Measures Implemented

APPENDIX A

SOUND INSULATION TEST DETAILS

LOCATION

60 Spring Gardens, Manchester

DATE OF TEST

15 October 2016

WEATHER

Cool, calm and dry

EQUIPMENT

Equipment Description	Type Number	Manufacturer	Serial Number	Date of Last Calibration	Calibration Certificate Number
Sound Level Meter	XL2-TA	NTi Audio	A2A-11085-E0	30/3/2016	42459-A2A-11085-E0
Pre-amp/ Microphone	M2230	NTi Audio	5927/9182	30/3/2016	42459-5927-M2230
Calibrator	CAL200	NTi Audio	12583	30/3/2016	42459-12583
Signal generator	Minirator MR1	Neutrik	GTR179F1D0	n/a	n/a
Loudspeaker	DBR10	Yamaha	BFV101002	n/a	n/a

Table A1 Results of Daytime Sound Insulation/Transmission Tests

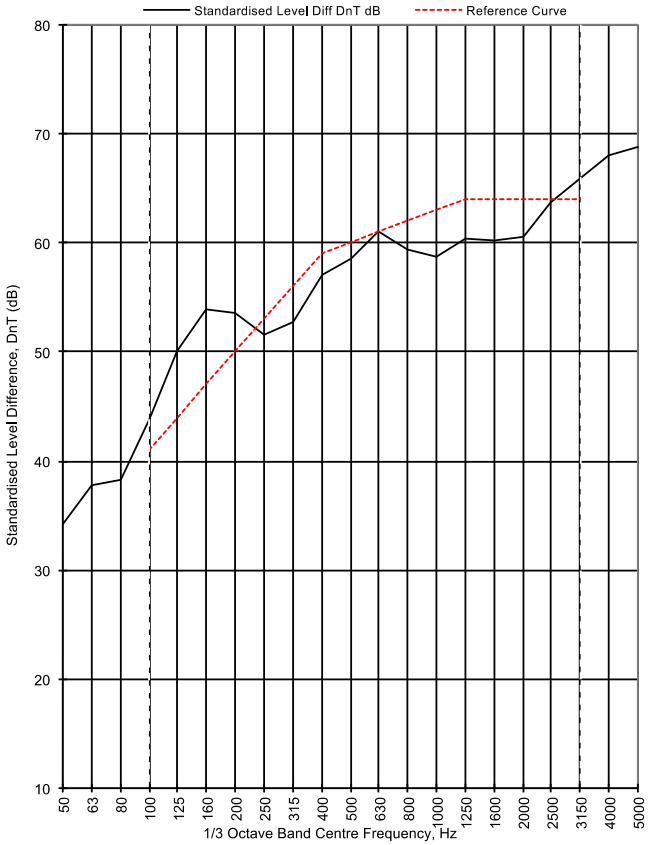
	Measured Noise Level @ Octave Band Centre Frequency (Hz)																				
	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000
Internal Noise Measurements																					
Source noise level in side 1 commercial unit	87.0	93.5	94.8	96.6	95.3	92.3	89.5	88.1	87.3	88.3	87.4	87.9	83.2	80.6	81.7	79.2	79.0	81.2	81.6	83.2	83.3
Source noise level behind main entrance door of commerical unit	86.0	93.0	94.7	92.2	93.0	91.7	89.8	87.3	85.7	87.3	86.2	88.2	82.0	79.8	79.3	77.3	78.6	79.2	80.3	81.5	81.6
Source noise level behind fire exit door of commerical unit	88.2	83.1	82.4	89.2	91.2	87.4	84.3	84.1	81.4	82.2	79.2	79.7	75.1	72.9	73.5	69.6	71.0	73.5	74.1	74.6	74.7
Receiver noise level in 1st floor office	52.8	56.0	53.8	51.2	44.6	39.4	38.1	36.6	34.6	31.9	28.9	27.4	23.3	21.4	20.8	18.5	17.5	16.4	15.1	14.3	13.3
