Quarterly Environment Construction Monitoring Report

Q2 2022 –

April to June 2022

Pitt Street Integrated Station Development

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1. Introduction

1.1 Project Summary

The Sydney Metro City and Southwest is the second portion of the new standalone rail network known as the Sydney Metro, which is Australia's largest public transport infrastructure project and a priority rail project for the NSW Government. CPB Contractors (CPB) have been contracted by Transport for New South Wales to design and construct the Integrated Station Development (ISD) component of the future Pitt Street Station.

Pitt Street is situated within the Sydney CBD, largely surrounded by high-rise commercial and residential buildings. The Station is a binocular cavern station with north and southbound platform caverns running beneath Pitt and Castlereagh Streets respectively. The Station has two entrance shafts from the surface one at Pitt Street North and Pitt Street South connected to the platform caverns via adit tunnels.

Pitt Street North is located on Park Street between Pitt and Castlereagh Street, with the station entrance facing onto Park Street. The Over Station Development (OSD) surrounds the station entrance and access is provided on Pitt, Park and Castlereagh Streets. Pitt Street South is located on the corner of Pitt and Bathurst Street. It is configured in an 'L' shape which wraps around the Edinburgh Castle Hotel with the station entrance opening onto Bathurst Street. Access to the OSD is provided from Pitt Street.

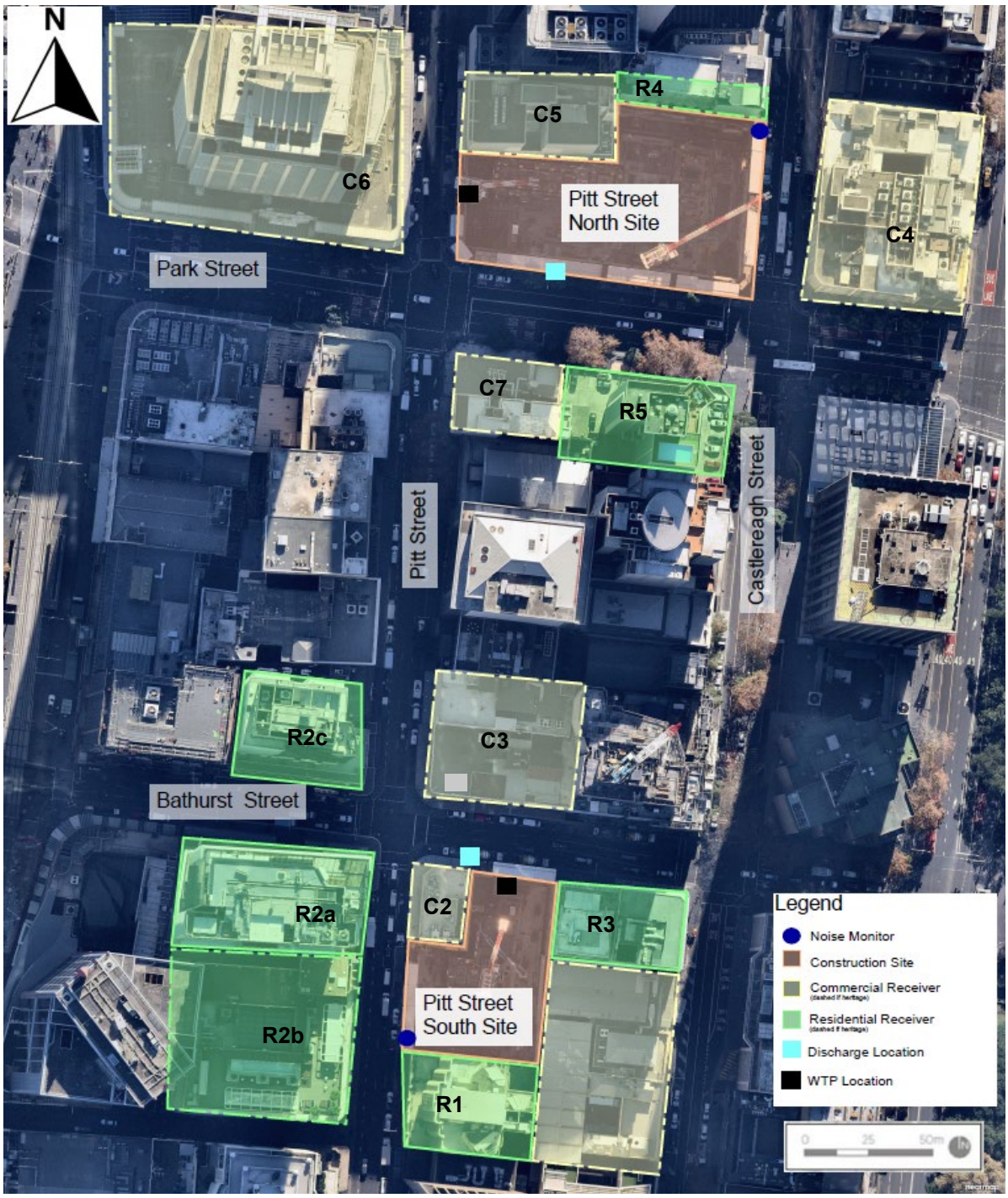


Figure 1-1 Pitt Street Station location and indicative monitoring layout

1.2 Site Activities

The Construction Environment Management Plan (CEMP) and associated sub-plans were approved by the Department of Planning, Industry and Environment (DPIE) on 24 December 2020 and construction works commenced on the project on 6 January 2021. The CEMP was revised with minor updates and reviewed during October to December 2021 with Revision 1 (dated 21/02/2022) approved by the ER on 23 February 2022.

This is the second quarterly report for 2022 and reflects the monitoring that was conducted from April to June 2022. **Table 1-1** outlines the site activities that occurred during the reporting period.

Table 1-1 Site Activities

Location	Site Activities
Pitt Street North	Slab pours completed from L01 to L03 Central blade walls, western jump form and mega column complete Jump forms dismantled Stripping formwork up to level B03 West core hoist installed Shotcrete to B03, B02 and B01 FRP Level 1 – Level 3 complete
Pitt Street South	Central Jump form Core Walls Cycles 14 - 16 Tunnel Ventilation Jump Form completed (Cycles 6 – 10) Dismantle of Tunnel Ventilation Jump Forms completed FRP Levels 03 & 04 Blockwork construction B4 – B1 Building Services B4 – B1 OSD Hoist Established Perimeter Scaffolds Established across all elevations Basement Fit-Outs on-going
Caverns	GRC install Subframe for tube cladding install Platform screen doors cladding over Site accommodation being built Services rough-in

2. Reporting Requirements

A Planning Approval has been obtained to construct Sydney Metro City and Southwest Chatswood to Sydenham, which was identified as Critical State-Significant Infrastructure (CSSI) SSI 15_7400.

