RODNEY STEVENS ACOUSTICS
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REPORT 150154R0

Revision 0

Noise Assessment Report
Proposed Gymnasium
Maxzone Fitness
St Clair Shopping Centre
Shop 2, 155 Bennett Road
St Clair NSW

PREPARED FOR:
While We Sleep Pty Ltd
Rear of, 317 Concord Road
Concord West NSW 2138
c/- Mr. James Sanders
Sellex Pty Ltd

15 June 2015

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Noise Assessment Report

Proposed Gymnasium

Maxzone Fitness

St Clair Shopping Centre

Shop 2, 155 Bennett Road, St Clair NSW 2219

PREPARED BY:

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DOCUMENT CONTROL

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1 INTRODUCTION

Rodney Stevens Acoustics Pty Ltd (hereforth referred to as RSA) has been commissioned by Mr. James Sanders on behalf of While We Sleep Pty Ltd to assess the noise impact from the proposed gymnasium located at 155 Bennett Road St Clair NSW. This report will form part of the development application (DA) to the Penrith City Council.

The purpose of this assessment is to determine the potential noise impacts on nearby residential receivers and where necessary, provide treatment recommendations to enable the development to operate in an acoustically compliant manner.

This report presents the study methodology, assessment criteria, assessment of noise emissions and noise control recommendations in relation to the following specific areas of acoustical significance:

- Noise emissions from the operation of the proposed gymnasium

Specific acoustic terminology is used in this report. An explanation of common acoustic terms is provided in Appendix A.

2 PROJECT AREA AND SENSITIVE RECEIVERS

The proposed gymnasium will be located at St Clair Shopping Shop 2 155 Bennett Road St Clair NSW. The project area and its surrounding environment are presented in Figure 2-1 below.

Figure 2-1 Project Area and Surrounding Environment

Image Courtesy of Nearmap 2015

The proposed gymnasium will operate in the ground floor of the existing building site. The site will be renovated to meet the operating requirements of the gymnasium.

The proposed gymnasium will be as follows:

- Monday to Thursday: 5.30 am to 10:00 pm.
- Friday: 5.30 am to 9:00 pm.
- Saturday: 7:00 am to 5:00 pm.
- Sunday: 7:00 am to 5:00 pm.
- Public holiday trade will be subject to reduced hours and permissible shopping Centre trade obligations.

3 SITE PLAN

The proposed site layout of the gymnasium is presented in Figure 3-1 below.

Figure 3-1 Proposed Floor Plan

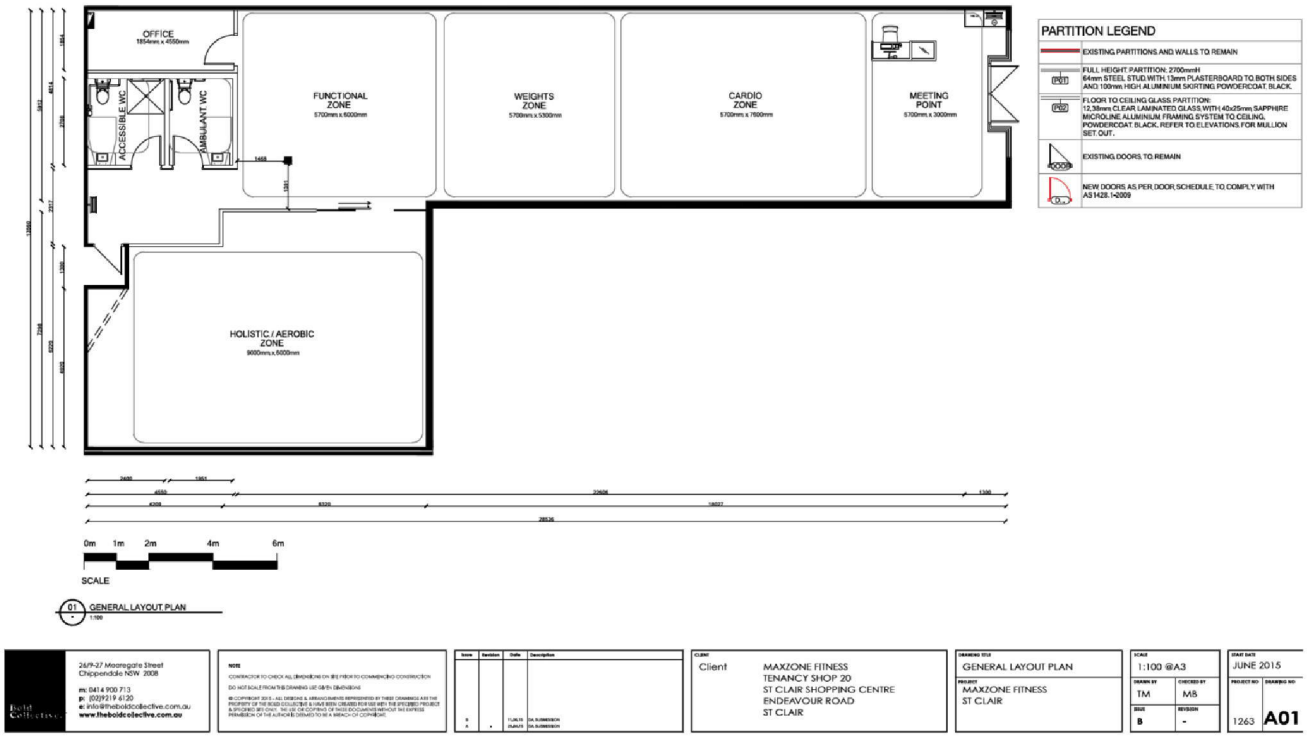


Image courtesy of The Bold Creative

4 EXISTING NOISE ENVIRONMENT

4.1 Ambient Noise Monitoring

In order to establish the existing noise environment of the area, a survey of ambient noise levels was conducted on 15 May to 22 May 2015. The monitoring location was considered representative of the nearest potentially sensitive receiver and representative of the lowest residential background noise levels for nearby residential receivers surrounding the site.

The location was selected after a detailed inspection of the project area giving consideration to other noise sources which may influence the readings, the proximity of noise-sensitive receivers, security issues for the noise monitoring device and gaining permission for access from the residents or landowners. The results of the ambient noise monitoring are shown in Table 4-1.