Ambient noise level in 1st floor office	42.0	40.2	39.2	34.4	33.6	29.4	26.8	29.1	26.6	26.3	25.3	22.7	21.2	19.7	18.1	16.1	16.8	16.3	14.0	12.3	11.7
Receiver noise level in reception area	60.0	72.3	70.2	68.3	66.8	58.0	56.0	55.5	52.7	51.0	47.7	49.3	42.6	40.3	39.0	36.4	33.7	35.6	34.3	31.7	29.6
Ambient noise level in reception area	40.0	41.8	39.3	36.5	48.0	38.5	40.3	41.4	40.5	40.7	36.6	38.2	31.9	30.6	31.4	25.7	23.6	19.3	17.5	14.4	13.0
Receiver noise level in stairwell	59.2	64.1	63.6	57.0	54.3	50.8	50.4	45.4	43.9	41.3	38.1	37.2	32.5	27.6	26.2	23.5	22.8	22.9	21.7	23.2	20.2
Ambient noise level in stairwell	40.0	34.3	36.6	41.3	35.9	35.0	33.0	31.8	33.9	30.3	27.5	23.5	19.5	18.5	17.7	15.5	14.7	13.5	12.6	11.6	11.6
External Noise Measurements																					
Receiver noise level outside 5 Spring Gardens façade	68.4	68.1	65.0	65.9	65.7	67.7	64.7	60.7	59.2	56.1	56.4	59.8	55.8	54.4	54.0	51.0	48.7	46.6	44.8	46.4	43.4
Ambient noise level on 5 Spring Gardens	66.0	56.7	52.7	55.2	54.2	56.7	53.7	53.5	54.0	51.3	52.3	52.3	51.1	49.7	50.3	49.4	49.2	45.0	43.4	42.9	39.7
Receiver noise level outside Concert Lane façade	73.3	66.7	71.8	72.4	70.1	69.9	66.5	61.8	61.6	60.0	59.1	60.1	55.0	55.4	56.1	54.0	52.3	50.7	51.2	47.2	47.8
Ambient noise level on Concert Lane	64.9	59.4	55.4	55.4	52.6	55.4	54.0	52.8	51.0	52.0	51.6	50.1	49.9	48.2	47.3	45.9	44.3	41.8	39.7	39.0	35.5
Receiver noise level outside main entrance	76.9	80.6	76.0	75.9	70.2	69.6	67.3	66.4	62.4	64.3	63.9	64.2	59.5	57.7	58.6	56.2	53.5	54.8	55.4	56.3	54.8
Receiver noise level outside fire exit	66.8	66.1	73.6	70.9	66.0	63.9	59.3	58.2	53.3	55.3	54.9	54.5	52.2	51.9	51.4	49.9	49.1	49.4	48.3	49.6	50.7