Conditions C9 to C16 of the Planning Approval describes monitoring and reporting requirements for the ISD Works.

Monitoring and reporting requirements are detailed in the Construction Environmental Management Plan (approved by NSW DPE on 24 Dec 2020), and the following associated sub-plans:

- Soil, Water and Groundwater Management Sub-Plan; and
- Noise and Vibration Management Sub-Plan

The following report details environmental monitoring that was undertaken during this reporting period conducted as per the Planning Approval, the approved CEMP (Revision 1) and its associated sub-plans.

A copy of the Planning Approval can be found by following the link below to the NSW Planning Portal website.

https://www.planningportal.nsw.gov.au/major-projects/project/3601

The results of the Construction Monitoring Program are included in this Construction Monitoring Report and will be submitted to the Acoustic Advisor (AA), Sydney Metro and the Environmental Representative (ER) who will endorse the document prior to submission to DPE and being made publicly available on the project website located at https://pittstreetsydneymetroisd.com.au. CPB will also issue the Construction Monitoring report to Council, NRAR and EPA.

2.1 Inspections

Periodic environmental inspections are undertaken by CPB to verify the adequacy of all environmental mitigation measures. In addition, inspections are conducted before and following significant rainfall events that are predicted to be over 10mm in 24 hours. Weather data for the period is included in **Appendix A**.

The Site Environmental Plans (SEPs) identify the environmental control measures on both PSISD sites. SEPs and environmental controls are monitored through these periodic environmental inspections and are updated as required to reflect the changing nature of the PSISD sites. All records of SEP inspections are documented in the CPB Environmental Inspection Checklist. Internal CPB inspections are conducted by the CPB Environmental and Project Team. ER inspections are attended by Sydney Metro, CPB, the DPE endorsed Acoustic Advisor (AA) and the ER.

During the reporting period there were five inspections conducted by Sydney Metro Environmental Representatives and the ER/AA. Additionally, CPB completed nine internal environmental inspections during the reporting period.

2.2 Water Quality Monitoring

2.2.1 Background

Water quality parameters were determined from the Discharge Impact Assessment (supporting the Construction Environmental Management Plan Rev 0) which was updated in May 2021 to include the TSS/NTU correlation following ER review of the first Construction Monitoring Report (Q1 2021) and clarification of the Discharge Management Protocol.

Water quality parameters for the discharge criteria for the Project are presented in **Table 2-1**.

Table 2-1 Water Quality Discharge Criteria Parameters

Parameter	Unit	Discharge Criteria
pH	pH	6.5 – 8.5
Total Suspended Solids	mg/L	50mg/L (TSS:NTU correlation equivalent of 50NTU)
Oil and Grease	Visual	No visible surface sheen
Copper	mg/L	0.0013mg/L (50 percentile limit) 0.005mg/L (100 percentile limit)
Zinc	mg/L	0.015mg/L (50 percentile limit) 0.043mg/L (100 percentile limit)

CPB has a temporary stormwater connection for both the North site and South sites approved by the City of Sydney Council (CoSC) since 4 December 2020. Water is collected at the Pitt Street North site (PSN) and Pitt Street South site (PSS) in permanent stormwater tanks the capacity of which are approximately 200kL and 100kL respectively. Water is pumped form the stormwater tanks to the treatment system where it is then tested prior to discharge. At PSN there is a water reuse system established that provides water for site activities.

Water discharged from the site is predominantly rainwater and construction (potable) water. Negligible groundwater is encountered which is evidenced by the frequency of discharge relating more to rainfall events than construction activities.

2.2.2 Water Quality Monitoring Methodology

Regular field tests are conducted by CPB Environmental Team using the calibrated water quality probe within the stormwater pit to confirm parameters are within the discharge criteria for pH, NTU and no visible oil and grease. If water requires treatment it is treated in the stormwater pit with the appropriate chemicals and retested again until compliant values are obtained. If the parameters are within the field criteria and monthly laboratory samples have been obtained, a permit to dewater will be issued. Additional field tests are undertaken by taking a sample of water from the sample valve located post-treatment to confirm the pH and NTU values and no visible oil and grease during discharge.

Table 2-2 outlines the CPB water quality monitoring equipment used during the reporting period.

Table 2-2 Water Quality Monitoring Equipment Details

Monitoring Type	Equipment Details	Serial Number	Calibration Date
Water Quality Multi Parameter Meter	Yeo-Kal 611	426	15/07/2021
Water Quality Multi Parameter Meter	Yeo-Kal 618	676	21/04/2022
Water Quality Multi Parameter Meter	Yeo-Kal 618	638	28/03/2022

Laboratory testing is conducted monthly via grab samples to confirm the criteria in Table 2-1 in accordance with the Discharge Impact Assessment – Discharge Management Protocol.
Laboratory Testing of water quality is undertaken at Eurofins Sydney Laboratory in Lane Cove West, a NATA accredited laboratory. Laboratory results are provided in Appendix D.

2.2.3 Water Quality Monitoring Results

Detailed discharge monitoring results for this reporting period are presented in **Table 2-3.**

All analytical results were below the Water Quality Discharge Criteria with the exception of dissolved copper for the May verification (17/05/2022) at Pitt Street South which was above the 100% percentile. The site supervisor was notified, and no discharge occurred until the exceedance was investigated. Subsequently, the tank water was moved to the stormwater holding pit and the holding tank was cleaned. The water and holding tank cleaning water were retreated using the onsite treatment system, and an additional sample was collected for dissolved copper. The reported concentration for the additional sample was below the Limit of Reporting (LOR) and compliant with the discharge criteria. No monthly samples exceeded the Stage 3 protocol exceedance (2 consecutive exceedances of the same parameter) during the reporting period. All discharges were compliant with the Discharge Management Protocol.

