23 September 2021
TK614-05F02 Acoustic Certification for OC (r0)

The Star Sydney
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Sports UGA, The Star - Acoustic Certification for Occupation Certificate

Renzo Tonin & Associates certifies that the acoustic requirements of the Modification of Minister's Approval No. MP 08_0098 MOD 14 Part F have been satisfied on the basis of the results and findings from the site inspection and compliance testing carried out by Renzo Tonin & Associates on 10 September 2021.

1 Introduction

Renzo Tonin & Associates was engaged to provide an acoustic Occupation Certificate (OC) for the implementation of Audio (speakers) into the Level 1 Pirrama Road Outdoor Gaming Area (also known as Sports UGA) at The Star, Pyrmont.

This certificate is to address the acoustic requirements presented in the Modification of Minister's Approval No. MP 08_0098 MOD 14 and in accordance with all recommendations and performance parameters contained in the report entitled The Star – Pirrama Road Level 1 Unenclosed Gaming Areas Speakers and Music Assessment, prepared by Renzo Tonin & Associates and dated 8 May 2014 [ref: TG004-13F05 (r2) L1 UGA Report] (Acoustic Report).

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001.

2 Noise testing

Operational noise compliance testing was undertaken at the nearest identified residential receiver location during the period when background music is played through the speakers to set the noise limiters inside the UGA and to verify that noise emissions comply with the relevant criteria.

