
Our Reference: NIA/1199/23/248/v2.0/360 Lounge

20th November 2023

Syed Helal Uddin Architectural Services
58 Southwood Drive
Baxenden
Accrington
Lancashire
BB5 2PZ



Dear Sir

NOISE IMPACT ASSESSMENT FOR THE PROPOSED VARIATION OF CONDITION NO. 3 (HOURS OF OPENING) ATTACHED TO PLANNING PERMISSION 034433 TO ALLOW THE PREMISES TO OPEN FROM 8.00 AM TO 5.00 AM SEVEN DAYS A WEEK

THE 360 LOUNGE, 54–56 WILMSLOW ROAD, MANCHESTER, M14 5AL

MANCHESTER CITY COUNCIL PLANNING APPLICATION 138303/JO/2023

1.00 SCOPE OF ACOUSTIC CONSULTANCY SERVICES

- 1.01 RP Acoustics Limited has been commissioned by Mr Sayamend Mamend to carry out a noise impact assessment for a proposed variation of Condition No. 3 (hours of opening) attached to Planning Permission 034433 to allow the premises to open from 8.00 am to 5.00 am seven days a week at the 360 Lounge, 54–56 Wilmslow Road, Manchester, M14 5AL (hereafter referred to as the application site).
- 1.02 The assessment has been undertaken in order to accompany / validate Planning Application 138303/JO/2023 submitted to Manchester City Council.
- 1.03 For reference, Condition No. 3 of Planning Permission 034433 states *‘The restaurant shall not be open outside the following hours:- Sunday to Thursday 8.00 am to 11.30 pm and Fridays and Saturdays 8.00 am to midnight.’*
- 1.04 The scope of work for the noise impact assessment is as follows:
- Determine the night time background and ambient noise levels at the application site
 - Determine the noise levels within the restaurant
 - Determine the airborne sound insulation of the separating floor between the restaurant and the overlying dwelling flats
 - Determine the rating noise level associated with the new kitchen extraction system
 - Determine any further noise mitigation measures required
- 1.05 This report sets out the methodology and findings of the noise assessment. It has been prepared on behalf of Mr Sayamend Mamend for the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties making reference to the report should consult Mr Sayamend Mamend (applicant), Syed Helal Uddin Architectural Services (applicant’s agent) and RP Acoustics Limited as to the extent to which the findings may be appropriate for their use.
- 1.06 A glossary of acoustic terms is contained in Appendix 1 for reference.

2.00 APPLICATION SITE SETTING AND EXISTING RESTAURANT

- 2.01 The application site is located on the B5117 Wilmslow Road in a mixed commercial and residential setting in Rusholme, circa 5 kilometres to the south south east of Manchester city centre. The locality consists of numerous eating establishments (with opening times permitted late at night / early in the morning) with dwelling flats directly above (which is also the case with the 360 Lounge). The application site location plan is reproduced in Appendix 2 for reference.
- 2.02 The application site (existing restaurant) consists of:
- A covered outdoor forecourt fronting onto the B5117 Wilmslow Road
 - A front part which is ground floor restaurant with a further two storeys of dwelling flats above
 - A middle part which is ground floor restaurant; this part is single storey above which is the access gangway to the upper floor dwelling flats
 - A rear part which consists of ground floor back of house area (kitchen) with a lounge area (to be used for post meal refreshments) at first floor
- 2.03 The proposed floor plans and proposed elevations are reproduced in Appendix 3 for reference. The proposed 3D views are reproduced in Appendix 4 for reference.
- 2.04 It is important to note that the restaurant will not serve alcohol.
- 2.05 For reference, a core hole in the two-storey rear part of the building illustrates that the separating construction above the ground floor consists of:
- 75 mm sand; cement screed
 - Resilient layer
 - 225 mm concrete slab
 - 50 mm timber battens to form a ceiling void
 - 15 mm fire line plasterboard
- 2.06 In terms of sound insulation, the existing separating floor construction is substantial and provides airborne sound insulation very significantly above that required under Building Regulations Approved Document E 'Resistance to the Passage of Sound' 2003 (ADE 2003). This is discussed later in this assessment.

3.00 PRE-ASSESSMENT CONSULTATION

- 3.01 Due to the timescales involved with the noise impact assessment required by 15th November 2023 in order to validate the planning application, it has not been possible to undertake pre-assessment consultation with the Environmental Health Department at Manchester City Council.
- 3.02 Notwithstanding this, Manchester City Council's Planning and Noise Technical Guidance dated October 2022 has been followed.

4.00 BASELINE NOISE SURVEY

- 4.01 A baseline noise survey was undertaken from 2300 hours on Friday 3rd to 0445 on Saturday 4th November 2023. For the purpose of the baseline noise survey, the following noise monitoring positions were adopted (see Appendix 5).
- NMP1 was located in a free field environment at first floor height in line with the Wilmslow Road façade
 - NMP2 was located in a free field environment at first floor on the entrance walkway to the dwelling flats

- 4.02 Noise measurements were undertaken using an NtI Audio XL2 Type 1 integrating sound level meter. A 90 mm windshield was fitted for all measurements. The measurement system calibration was verified immediately before and after measurement sessions with no drift in calibration level was noted (calibration certificates reproduced in Appendix 6 for reference).
- 4.03 Measurements consisted of A-weighted broadband parameters, together with linear third octave band L_{eq} levels, with a logging interval of 1 second. The following table contains a summary of the relevant measurement data, rounded to the nearest decibel

Table 4.1 – Baseline Noise Measurement Data

Position	Date	Time	L _{Aeq} (dB)	L _{A90} (dB)	L _{A10} (dB)	L _{A1} (dB)	L _{AFMax} (dB)	Comments
NMP1	Friday 03/11/23	2300–2330	66	58	68	74	92	Wilmslow traffic dominant Pedestrians
		2330–0000	66	58	68	74	90	
	Saturday 04/11/23	0015–0100	66	58	68	74	92	
		0100–0200	65	57	67	73	90	
		0215–0300	65	56	67	74	89	
		0300–0400	65	55	66	73	88	
		0415–0445	64	55	66	72	89	
High Ambient Noise Climate circa 65 dB L _{Aeq} (0015–0445) Maximum Noise Level consistently above 70 dB L _{AFMax} due to traffic Note: Relevant re: Building Regulations Approved Document O ‘Overheating’								
NMP2	Saturday 04/11/23	0000–0015	56	55	57	59	63	Broadband plant from existing hot food takeaways, distant traffic
		0200–0215	54	51	55	61	63	
		0400–0415	53	50	56	60	63	
Night Time Background Noise Level 50 dB L _{A90} (15 minutes, 2300–0700)								

- 4.04 Ambient and maximum noise levels at the front of the dwelling flats facing the B5177 Wilmslow Road are consistently high due to traffic. There is no notable ‘drop-off’ in ambient, background and maximum noise levels as the night progresses due to the busy night time economy of the locale (illustrated by regular public service buses continuing to 0330 hours).
- 4.05 Building Regulations Approved Document O ‘Overheating’ 2022 (BRADO) states ‘*In locations where external noise may be an issue (for example, where the Local Planning Authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11 pm to 7 am). Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits: 40 dB $L_{Aeq,T}$ averaged over 8 hours (between 11 pm and 7 am); and 55 dB L_{AFMax} more than 10 times a night (between 11 pm and 7 am).*’
- 4.06 In accordance with BRADO, it therefore follows that, based on 15 dB attenuation for a partially open window for thermal comfort, where external noise levels above 55 dB L_{Aeq} (2300–0700) and 70 dB L_{AFMax} (2300–0700) (11th highest), windows are likely to remain closed at night. This was observed to be the case with the B5177 Wilmslow Road façade of the upper floor dwelling flats during the course of the baseline noise survey.