Table 2-3 Discharge Water Monitoring Data

Identifier	Dates Sampled	Parameter, Criteria or Measured Value					Testing Method	Status
		pH (6.5-8.5)	Turbidity (<50NTU)	Copper (<0.005 mg/L)	Zinc (<0.043 mg/L)	Oil & Grease (visible/ <10mg/L)		
PSS01	28/03/2022	8.32	6.7	-	-	-	Field	Compliant
PSN01	29/03/2022	7.99	8.7	-	-	-	Field	Compliant
PSS01	31/03/2022	8.03	18.8	-	-	-	Field	Compliant
PSS01	6/04/2022	7.27	1	-	-	-	Field	Compliant
PSN01	7/04/2022	8.29	11.3	-	-	-	Field	Compliant
S01	20/04/2022	7.5	1	<0.001	0.012	<10	Laboratory	Compliant
PSS01	28/04/2022	7.49	48.2	-	-	-	Field	Compliant
PSS01	13/05/2022	7.21	45.7	-	-	-	Field	Compliant
PSS_01	17/05/2022	7.8	1.5	0.015	0.024	<10	Laboratory	Stage 2 exceedance
S01	23/05/2022	*	*	<0.001	*	*	Laboratory	Compliant
PSS01	20/05/2022	6.87	20.3	-	-	-	Field	Compliant
N01	23/05/2022	7.6	4.7	0.002	<0.005	<10	Laboratory	Compliant
PSN_01	16/06/2022	7.9	3.3	<0.001	<0.005	<10	Laboratory	Compliant
PSS_01	16/06/2022	7.7	1	<0.001	0.006	<10	Laboratory	Compliant
PSN01	29/06/2022	8.32	3	-	-	-	Field	Compliant
PSS01	30/06/2022	7.37	9.6	-	-	-	Field	Compliant

* No Laboratory testing was taken of these parameters. Only the parameter that exceeded the criteria was re-tested as a requirement of a Stage 2 exceedance.

2.2.4 Groundwater Monitoring Results

Water discharged from the site is predominantly rainwater collected and potable water used for dust suppression which is evident from the relation between rainfall events and the discharge dates. It is therefore determined that less than 7kL/day of groundwater seepage is being captured and discharged.

Monthly settlement monitoring of the buildings adjacent to the PSISD sites has been undertaken to monitor for any settlement due to groundwater seepage. Total Survey Solutions are engaged by CPB to monitor the movement of structures over the entire Pitt Street Metro Project. This includes monitoring of the external buildings adjacent to the North and South sites, walls of the North and South station boxes and through the caverns/ adits between them. The monitoring uses total station instruments to take direct measurements to reference targets on and inside adjacent buildings and walls to calculate any movement measured as an angle of tilt that is recorded live on Geomotion. The angles that trigger concern have been determined by Structural Engineers and alarms have been set to activate text messages if the triggers are reached. The PSN site tiltmeters located on the walls of the station box were decommissioned in January 2022 and were replaced by targets on the Ground Floor slab. There were no settlement monitoring triggers at Pitt Street South site and Pitt Street North site during the reporting period.

2.3 Noise and Vibration Monitoring

2.3.1 Background

The Main Works Construction Noise and Vibration Impact Statement (CNVIS) is regularly reviewed to ensure it captures all works being undertaken prior to works commencing. **Table 2-4** outlines the CNVIS developed during the reporting period. The current CNVIS is provided on the project website at https://pittstreetsydneymetroisd.com.au.

Table 2-4 CNVIS' developed and approved during the reporting period.

CNVIS	Details
CNVIS – Station Box Main Works	8/4/2022– Revision 13.3 issued to Sydney Metro, ER and AA and endorsed by the AA on 8 April 2022
	21/04/2022 – Revision 13.4 issued to Sydney Metro, ER and AA
	02/05/2022 – Revision 13.5 issued to Sydney Metro, ER and AA and endorsed by the AA on 9 May 2022
	11/05/2022 - Revision 13.6 issued to Sydney Metro, ER and AA
	23/05/2022 Revision 13.7 issued to Sydney Metro, ER and AA and endorsed by the AA on 24 June 2022
	30/06/2022 – Revision 14.0.1 issued to Sydney Metro, ER and AA and endorsed 7 July 2022

Out of Hours works (OOHW) were conducted during the reporting period in accordance with the Sydney Metro Out of Hours Protocol and subsequent approved Out of Hours Works Applications (OOHWA).

2.3.2 Noise and Vibration Criteria

Relevant criteria relating to noise and vibration are outlined in the PSISD Construction Noise and Vibration Management Sub Plan and respective CNVIS. These are outlined in **Table 2-5**.

Table 2-5 Construction noise management levels at receivers[1, 2]

Receiver type	Time of Day[2]	EIS Chapter 10 Requirements				CSSI Approval Requirements	
		ICNG*	Ground Borne Noise	Sleep Disturbance	Construction Traffic	Condition E37[3]	Condition E41[4]
Pitt Street South							
Residential	Day (Standard – 7am-6pm)	74dB(A)$L_{eq(15min)}$ 75dB(A)$L_{eq(15min)}$ – Highly Noise Affected Threshold	45dB(A)$L_{eq(15min)}$ (internal noise level)	N/A	60dB(A)$L_{eq(15hr)}$	60dB(A)$L_{eq(15min)}$ (internal noise level) 80dB(A)$L_{eq(15min)}$ (external noise level)**	N/A
	Day (OOH)	69dB(A)$L_{eq(15min)}$	45dB(A)$L_{eq(15min)}$ (internal noise level)	N/A	60dB(A)$L_{eq(15hr)}$	60dB(A)$L_{eq(15min)}$ (internal noise level) 80dB(A)$L_{eq(15min)}$ (external noise level)**	N/A
	Evening (OOH)	66dB(A)$L_{eq(15min)}$	40dB(A)$L_{eq(15min)}$ (internal noise level)	N/A	60dB(A)$L_{eq(15hr)}$	N/A	60dB(A)$L_{eq(15min)}$ (internal noise level) 80dB(A)$L_{eq(15min)}$ (external noise level)**
	Night (OOH)	63dB(A)$L_{eq(15min)}$	35dB(A)$L_{eq(15min)}$ (internal noise level)	65dB(A)L_{max} (external noise level)	55dB(A)$L_{eq(9hr)}$	N/A	45dB(A)$L_{eq(15min)}$ (internal noise level) 65dB(A)$L_{eq(15min)}$ (external noise level)**
Commercial	When in use	70dB(A)$L_{eq(15min)}$	N/A	N/A	N/A	60dB(A)$L_{eq(15min)}$ (internal noise level) 80dB(A)$L_{eq(15min)}$ (external noise level)**	N/A