Standardised level difference according to ISO 140-4
Field measurements of airborne sound insulation between rooms

Project No:	A0063	ANC Test No:	0	Date of Test:	14-Oct-16
Client:	0			Transmission Path:	Roc & Rye Unit to Office Above
Location:	60 Spring Gardens, Manchester			Building Element:	Party Floor
Construction:					

Source room volume: 0.0 m^3
Receiving room volume: 0.0 m^3

1/3 Octave Band Centre Frequency Hz	Standardised Level Diff D_{nT} dB
50	34.2
63	37.7
80	38.2
100	43.9
125	50.1
160	53.9
200	53.5
250	51.6
315	52.8
400	≥ 57.0
500	≥ 58.5
630	≥ 61.1
800	≥ 59.4
1000	≥ 58.7
1250	≥ 60.4
1600	≥ 60.2
2000	≥ 60.6
2500	≥ 63.7
3150	≥ 65.9
4000	≥ 68.0
5000	≥ 68.8



D_w ≥ 60 dB

Rating according to BS EN ISO 717-1

$D_{nT,w}$ ($C;C_{tr}$) = 60 (-1 ; -3) dB

$C_{50\text{-}3150}$ =	-1	dB	$C_{50\text{-}5000}$ =	0	dB	$C_{100\text{-}5000}$ =	0	dB
$C_{tr,\ 50\text{-}3150}$ =	-7	dB	$C_{tr,\ 50\text{-}5000}$ =	-7	dB	$C_{tr\ 100\text{-}5000}$ =	-3	dB

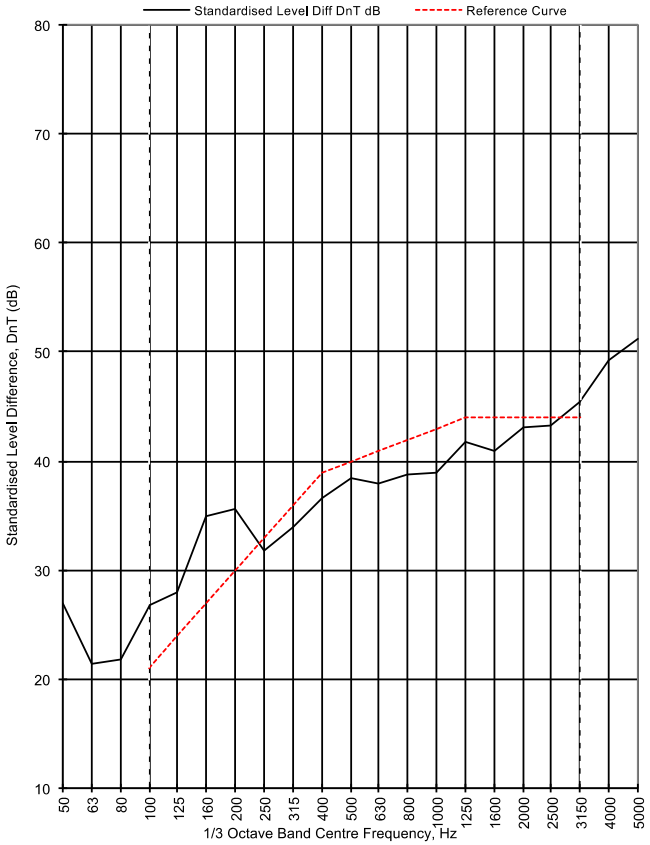
Evaluation based on field measurement results obtained by an engineering method

Standardised level difference according to ISO 140-4
Field measurements of airborne sound insulation between rooms

Project No:	A0063	ANC Test No:	0	Date of Test:	14-Oct-16
Client:	0			Transmission Path:	Roc & Rye Unit to Reception
Location:	60 Spring Gardens, Manchester			Building Element:	Party Wall
Construction:					

Source room volume: 0.0 m^3
Receiving room volume: 0.0 m^3

1/3 Octave Band Centre Frequency Hz	Standardised Level Diff D_{nT} dB
50	27.0
63	21.4
80	21.8
100	26.8
125	27.9
160	34.9
200	35.6
250	31.8
315	33.9
400	36.6
500	38.4
630	37.9
800	38.8
1000	39.0
1250	41.7
1600	41.0
2000	43.1
2500	43.2
3150	45.4
4000	49.3
5000	51.2



D_w = 40 dB

Rating according to BS EN ISO 717-1

$D_{nT,w}$ $(C;C_{tr})$ = 40 (0 ; -3) dB

$C_{50\text{-}3150}$ =	-1	dB	$C_{50\text{-}5000}$ =	0	dB	$C_{100\text{-}5000}$ =	1	dB			
$C_{tr,\ 50\text{-}3150}$ =	-4	dB	$C_{tr,\ 50\text{-}5000}$ =	-4	dB	$C_{tr\ 100\text{-}5000}$ =	-3	dB			