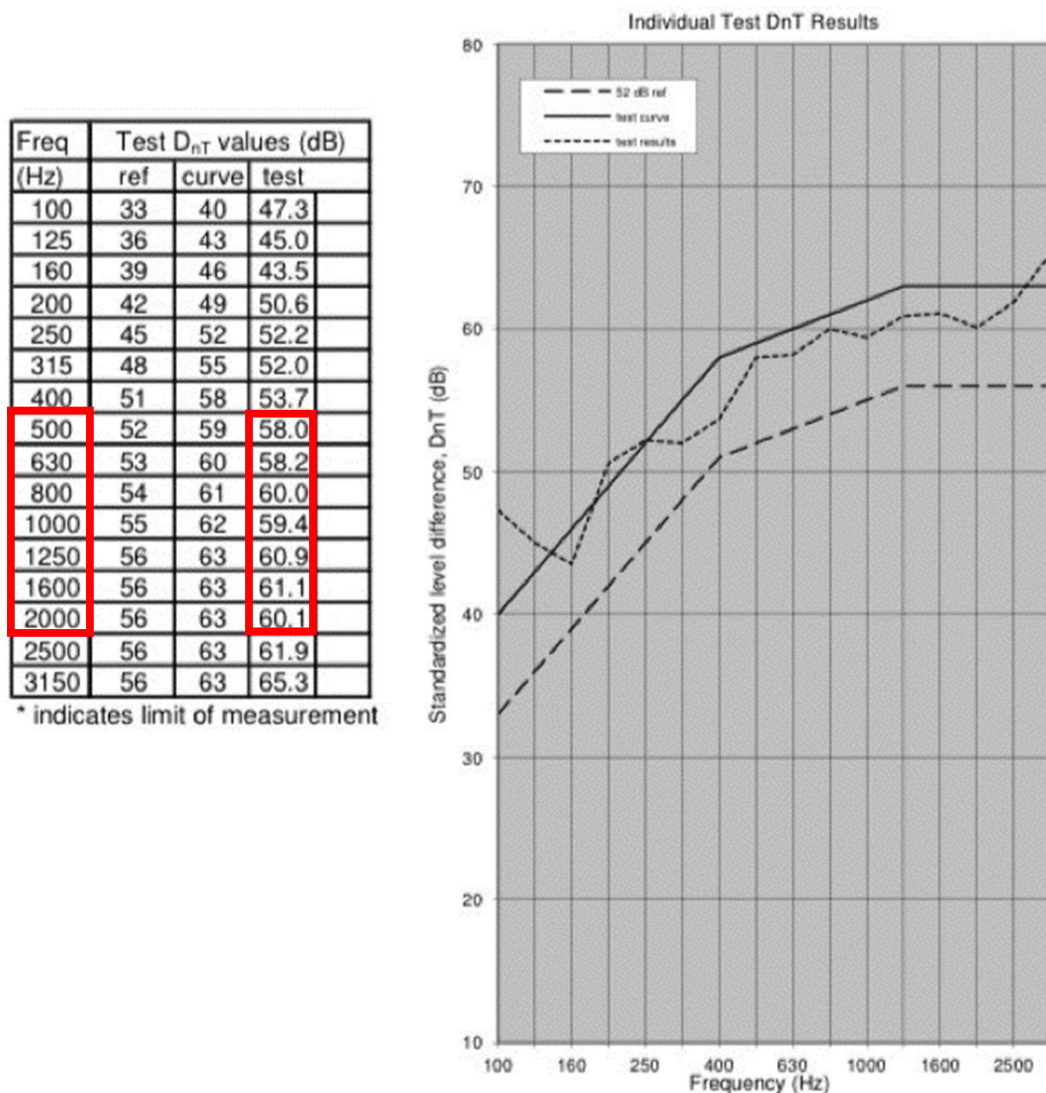
5.00 NOISE IMPACT ASSESSMENT

- 5.01 In respect of the potential noise impact of the proposed extended trading hours (to 5.00 am) of the 360 Lounge on the dwelling flats above, the following require consideration:

- Noise transmission through the separating floor to the dwelling flats above
- Noise transmission through the first floor fire door opening onto the flat’s access walkway
- Noise transmission from the covered forecourt area
- Noise associated with the kitchen extraction system

Noise Transmission Through The Separating Floor To The Dwelling Flats Above

- 5.02 With respect to sound insulation, Building Regulations ADE 2003 Requirement E1 states *'Dwelling-houses, flats, and rooms for residential purposes shall be design and constructed in such a way that they provide reasonable resistance to sound from other parts of the same building and from adjoining buildings'*.
- 5.03 Building Regulations ADE 2003 sets the minimum performance criteria for separating floors (in an existing building) between residential uses as airborne sound insulation of at least 43 dB $D_{nT,w} + C_{tr}$ (the higher the better).
- 5.04 In the situation where residential use is adjacent to commercial use, a judgement is to be made whether a higher standard of sound insulation is required due to the level and/or character of noise generated within the commercial use.
- 5.05 The proposed ground floor use is as a restaurant. Such use falls within Use Class E, which includes shops, financial and professional services, restaurants and cafes (where the consumption of food and drink is mostly undertaken on the premises).
- 5.06 It is not considered that the noise sources within the proposed use are materially different in character to those found within a residential setting (voices). Notwithstanding this, however, considering the size of the restaurant dining area at circa 120 m² (when allowing for a drinks service area and a food service area) there will be circa 80 covers (seats) based on an the standard spacing of 1.5 m² per person seat. As such, there is the potential for an intensification of use compared to residential use.
- 5.07 It is therefore considered that the airborne sound insulation over and above the minimum performance criteria set out in Building Regulations ADE 2003 will be required to protect the overlying residential dwelling flats from noise from the restaurant dining area.
- 5.08 The existing separating floor above the restaurant dining area (to be overlying residential dwelling flats) is:
- 75 mm sand;cement screed
 - Resilient layer
 - 225 mm concrete slab
 - 50 mm timber battens to form a ceiling void
 - 15 mm fire line plasterboard
- 5.09 In terms of sound insulation, the existing separating floor construction is comparable to Robust Detail (RD) E-FC-18. RD E-FC-18 is awarded 3 credits under the Code for Sustainable Homes which means that the minimum airborne sound insulation is at least 50 dB $D_{nT,w} + C_{tr}$ (and for reference at least 56 dB $D_{nT,w}$).
- 5.10 A sound insulation test of a comparable separating floor construction is shown overleaf in Figure 5.1. For reference, the airborne sound insulation of a comparable separating floor construction was 55 dB $D_{nT,w} + C_{tr}$ and 59 dB $D_{nT,w}$. This is very significantly above the minimum airborne performance standard (for existing buildings) of 43 dB $D_{nT,w} + C_{tr}$ required under Building Regulations ADE 2003.
- 5.11 It is also noteworthy that the airborne sound insulation across the speech frequencies range was 58 dB at 500 hertz, 59 dB at 1,000 hertz and 60 dB at 2,000 hertz (this is discussed in more detail in the following paragraphs).

Figure 5.1 – Sound Insulation Test of Concrete Separating Floor

- 5.12 In order to establish the maximum noise levels associated within the restaurant dining area incident upon the underside of the separating floor to the dwelling flats above, measurements were made inside a busy (full occupancy) city centre restaurant during a weekend night. The highest ambient noise level was 83 dB $L_{Aeq}(15 \text{ minutes})$ and the absolute highest maximum noise level was 90 dB L_{AFMax} . These levels are reduced by 3 dB to 80 dB $L_{Aeq}(15 \text{ minutes})$ and 87 dB L_{AFMax} in order to establish the free field noise level incident upon the underside of the ceiling.
- 5.13 Based on other measurements taken within restaurant situations, these ambient and maximum noise levels are considered robust. Furthermore, these levels are considered robust given that the 'Engineering Toolbox' reports that the Speech Interference Level¹ at 0.3 metres is 70 dB for a normal voice, 76 dB for a raised voice, 82 dB for a very loud voice and 88 dB for shouting.

