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Mono Acoustics Limited established in 2020 and providing noise consultancy services to hospitality and entertainment industry.

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Disclaimer:

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The recommendations within this report relate to acoustics performance only and will need to be integrated within the overall design by the lead designer to incorporate all other design disciplines such as fire, structural integrity, setting out, etc. Similarly, any sketches appended to this report illustrate acoustic principles only and again will need to be developed into full working drawings by the lead designer to incorporate all other design disciplines.

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1.0 INTRODUCTION

Mono Acoustics has been commissioned by Calyx Property Limited to conduct a noise survey to investigate and reduce the potential noise breakout. It is understood that the premises held a premises licence that allows it to operate from 10:00 to 00:00 hours on Mondays to Thursdays, and from 10:00 and 01:00 hours on Fridays and Saturdays, as well as from 10:00 and 22:30 hours on Sundays.

1.1 Site Description

The premises is located at number 3 – 7 on the south side of Delancey Street. To the east is a bar and restaurant, and to the west are commercial shops and restaurant with residential above. To the north is new construction site for a hotel. The area is a mixture of residential and commercial buildings, with many bars and shops. However, heavy road traffic is the main source of noise pollution in the area.

1.2 Nearest Noise-Sensitive Receptor

The nearest noise sensitive receptors (NSR) are located on 9 Delancey Street at the second-floor flats across to premises at a distance about 12 metres.

2.0 NOISE CRITERIA AND REGULATIONS

Following guidance and standards are followed to perform the survey.

2.1 London Borough of Camden Noise Control Criteria

The Local Authority has established criteria for noise levels in L_{Aeq} emanating from the licenced premises, as measured 1 metre from any façade of any noise sensitive premises over any 5-minute period with entertainment taking place shall not increase by more than 3 dB as compared to the same measure, from the same position with no entertainment taking place.

2.2 Institute of Acoustics Good Practice Guide on the Control of Noise from Pubs and Clubs

There are no British Standards relating to the assessment of noise from amplified music regard to planning control for entertainment places. However, Institute of Acoustics published a guide that provides guidance for the assessment and control of noise affecting noise sensitive properties.

2.3 BS 8233:2014 Guidance of sound insulation and Noise reduction for buildings

The Standard gives recommendations for acceptable internal noise levels in residential properties. Assuming worst case conditions, of the closest window being for a bedroom, BS8233:2014 recommends 30 dB(A) as being suitable internal resting/sleeping conditions.

3.0 NOISE SURVEY

Measurements have been taken multiple locations, including roof top of the venue, and nearest resident across the venue.

3.1 Methodology

In order to establish a representative background and ambient noise levels, the environmental noise survey was carried out at a measurement location situated outside on a flat rooftop near the NSR. The survey was conducted from 14 February 2023 at 14:45 to 15 February 2023 at 14:45, covering the most sensitive operational period during which lower levels of background noise were expected. The sound level meter was positioned at second floor level, elevated to residential windows, and at least 3.5m from the reflecting surfaces. The monitoring positions are considered representative of background noise levels at the nearest identified noise sensitive properties and shown in Appendix E.

The music sound levels were measured at around 2000 hours on 20 April 2023. Measurement locations were selected as below:

- Location A – side façade of the venue (Delancey Passage).
- Location B – Nearest NSR's façade, 12 m away from the venue.
- Location C – Roof top

Measurement positions shown within Figure 1 below.



Figure 1 – Measurement positions (source: Google Maps)

3.2 Measurement Equipment

The measurement equipment illustrated in Table 1 was used during the survey, all equipment complies with IEC 61672-3:2013, Class 1 and IEC 60942:2017, Class 1.

Name	Serial Number	Last Calibrated	Certificate No
NTI XL2- TA Acoustic Analyser	A2A-17797-E0	22 August 2022	UCRT22/2028
M2230 Measurement Microphone	8561	22 August 2022	UCRT22/2026
Larson Davis Class 1 Calibrator	17147	19 August 2022	UCRT22/2024

Table 1 – Equipment

3.3 Weather Conditions

Weather conditions throughout the entire noise survey period were between 5 - 7 degrees Celsius, dry, and mainly clear during the measurement period, and a light wind (<5metres per second) from south – west. These conditions were maintained throughout most of the survey period and are considered reasonable for undertaking environmental noise measurements.

4.0 RESULTS

Measurement results presented and analysed in this section.