Pitt Street North							
Residential	Day (Standard – 7am-6pm)	73dB(A)$L_{eq(15min)}$ (weekdays) 75dB(A) – Highly Noise Affected Threshold	45dB(A)$L_{eq(15min)}$ (internal noise level)	N/A	60dB(A)$L_{eq(15hr)}$	60dB(A)$L_{eq(15min)}$ (internal noise level) 80dB(A)$L_{eq(15min)}$ (external noise level)**	N/A
	Day (OOH)***	68dB(A)$L_{eq(15min)}$	45dB(A) $L_{eq(15min)}$ (internal noise level)	N/A	60dB(A)$L_{eq(15hr)}$	60dB(A)$L_{eq(15min)}$ (internal noise level) 80dB(A)$L_{eq(15min)}$ (external noise level)**	N/A
	Evening	66dB(A)$L_{eq(15min)}$	40dB(A) $L_{eq(15min)}$ (internal noise level)	N/A	60dB(A)$L_{eq(15hr)}$	N/A	60dB(A)$L_{eq(15min)}$ (internal noise level) 80dB(A)$L_{eq(15min)}$ (external noise level)**
	Night	64dB(A)$L_{eq(15min)}$	35dB(A) $L_{eq(15min)}$ (internal noise level)	65dB(A) L_{max} (external noise level)	55dB(A)$L_{eq(9hr)}$	N/A	45dB(A)$L_{eq(15min)}$ (internal noise level) 65dB(A)$L_{eq(15min)}$ (external noise level)**
Commercial	When in use	70dB(A)$L_{eq(15min)}$	N/A	N/A	N/A	60dB(A)$L_{eq(15min)}$ (internal noise level) 80dB(A)$L_{eq(15min)}$ (external noise level)**	N/A

*ICNG noise management levels for residential receivers are based on the background noise levels presented in Section 4 of the CNVIS.

** External noise target determined by assuming a 20dB (A) noise reduction between outside and inside (closed windows).

1. Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5m above ground level unless stated otherwise.
2. Noise management levels apply when receiver areas are in use only.
3. Exceedance of this level triggers the need for consideration of respite periods as per Conditions of Approval E38.
4. Exceedances of this level trigger the need to consider additional mitigation methods as detailed in Sydney Metro City and South West Noise and Vibration Strategy.

As a conservative approach, and in accordance with *British Standard BS 7385-2*, the vibration screening criteria has been applied to buildings at Pitt Street:

- Screening criteria – 2.5 mm/s (Peak Particle Velocity (PPV)

2.3.3 Attended Monitoring Methodology

Attended noise monitoring was undertaken during this reporting period with details provided in Section 2.3.4. Attended monitoring is undertaken when two OOH scenarios occur simultaneously where predicted exceedances are expected to be >20dB above RBL, as well as in response to recommendations by the ER and AA, or if required on receival of a complaint.

Some measurement locations are affected by road traffic noise, (buses/truck passing by etc) intermittently generating noise levels similar or higher than the construction noise. As such, conducting a long-term noise measurement (15 minute Leq) was not possible – the measurement would be effected by extraneous noise. To address this, shorter duration measurements Leq had to be made during breaks in traffic (to get measurement periods not effected by intermittent extraneous noise). Given that acoustic criteria are set using a 15 minute Leq descriptor, it is necessary to account for the fact that the equipment item operates for only a percentage of the 15 minute period, i.e.:

- When determining the Leq(15min) noise level for equipment items such as a road saw, jackhammer and compactor, we assume the item is used for approximately 50% of any 15 minute period.
- When determining the Leq(15min) noise level for equipment items such as concrete pumps and vacuum trucks, these are assumed to operate continuously.

The recordings were taken from a height of 1.2 m from the ground, at least 1m from the walls or other major reflecting surfaces.

Table 2-6 CNVIS Requirements

Plan	Requirements
CNVIS r14.0-Section 7.2	In the event that use of hydraulic hammers or vibratory rollers is required, vibration monitoring will be conducted at receivers R1 and R3 in addition to those detailed above. Given these buildings are not heritage buildings, this can potentially be done in the event of complaint by occupants or by attended vibration measurement.
CNVIS r14.0 – Appendix E	Long term vibration monitors will be installed at the heritage buildings sharing a common boundary with the site (Receivers C1, C2, C5 and R4). Monitoring to commence 2 days before the start of detailed excavation.

2.3.4 Attended Monitoring Results

Attended noise measurements provided below in Table 2-7 and Table 2-8 for Out of Hours works (utilities investigation), were conducted by on-site measurements at PSISD – Pitt Street North on 19 and 20 May 2022.

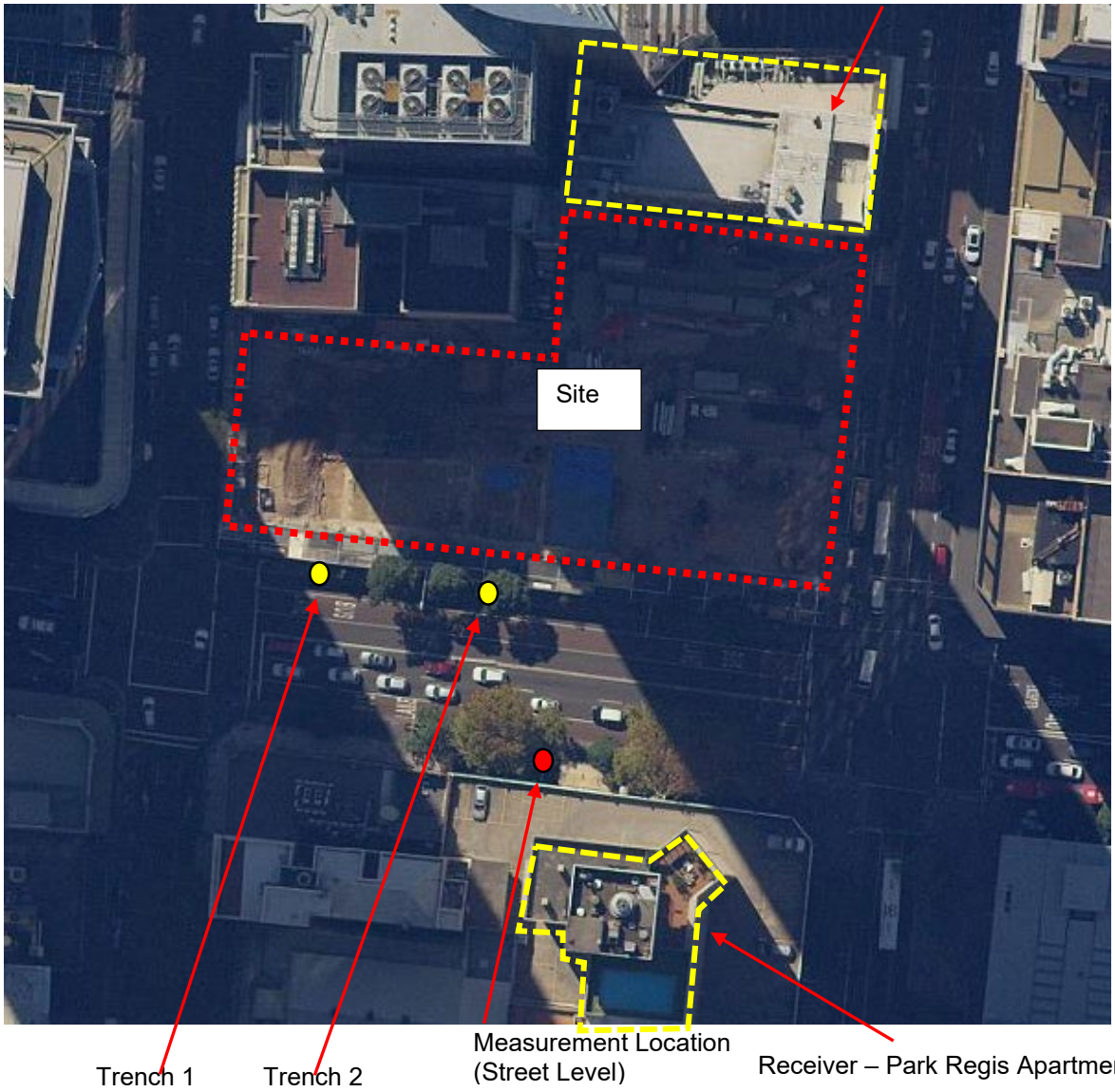
Table 2-7 Measured Noise Levels (Park Regis) – Construction Activities – up to 12am