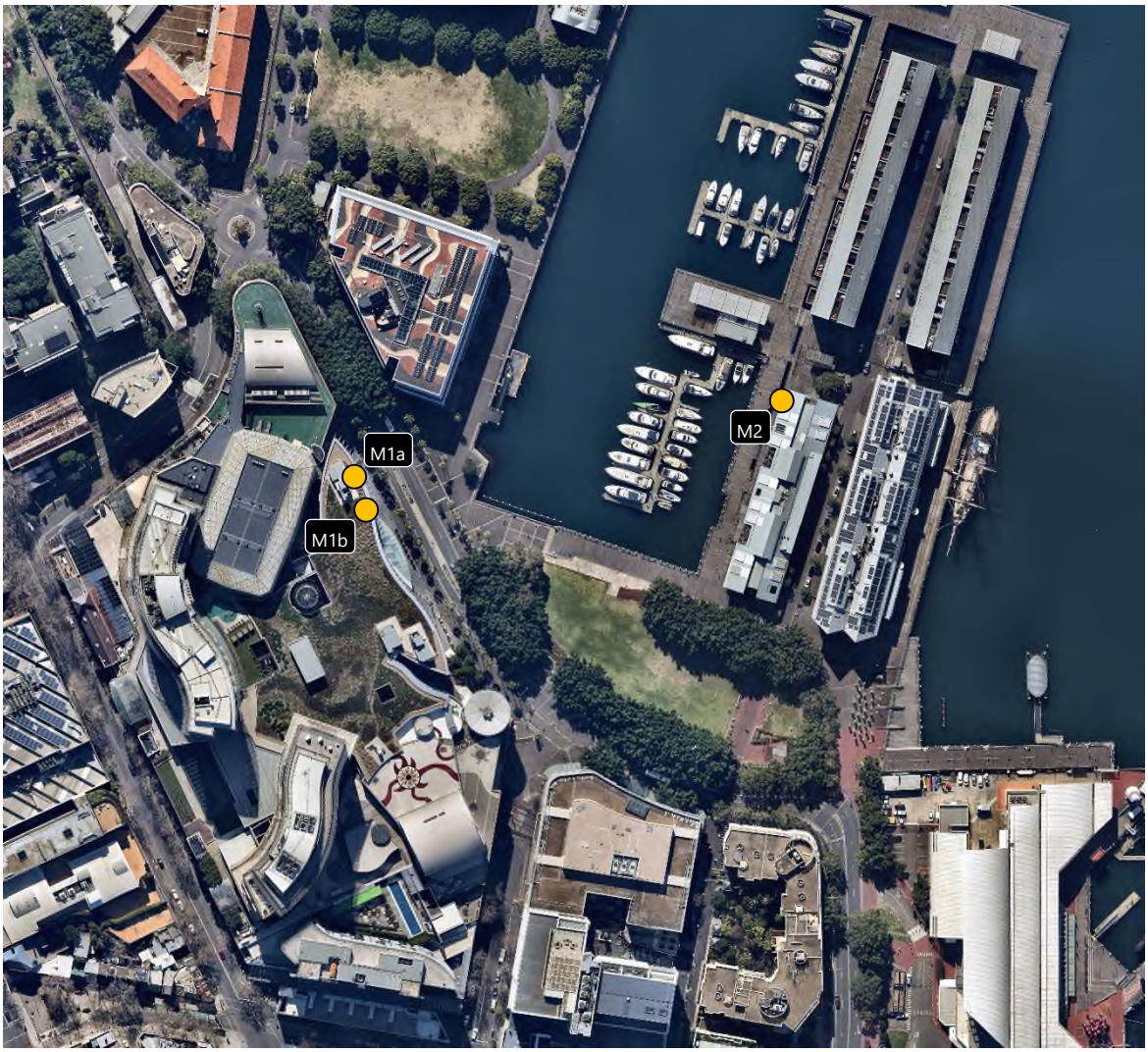
2.1 Noise measurement locations

The short-term measurement locations are outlined in Table 2.1 and shown in Figure 1.

Table 2.1: Noise measurement locations

ID	Address	Description
M1a	Sports UGA, The Star (northern)	The monitor was located directly underneath one of the ceiling speakers (2.6m), approx. 2m from the open facade in the UGA
M1b	Sports UGA, The Star (southern)	The monitor was located directly underneath one of the ceiling speakers (2.6m), approx. 2m from the open facade in the UGA
M2	Sydney Wharf 8/9, 56-56A Pirrama Road, Pyrmont	Due to LuMi Dining, 56 Pirrama Road, Pyrmont, operating with full open facade during the measurement period, an alternative position was adopted. The monitor was located to the west of the building at 50D Pirrama Road, south of the Sydney Wharf 8/9, on the ground floor. The noise environment at the time of measurements was dominated by general urban hum. Music noise from the speakers was not audible at any time during the measurements. The internal noise level limits have been set prior in accordance with the maximum allowable levels within the gaming areas as presented in Table 6 of the Acoustic Report.

Figure 1: Noise measurement locations



2.2 Noise measurement methodology

In order to quantify the operational noise emission levels from the speakers, inspections and short-term noise measurements were undertaken between 3:00pm and 5:00pm on Friday, 10 September 2021.

The weather condition during the measurements was genuinely calm, with no wind gust. The conditions were considered conducive for noise measurements.

The following procedure was used to establish compliance from the speakers in the UGAs:

- Audio limiting applied to speakers to ensure compliance with points 1(a) and 1(d) of Condition F1D of MP08_0098 inside the UGA. The noise limiter was set and locked to the maximum allowable sound pressure levels of the 10:00pm to 12:00am period in Table 6 of the Acoustic Report. During PA announcements, the music signal is ducked.
- It is understood that no audio is played in the UGA between 11:59pm and 07:00am in accordance with points 1(b) and 1(c) of Condition F1D of MP08_0098.
- Simultaneous sound level measurements were undertaken in general accordance with AS1055.1-1997 '*Acoustics - Description and Measurement of Environmental Noise*'. Continuous ambient noise measurements were undertaken at the noise measurement locations as set out in Table 2.1 above. Music noise from the speakers was not audible at Location M2 at any time during the measurements.

2.3 Noise measurement results

The measured noise levels are presented in Table 2.2 and Table 2.3.