Instrumentation for the survey comprised an ARL Rion NL-42 Environmental Noise Logger (Serial number 133010) fitted with a microphone and windshield. Calibration of the logger was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dBA. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

4.2 Noise Results

In order to assess the acoustical implications of the proposed development on the levels of noise received at the neighboring residential premises, the measured data was processed according to the *NSW Environment Protection Authority* (EPA) and *Industrial Noise Policy* (INP) assessment time periods. Table 4-1 details the RBL (background) and LAeq noise levels recorded during the daytime and evening period.

Table 4-1 Measured Ambient Noise Levels at Residential Receiver

Noise Level – dBA re 20 µPa – Residential					
Daytime		Evening Time		Night Time	
RBL [1]	LAeq [2]	RBL [1]	LAeq [2]	RBL [1]	LAeq [2]
57	67	54	64	50	59

Note 1: The RBL noise level is representative of the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

Note 2: The LAeq is essentially the average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

Ambient noise levels were also measured inside the commercial premises adjoining the proposed gymnasium. The noise measurements were conducted on 15 May 2015 between the hours of 10:30 am to 12:30 pm. Table 4-2 details the RBL and LAeq noise levels during the measured period. The noise levels were measured using a Type I Sound Level Meter, Svantek 959 (serial 12916).

Table 4-2 Measured Ambient Noise Levels at Commercial Receiver

Location	Noise Level	
(Commercial Premise)	RBL	LAeq
Chrystal Jade Chinese Restaurant	53	57
Pizza Rocco	55	62
Price Plus	53	57

5 ASSESSMENT CRITERIA

5.1 Operational Noise – NSW EPA Industrial Noise Policy

Responsibility for the control of noise emissions in New South Wales is vested in Local Government and the EPA.

The EPA oversees the Industrial Noise Policy (INP) January 2000 which provides a framework and process for deriving noise criteria. The INP criteria for industrial noise sources have two (2) components:

- Controlling the intrusive noise impacts for residents and other sensitive receivers in the short term; and
- Maintaining noise level amenity for particular land uses for residents and sensitive receivers in other land uses.

Intrusiveness Criterion

For assessing intrusiveness, the background noise generally needs to be measured. The intrusiveness criterion essentially means that the equivalent continuous noise level (L_{Aeq}) of the source should not be more than 5 dB(A) above the measured Rated Background Level (RBL), over any 15 minute period.

Amenity Criterion

The amenity criterion is based on land use and associated activities (and their sensitivity to noise emission). The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. The criteria relate only to other industrial-type noise sources and do not include road, rail or community noise. The existing noise level from industry is measured. If it approaches the criterion value, then noise levels from new industrial-type noise sources, (including air-conditioning mechanical plant) need to be designed so that the cumulative effect does not produce total noise levels that would significantly exceed the criterion.

Area Classification

The INP characterises the “Urban” noise environment as an area with an acoustical environment that:

- Is dominated by ‘urban hum’ or industrial source noise
- Has through traffic with characteristically heavy and continuous traffic flows during peak periods
- Is near commercial districts or industrial districts
- Has any combination of the above.

The term ‘urban hum’ means the aggregate sound of many unidentifiable, mostly traffic-related sound sources.

The area surrounding the proposed development falls under the “Urban” area classification.

Project Specific Noise Levels

Having defined the area type, the processed results of the unattended noise monitoring have been used to determine project specific noise criteria. The intrusive and amenity criteria for nearby residential premises are presented in Table 5-1. These criteria are nominated for the purpose of assessing potential noise impacts from the proposed development.

In this case, the ambient noise environment is not controlled by industrial noise sources and therefore the amenity criteria become equal to the Recommended Amenity Criteria for Residences in an Urban Area (ie ANL or Acceptable Noise Level). For each assessment period, the lower (ie the more stringent) of the amenity or intrusive criteria are adopted. These are shown in bold text in Table 5-1

Table 5-1 Operational Noise Criteria

Receiver	Time of Day	ANL [1] $L_{Aeq(15\ minute)}$	Measured RBL [2] $L_{A90(15minute)}$	Measured L_{Aeq} Noise Level)	Criteria for New Sources	
					Intrusive $L_{Aeq((15min)}$	Amenity [3] $L_{Aeq(15min)}$
Residential	Day	60	57	67	63	**57**
	Evening	50	54	64	59	**54**
	Night	45	50	59	55	**49**
Commercial (Chrystal Jade Chinese Restaurant)	When in use	65	53	57	**58**	65
Commercial (Pizza Rocco)	When in use	65	55	62	**60**	62
Commercial (Price Plus)	When in use	65	53	57	**58**	65

Note 1: ANL = “Acceptable Noise Level” for residences in Urban Areas.

Note 2: RBL = “Rating Background Level”.

Note 3: Assuming existing noise levels are unlikely to decrease in the future

Note 4: Current measured RBL meets the ANL requirement

6 NOISE IMPACT ASSESSMENT

6.1 Patron Noise and Amplified Background Noise Emissions

The following sections summaries the results of patron and amplified background noise assessment and predicted levels at the surrounding residential and commercial receivers due to the operation of the proposed Gymnasium.

6.1.1 Typical Patron Vocal Levels

Calculations of the amount of noise transmitted to these receivers from the proposed gymnasium have been made based on a typical patron sound power spectrum as based on a Harris loud voice. The sound power levels are derived from Table 16.1 in "*Handbook of Acoustical Measurements and Noise Control*" by C.M. Harris.

Harris indicates that a typical casual male voice is 53 dBA at 1 m, a typical normal voice is 58 dBA at 1 m, a typical raised voice is 65 dBA at 1 m, a typical loud voice is 75 dBA at 1 m and a shouting voice is 88 dBA at 1 m. Taking the standard conversion of adding 8 dBA to convert sound pressure level at 1 m to sound power level, the sound power level of a typical raised voice equates to 73 dBA.

Table 6-1 outlines the sound power spectrum a patron talking with a vocal effort of raised voice

Table 6-1 Typical Sound Power Level of 1 Person with Raised Voice - L_W (dBA)

Scenario	Resultant Noise Level per Octave Band (dB)								Overall (dBA)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
1 Patron – Raised Vocal	53	54	64	71	69	63	59	50	73

This spectrum and overall noise level is believed to be a reasonable approximation of the typical "worst case" that could be expected from the internal area of the gymnasium.