¹ Speech Interference Level (SIL) is the arithmetic mean in the 500, 1,000 and 2,000 Hertz octave bands (the speech frequencies)

- 5.14 Based on a highest ambient noise level of 80 dB L_{Aeq} (15 minutes) and an absolute highest maximum noise level of 87 dB L_{AFMax} (both free field incident upon the underside of the ceiling), and the airborne sound insulation of the separating floor (Figure 5.1), the resultant noise levels in the dwelling flats above is calculated at 20 dB L_{Aeq} (15 minutes) and 31 dB L_{AFMax} (see Table 5.1); for clarification the frequency range 400 to 2,500 hertz is shown in the table below as these are the dominant frequencies.

Table 5.1 – Calculation of Ambient and Maximum Noise Levels in the Overlying Dwelling Flats due to the Restaurant

	L_{Zeq} @400.0 [dB]	L_{Zeq} @500.0 [dB]	L_{Zeq} @630.0 [dB]	L_{Zeq} @800.0 [dB]	L_{Zeq} @1k [dB]	L_{Zeq} @1.25k [dB]	L_{Zeq} @1.6k [dB]	L_{Zeq} @2k [dB]	L_{Zeq} @2.5k [dB]	L_{Aeq} @400-2.5k [dB]
Voice L_{Zeq} (15 mins)	72.0	76.0	77.7	75.9	72.5	72.9	73.1	69.9	62.9	83
Reflective Field	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	80
Separating Floor	-53.7	-58.0	-58.2	-60.0	-59.4	-60.9	-61.1	-60.1	-61.9	
A-weighting	-4.8	-3.2	-1.9	-0.8	0.0	0.6	1.0	1.2	1.3	
Resultant	10.5	11.8	14.6	12.1	10.1	9.6	10.0	8.0	-0.7	20

	L_{ZFmax} @400.0 [dB]	L_{ZFmax} @500.0 [dB]	L_{ZFmax} @630.0 [dB]	L_{ZFmax} @800.0 [dB]	L_{ZFmax} @1k [dB]	L_{ZFmax} @1.25k [dB]	L_{ZFmax} @1.6k [dB]	L_{ZFmax} @2k [dB]	L_{ZFmax} @2.5k [dB]	L_{AFmax} @400-2.5k [dB]
Voice Max	84.6	84.9	87.2	86.9	82.9	85.4	82.4	80.8	69.5	90
Reflective Field	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	87
Separating Floor	-53.7	-58.0	-58.2	-60.0	-59.4	-60.9	-61.1	-60.1	-61.9	
A-weighting	-4.8	-3.2	-1.9	-0.8	0.0	0.6	1.0	1.2	1.3	
Resultant	23.1	20.7	24.1	23.1	20.5	22.1	19.3	18.9	5.9	31

- 5.15 In terms of ambient noise levels this is 10 decibels below the 30 dB L_{Aeq} (2300–0700) threshold of ‘good sleeping conditions’ as defined in BS 8233 and 14 decibels below the 45 dB L_{AFMax} threshold below which the effects of individual noise events (from all sources) on sleep can be regarded as negligible as defined in Appendix A of ProPG Professional Planning Guidance on Planning and Noise.

- 5.16 It is therefore concluded that there is no issue with respect to sound transmission from the ground floor restaurant to the overlying dwelling flats via the separating floor with the proposed opening hours up to 5.00 am.

Noise Transmission Through First Floor Fire Door

- 5.17 It is noted that there is a fire door at first floor level (lounge area to be used for post meal refreshments) that (in the event of an emergency) opens onto the walkway to the dwelling flats (circa 4 metres distance away).

- 5.18 Based on the (highly unlikely) worst case scenario of maximum noise levels in the ground floor dining area being replicated in the first floor lounge area (to be used for post meal refreshments) at first floor, the noise break out is calculated in accordance with the following equation:

$$\begin{aligned}
 L_{Aeq \text{ Outside}} &= L_{Aeq \text{ Inside}} - R_w - 6 - DA \text{ where} & R_w &= 30 \text{ dB Fire Door} \\
 L_{Aeq \text{ Outside}} &= 80 - 30 - 6 - 12 & -6 &= \text{Internal/External Correction} \\
 L_{Aeq \text{ Outside}} &= 32 \text{ dB } L_{Aeq} & \text{Distance Attenuation} &= 20\log(4)
 \end{aligned}$$

Note: this is 18 decibels below than the lowest night time background noise level at the rear

$$\begin{aligned}
 L_{AFMax} \text{ Outside} &= L_{AFMax} \text{ Inside} - R_w - 6 - DA \text{ where } R_w = 30 \text{ dB Fire Door} \\
 L_{AFMax} \text{ Outside} &= 87 - 30 - 6 - 12 \quad - 6 = \text{Internal/External Correction} \\
 L_{AFMax} \text{ Outside} &= 39 \text{ dB(A)} \quad \text{Distance Attenuation} = 20\log(4)
 \end{aligned}$$

Note: allowing 15 decibels attenuation for a partially open window, the resultant maximum noise level inside the adjacent dwelling flats would be 24 dB L_{AFMax} ; this is 21 decibels below the 45 dB L_{AFMax} threshold below which the effects of individual noise events (from all sources) on sleep can be regarded as negligible

- 5.19 It is therefore concluded that there is no issue with respect to sound transmission from the first floor lounge area via the fire door on the nearby dwelling flats associated with the proposed opening hours up to 5.00 am.

Noise Transmission from the Covered Forecourt Area

- 5.20 The canopy which runs over the entire length of the front of the block (protruding from the front façade of the buildings to the pavement) is felt over 22 mm marine ply over circa 350 mm timber joists over 22 mm chipboard). This is akin to an internal timber floor in a dwelling house, although deeper (and thus will provide a higher standard of sound insulation). A sound insulation test of an internal separating floor construction is shown below in Figure 5.1.

Figure 5.1 – Sound Insulation Test of Internal Timber Floor

Rating according to ISO 717-1

DnT,w (C; Ctr) : 37 (-2; -7) dB

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

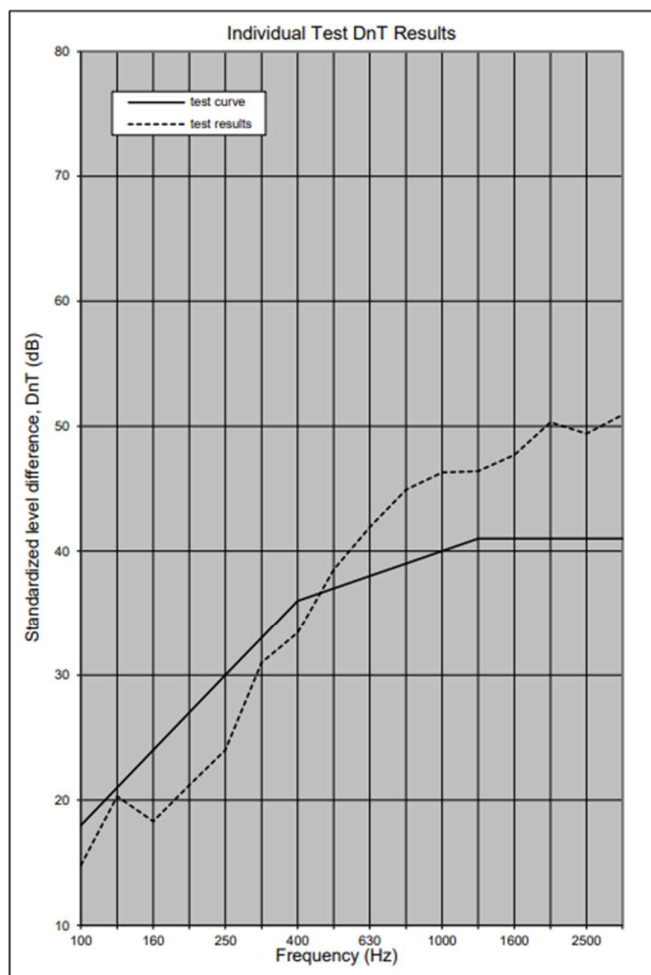
Freq (Hz)	Test D_{nT} values (dB)	
	curve	test
100	18	14.8
125	21	20.3
160	24	18.3
200	27	21.2
250	30	24.0
315	33	31.0
400	36	33.4
500	37	38.5
630	38	41.9
800	39	44.9
1000	40	46.3
1250	41	46.4
1600	41	47.7
2000	41	50.3
2500	41	49.4
3150	41	50.9

indicates background corrected

* indicates limit of measurement

Construction details:

Internal Timber Floor



- 5.21 Based on the (unlikely) worst case scenario of ambient and maximum noise levels in the ground floor dining area being replicated in the enclosed canopy area, and the airborne sound insulation of the canopy (Figure 5.2), the resultant noise levels **outside** the dwelling flats above is calculated at 28 dB L_{Aeq} (15 minutes) and 39 dB L_{AFMax} (see Table 5.2); for clarification the frequency range 400 to 2,500 hertz is shown in the table below as these are the dominant frequencies.

