

Acoustic assessment of a proposed restaurant and external dining space

2 Spinningfields Square, Manchester



Client: Caprice Restaurants

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0. SUMMARY

- 0.1. ACA Acoustics Limited has been commissioned to carry out an assessment of noise emissions from a proposed restaurant at ground and mezzanine floor levels, along with external seating area at 2 Spinningfields Square, Manchester.
- 0.2. No residential receptors have been identified in the vicinity and as such adjoining offices have been considered the closest noise-sensitive receptors.
- 0.3. A sound insulation test was conducted on the separating floor between the mezzanine area and the first-floor offices above. Measured sound insulation performance of the separating floor was D,w 59dB. However, background sound levels in the offices limited the measurable performance and the actual sound insulation of the floor will be considerably higher.
- 0.4. Allowing for anticipated operational sound levels within the proposed restaurant, sound transmission into the offices will be lower than L_{Aeq} 33dB. This is significantly below guideline maximum values within BS 8233:2014 for executive offices, open plan offices, and meeting rooms. Calculated levels will be at least 8dB below the measured existing background sound level within the office.
- 0.5. The assessment confirms that operational sound transmission from the proposed restaurant will be low and will not be disturbing to occupants of the offices.
- 0.6. Whilst on site on the 6th October 2021, a sound level survey was conducted in the vicinity to establish existing external background sound levels. Lowest measured residual sound levels in the area were L_{Aeq} 64dB during the daytime to 19:00 hours and L_{Aeq} 59dB to the late evening/early night time periods.
- 0.7. A 3D computer model has been set up to calculate sound transmission from patrons using the external dining area. Calculated sound levels from patrons will be around L_{Aeq} 58dB outside first floor office windows and L_{Aeq} 61dB to the underside of the overhanging slab.
- 0.8. Allowing a very conservative sound insulation performance of façade elements of D,w 30dB for the curtain wall glazing and D,w 50dB for the concrete slab, calculated internal sound levels from patrons will not exceed a level of L_{Aeq} 28dB inside the offices above. This is significantly below guideline values of BS 8233:2014 and the existing background sound levels in the offices. Noise from patrons using the outside dining area would be exceptionally low and not be detrimental to the amenity of occupants of the offices.
- 0.9. In conclusion, operational noise emissions from the proposed restaurant and external dining seating area will be low and will not be detrimental to the amenity of any occupants in the vicinity.

1. INTRODUCTION

The client is preparing for the use of a ground floor unit at 2 Spinningfields Square, Manchester as a restaurant with external seating area.

ACA Acoustics Limited has been commissioned by Caprice Restaurant to carry out a survey and assessment of noise emissions from the proposed restaurant and, where necessary, to make recommendations for a suitable sound mitigation scheme. The purpose of the assessment is to ensure that the amenity of nearby noise-sensitive properties is not compromised.

No residential properties have been identified in the vicinity and as such it is considered that noise emissions from the restaurant and external dining area would not impact on any residential occupants. Adjoining commercial offices have been taken to be the closest noise-sensitive properties.

This report presents results of the sound level survey, computer modelling, and assessments.

2. ACOUSTIC CRITERIA

2.1 BS 8233:2014

British Standard BS 8233:2014 provides guideline internal sound levels to be achieved within offices.

Guidance limits for internal sound levels within open plan offices, executive offices, and meeting rooms, taken from Table 2 and Table 4 of BS 8233:2014, are shown in Table 1 below.

Location	Design Range LAeq
Open plan office	45dB - 50dB
Staff/Meeting room	35dB - 45dB
Executive office	35dB - 40dB

Table 1: BS 8233:2014 indoor ambient sound levels for office and places of work

2.2 Existing Background Sound Levels

While on site, ACA Acoustics measured a short-term background sound level of LA90 41dB, with a residual level of LAeq 42dB. Typically, ACA Acoustics recommend that to achieve a good standard of

amenity for existing occupants, noise transmission from licensed premises should be designed to not exceed a level of 5dB below the measured background sound level to inside adjoining noise-sensitive commercial properties.

Based on the measured background sound levels, this equates to a criteria of LAeq 36dB to inside the offices.