Table 2.2: Short-term noise monitoring results to set limiter

Time	Descriptor	Overall	Octave band centre frequency - Hz (dBZ)								
		dB(A)	31.5	63	125	250	500	1k	2k	4k	8k
M1a - Sports UGA (northern)											
3:32pm - 3:36pm	L_{10}	69	62	63	68	65	67	62	63	60	58
Maximum allowable sound pressure level from UGAs between 10:00pm and 12:00am	L_{10}	78	89	86	83	80	75	73	67	61	64

Notes: The equipment used for noise measurements were Brüel & Kjær Type 2250 precision sound level analysers, which are Class 1 instruments having accuracy suitable for field and laboratory uses. The instruments were calibrated prior and subsequent to measurements using Brüel & Kjær Type 4231 calibrators. No significant drift in calibration was observed. All instrumentation complies with AS IEC 61672.1 2019 'Electroacoustics - Sound Level Meters' and carries current NATA certification (or if less than 2 years old, manufacturers certification).

Table 2.3: Short-term noise monitoring results for compliance

Time	Descriptor	Overall	Octave band centre frequency - Hz (dBZ)								
		dB(A)	31.5	63	125	250	500	1k	2k	4k	8k
M1a - Sports UGA (northern)											
3:49pm - 3:56pm Music on	L_{10}	70	63	64	68	64	66	64	64	61	56
3:57pm - 4:12pm Music off	L_{10}	56	63	60	56	54	52	53	48	41	34
	L_{90}	49	58	53	52	49	46	45	40	34	23
M1b - Sports UGA (southern)											
4:15pm - 4:22pm Music on	L_{10}	68	65	72	66	66	64	61	61	60	53
M2 - Sydney Wharf 8/9 (alternative location)											
3:49pm - 3:56pm Music on	L_{10}	51	61	58	54	51	49	46	41	36	25
	L_{90}	48	54	53	51	48	46	43	37	28	17
3:57pm - 4:12pm Music off	L_{10}	51	60	57	54	50	49	46	41	35	26
	L_{90}	47	53	53	50	47	46	42	37	28	17
4:15pm - 4:22pm Music on	L_{10}	50	61	61	56	50	49	45	40	33	23
	L_{90}	47	54	53	51	47	46	43	37	28	16

Notes: The equipment used for noise measurements were Brüel & Kjær Type 2250 precision sound level analysers, which are Class 1 instruments having accuracy suitable for field and laboratory uses. The instruments were calibrated prior and subsequent to measurements using Brüel & Kjær Type 4231 calibrators. No significant drift in calibration was observed. All instrumentation complies with AS IEC 61672.1 2019 'Electroacoustics - Sound Level Meters' and carries current NATA certification (or if less than 2 years old, manufacturers certification).

No music was audible throughout the measurements at Location M2 with the noise levels inside M1a and M1b as per the table above; and therefore, the noise emission from the speakers was deemed to comply with the requirement of the Modification of Minister's Approval No. MP 08_0098 MOD 14 Part F.

DSP audio level limiters have been incorporated into the sound system to prevent noise levels generated by the system from exceeding allowable limits. Access to change the noise limiter settings is locked out to staff and will be accessible only by AV contractors and the Technical Manager.

3 Noise assessment

As there is no detectable music noise, the operational noise levels are deemed to comply with the requirement of the Modification of Minister's Approval No. MP 08_0098 MOD 14 Part F.

It is noted however with the exception of the 4kHz octave band centre frequency, the music noise level limit can be increased, especially in the lower frequencies, as follows:

Table 3.1: Increase in noise limiter setting if required

Description	Overall	Octave band centre frequency - Hz (dBZ)								
	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k
Increase in noise limiter setting	-	9	9	9	3	3	3	0	0	0

4 Conclusion

Renzo Tonin & Associates conducted operational noise compliance testing for Sports UGA, The Star.

Based on the observations, measurement results presented and acoustic measures implemented as above, we advise that the implementation of Audio (speakers) into the Level 1 Pirrama Road Outdoor Gaming Area is deemed to comply with the requirements of the Modification of Minister's Approval No. MP 08_0098 MOD 14 Part F.

Renzo Tonin & Associates is a company member of the Association of Australian Acoustical Consultants (AAAC) and the undersigned is a current individual member of the Australian Acoustical Society (AAS).

Regards,

David Suwandi
Principal Engineer