4.1 Background Noise Levels

Figure 2 shows the statistical analysis of the results of two consecutive days measurement period in order to determine background sound levels. For this distribution of the data an $L_{A90,15\text{mins}}$ of 55 dB was considered representative and in this instance was also the most commonly occurring value. However, the lowest background sound level during the operating period is 47 dB at night-time between 00:45 and 01:00 hours. The measurement data is provided within Appendix C of this report.

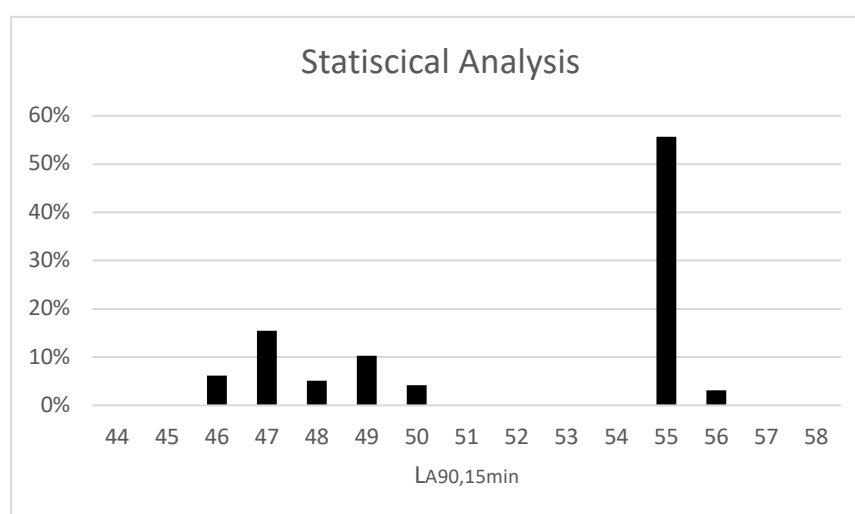


Figure 2 – Background Noise Levels

4.2 Music levels at measurement positions

The sound level meter was set in octave band logging mode at 1-minute intervals, which resulted in measurements of the music sound level in $L_{Aeq,1\text{min}}$. The measurements were repeated during the intervals of live music. Results are shown in Table 2 below.

Location	Entertainment Live Music	$L_{Aeq,1\text{min}}$	Subjective Assessment	Notes
A	On	71	Perceptible	Noise emanating from venue' side façade
A	Off	64		Ambient Noise
B	On	63	Just perceptible	Mid frequency sound, and traffic noise
B	Off	60		Ambient Noise
C	On	67	Perceptible	Mid frequency sound
C	Off	57		Ambient Noise + plant noise dominant

Table 2 – Summary of results

5.0 DISCUSSION

The area is relatively busy, and there is another live music venue nearby. Music sound levels at the measurement points might have been affected by other sources. The noise level from the kitchen extraction system near Location C on the rooftop is calculated to be 67 dB at the façade of the residence. Nevertheless, since the measurement was taken from the side façade of the venue (Location A), it can still be considered a representative value and the noise levels at nearby residences can be predicted through calculations. Distance attenuation calculations are provided in Appendix B.

During the ambient noise level measurements, the mid frequency bass tones were just perceptible at location B. However, no predominant increase was detected by the sound level meter.

6.0 NOISE CONTROL MEASURES

Necessary noise control measures explained below.

6.1 Soundproof secondary windows / Additional glazing

To reduce the sound that escapes from the venue, it is recommended to install at least 6mm thick additional glass internally within the inside of the premises, covering existing windows and glass roof, with leaving a 100 mm gap from existing glass. By adding a second layer of glass, sound transmission through the windows and glass roof can be significantly reduced, typically by 15 dB.

6.2 Soundproof Curtain

820gms / m² flame retardant acoustic absorption rated soundproof curtains should be installed around the glass walls and windows of the venue to help with noise reduction.



Figure 3 – Example of curtain installation in a venue

6.3 Automatic Volume Control Unit (Sound Limiter): The use of a sound limiter on the main sound system is an effective way to control the volume of music in a venue, which can help prevent excessive music sound levels and potential complaints from nearby residents. The sound limiter should be calibrated to attenuate the low frequency range, at least by 6 dB at 63 Hz 125 Hz, from the current sound levels inside the venue and by reducing overall levels by 3 dB below the current levels at broadband frequencies. This will help prevent low-mid bass sound from escaping the venue. Appendix D provides information on the volume control unit.

Sound propagation and inaudibility tests should be repeated before a calibration certificate issued.