6.1.2 Patron Sound Power Level

Based on a maximum number of 25 patrons, the following worst-case operational scenarios have also been assumed for our assessment:

- A total of 20-25 people inside the Gymnasium at any one time.

6.1.3 Amplified Background Music Sound Power Level

Based on typical amplified background music and reinforced speech (through a microphone) in a gymnasium, the sound power level spectrum of background music is shown in Table 6-2.

Table 6-2 Typical Sound Power Level of Typical Background Music – L_W (dBA)

Scenario	Resultant Sound Power Level per Octave Band (dB)								Overall (dBA)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
Background Music (Amplified)	91	96	91	91	89	82	74	70	93

The 32 Hz octave band has not been assessed due to the limited availability of transmission loss (TL) data in this low (bass) frequency band. It is also very likely that even if noise emission in this low frequency octave band exceeds the noise criterion; it will be very close to, if not below, the human threshold of hearing at the receivers.

6.1.4 Predicted Patron and Background Music Noise Impacts

Predictive resultant noise spectrums based on the proposed gymnasium have been calculated for patron and amplified background noise emissions at neighbouring residential and commercial receiver are presented in Table 6-3. The following assessment was conducted without any form of noise control other than attenuation provided by the existing building façades.

Table 6-3 Patron and Background Music Noise Assessment at Nearby Noise Sensitive Receivers

Receiver	Time Period	Resultant Noise Impact dB(A)	INP Criteria	Compliance (y/n)
Residential Receiver: 162 Bennett Road	Daytime	28 dB(A)	57 dB(A)	Yes
	Evening	28 dB(A)	54 dB(A)	Yes
Commercial Receiver (Price Plus)	When in Operation	60 dB(A)	58 dB(A)	With Recommendations
Commercial Receiver (Pizza Rocco)	When in Operation	63 dB(A)	60 dB(A)	With Recommendations
Commercial Receiver (Chrystal Jade Chinese Restaurant)	When in Operation	61 dB(A)	58 dB(A)	With Recommendations

6.2 Gymnasium Equipment Noise Emissions

Potential for noise emanating from the proposed gymnasium could be the noise from the use of the gym equipment. In a standard gymnasium environment where there is a free weight section, unwanted noise can be generated when free weights are dropped from a height of more than 1 meter. This can cause structure borne noise that can transmit into attached residential dwelling and commercial premises. Weights being dropped on a standard concrete floor with 5mm carpet can have a noise impact of 52 dB(A) when measured at 1 meter from the drop spot.

In order to access the impact of vibrational borne disturbances (caused by the dropping of weights) into the commercial units located on adjacent to the proposed gymnasium, 20 kg dumbbell had been dropped at a similar site with similar building constraints.

The vibration response was measured at the base of the concrete ceiling on the ground floor. The impact source included the drop of a 20 kg dumbbell. The vibration levels were measured using a Svantek Type I Sound Level Meter Model 959 on Vibration mode (serial number: 12916) fitted with a Brüel & Kjær accelerometer.

The 20 kg dumb bell was dropped from a height of 0.5 m on the concrete floor with the following floor coverings:

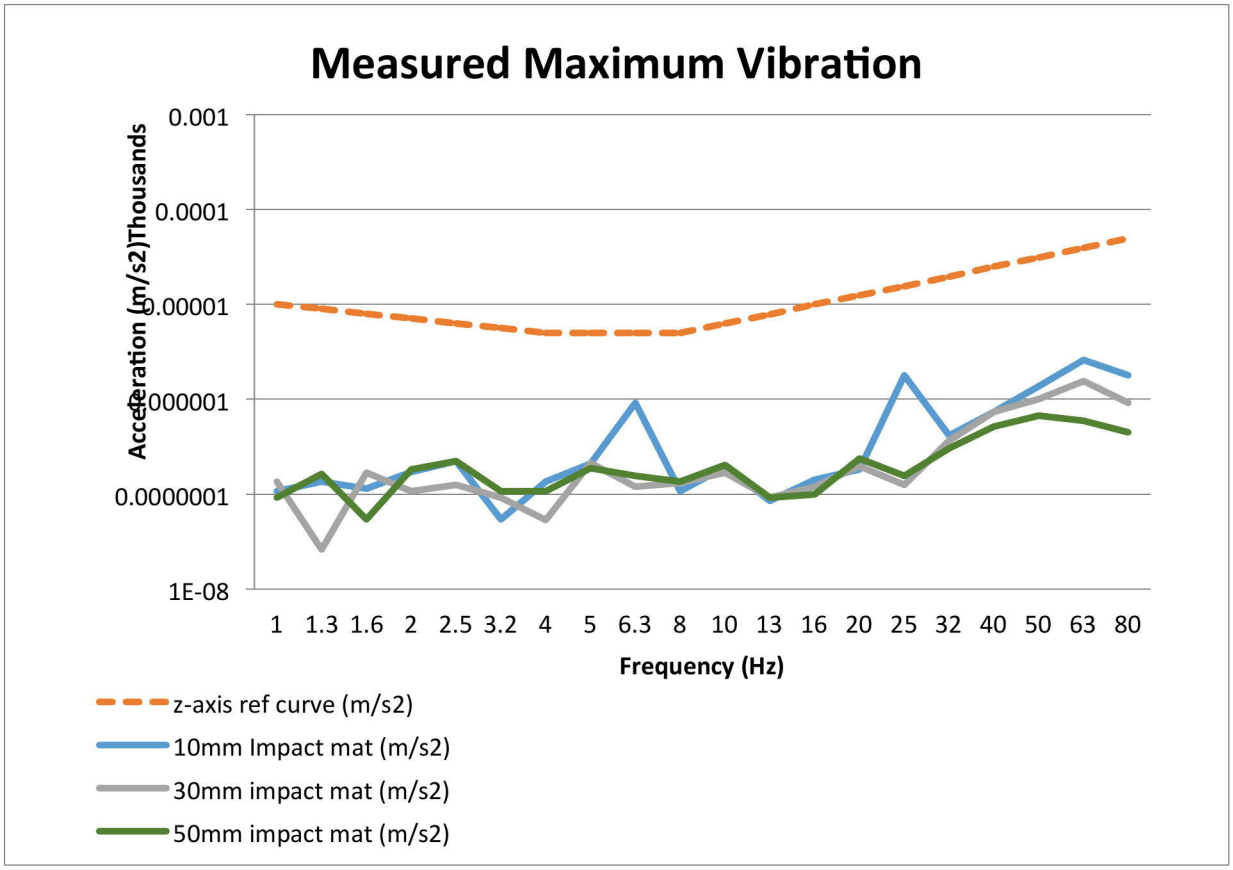
- 10 mm thick A1 Rubber Impact mat
- 30 mm thick A1 Rubber Impact mat
- 50 mm thick A1 Rubber Impact mat