Evaluation based on field measurement results obtained by an engineering method

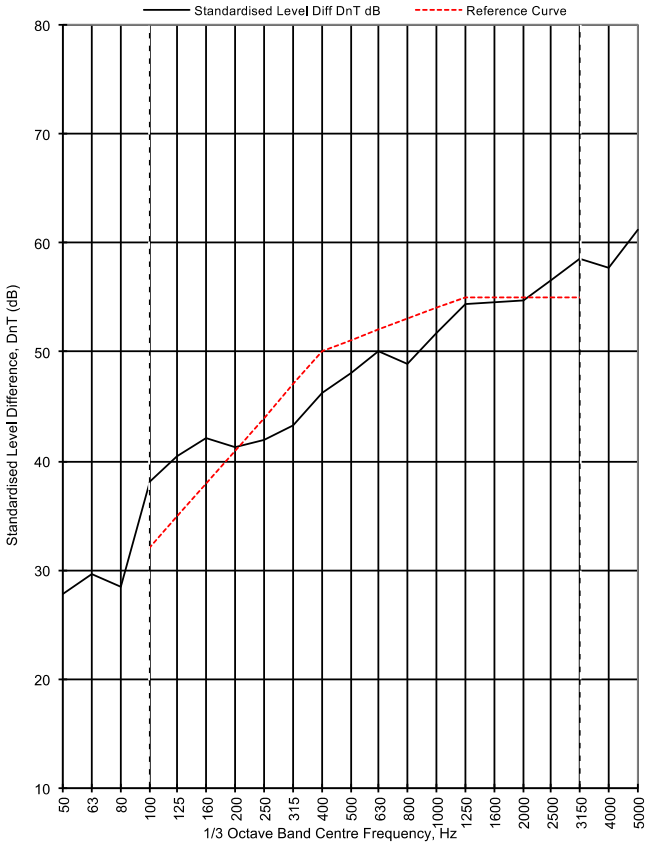
Standardised level difference according to ISO 140-4
Field measurements of airborne sound insulation between rooms

Project No:	A0063	ANC Test No:	0	Date of Test:	14-Oct-16
Client:	0			Transmission Path:	Roc & Rye Unit to Stairs
Location:	60 Spring Gardens, Manchester			Building Element:	Party Wall
Construction:					

Source room volume: 0.0 m^3
Receiving room volume: 0.0 m^3

Frequency range according to curve of reference values (ISO 717-1)

1/3 Octave Band Centre Frequency Hz	Standardised Level Diff D_{nT} dB
50	27.8
63	29.6
80	28.4
100	38.1
125	40.4
160	42.1
200	41.2
250	41.9
315	43.2
400	46.3
500	48.0
630	50.0
800	48.9
1000	51.8
1250	54.4
1600	54.6
2000	54.7
2500	56.5
3150	58.5
4000	57.8
5000	61.2



D_w = 51 dB

Rating according to BS EN ISO 717-1

$D_{nT,w}$ (C;C_{tr}) = 51 (0 ; -3) dB

$C_{50\text{-}3150}$ = -1 dB $C_{50\text{-}5000}$ = 0 dB $C_{100\text{-}5000}$ = 1 dB

$C_{tr,\ 50\text{-}3150}$ = -7 dB $C_{tr,\ 50\text{-}5000}$ = -7 dB $C_{tr\ 100\text{-}5000}$ = -3 dB

Evaluation based on field measurement results obtained by an engineering method

APPENDIX B

AMBIENT NOISE SURVEY DETAILS

LOCATION

60 Spring Gardens, Manchester

DATE OF TEST

20 October 2016 – Afternoon and early hours of morning

WEATHER

Cool, calm and dry during both survey periods

EQUIPMENT

Equipment Description	Type Number	Manufacturer	Serial Number	Date of Last Calibration	Calibration Certificate Number
Sound Level Meter	XL2-TA	NTi Audio	A2A-11085-E0	30/3/2016	42459-A2A-11085-E0
Pre-amp/ Microphone	M2230	NTi Audio	5927/9182	30/3/2016	42459-5927-M2230
Calibrator	CAL200	NTi Audio	12583	30/3/2016	42459-12583