7.0 CONCLUSION

The venue, The Forge, 3 – 7 Delancey Street, London, NW1 7NL, has been investigated for potential noise issues, and a sound propagation test was conducted to monitor sound levels in various locations during typical operating conditions. Noise reduction measures have been proposed to address the issue of potential noise breakout, and recommendations have been made based on finding of the investigation.

It has been concluded that noise emissions from the venue would not have an adverse impact on the nearest residents if the noise control measures presented in Section 6 are followed, and therefore the Local Authority Noise Control Criteria will be met.

APENDIX A

Glossary of Acoustic terms

- **Decibel, dB:** A unit of logarithmic ratio between a sound pressure and a known reference pressure.
- **dB(A):** A weighted dB. A-weighting is an electronic frequency weighting network which attempts to build the human response to different frequencies into the reading indicated by a sound level meter, so that it will relate to this loudness of the noise.
- **dB(C):** The C-weighting is the 'flattest' of the weightings and so dB(C) is sometimes used as an approximation to the un-weighted sound pressure level, and the difference between dB(A) and dB(C) is used as an indication of low frequency content of a noise.
- **Background sound level, $L_{A90,t}$:** A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of given time interval T measured using time weighting F and quoted the nearest whole number of decibels.
- **$L_{Aeq,T}$:** is equivalent continuous A-weighted sound pressure level. Value of the A-weighted sound pressure level in decibels of continuous steady sound that within a specified time interval has the same mean-squared sound pressure as a sound that varies with time.
- **$L_{Ceq,T}$:** Value of the C-weighted sound pressure level in decibels of continuous steady sound that within a specified time interval has the same mean-squared sound pressure as a sound that varies with time.

APPENDIX B

Calculations

Noise level prediction at nearest NSR (Location B)

	Hz	63	125	250	500	1kHz	2kHz	4kHz	8kHz	Overall
Source	dBA	48	55	65	65	68	59	48	38	
Distance Loss	12 m/ dB	-22	-22	-22	-22	-22	-22	-22	-22	
Sound Limiter	dB	-6	-6	-3	-3	-3	-3	-3	-3	
Additional Glazing	dB	-15	-15	-15	-15	-15	-15	-15	-15	
Total SPL at NSR	dBA	5	12	25	25	28	19	8	-2	31

Table 3 – Calculations for Location B

Noise level prediction at nearest NSR (Location C)

	Hz	63	125	250	500	1kHz	2kHz	4kHz	8kHz	Overall
Source	dBA	50	57	61	59	61	57	43	32	
Sound Limiter	dB	-6	-6	-3	-3	-3	-3	-3	-3	
Additional Glazing	dB	-15	-15	-15	-15	-15	-15	-15	-15	
Total SPL at NSR	dBA	29	36	43	41	43	39	25	14	48