Work Location	Activity	Measured Noise Level (Pitt Street)	Predicted Noise Level (Park Regis)	Comment
Trench 1	Road Saw	73dB(A)L_{eq} when in use 70dB(A)$L_{eq(15min)}$ 74dB(A)L_{max}	72dB(A)L_{eq} when in use **69dB(A)$L_{eq(15min)}$** 73dB(A)L_{max}	Complies CNVIS prediction to R5 (80dB(A)$L_{eq(15min)}$)
	Generator	76dB(A) at 6m from generator	60dB(A)L_{eq} when in use **60dB(A)$L_{eq(15min)}$** 60dB(A)L_{max}	Complies CNVIS prediction to R5 (80dB(A)$L_{eq(15min)}$)
Trench 2	Road Saw	80dB(A)L_{eq} when in use 77dB(A)$L_{eq(15min)}$ 82dB(A)L_{max}	78dB(A)L_{eq} when in use **75dB(A)$L_{eq(15min)}$** 80dB(A)L_{max}	Complies CNVIS prediction to R5 (80dB(A)$L_{eq(15min)}$)
	Jackhammer (on asphalt)	71dB(A)L_{eq} when in use 68dB(A)$L_{eq(15min)}$ 73dB(A)L_{max}	69dB(A)L_{eq} when in use **66dB(A)$L_{eq(15min)}$** 71dB(A)L_{max}	Complies CNVIS prediction to R5 (80dB(A)$L_{eq(15min)}$)
	Vacuum Truck (full pump power)	78dB(A)L_{eq} when in use 78dB(A)$L_{eq(15min)}$ 79dB(A)L_{max}	76dB(A)L_{eq} when in use **76dB(A)$L_{eq(15min)}$** 77dB(A)L_{max}	Complies CNVIS prediction to R5 (80dB(A)$L_{eq(15min)}$)

Table 2-8 Measured Noise Levels (Park Regis) – Construction Activities – after 12am

Work Location	Activity	Measured Noise Level (Pitt Street)	Predicted Noise Level (Park Regis)	Comment
Trench 2	Excavator	69dB(A)L_{eq} when in use 69dB(A)$L_{eq(15min)}$ 71dB(A)L_{max}	67dB(A)L_{eq} when in use **67dB(A)$L_{eq(15min)}$** 69dB(A)L_{max}	Complies CNVIS prediction to R5 (70dB(A)$L_{eq(15min)}$)
	Vacuum Truck (reduced pump power)	72dB(A)L_{eq} when in use 72dB(A)$L_{eq(15min)}$ 74dB(A)L_{max}	70dB(A)L_{eq} when in use **70dB(A)$L_{eq(15min)}$** 72dB(A)L_{max}	Complies CNVIS prediction to R5 (70dB(A)$L_{eq(15min)}$)
	Truck	65dB(A)L_{eq} when in use 65dB(A)$L_{eq(15min)}$ 67dB(A)L_{max}	63dB(A)L_{eq} when in use **63dB(A)$L_{eq(15min)}$** 65dB(A)L_{max}	Complies CNVIS prediction to R5 (70dB(A)$L_{eq(15min)}$)
	Jumping Jack Compactor	73dB(A) at 10m from compactor	65dB(A)L_{eq} when in use **62dB(A)$L_{eq(15min)}$** 67dB(A)L_{max}	Complies CNVIS prediction to R5 (70dB(A)$L_{eq(15min)}$)

See below for measurement locations.



2.3.5 Attended Monitoring Results – 22 May 2022 (Utilities Investigation – Pitt Street North)

Noise measurements provided on the following page in Table 2-9, Table 2-10, Table 2-11 and Table 2-12 for Out of Hours works (Utilities Investigation), were conducted by on-site measurements at PSISD – Pitt Street North on 22 May 2022.

Table 2-9 Measured Noise Levels (Park Regis) – Construction Activities – up to 12am

Work Location	Activity	Measured Noise Level (Park Regis – Podium Edge)*	Predicted Noise Level (Park Regis - Facade)**	Comment
Trench 2	Road Saw	71dB(A)L_{eq} when in use 68dB(A)$L_{eq(15min)}$ 72dB(A)L_{max}	70dB(A)L_{eq} when in use **67dB(A)$L_{eq(15min)}$** 71dB(A)L_{max}	Complies CNVIS prediction to R5 (80dB(A)$L_{eq(15min)}$)
	Jackhammer (on asphalt)	69dB(A)L_{eq} when in use 66dB(A)$L_{eq(15min)}$ 71dB(A)L_{max}	68dB(A)L_{eq} when in use **65dB(A)$L_{eq(15min)}$** 70dB(A)L_{max}	Complies CNVIS prediction to R5 (80dB(A)$L_{eq(15min)}$)
	Vacuum Truck (full pump power)	71dB(A)L_{eq} when in use 71dB(A)$L_{eq(15min)}$ 72dB(A)L_{max}	70dB(A)L_{eq} when in use **70dB(A)$L_{eq(15min)}$** 71dB(A)L_{max}	Complies CNVIS prediction to R5 (80dB(A)$L_{eq(15min)}$)

*Approx. 50m from Trench 2.
**Approx. 55m from Trench 2.