Table B1 Results of Daytime Ambient Noise Survey

Measurement Position	Start Time	L_{Aeq}, (dB)	L_{Amax} (dB)	L_{A90} (dB)	Sound Level L_{eq} at Octave Band Centre Frequency (Hz)						
					63	125	250	500	1k	2k	4k
Position 1	14:45	55.9	61.6	54.0	64.4	57.3	55.3	52.0	51.2	48.4	42.8
	14:50	57.9	69.1	53.8	67.5	58.5	58.5	54.1	52.4	50.6	45.9
	14:55	56.6	67.9	52.7	65.1	58.0	55.8	51.2	51.8	50.6	42.9
	15:00	58.1	72.4	54.6	68.2	60.1	57.6	53.5	52.3	51.7	46.9
	15:51	57.7	68.1	53.0	68.4	60.6	57.0	53.4	52.6	50.5	44.9
	15:56	55.2	65.8	52.7	65.7	57.5	56.3	51.2	49.6	47.4	42.4
	16:01	58.7	65.5	55.8	70.9	64.5	58.8	56.2	52.8	50.5	46.1
	Typical L_{90} spectrum				62	55	54	50	48	45	40
Position 2	15:22	62.9	80.1	57.4	70.1	64.5	61.3	59.1	57.4	55.7	52.7
	15:27	63.9	79.1	58.6	74.5	66.7	63.5	59.8	58.6	56.5	52.2
	15:32	65.0	82.7	57.9	71.9	66.0	62.2	61.2	60.9	57.0	52.5
	15:37	62.0	74.1	58.5	69.5	63.3	60.8	59.7	57.0	53.8	48.5
	16:10	61.6	74.3	57.6	70.1	62.5	60.1	58.7	57.0	54.2	47.2
	16:15	64.8	74.9	60.8	73.0	66.9	62.7	60.9	59.2	57.7	54.5
	16:20	66.2	78.2	60.9	73.7	67.3	64.1	62.1	61.6	58.7	53.9
	16:25	63.7	76.1	59.4	72.0	66.1	61.7	60.2	58.6	56.2	52.5
	Typical L_{90} spectrum				65	61	58	55	52	49	43

Table B2 Results of Night-time Ambient Noise Survey

Measurement Position	Start Time	L_{Aeq}, (dB)	L_{Amax} (dB)	L_{A90} (dB)	Sound Level L_{eq} at Octave Band Centre Frequency (Hz)						
					63	125	250	500	1k	2k	4k
Position 1	02:02	56.5	66.0	46.8	60.6	53.6	51.4	44.8	45.5	42.8	39.4
	02:07	51.9	58.8	47.1	63.4	57.7	52.3	45.7	44.4	40.1	31.7
	02:12	49.8	53.2	46.7	57.4	54.0	51.4	44.5	43.6	38.2	29.9
	Typical L_{90} spectrum				53	52	50	42	40	34	26
Position 2	02:20	53.6	65.4	50.8	61.6	58.4	55.2	49.8	48.8	43.6	36.7
	02:25	53.5	57.9	51.3	62.5	58.3	55.4	50.0	48.4	43.6	35.2
	02:30	57.7	66.4	51.4	65.5	60.1	57.6	54.7	52.8	50.0	42.7
	02:35	55.8	66.6	50.7	63.5	59.3	55.7	52.5	51.1	47.0	41.3
	02:40	53.8	62.5	50.7	62.8	58.2	55.7	50.1	48.5	44.5	35.8
	02:45	51.7	57.7	50.3	60.9	57.2	55.1	48.2	45.0	40.4	32.6
	02:50	55.2	63.9	51.1	63.6	58.6	56.4	51.2	50.7	46.0	37.8
	02:55	54.2	67.4	51.1	62.1	58.4	56.1	50.5	49.8	43.4	34.2
	03:00	52.7	60.3	50.2	61.0	57.8	54.9	49.8	46.7	42.2	34.1
	Typical L_{90} spectrum				58	56	54	47	44	38	30