The floor coverings were sample sizes (1m x 1m) placed at the location for the free weights area at the proposed floor plan.

Environmental Protection Agency's (EPA) document *Noise Management (ENM) "Assessing Vibration: A Technical Guide"* presents the criteria for the assessment of vibration and its affect on human responses.

The maximum vibration levels recorded from the weight being dropped in relation to the reference curve as outlined by EPA ENM criteria are presented in Figure 6-1 below.

Figure 6-1 Measured Maximum Vibration Levels (m/s^2)



The measured vibration levels show that in the case of weights being dropped on the concrete floor with impact rubber matting, the recommended vibration criteria will be easily achieved.

6.3 Mechanical Services

No equipment for the mechanical has been selected at this stage. The plant would need to be selected on the basis of quiet operation. It is recommended that any outdoor air-conditioning plants be located on the roof of the existing building to provide maximum attenuation to neighbouring residential receivers. It is envisaged that any mechanical noise emissions will be controllable by selection of low-noise equipment and judicious location of plant, as well as installation of an acoustic enclosure (where required).

7 RECOMMENDATIONS

The scope of the assessment involved a noise measurement survey, noise predictions for the operational scenario, noise impact assessment relative to appropriate criteria and, where required, recommendations for noise control measures.

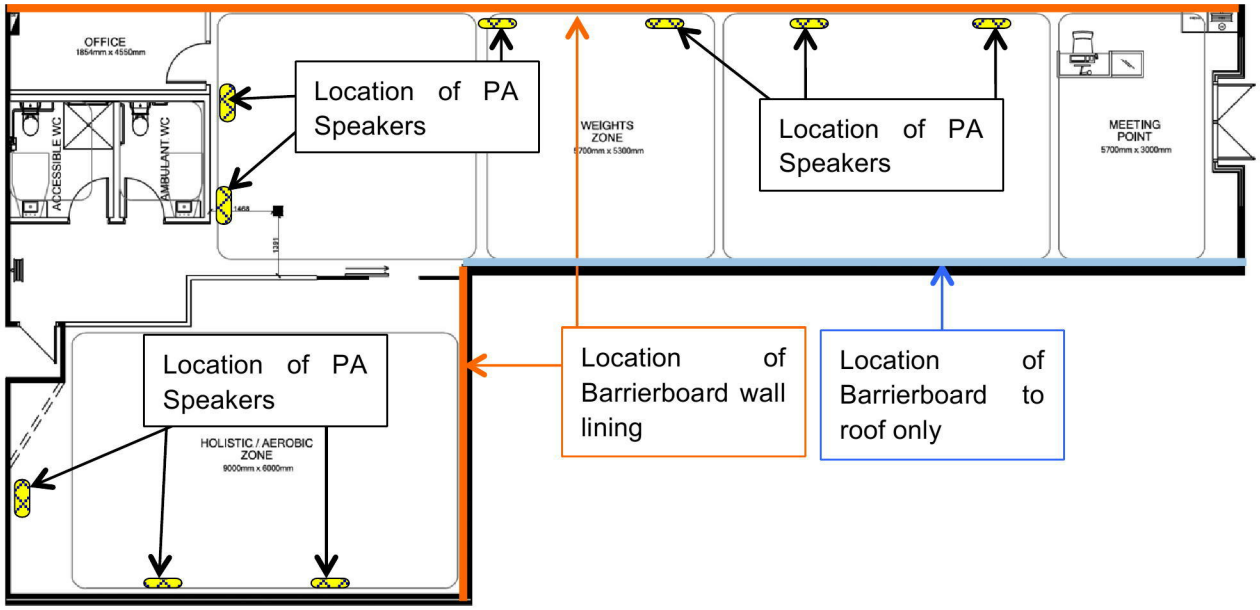
The following measures are recommended to preserve acoustic amenity:

- 15mm impact (rubber) mat to be placed at locations used in the “Weights Zone” section;
- Signs to be installed in the “Weights Zone” section advising members not to drop weights on the floor;
- External doors to be adequately sealed when closed to minimise noise leaking.
- All external doors to be closed while the gymnasium is in operation.
- An electronic frequency dependent limiting device should be installed to the sound system to ensure that the amplified music is set to the limit the music to the levels as set out below:

Scenario	Resultant L10 Noise Level at 1 meter per Octave Band (dB)								Overall L_{A10} (dB)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
Background Music (Amplified)	80	80	83	85	85	79	71	70	80

- Walls adjoining the *Pizza Rocco, Price Plus* and *Chrystal Jade Chinese Restaurant (holistic zone only)* to have *Barrierboard* composite wall installed. *Barrierboard* is to be installed internally with the height reaching the roof. The wall separating the weights zone, cardio zone and meeting point with the *Jade Chinese Restaurant* is to have *Barrierboard* installed from the existing wall to the roof. Figure 7-1 presents the location of the *Barrierboard* installation.

Figure 7-1 Location of Barrierboard wall lining, PA speakers and absorption panels



- Speakers for the PA system to be installed on walls only. Rubber padding is recommended to be used to isolate the speaker mounts to the walls. No speaker is to be installed in the ceiling space. Figure 7-1 presents the location of the PA speakers.

8 CONCLUSION

Rodney Stevens Acoustics has conducted a noise impact assessment for the operational noise emissions for the proposed Gymnasium at Shop 2, 155 Bennett Road St Clair NSW 2219. This assessment has been carried out in accordance with the NSW Industrial Noise Policy (INP) regulatory requirements and this report is to form part of a Development Application for the site.