Table 5.2 – Calculation of Ambient and Maximum Noise Levels outside the Overlying Dwelling Flats due to the Enclosed Canopy Area

	L_{Zeq} @400.0 [dB]	L_{Zeq} @500.0 [dB]	L_{Zeq} @630.0 [dB]	L_{Zeq} @800.0 [dB]	L_{Zeq} @1k [dB]	L_{Zeq} @1.25k [dB]	L_{Zeq} @1.6k [dB]	L_{Zeq} @2k [dB]	L_{Zeq} @2.5k [dB]	L_{Aeq} @400-2.5k [dB]
Voice L_{Zeq} (15 mins)	72.0	76.0	77.7	75.9	72.5	72.9	73.1	69.9	62.9	83
Internal to External	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	77
400mm Deep Canopy	-33.4	-38.5	-41.9	-44.9	-46.3	-46.4	-47.7	-50.3	-49.4	
Distance Attenuation ($10 \cdot \log(2)$)	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	
A-weighting	-4.8	-3.2	-1.9	-0.8	0.0	0.6	1.0	1.2	1.3	
Resultant	21.8	22.3	21.9	18.2	14.2	15.1	14.4	8.8	2.8	28

Note: this is 27 decibels below than the lowest night time background noise level at the front

	L_{ZFmax} @400.0 [dB]	L_{ZFmax} @500.0 [dB]	L_{ZFmax} @630.0 [dB]	L_{ZFmax} @800.0 [dB]	L_{ZFmax} @1k [dB]	L_{ZFmax} @1.25k [dB]	L_{ZFmax} @1.6k [dB]	L_{ZFmax} @2k [dB]	L_{ZFmax} @2.5k [dB]	L_{AFmax} @400-2.5k [dB]
Voice Max	84.6	84.9	87.2	86.9	82.9	85.4	82.4	80.8	69.5	90
Internal to External	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	
400mm Deep Canopy	-33.4	-38.5	-41.9	-44.9	-46.3	-46.4	-47.7	-50.3	-49.4	
Distance Attenuation ($10 \cdot \log(2)$)	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	
A-weighting	-4.8	-3.2	-1.9	-0.8	0.0	0.6	1.0	1.2	1.3	
Resultant	34.4	31.2	31.4	29.2	24.6	27.6	23.7	19.7	9.4	39

Note: allowing 15 decibels attenuation for a partially open window, the resultant maximum noise level inside the adjacent dwelling flats would be 24 dB L_{AFMax} ; this is 21 decibels below the 45 dB L_{AFMax} threshold below which the effects of individual noise events (from all sources) on sleep can be regarded as negligible

- 5.22 It is therefore concluded that there is no issue with respect to sound transmission from the enclosed canopy area at the front on the dwelling flats associated with the proposed opening hours up to 5.00 am.
- 5.23 It is noteworthy that there are numerous other cafes and hot food takeaways within the same block that operate until the early hours of the morning, for example:

Name	Address	Open Until
Antalya Café	86 Wilmslow Road	4.00 am
Al-Madina	76 Wilmslow Road	1.00 am
Kobeda Place	74 Wilmslow Road	3.30 am
Aura Lounge	72 Wilmslow Road	4.00 am
Wanasah Café	68–70 Wilmslow Road	5.00 am
Habiba Lounge	64 Wilmslow Road	4.00 am
Rusholme Chippy	62 Wilmslow Road	3.00 am

Noise Associated with the Kitchen Extraction System

- 5.24 The replacement kitchen extraction system (utilising the existing flue) incorporates:
- Flakt Woods JM Maxfan Compac extraction fan (see Appendix 7)
 - Flakt Woods 40JM/16/4/5/1PH long cased axial flow intake fan for make-up air (see Appendix 7); note: the intake fan is significantly quieter than the extraction fan
 - 2D straight through silencers on the inlet and outlet side of both fans (see Appendix 7)
 - The fans will be accompanied with anti-vibration housing, anti-vibration mounts and flexible connections to prevent vibration transfer and minimise noise transfer through fixings or structures; furthermore, the fans will be lagged
- 5.25 The noise level associated with the fume extraction system is calculated in accordance with the following equation:
- $$\text{SPL} = \text{SWL} - \text{DA} - \text{DL} - \text{DI} - \text{IL} - 11 \text{ where}$$
- SPL = Sound Pressure Level
 SWL = Sound Power Level of Extraction Fan
 D = Distance Attenuation ($20 \times \log(\text{distance to receptor})$)
 DL = Duct Loss (typically 0.15 dB per linear metre)
 DI = Directivity Index (see Appendix 8)
 IL = Insertion Loss due to in-line silencer on outlet side
 - 11 = Conversion factor from SWL to SPL
- 5.26 For reference, the sound power level of the Flakt Woods JM Maxfan Compac extraction fan on the outlet side outlet is 104 dB (note: this is not A-weighted), whilst the sound power level of the Flakt Woods 40JM/16/4/5/1PH long cased axial flow intake fan on the outlet side is 80 dB (note: this is not A-weighted). Both fans are broadband in character (not tonal).
- 5.27 Due to the difference in sound power levels being 24 dB, it is only necessary to consider the noise associated with the extraction fan system. There will be no cumulative impact.
- 5.28 The noise level associated at the nearest residential dwellings associated with the kitchen extraction fan system is calculated in the following table.

Table 5.3 – Kitchen Extraction System Noise at Nearest Residential Dwellings

Item	Octave band (Hz)	63	125	250	500	1000	2000	4000	8000	
A	Outlet SWL(dB)	93	89	98	99	95	94	90	87	104
B	A-Weighting Correction Outlet SWL(dBA)	-26	-16	-9	-3	0	1	1	-1	
C	Distance Attenuation at 12 metres	22	22	22	22	22	22	22	22	
D	Duct losses due to duct length	1	1	1	1	1	1	1	1	
E	Directivity Index (receptors perpendicular to outlet)	2	3	7	12	16	22	27	31	
F	2D Silencer Attenuation	4	8	12	17	23	17	12	10	
G	Correction SWL to SPL	11	11	11	11	11	11	11	11	
	Resultant SPL dB(A) at receptor (A+B-C-D-E-F-G)	27	28	36	33	22	22	18	11	39

- 5.29 The extraction system rated noise level outside the nearest residential dwellings is calculated at 39 dB(A). This is 11 decibels below the lowest night time background noise level at the rear. This is wholly acceptable in accordance with British Standard 4142:2014+A1:2019 'Methods for Rating and Assessing Industrial and Commercial Sound' (BS 4142).

- 5.30 In accordance with the National Planning Policy Framework Planning Practice Guidance Note on Noise, the noise associated with the extraction system is classed as being at the No Observed Adverse Effect Level (NOAEL) in that *'Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.'*
- 5.31 Furthermore, good internal ambient noise levels (due to the kitchen extraction system) will be achieved in the neighbouring dwelling flats with windows open.