2.3 Summary of Appropriate Criteria

Based on the criteria discussed above, it is recommended that noise emissions from the restaurant and external dining area should be designed such that they do not exceed a level of LAeq 35dB inside the adjacent offices. This is the more stringent of the two criteria discussed.

3. REVIEW OF SITE LOCATION & DEVELOPMENT PROPOSALS

The development site is at 2 Spinningfields Square, Manchester.

The ground and mezzanine floor unit will be used as a restaurant, along with an external dining area.

The external seating area will be located beneath the concrete slab overhang, above which there are three floors of existing offices.

4. SOUND LEVEL SURVEY

4.1 External Sound Level Survey

To assess the impact of the proposed development, a sound level survey has been conducted at the development site. Details of the sound level survey carried out by ACA Acoustics are provided below.

An attended survey was carried out using a single measurement position to the front of the unit during the late afternoon and evening of the 6th October 2021 at the position shown in Figure 1.

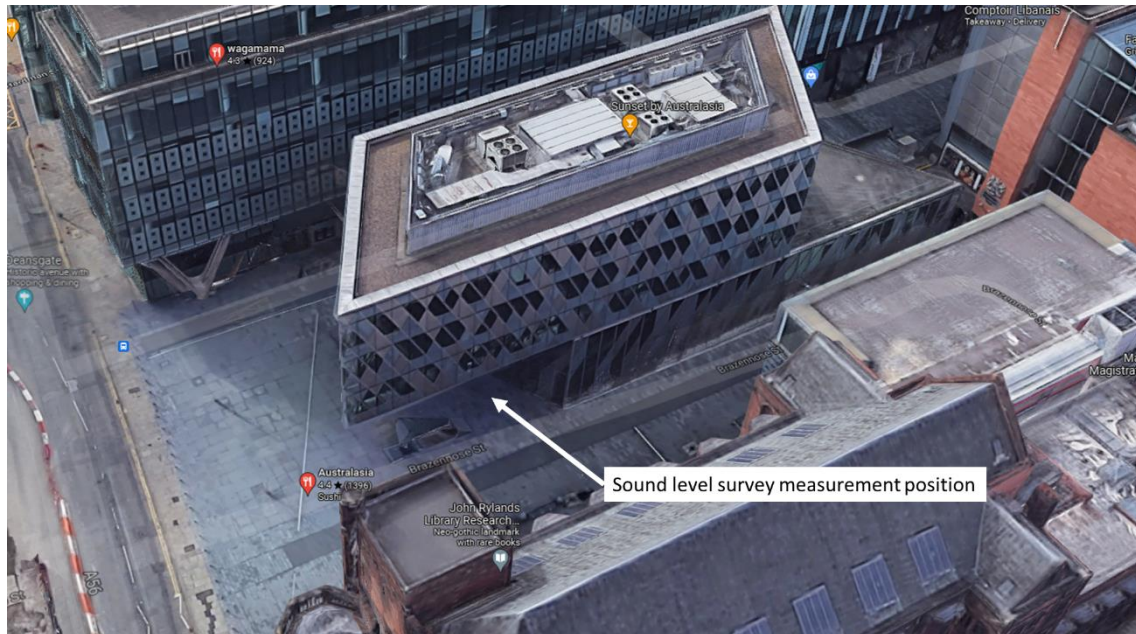


Figure 1: Sound level survey measurement location

Sound levels were recorded in consecutive 15-minute samples of overall LAfmax, LAeq, and LA90 values along with other statistical indices and octave band spectra.

The following equipment was used during the survey; a calibration check was conducted on the sound level meter prior to the survey and repeated after with no deviation noted.

Equipment	Serial Number
NTi Audio Class 1 sound level meter type XL2 complete with weatherproof and lockable outdoor environmental kit	A2A-06294-E0
Svantek calibrator type SV33B. Compliant to IEC 60942-1:2003	83826

Table 2: Equipment used for MP1

Weather conditions at the time of the survey were cold, calm, and clear. Meteorological conditions will not have influenced the measurement results.

Results of the survey are shown in graphical form in Figure 2. Summary results are included in the table below.