This report shows that under the most conservative operating scenarios, operational noise emissions from the proposed Gymnasium is likely to comply with the established criteria at sensitive residential receivers if recommendations presented in this report are followed.

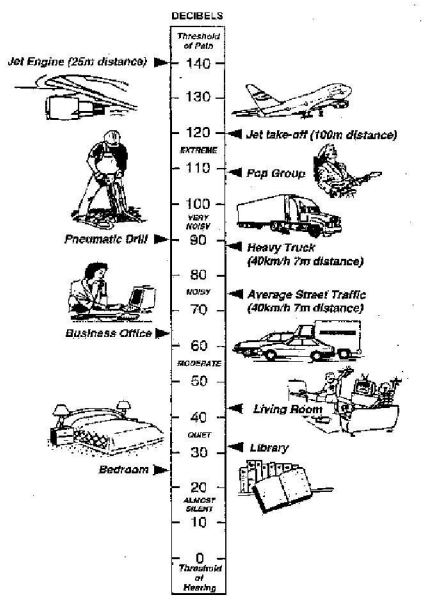
Approved

Rodney Stevens
Principal/Manager

Appendix A – Acoustic Terminology

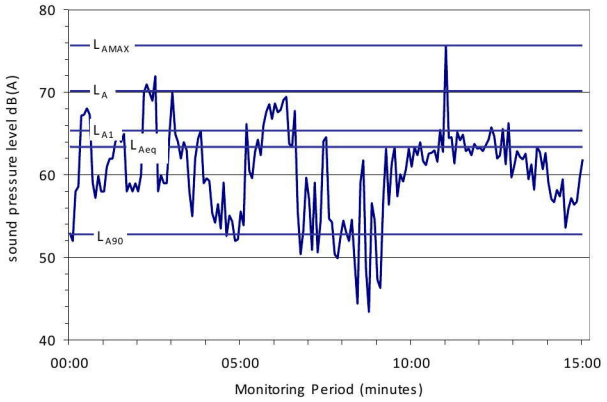
A-weighted sound pressure	The human ear is not equally sensitive to sound at different frequencies. People are more sensitive to sound in the range of 1 to 4 kHz (1000 – 4000 vibrations per second) and less sensitive to lower and higher frequency sound. During noise measurement an electronic '*A-weighting*' frequency filter is applied to the measured sound level *dB(A)* to account for these sensitivities. Other frequency weightings (B, C and D) are less commonly used. Sound measured without a filter is denoted as linear weighted dB(linear).
Ambient noise	The **total** noise in a given situation, inclusive of all noise source contributions in the near and far field.
Community annoyance	**Includes** noise annoyance due to: ▪ character of the noise (e.g. sound pressure level, tonality, impulsiveness, low-frequency content) ▪ character of the environment (e.g. very quiet suburban, suburban, urban, near industry) ▪ miscellaneous circumstances (e.g. noise avoidance possibilities, cognitive noise, unpleasant associations) ▪ human activity being interrupted (e.g. sleep, communicating, reading, working, listening to radio/TV, recreation).
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Cumulative noise level	The total level of noise from all sources.
Extraneous noise	Noise resulting from activities that are not typical to the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Feasible and reasonable measures	Feasibility relates to engineering considerations and what is practical to build; reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors: ▪ Noise mitigation benefits (amount of noise reduction provided, number of people protected). ▪ Cost of mitigation (cost of mitigation versus benefit provided). ▪ Community views (aesthetic impacts and community wishes). ▪ Noise levels for affected land uses (existing and future levels, and changes in noise levels).
Impulsiveness	Impulsive noise is noise with a high peak of short duration or a sequence of these peaks. Impulsive noise is also considered annoying.
Low frequency	Noise containing major components in the low-frequency range (20 to 250 Hz) of the frequency spectrum.

Noise criteria	The general set of non-mandatory noise levels for protecting against intrusive **noise** (for example, background noise plus 5 dB) and loss of amenity (e.g. noise levels for various land use).
Noise level (goal)	A noise level that should be adopted for planning purposes as the highest acceptable noise level for the specific area, land use and time of day.
Noise limits	Enforceable noise levels that appear in conditions on consents and licences. The noise limits are based on achievable noise levels, which the proponent has predicted can be met during the environmental assessment. Exceedance of the noise limits can result in the requirement for either the development of noise management plans or legal action.
Performance-based goals	Goals specified in terms of the outcomes/performance to be achieved, but not in terms of the means of achieving them.
Rating Background Level (RBL)	The rating background level is the overall single figure background level representing each day, evening and night time period. The rating background level is the 10th percentile min L_{A90} noise level measured over all day, evening and night time monitoring periods.
Receptor	The noise-sensitive land use at which noise from a development can be heard.
Sleep disturbance	Awakenings and disturbance of sleep stages.
Sound and decibels (dB)	**Sound** (or noise) is caused by minute changes in atmospheric pressure that are detected by the human ear. The ratio between the quietest noise audible and that which should cause permanent hearing damage is a million times the change in sound pressure. To simplify this range the sound pressures are logarithmically converted to decibels from a reference level of 2 x 10-5 Pa. The picture below indicates typical noise levels from common noise sources.



dB is the abbreviation for decibel – a unit of sound measurement. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.

Sound power Level (SWL)	The sound power level of a noise source is the sound energy emitted by the source. Notated as SWL, sound power levels are typically presented in *dB(A)*.
Sound Pressure Level (SPL)	The level of noise, usually expressed as SPL in *dB(A)*, as measured by a standard sound level meter with a pressure microphone. The sound pressure level in *dB(A)* gives a close indication of the subjective loudness of the noise.
Statistic noise levels	**Noise** levels varying over time (e.g. community noise, traffic noise, construction noise) are described in terms of the statistical exceedance level. A hypothetical example of A weighted noise levels over a 15 minute measurement period is indicated in the following figure:



Key descriptors:

L_{Amax} Maximum recorded noise level.

L_{A1} The noise level exceeded for 1% of the 15 minute interval.