Table 2-10 Measured Noise Levels (Park Regis) – Construction Activities (reduced Vacuum Truck power for use after 12am

Work Location	Activity	Measured Noise Level (Park Regis – Podium Edge)*	Predicted Noise Level (Park Regis - Facade)**	Comment
Trench 2	Vacuum Truck (reduced pump power)	69dB(A)L_{eq} when in use 69dB(A)$L_{eq(15min)}$ 70dB(A)L_{max}	68dB(A)L_{eq} when in use **68dB(A)$L_{eq(15min)}$** 70dB(A)L_{max}	Complies CNVIS prediction to R5 (70dB(A)$L_{eq(15min)}$)

*Approx. 50m from Trench 2.
**Approx. 55m from Trench 2.

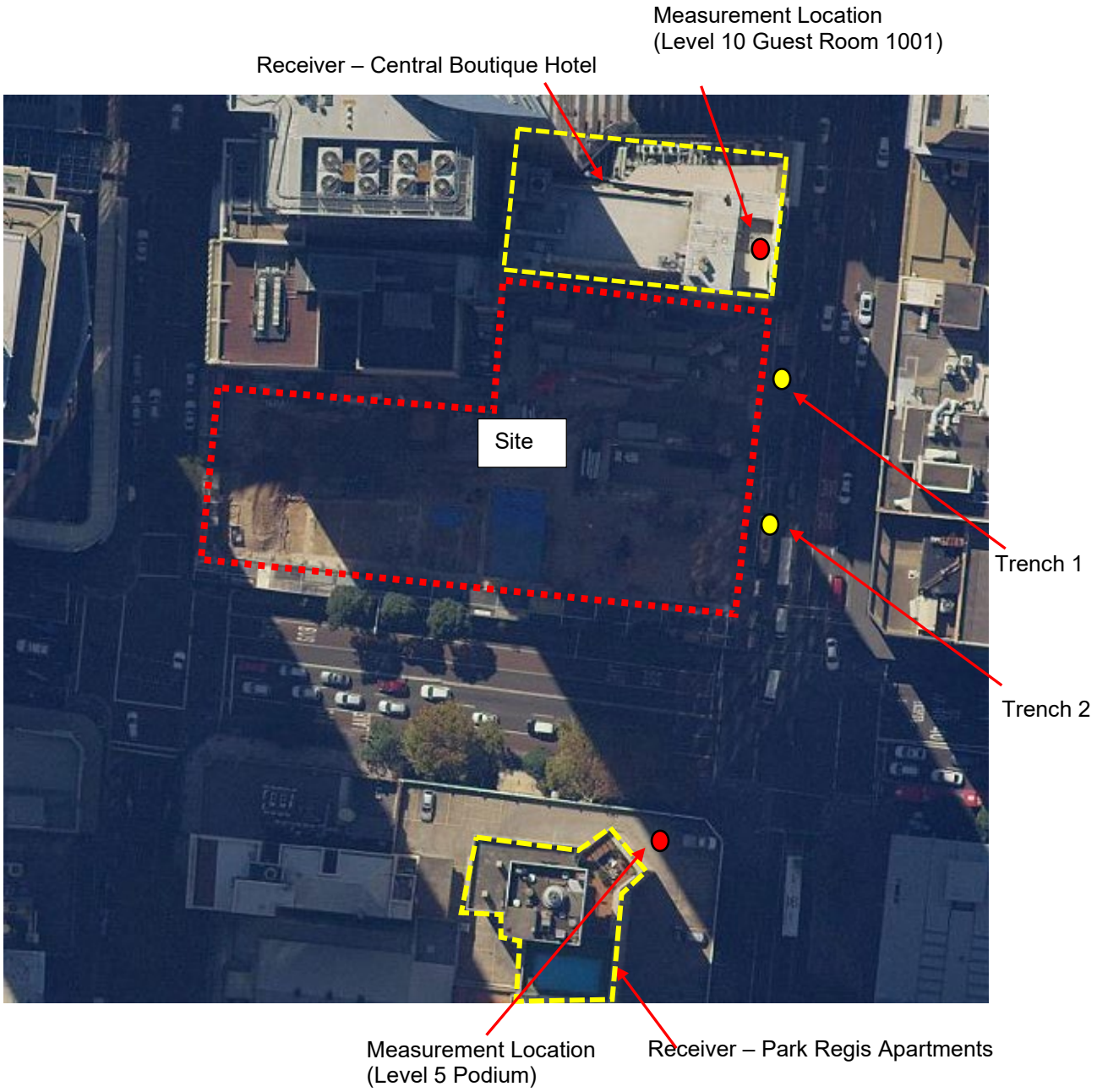
Table 2-11 Measured Noise Levels (Central Boutique Hotel) – Construction Activities – up to 12am

Work Location	Activity	Measured Noise Level (Level 10)	Predicted Noise Level (Level 6)	Comment
Trench 2	Road Saw	71dB(A)L_{eq} when in use 68dB(A)$L_{eq(15min)}$ 72dB(A)L_{max} *(39dB(A)$L_{eq(15min)}$ inside)*	73dB(A)L_{eq} when in use **70dB(A)$L_{eq(15min)}$** 73dB(A)L_{max} *(41dB(A)$L_{eq(15min)}$ inside)*	Complies CNVIS prediction to R5 (85dB(A)$L_{eq(15min)}$ - outside) *(65dB(A)$L_{eq(15min)}$ - inside)*
	Jackhammer (on asphalt)	67dB(A)L_{eq} when in use 64dB(A)$L_{eq(15min)}$ 68dB(A)L_{max} *(38dB(A)$L_{eq(15min)}$ inside)*	69dB(A)L_{eq} when in use **66dB(A)$L_{eq(15min)}$** 70dB(A)L_{max} *(40dB(A)$L_{eq(15min)}$ inside)*	Complies CNVIS prediction to R5 (85dB(A)$L_{eq(15min)}$ - outside) *(65dB(A)$L_{eq(15min)}$ - inside)*
	Vacuum Truck (full pump power)	68dB(A)L_{eq} when in use 68dB(A)$L_{eq(15min)}$ 69dB(A)L_{max} *(42dB(A)$L_{eq(15min)}$ inside)*	70dB(A)L_{eq} when in use **70dB(A)$L_{eq(15min)}$** 71dB(A)L_{max} *(44dB(A)$L_{eq(15min)}$ inside)*	Complies CNVIS prediction to R5 (85dB(A)$L_{eq(15min)}$ - outside) *(65dB(A)$L_{eq(15min)}$ - inside)*