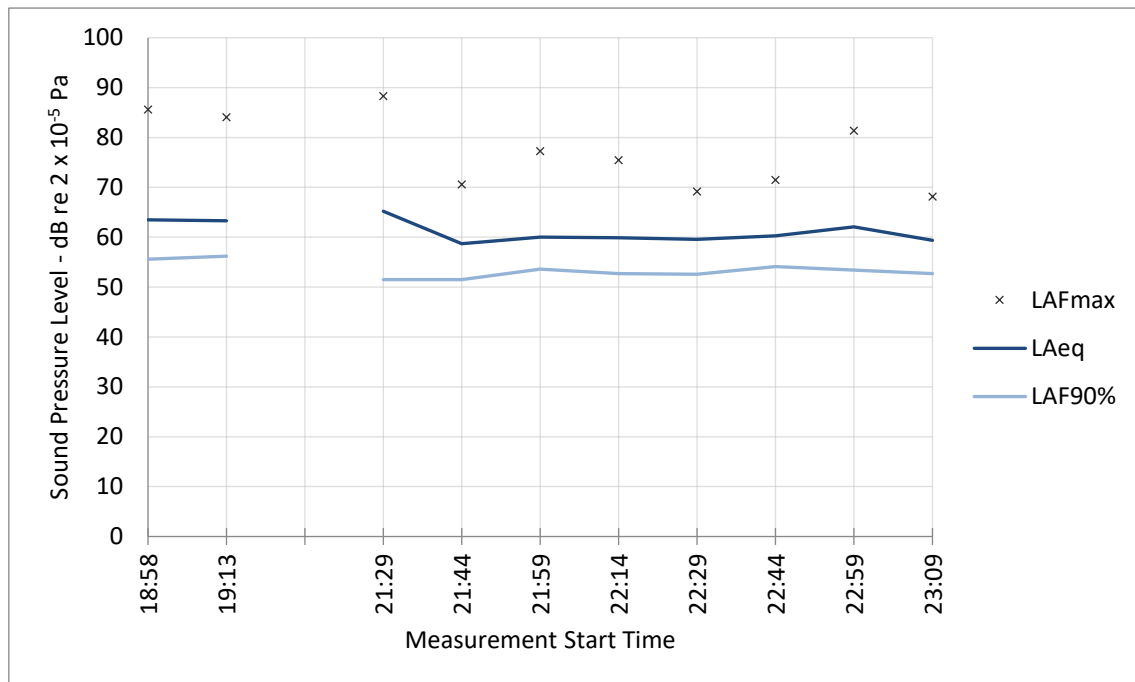


Figure 2: Sound level survey results

4.2 Sound Insulation Tests

A sound insulation test has been carried out between the 1st floor mezzanine area and the 2nd floor office space.

The survey was conducted by Tommy Burn of ACA Acoustics. Tests were conducted in accordance with the methodology of BS EN ISO 16283-1:2014. Tommy Burn is accredited to undertake sound insulation tests in accordance with the SITMA registration scheme.

Summary results are shown in the table below.

Source Room	Receiving Room	Level Difference D,w (dB)
1 st Floor, Mezzanine level	2 nd Floor office	59

Table 3: Sound insulation test results

The sound insulation results on the existing structure confirm that the building is providing a very good standard of sound insulation.

The measured sound insulation performance is significantly limited by the prevailing background sound level within the offices from the ceiling ventilation and thermal comfort equipment. With the loudspeaker playing “pink” noise in the mezzanine area at around LAeq 100dB subjectively transmission into the office space was almost imperceptible above the background sound level in

the office. What this means is that the actual level of sound insulation will be much higher than that shown and consequently actual levels of sound transmission from the proposed restaurant will also be significantly lower than those calculated below.

5. ASSESSMENT OF INTERNAL NOISE TRANSMISSION

ACA Acoustics have measured music levels within an existing restaurant of the proposed operator during busy trading hours. Levels measured will be representative of those within the proposed restaurant during a busy weekend evening period, with amplified music playing, and patrons talking loudly.

Typical source sound levels are shown in the table below. These equate to a level of LAeq 86dB.