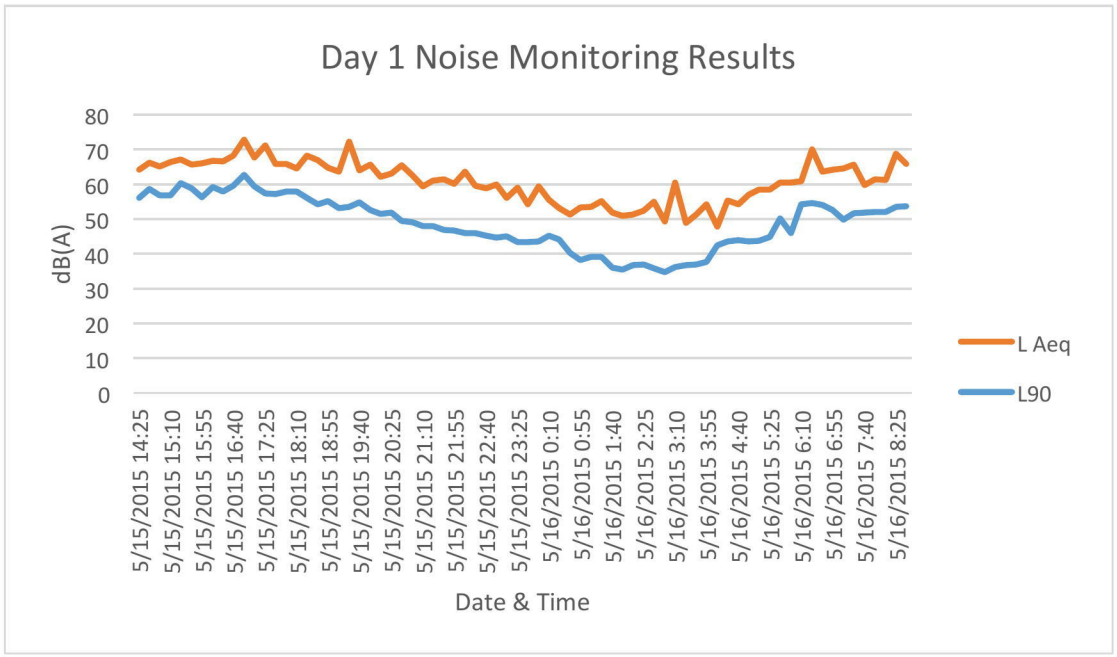
L_{A10} Noise level present for 10% of the 15 minute interval. Commonly referred to the average maximum noise level.

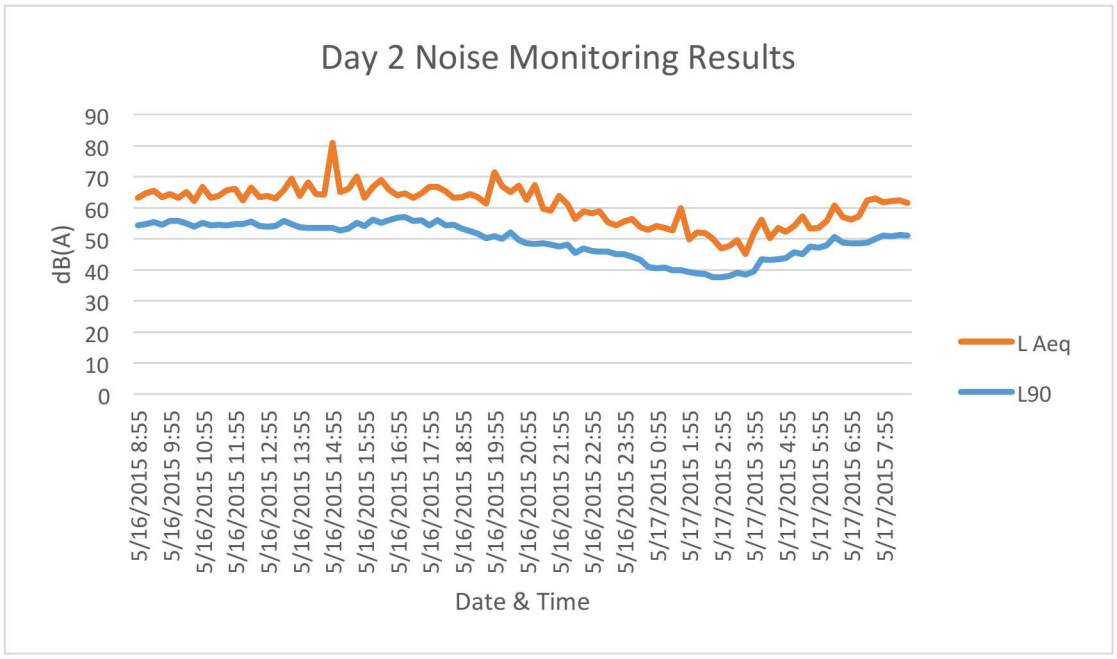
L_{Aeq} Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding time-varying sound.

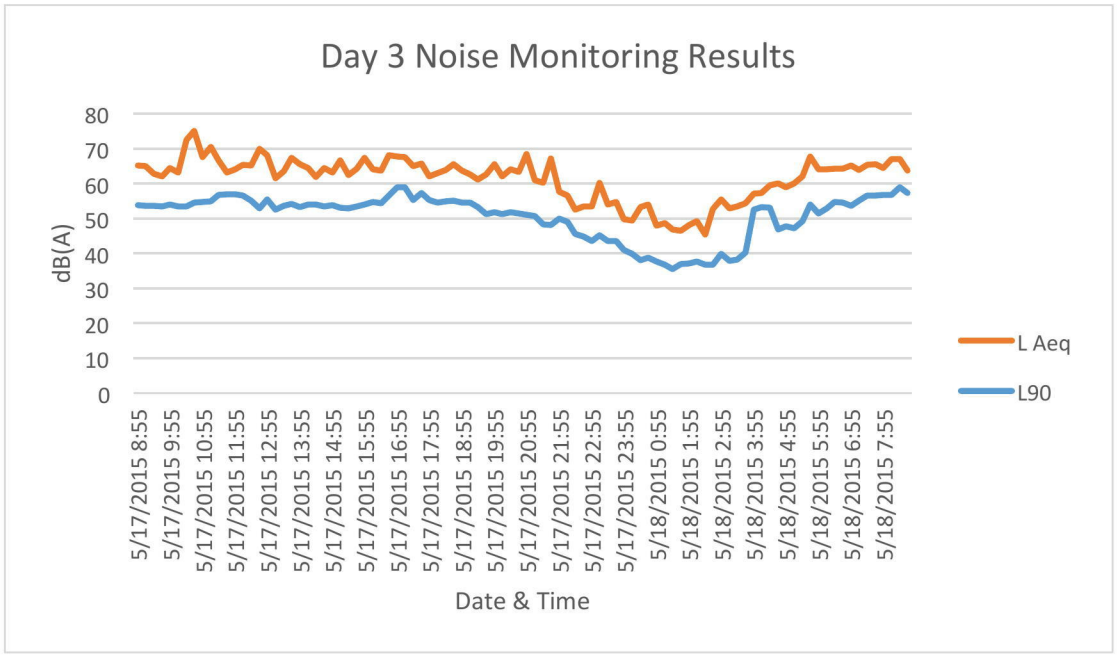
L_{A90} Noise level exceeded for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).