6.00 CONCLUSION

- 6.01 A noise impact assessment has been undertaken for a proposed extension of opening hours from 11.30 pm to 05.00 am of the 360 Lounge (a restaurant) at 54–56 Wilmslow Road, Manchester, M14 5AL.
- 6.02 Due to the high ambient and background noise levels in the area during the early hours (it is noteworthy that there are numerous other cafes and hot food takeaways within the same block that operate until the early hours), allied to the sound insulation of the concrete separating floor, the restaurant will not have an adverse impact on the amenity of the overlying dwelling flats.
- 6.03 As a consequence, noise does not pose a material constraint to the variation of the existing planning permission.

If we can be of any further assistance, please do not hesitate to contact us.

Yours sincerely

Jonathan Rigg
MEng(Hons), AMIOA, Diploma in Acoustics and Noise Control
For RP Acoustics Ltd

APPENDIX 1

GLOSSARY OF ACOUSTIC TERMS

Sound Pressure Level (L_p)

The basic unit of sound measurement is the sound pressure level. As the pressures to which the human ear responds can range from 20 μPa to 200 Pa, a linear measurement of sound levels would involve many orders of magnitude. Consequently, the pressures are converted to a logarithmic scale and expressed in decibels (dB) as follows:

$$L_p = 20 \log_{10}(p/p_0) \text{ where}$$

L_p = sound pressure level in dB; p = rms sound pressure in Pa; and p_0 = reference sound pressure (20 μPa).

A-weighting Network

A frequency filtering system in a sound level meter, which approximates under defined conditions the frequency response of the human ear. The A-weighted sound pressure level, expressed in dB(A), has been shown to correlate well with subjective response to noise.

Equivalent continuous A-weighted sound pressure level, $L_{Aeq, T}$

The value of the A-weighted sound pressure level in decibels of continuous steady sound that within a specified time interval, T , has the same mean-square sound pressure as a sound that varies with time. $L_{Aeq, 16h}$ (07:00 to 23:00 hours) and $L_{Aeq, 8h}$ (23:00 to 07:00 hours) are used to qualify daytime and night time noise levels.

$L_{A10, T}$

The A-weighted sound pressure level in decibels exceeded for 10% of the measurement period, T . $L_{A10, 18h}$ is the arithmetic mean of the 18 hourly values from 06:00 to 24:00 hours.

$L_{A90, T}$

The A-weighted sound pressure level of the residual noise in decibels exceeded 90% of a given time interval, T . L_{A90} is typically taken as representative of background noise.

$L_{AF \text{ max}}$

The maximum A-weighted noise level recorded during the measurement period. The subscript 'F' denotes fast time weighting, slow time weighting 'S' is also used.

Sound Exposure Level (SEL or L_{AE})

The energy produced by a discrete noise event averaged over one second, no matter how long the event actually took. This allows for comparison between different noise events that occur over different lengths of time.

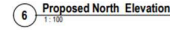
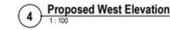
Building Regulations ADE 2003 Standard ($D_{nT,w} + C_{tr}$)

A single-number quantity which characterises the airborne sound insulation between rooms using noise spectrum No. 2 as defined in BS EN ISO 717-1:1997.

APPENDIX 2
APPLICATION SITE LOCATION PLAN

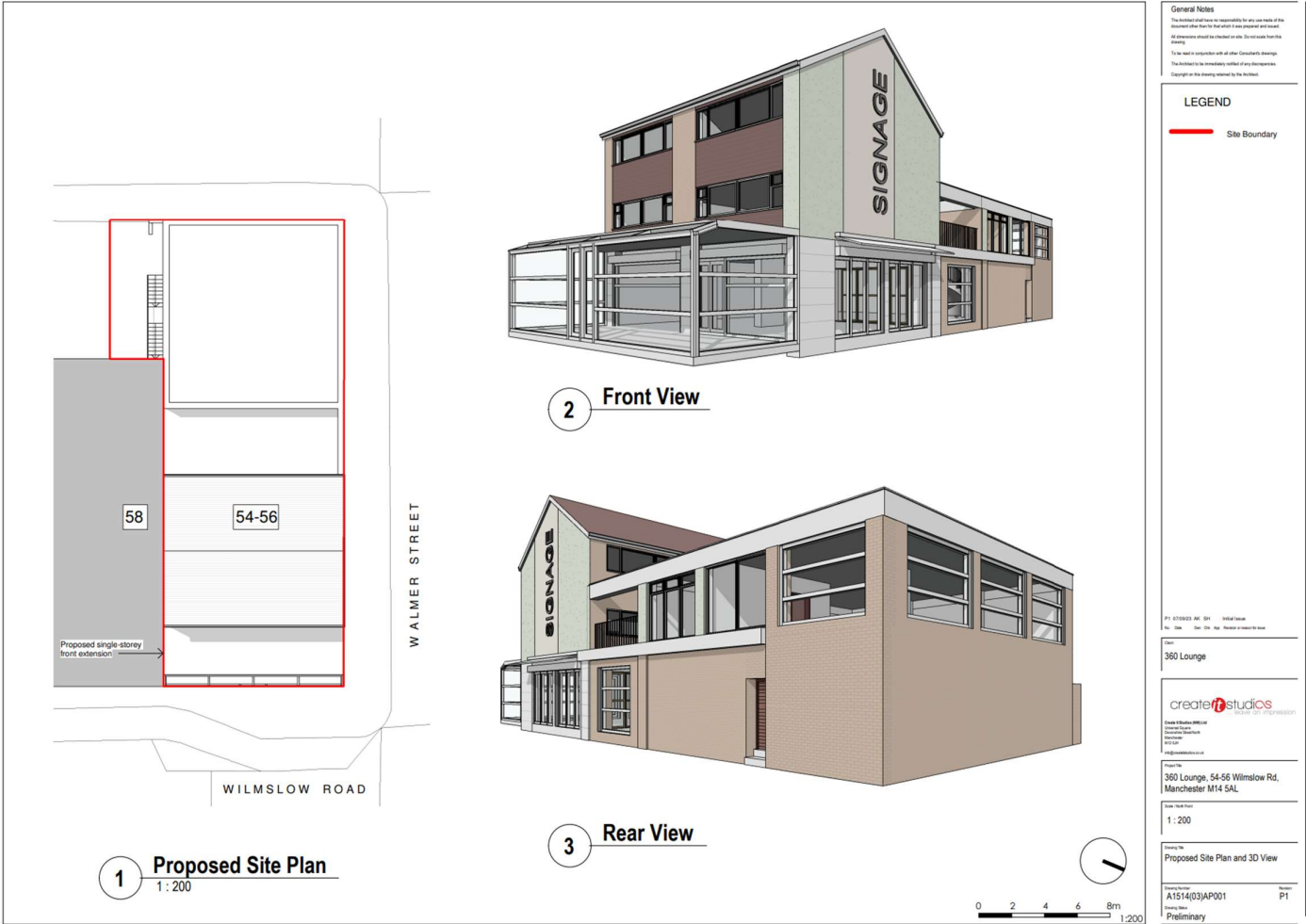


General Notes
The Addict shall have no responsibility for any use made of this document other than for that which it was prepared and issued.
No dimensions should be checked or set. Do not scale from the drawing.
To be used in conjunction with all other Consultants drawings.
The Addict is not immediately notified of any discrepancies.
Copyright in this drawing remains with the Addict.