Table 2-12 Measured Noise Levels (Central Boutique Hotel) – Construction Activities (reduced Vacuum Truck power for use after 12am

Work Location	Activity	Measured Noise Level (Level 10)	Predicted Noise Level (Level 6)	Comment
Trench 2	Vacuum Truck (reduced pump power – 1335rpm, 56PSI)	65dB(A)L_{eq} when in use 62dB(A)$L_{eq(15min)}$ 66dB(A)L_{max} *(38dB(A)$L_{eq(15min)}$ inside)*	67dB(A)L_{eq} when in use **64dB(A)$L_{eq(15min)}$** 78dB(A)L_{max} *(40dB(A)$L_{eq(15min)}$ inside)*	Complies CNVIS prediction to R5 (85dB(A)$L_{eq(15min)}$ - outside) *(65dB(A)$L_{eq(15min)}$ - inside)*

See below for measurement locations.



2.3.6 Attended Monitoring Results – 24 May 2022 (Utilities Investigation – Pitt Street South)

Attended noise measurements provided below in Table 2-13, Table 2-14, Table 2-15 and Table 2-16 of out of hours work (utilities investigation), were conducted by on-site measurements at PSISD – Pitt Street South on 24 May 2022.

Table 2-13 Measured Noise Levels (Euro Tower – R3) – Construction Activities

Work Location	Activity	Measured Noise Level	Comment
Works before 12am			
Trench 1 and 2	Road Saw	*North façade:* 79dB(A)L_{eq} when in use **76dB(A)$L_{eq(15min)}$** 80dB(A)L_{max} *South façade:* 69dB(A)L_{eq} when in use **66dB(A)$L_{eq(15min)}$** 70dB(A)L_{ma}	Complies CNVIS prediction to R3 (85dB(A)$L_{eq(15min)}$)

Work Location	Activity	Measured Noise Level	Comment
Works before 12am			
Trench 1 and 2	Jackhammer (on asphalt)	*North façade:* 68dB(A)L_{eq} when in use **65dB(A)$L_{eq(15min)}$** 70dB(A)L_{max}	Complies CNVIS prediction to R3 (80dB(A)$L_{eq(15min)}$)
Works after 12am			
Trench 1 and 2	Vacuum Truck (reduced pump speed – 1330RPM)	*North façade:* 72dB(A)L_{eq} when in use **72dB(A)$L_{eq(15min)}$** 74dB(A)L_{max} *South façade:* 62dB(A)L_{eq} when in use **62dB(A)$L_{eq(15min)}$** 64dB(A)L_{ma}	Complies CNVIS prediction to R3 (75dB(A)$L_{eq(15min)}$)

Table 2-14 Measured Noise Levels (Princeton Apartments – R1) – Construction Activities

Work Location	Activity	Measured Noise Level	Comment
Works before 12am			
Trench 1 and 2	Road Saw	*North façade:* 65dB(A)L_{eq} when in use **62dB(A)$L_{eq(15min)}$** 66dB(A)L_{max}	Complies CNVIS prediction to R1 (85dB(A)$L_{eq(15min)}$)
	Jackhammer (on asphalt)	*North façade:* 68dB(A)L_{eq} when in use **65dB(A)$L_{eq(15min)}$** 70dB(A)L_{max}	Complies CNVIS prediction to R1 (80dB(A)$L_{eq(15min)}$)
Works after 12am			
Trench 1 and 2	Vacuum Truck (reduced pump speed – 1330RPM)	*North façade:* 63dB(A)L_{eq} when in use **63dB(A)$L_{eq(15min)}$** 65dB(A)L_{max}	Complies CNVIS prediction to R1 (75dB(A)$L_{eq(15min)}$)

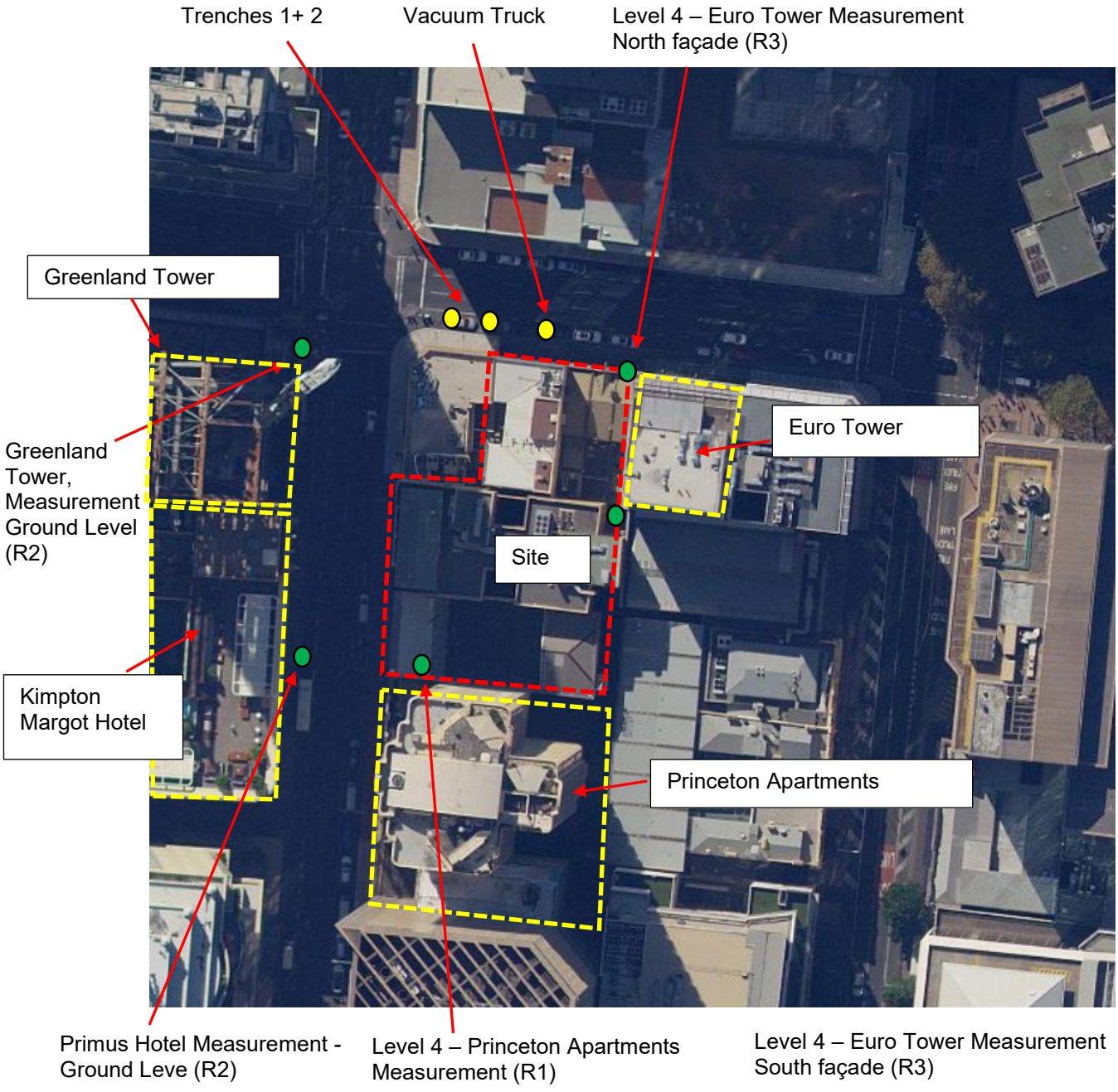
Table 2-15 Measured Noise Levels (Greenland Tower – R2) – Construction Activities