Table 4 – Calculations for Location C

APPENDIX C

Measurement data

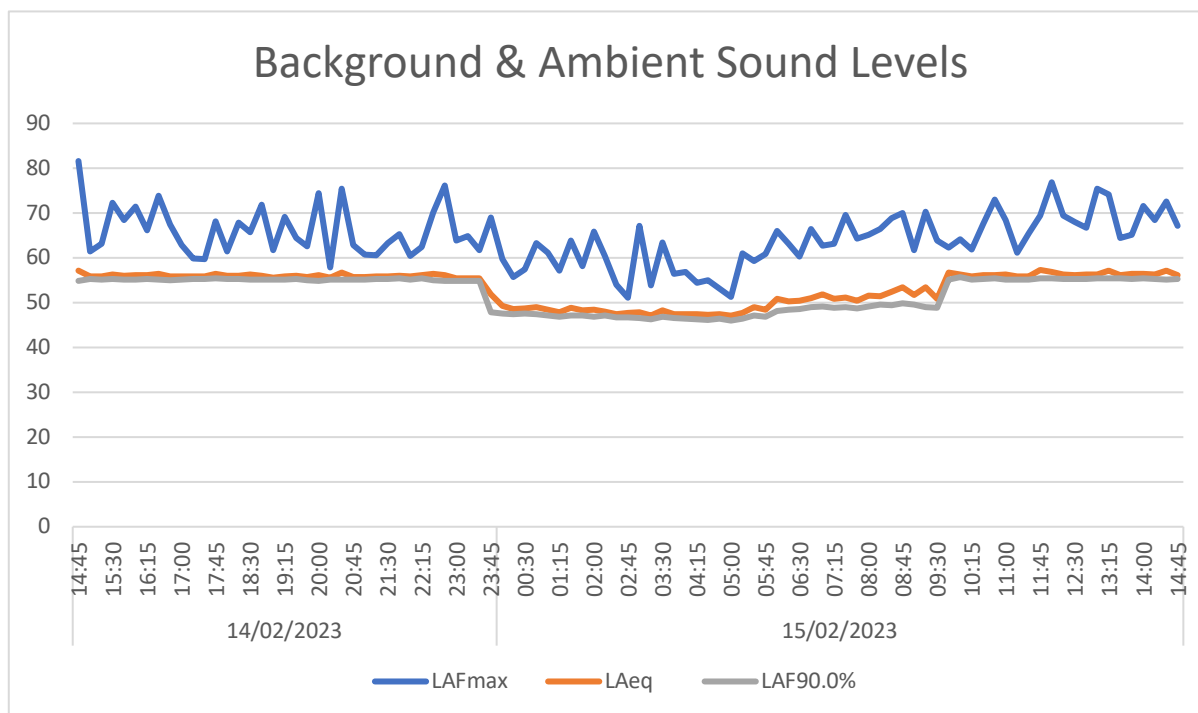


Figure 4 – Measured Noise Levels

APPENDIX D

Manufacturers Data

AVC 2D

AUTOMATIC VOLUME CONTROL

Analogue signal processing

With all the features of the AVC2 plus a number of enhancements the AVC 2D gives full control of music levels without compromising the audio quality.

Digital control

The AVC 2D has three operating modes. The first is stereo, the second is two mono channels and the third is stereo with control microphone.

The LCD displays shows the status and all the information required is clearly visible for installer and operator. There is an LED to show if the input is clipping.



The AVC 2D automatically adjusts the volume once a preset threshold has been reached to keep the audio level within that required.

When attenuating the audio signal the distortion from the AVC 2D is less than 0.01% so the quality of the audio is not compromised.

The audio signal processing is entirely analogue, control of the audio level is digital using a PIC controller. This combination gives the best control of audio levels and retains the sound quality.

In stereo mode; two thresholds can be set; so for example one level could be for daytime and the second for night.

In mode 3 with control microphone connected the sound level is controlled based on the actual SPL so changes to equipment after the AVC 2D are compensated for.

A fourth mode to be added later will monitor the level of ambient sound, and for example adjust the paging level up if noise is high.

The factory setting will not instantly react to individual peaks or dips but responds to average programme level (this is a good thing). The attack and decay is adjustable.

The factory setting gives smooth operation that is almost imperceptible as the level is automatically adjusted, with minimal effect on your systems audio quality.

A security panel on the back protects against unauthorised adjustment.



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AVC2-D SPECIFICATIONS

Frequency response	20Hz - 20kHz	+/- 0.5dB
Distortion (THD and noise) freq 1kHz	O/P@ any level 0 to +22dBu	Attenuation @ any level 0 to -90dB < 0.01% (typically 0.005%)
Noise measured 20Hz-20kHz	Equiv. input noise	< -90dBu
INPUTS Electronically balanced, connect pins 1 & 3 to screen pin 2 hot for unbalanced use		
XLR Connectors	Pin 1 screen Pin 3 -Ve Non Phase Pin 2 +Ve Phase	
Input impedance	Balanced 20K ohms Unbalanced 10K ohms	
Maximum input level	+22dBu	
Clip indicator	Indicates @ +20dBu	
OUTPUTS Electronically balanced, connect pins 1 & 3 to screen pin 2 hot for unbalanced use		
XLR Connectors	Pin 1 screen Pin 3 -Ve Non Phase Pin 2 +Ve Phase	
Source impedance	100 ohms	
Minimum load impedance	600 ohms	
Operating Threshold Range	Average level +10 dBu -20dBu	
Operating Modes 3		
Mode 1	Stereo operation. (A & B channels are controlled together)	
Mode 2	2 x Mono operation. (A & B Channels are controlled independently)	
Mode 3	Stereo operation with control taken from an optional microphone which will measure & control actual sound pressure level (SPL) in the venue.	
AUX CONNECTIONS	1 & 2 Open to Mute 5 & 6 Warning LED 9 & 10 close to DIM - 20dB	3 & 4 Coms (future development) 7 & 8 Clip LED 11 & 12 Close to select level 2
MICROPHONE CONTROL INPUT	XLR Connector Lo Z Balanced input (15V Phantom internal selection)	
DISPLAY	2 X 20 Segment Liquid Crystal Display (LCD) Backlight & Contrast are internally adjustable 1 Green LED Power indicator 1 Red LED Input Clip indicator	
POWER		
220-240 V AC	110 -120V AC Operation Internal selection	I.E.C. Mains connector
Mains Fuse 220V operation 250mA slow blow. 110V operation 500mA slow blow		
FINISH		
Front and Rear panels - Black anodised aluminium with silver notation Case black plastic-coated steel.		
DIMENSIONS		
19" Rack mounting 1RU Width 482mm (19") Depth 200mm (7.9") Height 44mm (1.75")		
FORMULA SOUND Ltd Unit 23 Stadium Business Centre North End Road Wembley Middlesex; UK HA9 0AT		
TEL 0208 900 0947 (+44 208 900 0947) FAX 0208 903 8657 (+44 208 903 8657) Email: info@formula-sound.co.uk www.formula-sound.co.uk		
Formula Sound reserve the right to alter specifications at any time without notice		