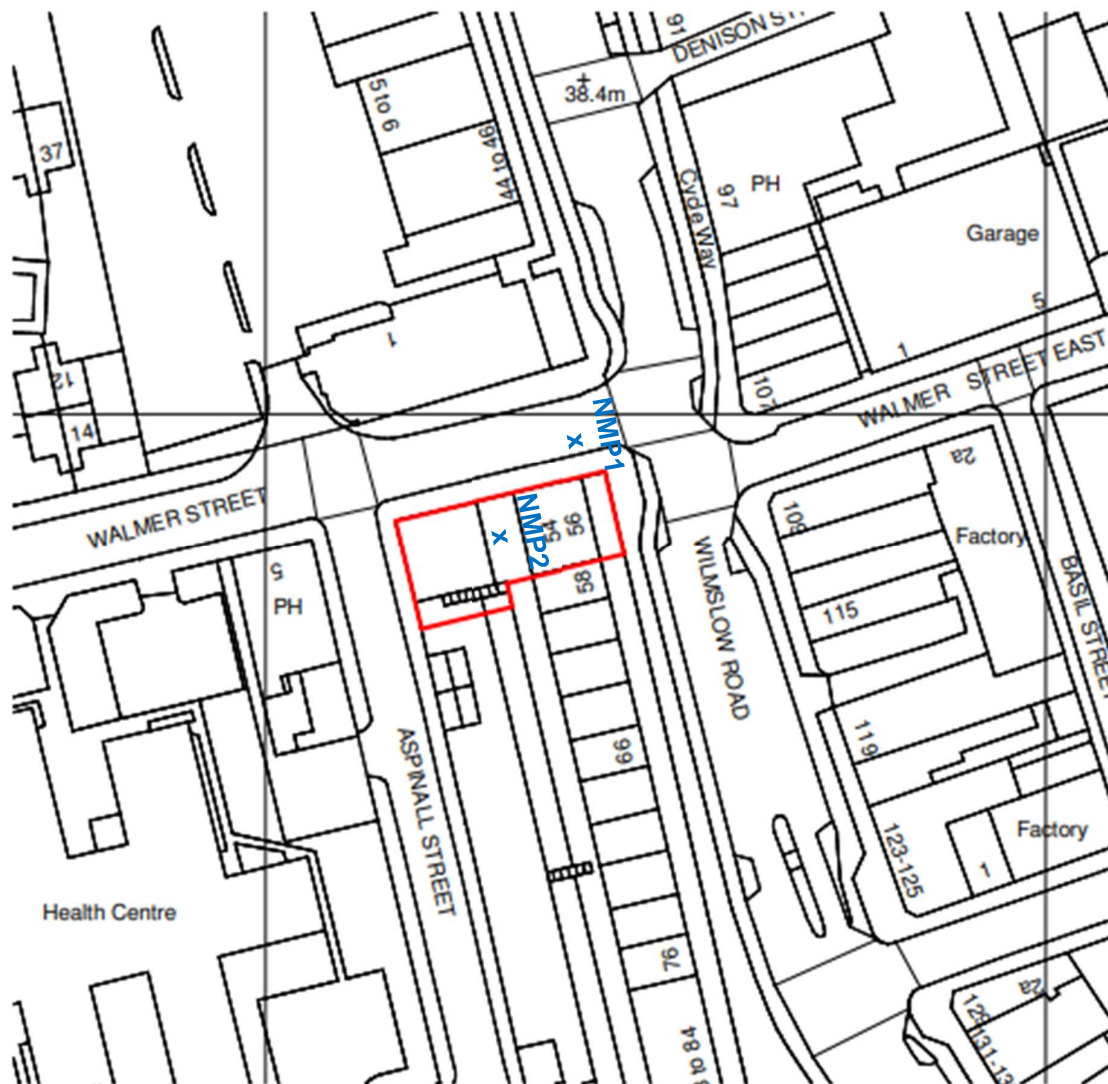


P1	PT 01/09/23	Acc	Spt	Initial Issue
Pl	Date	Doc	Type	Map
				Revision or reason for issue
Unit 360 Lounge				
 social & imagination				
Creative Studios Ltd Director's Office Commercial Development Manchester M14 5SL info@creativestudios.co.uk				
Project Title 360 Lounge, 54-56 Wilmslow Rd, Manchester M14 5SL				
Scale: North South 1 : 100				
Drawing Title Proposed Floor Plans and Elevations				
Drawing Number		A15/0103/AP002		Revision
Drawing Scale				P1

APPENDIX 4
PROPOSED 3D VIEW



APPENDIX 5
NOISE MONITORING POSITIONS



APPENDIX 6

CALIBRATION CERTIFICATE FOR SOUND LEVEL METER (CALIBRATION EVERY 2 YEARS)

Laboratory Location

Campbell Associates Ltd
5b Chelmsford Road Industrial Estate
GREAT DUNMOW, Essex, GB-CM6 1HD
Phone 01371 871030



Certificate of Calibration and Conformance

Certificate number: **U39995**

Test Object: Sound Level Meter, BS EN IEC 61672-1:2013 Class 1
Associated Frequency Analyser to BS EN IEC 61260:1996 Class 1
Producer: NTi Audio
Type: XL2-TA
Serial number: A2A-17283-E0
Customer: RP Acoustics Ltd
Address: 1 Dobcroft Close,
Sheffield, South Yorkshire. S11 9LL.
Contact Person: Richard Pennell
Order No:

Introduction:

Calibration has been performed as set out in CA Technical Procedures which are based on the procedures for periodic verification of sound level meters as per the **Test Object** listed above. Results and conformance statement are overleaf and detailed results, where appropriate, are provided in the attached Measurement Report.

Tested:	Producer	Type	Serial No	Certificate No
Microphone	NTi Audio	MC230A	A18352	39994
Calibrator*	Larson Davis	CAL200	17115	U39993
Preamplifier	NTi Audio	MA220	8854	Included

* The calibrator was complete with any required coupler for the microphone specified.

Additional items that have also been submitted for verification:

Wind shield - -
Attenuator - -
Extension cable - -

These items have been taken into account wherever appropriate.

Instruction Manual: NTi-Audio XL2 Operating Manual v3,11,02 August 2016 Firmware Version: v4,21 The test object is a single channel instrument.

Conditions	Pressure kPa	Temperature °C	Humidity %RH
Reference conditions	101.325	23	50
Measurement conditions	102.80 ±0.04	22.65 ±0.15	31.35 ±0.25

Calibration Dates:

Received date: 17/01/2022 Reviewed date: 25/01/2022
Calibration date: 25/01/2022 Issued date: 25/01/2022

Technicians: (Electronic certificate)

Calibrated by: *Palanivel Marappan B.Eng (Hons), M.Sc*

Reviewed by: *Darren Batten*

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

APPENDIX 6

CALIBRATION CERTIFICATE FOR SOUND LEVEL METER (CALIBRATION EVERY 2 YEARS)

Certificate of Calibration and Conformance

Continuation of Certificate number: U39995

The statements of conformance and observation notes detailed in this certificate are made with reference to the following standards in respect of the calibration of the test object.

Manufactured:	BS EN IEC 61672-1:2013
Periodic Tests:	BS EN IEC 61672-3:2013
Pattern Evaluation:	BS EN IEC 61672-2:2013
Filter Evaluation:	BS EN IEC 61260:1996 Class 1

Conformance:

From markings on the sound level meter or by reference to the manufacturer's published literature it has been determined that the instrument submitted for verification was originally manufactured to the listed standard and similarly that the associated sound calibrator conforms to the BS EN IEC 60942 standard.

Measurement Summary:

Indication at the calibration check frequency - IEC 61672-3 Ed.2 #10	Passed
Self-generated noise - IEC 61672-3 Ed.2.0 #11.2	Passed
Acoustical signal tests of a frequency weighting - IEC 61672-3 Ed.2.0 #12	Passed
Electrical signal tests of frequency weightings - IEC 61672-3 Ed.2.0 #13	Passed
Frequency weightings: A Network - IEC 61672-3 Ed.2.0 #13.3	Passed
Frequency weightings: C Network - IEC 61672-3 Ed.2.0 #13.3	Passed
Frequency weightings: Z Network - IEC 61672-3 Ed.2.0 #13.3	Passed
Frequency and time weightings at 1 kHz IEC 61672-3 Ed.2.0 #14	Passed
Level linearity on the reference level range - IEC 61672-3 Ed.2.0 #16	Passed
Level linearity including the level range control - IEC 61672-3 Ed.2.0 #17	Passed
Toneburst response - IEC 61672-3 Ed.2.0 #18	Passed
Peak C sound level - IEC 61672-3 Ed.2.0 #19	Passed
Overload indication - IEC 61672-3 Ed.2.0 #20	Passed
High level stability test - IEC 61672-3 Ed.2.0 #21	Passed
Long term stability test - IEC 61672-3 Ed.2.0 #15	Passed
1/1octave: Relative attenuation - IEC 61260, #4.4 & #5.3	Passed
1/3octave: Relative attenuation - IEC 61260, #4.4 & #5.3	Passed

Comments

Correct level with associated calibrator is 114.0dB(A).