	Octave Frequency (Hz)						
	63	125	250	500	1k	2k	4k
Leq dB	82	80	84	88	74	66	60

Table 4: Source sound level inside restaurant

Based on the anticipated source sound level and the measured level difference of the existing structure, resultant sound levels inside the adjoining offices are shown below in terms of overall LAeq values. Note that these are based on the existing structure and do not allow for any mitigation works. It is anticipated that the restaurant operator would fit out the restaurant including plasterboard ceilings to cover ductwork and services, which would improve the sound insulation performance further.

Receptor	Calculated Level of Sound Transmission	Recommended Criteria
Open plan office at 2 nd floor level	LAeq 33dB	LAeq ≤35dB

Table 5: Calculated sound emissions from restaurant transmitting through existing structure prior to undertaking any mitigation works

Results in Table 5 confirm that noise emissions to the offices, with music playing inside the restaurant with no acoustic treatment, achieve the recommended criteria.

It is worth noting that, as mentioned above, the actual level of sound insulation will be higher than that shown, and the calculated level of sound transmission will be subsequently much lower.

6. ASSESSMENT OF NOISE FROM THE EXTERNAL SEATING AREA

The proposed development includes forming an external dining area to the front of the unit. In order to ensure levels from the area do not cause reduction to the amenity of the office above the restaurant, assessment of levels from the seating area has been undertaken.

To calculate noise emissions from people using the external seating area it is necessary to establish what the typical source sound levels will be from the patrons. It is well documented that average conversational speech of an adult produces around Leq 60dBA at a distance of 1m from the speaker and that raised voices are around Leq 65dBA at 1m from the speaker (*Kinsler, Frey, Coppens, Sanders – Fundamentals of Acoustics, 4th Edition, p328*).

A computer calculation model has been set up of the proposed dining area. The calculation model uses iNoise proprietary noise mapping software based on the methodology of ISO 9613-2:1996 and ISO 17534-1:2015, the associated quality standard for software models. The calculation method of ISO 9613 takes account of the patron source sound levels, distance between the external dining area and residential properties, acoustic reflections, and acoustic screening. ISO 9613-2:1996 estimates accuracy of ± 3 dB.

Input data and assumptions made within the calculation model are detailed below.

- Around 50 patrons in the seating area.
- One in two patrons talking in raised voices. 65dBA at 1m for each raised voice. This is significantly conservative: it would normally be expected to have around one in three or one in four patrons talking at any one time. As such actual source levels are likely to be lower.
- No allowance for directivity has been taken. This therefore assumes all patrons speaking will be facing directly towards the receptors.
- The assessment assumes moderate downwind propagation from the source to the receptors.
- Ground absorption coefficient assumed to be 0 (fully reflective hard ground) throughout.
- The sound reflection coefficient from existing buildings is assumed to be 0.8, equating to traditional buildings with windows, small additions, or bays.

The author considers that the details used within the acoustic model equate to the likely 'worst-case' period of operation. This means that sound emissions from the dining area would often be lower than the levels calculated.

Printouts from the computer calculation model are provided in Appendix A. Calculated sound emissions from the external area to outside nearby residential properties are shown in Table 6 below.

External Seating Area Level of Occupancy	Separating Element	External Sound Level LAeq	Separating Element Minimum Likely Sound Reduction	Internal Level
Full capacity	To external glazed façade	58dB	30dB	28dB
	To just underneath concrete slab	61dB	50dB	11dB

Table 6: Calculated levels with opening in shop front, and comparison against measured residual LAeq

Table 6 shows that levels from the external seating area through the glazed façade and concrete slab floor are significantly below levels measured within the office and criteria detailed within Section 2.

7. CONCLUSION

A licencing application has been submitted for the conversion of the ground floor unit at 2 Spinningfields Square, Manchester to become a high-end food restaurant and ancillary bar, with outside seating area.

ACA Acoustics have undertaken sound level surveys of the separating floor, and in the external vicinity, along with computer modelling of noise emissions from the restaurant and external dining area to assess sound levels to within the upper floor office space.

The assessment confirms that cumulative levels from the high-end food restaurant and ancillary bar and external seating area will be at most 9dB below current sound levels inside the office and will be below guideline criteria for a good standard of amenity in offices set out in the relevant British Standard.

The proposals will not be detrimental to the amenity of occupants of the offices.

Appendix A

Acoustic Calculations