APPENDIX E

Measurement Locations / Pictures



Figure 5 – Background measurements

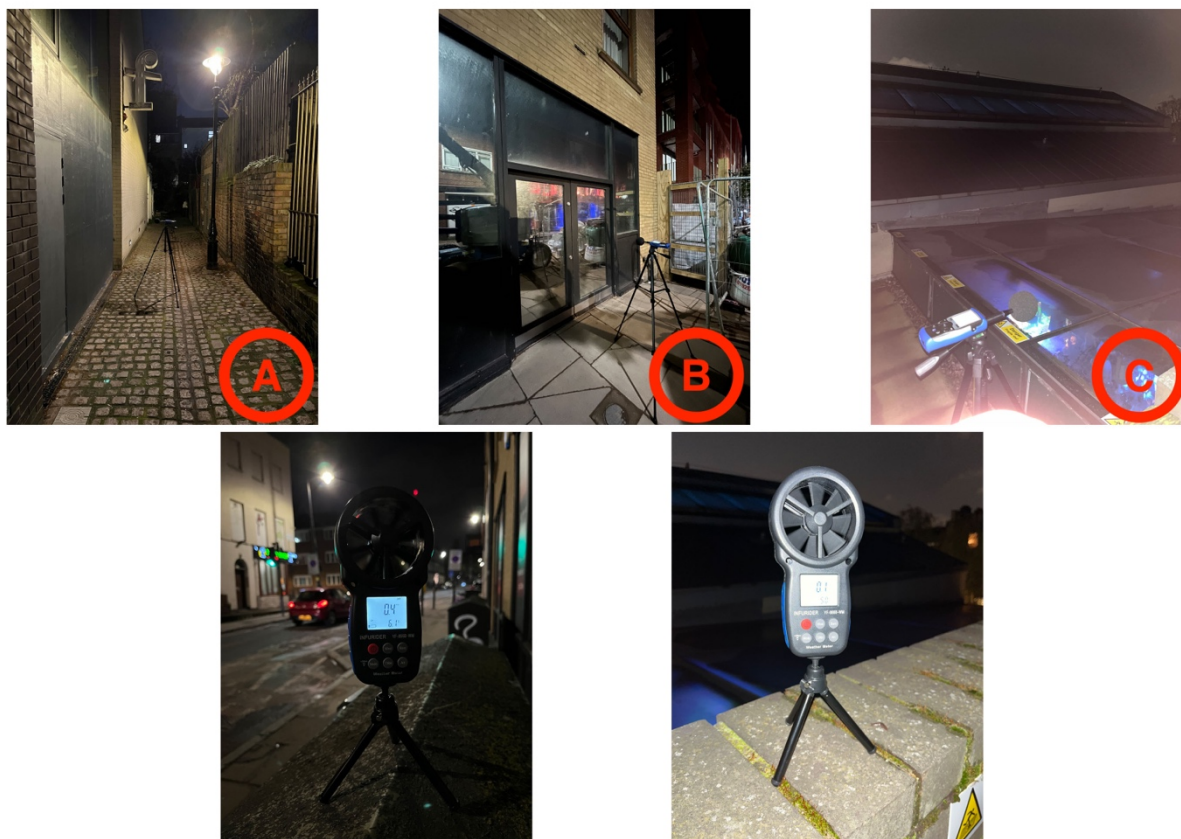


Figure 6 – Music sound level measurements and weather conditions