Statement of Conformance

The sound level meter submitted has successfully completed the periodic tests of the standard listed for the environmental conditions under which the tests were performed. As public evidence(1) was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with the manufacturer's standard to demonstrate that the model of sound level meter fully conformed to the requirements of the said standard, the sound level meter submitted for testing conforms to the relevant class of the said standard.

(1 - evidence is held on file at the calibration laboratory)

Filter Calibration

The filter functions have been found to conform, by electrical testing, to the relative attenuation requirement of the standard noted over the range of frequencies shown in the attached test report.

Observations

No information on the uncertainty of measurement, required by the listed standard, for the correction data was made available in the instruction manual / data sheets from the equipment manufacturer / supplier for the test object. The uncertainty of measurement of the correction data was therefore assumed to be the maximum-permitted uncertainty given in IEC 62585 for the corresponding free-field correction data and for a coverage probability of 95 %.

APPENDIX 6

CALIBRATION CERTIFICATE FOR SOUND LEVEL METER (CALIBRATION EVERY 2 YEARS)

Certificate of Calibration and Conformance

Continuation of Certificate number: U39995

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a coverage probability of approximately 95 %. The uncertainty evaluation has been carried out in accordance with UKAS requirements. Details of the uncertainty for each measurement are available from the Calibration Laboratory upon request. Details of the sources of corrections and their associated uncertainties that relate to this verification are contained within the test report accompanying this certificate.

Decision Rule

The decision rules will be applied in accordance with the procedure as described in BS EN 61672-3:2013.

A PASS or PASSED statement indicates that the instrument conforms with the relevant accuracy requirements of the testing standard AND the expanded measurement uncertainty ($k = 2$ for approximately 95 % coverage probability) is no greater in magnitude than the accuracy requirements defined in BS EN IEC 61260:1996 standard.

This certificate relates only to the items tested above.

** End of Certificate **

APPENDIX 6

CALIBRATION CERTIFICATE FOR SOUND CALIBRATOR (CALIBRATION EVERY YEAR)

Laboratory Location

Campbell Associates Ltd
5b Chelmsford Road Industrial Estate
GREAT DUNMOW, Essex, GB-CM6 1HD
Phone 01371 871030



Certificate of Calibration and Conformance

Certificate number: **U43128**

Test Object: **Sound Calibrator**

Producer: **Larson Davis**
Type: **CAL200**
Serial number: **17115**
Customer: **RP Acoustics Ltd**
Address: **1 Dobcroft Close,
Sheffield, S11 9LL**
Contact Person: **Richard Pennell**
Order No: **N/A**

Measurement Results	Level dB	Level Stability dB	Frequency Hz	Distortion %
Measurement 1	114.17	0.01	1000.32	0.48
Measurement 2	114.17	0.01	1000.32	0.48
Measurement 3	114.17	0.02	1000.32	0.48
Result (Average):	114.17	0.01	1000.32	0.48
Expanded Uncertainty:	0.1	0.02	1	0.1
Degree of Freedom:	>100	>100	>100	>100
Coverage Factor:	2	2	2	2

The stated level is relative to 20 μ Pa. The level is traceable to National Standards. The stated level is valid at reference conditions. The following correction factors have been applied during the measurement

Pres:0 dB/kPa Temp:0 dB/°C Humi:0 dB/%RH Load volume: 0 dB/mm³

Conditions	Pressure kPa	Temperature °C	Humidity %RH
Reference conditions	101.325	23	50
Measurement conditions	101.932 $\pm$ 0.042	22.4 $\pm$ 0.1	32.9 $\pm$ 0.8

The reported expanded uncertainty of measurements is based on a standard uncertainty multiplied by the coverage factor of k=2, providing a level of confidence of approximately 95%. Where the degrees of freedom are insufficient to maintain this confidence level, the coverage factor is increased to maintain this confidence level. The uncertainty has been determined in accordance with UKAS requirements.

Records: K:\C A\Calibration\Nor-1504\Nor-1018 CalCal\Current Year\LDL200_17115_M1.nmf

Preconditioning

The equipment was preconditioned for more than 4 hours in the specified calibration environment.

Method

Calibration has been performed as set out in the current version of CA Technical procedure TP01

Calibration Dates:

Received date:	24/01/2023	Reviewed date:	31/01/2023
Calibration date:	30/01/2023	Issued date:	31/01/2023

Technicians: (Electronic certificate)

Calibrated by: *Katie Brown*
Reviewed by: *Jenny Crawford*

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

Doc ref: Calb-Cert-Master-V3-05

APPENDIX 6

CALIBRATION CERTIFICATE FOR SOUND CALIBRATOR (CALIBRATION EVERY YEAR)

Certificate of Calibration and Conformance

Continuation of Certificate number: U43128

Reference Microphone: WSM11 (C) - GRAS40AG-291442

Measurements

The calibrator has been tested as described in the following annexes to BS EN IEC60942:2003 Sound Calibrators; B3.4 for sound pressure level, B3.5 for frequency, B3.6 for total distortion and A4.4 for short term stability of the pressure level.

Instruments and Program

A complete list of instruments, hardware and software that have been used for this calibration is available from the calibration laboratory

Comments

94dB spot check = 94.15dB. Note this is not UKAS data.

Statement of Conformance and Calibration

As public evidence was available*, from a testing organisation responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in annex A of BS EN IEC 60942:2003, the sound calibrator tested is considered to conform to all the class 1 requirements of that BS EN IEC 60942:2003.

*This evidence is held on file at the calibration laboratory.

Notes:

The sound pressure level generated by the calibrator in its ½ inch configuration was measured five times and averaged by a WS2P working standard microphone for class 1 or 2 devices or a LS2P reference microphone for class 0 or LS devices as specified in the International Standard BS EN 61094-4. The results of three replications and the mean of the measurements obtained are given in the measurement results table of this certificate. The frequency and distortion were measured in a similar manner. The figures in **BOLD** are the final results; a small correction factor may need to be added to the sound pressure level quoted here if the device is used to calibrate a sound level meter that is fitted with a free field response microphone. See manufacturer's handbooks for full details of this and other corrections that may be applicable.

Observations:

Decision Rule:

The decision rules have been applied in accordance with the procedure as described in BS EN 60942:2003

This certificate relates only to the items tested above.

** End of Certificate **

Fan Code	45 MaxFan Compac
Fan Diameter / Size	450 Size / mm
Fan Speed	2910 rpm
Velocity	7.5 m/s
Blade Angle	16°
Installation Type / Form of Running	D / AB
Fan Casing	Long
Requested Duty	1.19m³/s @ 622 Pa (static)
Outlet Dynamic Pressure	34 Pa
Duty Shaft Power	1.32 kW
Max Shaft Power	1.43 kW
Total Efficiency	60.3 %
Motor Frame	80 [Class F]
Motor Rating	1.32 kW [IE2]
Full Load Current	4.71 A
Starting Current	25.5 A
Motor Mounting	Pad
Electrical Supply	220-240 Volts 50 Hz 1 Phase
Start Type	DOL
Motor Winding	Standard
Enclosure	Standard All
ErP [FMEG] Rating	N 60 (ErP Compliant 2015)
ErP [FMEG] Target	N 58
FMEG Blade Angle [Range]	0° [0° - 0°]
Measurement Category	D (Total)
VSD	N
Fan + Motor Efficiency	55.4% (1.67 m³/s @ 515 Pa)
Motor Input Power (ErP)	1.55 kW
SFP value	1.36 W/(l/s) @ Requested Duty
Power from mains	1.63 kW
Energy Consumption	4904 kWh (3000 h/year)
Running Cost / Year	£589
Air Density	1.2 kg/m³ / 20 °C / 0 m / 50% RH
Smoke Venting	Non Smoke Venting
Product Number	EJ463266

The Maxfan Compact includes a preprogrammed inverter drive to operate via 1 phase supply, offering full speed control and optimised performance.