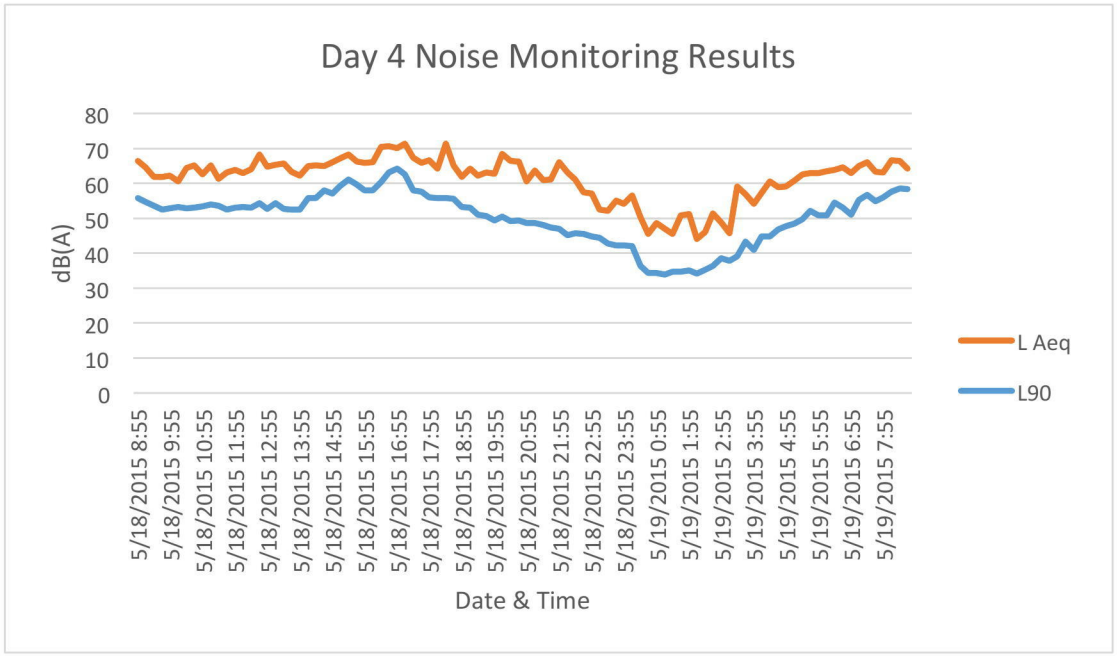
Threshold	The lowest sound pressure level that produces a detectable response (in an instrument/person).
Tonality	Tonal noise contains one or more prominent tones (and characterised by a distinct frequency components) and is considered more annoying. A 2 to 5 dB(A) penalty is typically applied to noise sources with tonal characteristics