Acoustic data has been derived from tests carried out in a Flakt Woods laboratory, in accordance with BS 848 Pt 2, 1985 / BS EN ISO 5136 under Ducted conditions. The single figure provided is the overall Inlet sound pressure level at the specified distance, under spherical, free field conditions.

Acoustic figures for adjusted running speeds have been interpolated and are for reference only.

Terms and Conditions: This offer is made subject to the terms and conditions detailed on the accompanying letter.

	Sound Spectrum (Hz)								Overall	
	63	125	250	500	1k	2k	4k	8k	Lw*	LpA @ 3 m**
Inlet*	91	89	96	98	95	94	90	87	103	81
Outlet*	93	89	98	99	95	94	90	87	104	81
Breakout*	83	71	76	76	70	65	68	63	85	57

* Lw dB re 10⁻¹² W
** dBA re 2x10⁻⁵ Pa

Sound data at requested duty.

Fan Code	40JM/16/4/5/40
Fan Diameter / Size	400 Size / mm
Blades	5
Fan Speed	1420 rpm
Velocity	8.0 m/s
Blade Angle	40°
Installation Type / Form of Running	D / B
Fan Casing	Long
Requested Duty	1m ³ /s @ 110 Pa (static)
Outlet Dynamic Pressure	38 Pa
Duty Shaft Power	0.265 kW
Max Shaft Power	0.271 kW
Total Efficiency	56.3 %
Pitch Angle Range	34° - 40°
Motor Frame	BT9 (Sized at 1.2kg/m ³ Air Density)
Motor Grade	IE1
Motor Rating	0.250 kW
Full Load Current	1.56 A
Starting Current	3.45 A
Motor Mounting	Pad
Electrical Supply	220-240 Volts 50 Hz 1 Phase
Start Type	DOL
Motor Winding	Standard
Enclosure	Standard All
ErP [FMEG] Rating	N 51 (ErP Compliant 2013)
ErP [FMEG] Target	N 50
Measurement Category	D
Efficiency Category	Total
Fan + Motor Efficiency	42.3% (1.28 m ³ /s @ 121 Pa)
Motor Input Power (ErP)	0.365 kW
SFP value	0.38 W/(l/s)
Energy Consumption	758 kWh (2000 h/year)
Running Cost / Year	£68
Air Density	1.2 kg/m ³ / 20 °C / 0 m / 50% RH
Smoke Venting	Non Smoke Venting
Product Number	EJ411452

	Sound Spectrum (Hz)								Overall	
	63	125	250	500	1k	2k	4k	8k	Lw*	LpA @ 3 m
Inlet*	75	73	71	70	65	62	58	53	79	51
Outlet*	76	75	71	70	66	64	60	55	80	52
Breakout*	66	60	51	49	40	35	35	32	67	30

* Lw dB re 10⁻¹² W ** dBA re 2x10⁻⁵ Pa

Acoustic data has been derived from tests carried out in a Flakt Woods laboratory, in accordance with BS 848 Pt 2, 1985 / BS EN ISO 5136 under Ducted conditions. The single figure provided is the overall Inlet sound pressure level at the specified distance, under spherical, free field conditions. Breakout levels stated are estimated from induct sound power levels and are provided for guidance.

Terms and Conditions: This offer is made subject to the terms and conditions detailed on the accompanying letter.

APPENDIX 7 KITCHEN EXTRACTION SYSTEM DETAILS 2D SILENCER



silencers

Elta offer 2 types of cylindrical silencers as standard;
Type ENP (without pod) and EP (with pod).

construction

Both types are rigidly constructed in galvanised sheet steel, with a highly absorbent sound attenuating lining between the outer casing and the inner perforated steel lining. The end faces of the silencer have a series of threaded holes for direct mounting to the LC/SC fan fixing flange/flexible collar.
The EP (podded versions) will provide an improved level of attenuation. The inner acoustic pod is constructed from perforated steel sheet with a sound absorbent in-fill.

Melindex lined silencers available on request.

3 options of each type can be provided with differing lengths – 1D = 1 times fan diameter, 1.5D = 1.5 times fan diameter or 2D = 2 times fan diameter.

silencer attenuation

To determine the sound level of a fan fitted with a silencer, the dynamic insertion loss should be subtracted from the sound power level spectrum (dBW) of the LC and SC fan.
This should be carried out for the entire octave band mid-frequency spectrum as published in the Elta fans characteristic data (obtainable on request).

The fan dBW ratings and silencer attenuation apply equally to in duct applications, with a silencer connected between the fan and the duct system.

important note!

In highly noise sensitive areas, where circular silencers cannot achieve the necessary attenuation levels, Elta can design and build splitter silencers for greater effect.

The velocity through EP silencers should not exceed 15m/s.

Silencer Type	Approx dBa reduction
1DENP	7-10
2DENP	10-13
1DEP	12-15
2DEP	15-18

dynamic insertion loss

The silencer attenuation is defined as the "dynamic insertion loss". The values quoted in the table below represent the difference between the sound power level of a fan and silencer combination (dBW) and that of the fan alone (dBW).

The dynamic insertion losses shown are the attenuations recorded under ideal working conditions. The achieved attenuation will vary according to the air velocity and flow pattern in the airways. Noise regeneration can occur at higher velocities, especially in EP silencers.

Fan Sizes	Silencer Length	Silencer Type	Insertion Loss @ Octave Band (Hz)							
			63	125	250	500	1k	2k	4k	8k
315-560	1D	ENP	-2	-5	-6	-9	-13	-11	-6	-6
		EP	-4	-6	-8	-11	-18	-19	-17	-14
	1.5D	ENP	-3	-6	-9	-13	-18	-14	-9	-8
		EP	-5	-8	-10	-16	-22	-22	-20	-18
	2D	ENP	-4	-6	-12	-17	-23	-17	-12	-10
		EP	-7	-10	-12	-21	-26	-26	-24	-22
630-800	1D	ENP	-3	-4	-9	-15	-15	-8	-7	-6
		EP	-4	-6	-8	-17	-23	-20	-18	-10
	1.5D	ENP	-4	-6	-11	-18	-18	-10	-9	-7
		EP	-6	-8	-12	-22	-27	-25	-23	-14
	2D	ENP	-6	-8	-13	-22	-22	-13	-12	-9
		EP	-8	-11	-16	-27	-32	-31	-29	-19
900-1400	1D	ENP	-3	-4	-9	-14	-13	-7	-7	-6
		EP	-4	-6	-11	-20	-18	-15	-13	-11
	1.5D	ENP	-4	-6	-11	-17	-15	-9	-9	-7
		EP	-6	-8	-14	-23	-22	-20	-17	-13
	2D	ENP	-6	-8	-13	-21	-18	-12	-11	-9
		EP	-8	-11	-18	-26	-27	-26	-22	-16
1600-2000	1D	ENP	-4	-5	-10	-14	-11	-6	-6	-5
		EP	-8	-9	-14	-19	-17	-11	-10	-9
	1.5D	ENP	-4	-6	-11	-16	-14	-9	-8	-7
		EP	-9	-11	-17	-22	-22	-18	-13	-11
	2D	ENP	-5	-7	-12	-19	-18	-13	-11	-9
		EP	-10	-14	-21	-25	-27	-25	-16	-14

APPENDIX 8 DIRECTIVITY INDEX