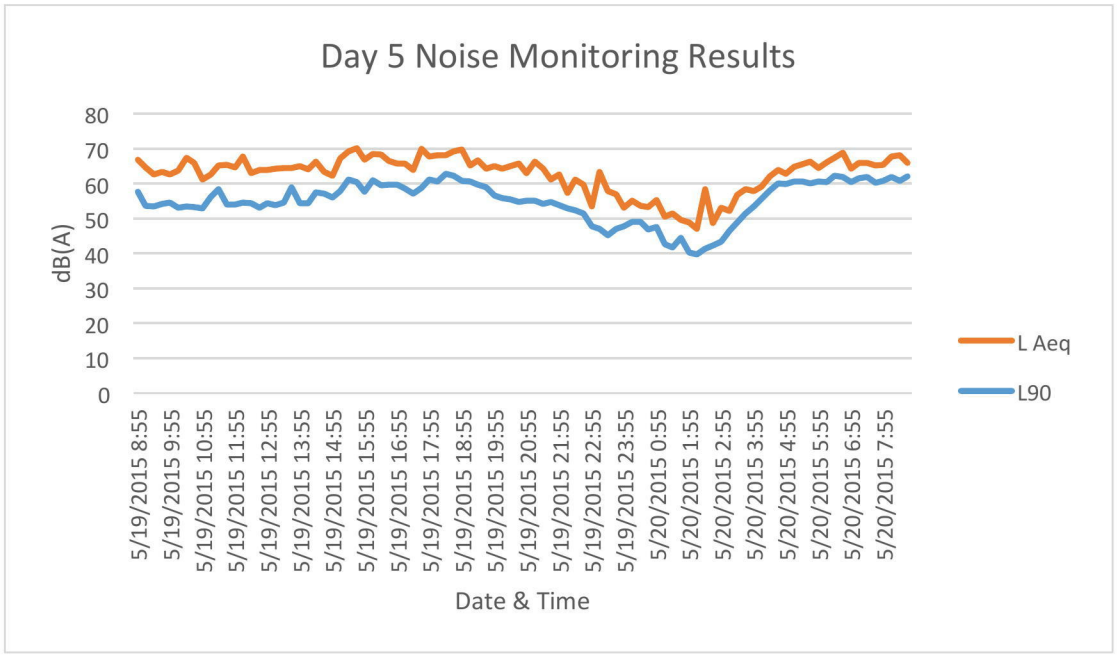
Appendix B – Noise Logging Results

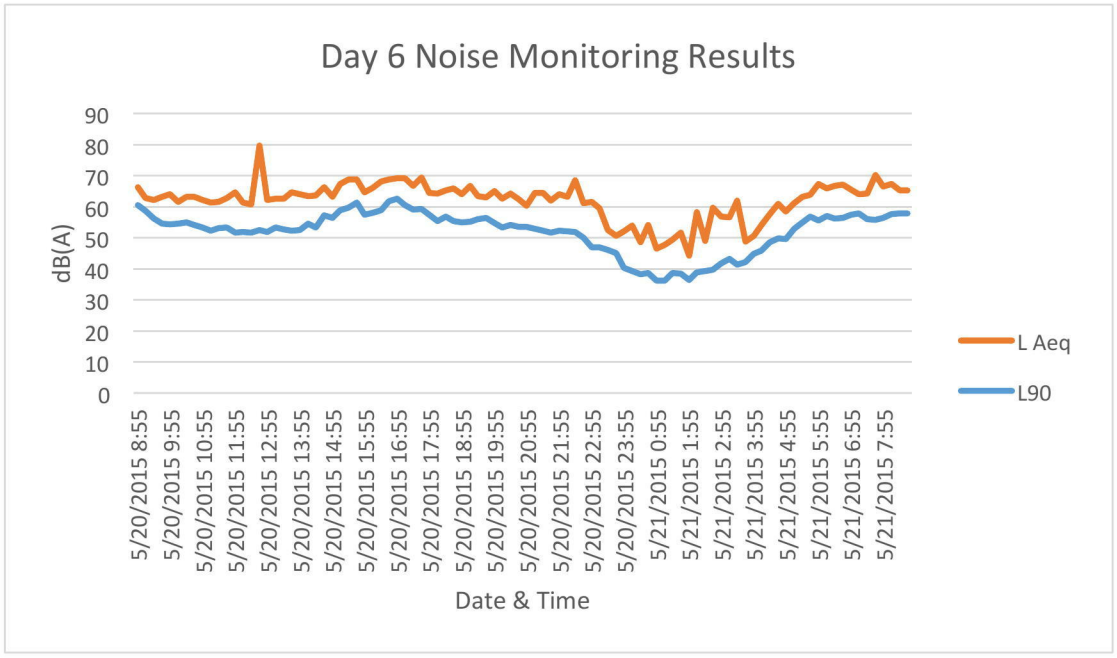


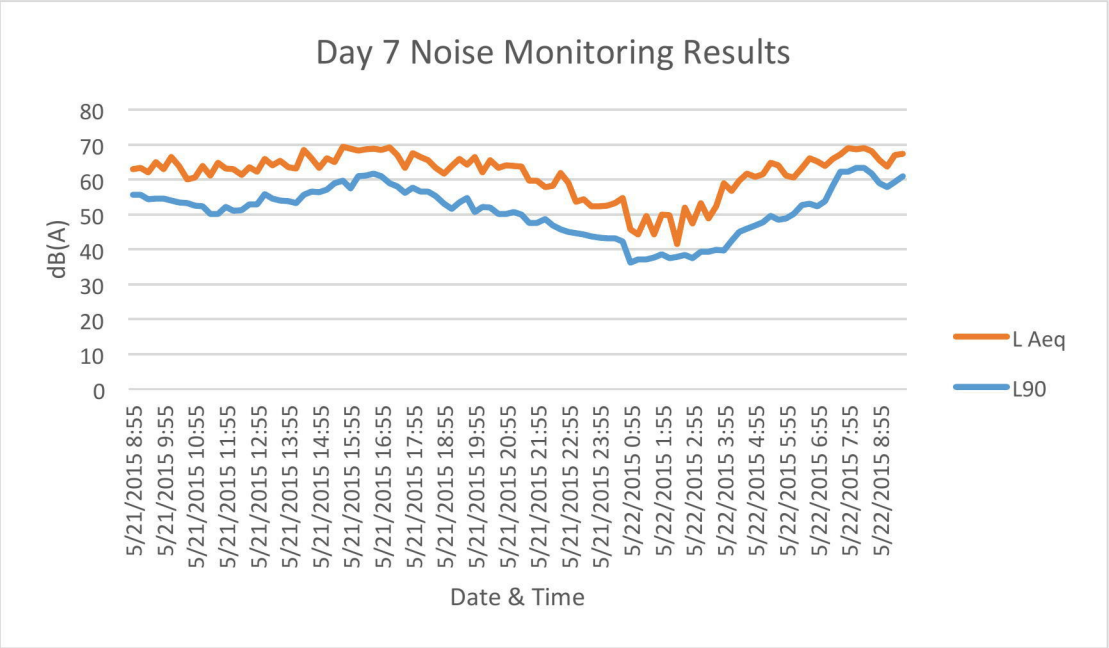












Appendix C – Equipment Calibration Certificate

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Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Calibration Certificate

Number : C13617

Client Details :	Rodney Stevens Acoustics Pty Ltd 1 Majura Close St Ives Chase NSW 2075
Equipment Tested/ Model Number :	**Rion NL-42**
Instrument Serial Number :	00810779
Microphone Serial Number :	146243
Preamplifier Serial Number :	34000
Ambient Temperature :	25°C
Relative Humidity :	34%
Barometric Pressure :	101 kPa
Calibration Technician :	Adrian Walker
Calibration Date :	21-October-2013
Secondary Check by :	Luke Hudson
Report Issue Date :	21-October-2013
Approved Signatory :	
Tested To :	IEC61672-3:2006

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
9: Indication at the calibration check frequency	Pass	14: Level linearity on the reference level range	Pass
10: Self-generated noise	Pass	15: Level linearity incl. the level range control	Pass
11: Acoustical tests of a frequency weighting	Pass	16: Toneburst response	Pass
12: Electrical tests of frequency weightings	Pass	17: Peak C sound level	Pass
13: Frequency and time weightings at 1 kHz	Pass	18: Overload indication	Pass

The sound level meter submitted for testing has successfully completed the class 2 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2002 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002 and because the periodic tests of IEC 61672-3:2006 cover only a limited subset of the specifications in IEC 61672-1:2002.

NATA
WORLD RECOGNISED ACCREDITATION

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