Work Location	Activity	Measured Noise Level (Ground Level)	Predicted Noise Level (Level 8 Facade)	Comment
Works before 12am				
Trench 1 and 2	Road Saw	79dB(A)L_{eq} when in use **76dB(A)$L_{eq(15min)}$** 80dB(A)L_{max}	77dB(A)L_{eq} when in use **74dB(A)$L_{eq(15min)}$** 78dB(A)L_{max}	Complies CNVIS prediction to R2 (80dB(A)$L_{eq(15min)}$)
Works after 12am				
Trench 1 and 2	Vacuum Truck (reduced pump speed – 1330RPM)	70dB(A)L_{eq} when in use **70dB(A)$L_{eq(15min)}$** 71dB(A)L_{max}	68dB(A)L_{eq} when in use **68dB(A)$L_{eq(15min)}$** 69dB(A)L_{max}	Complies CNVIS prediction to R2 (70dB(A)$L_{eq(15min)}$)

Table 2-16 Measured Noise Levels (Kimpton Margot Hotel – R2) – Construction Activities

Work Location	Activity	Measured Noise Level	Comment
Works before 12am			
Trench 1 and 2	Road Saw	69dB(A)L_{eq} when in use **66dB(A)$L_{eq(15min)}$** 70dB(A)L_{max}	Complies CNVIS prediction to R2 (80dB(A)$L_{eq(15min)}$)
Works after 12am			
Trench 1 and 2	Vacuum Truck (reduced pump speed – 1330RPM)	65dB(A)L_{eq} when in use **65dB(A)$L_{eq(15min)}$** 66dB(A)L_{max}	Complies CNVIS prediction to R2 (70dB(A)$L_{eq(15min)}$)

See below for measurement locations.



2.3.7 Attended Monitoring Results – (Utilities Investigation – Pitt Street South

Attended noise monitoring measurements provided below in Table 2-17, Table 2-18, Table 2-19, Table 2-20 and Table 2-21 of after-hours works (services investigation), were conducted by on-site measurements at PSISD – Pitt Street South on 30 May 2022.

Table 2-17 Measured Noise Levels (Princeton Apartments – R1) – Construction Activities

Work Location	Activity	Measured Noise Level	Comment
Works before 12am			
Trench 1	Road Saw	*North façade:* 78dB(A)L_{eq} when in use **65dB(A)$L_{eq(15min)}$** 79dB(A)L_{max}	Complies CNVIS prediction to R1 (85dB(A)$L_{eq(15min)}$)
Works after 12am			
Trench 1	Vacuum Truck (reduced pump speed – 1300RPM)	*North façade:* 71dB(A)L_{eq} when in use **68dB(A)$L_{eq(15min)}$** 72dB(A)L_{max}	Complies CNVIS prediction to R1 (75dB(A)$L_{eq(15min)}$)

Table 2-18 Measured Noise Levels (Kimpton Margot Hotel – R2a) – Construction Activities – Internal Noise Measurement

Work Location	Activity	Measured Noise Level	Comment
Works before 12am			
Trench 1	Road Saw	42dB(A)L_{eq} when in use **39dB(A)$L_{eq(15min)}$** 44dB(A)L_{max}	Complies CNVIS prediction to R2 (55dB(A)$L_{eq(15min)}$)
Works after 12am			
Trench 1	Vacuum Truck (reduced pump speed – 1300RPM)	42dB(A)L_{eq} when in use **40dB(A)$L_{eq(15min)}$** 44dB(A)L_{max}	Complies CNVIS prediction to R2 (55dB(A)$L_{eq(15min)}$)

Table 2-19 Measured Noise Levels (Greenland Tower - R2b) – Construction Activities – Internal Noise Measurement

Work Location	Activity	Measured Noise Level	Comment
Works before 12am			
Trench 1, 2, 3	Road Saw	78dB(A)L_{eq} when in use **75dB(A)$L_{eq(15min)}$** 79dB(A)L_{max}	Complies CNVIS prediction to R2 (80dB(A)$L_{eq(15min)}$)
Trench 1, 2, 3	Jackhammer	75dB(A)L_{eq} when in use **72dB(A)$L_{eq(15min)}$** 76dB(A)L_{max}	Complies CNVIS prediction to R2 (80dB(A)$L_{eq(15min)}$)
Works after 12am			
Trench 1, 2, 3	Vacuum Truck (reduced pump speed – 1300RPM)	70dB(A)L_{eq} when in use **70dB(A)$L_{eq(15min)}$** 71dB(A)L_{max}	Complies CNVIS prediction to R2 (70dB(A)$L_{eq(15min)}$)

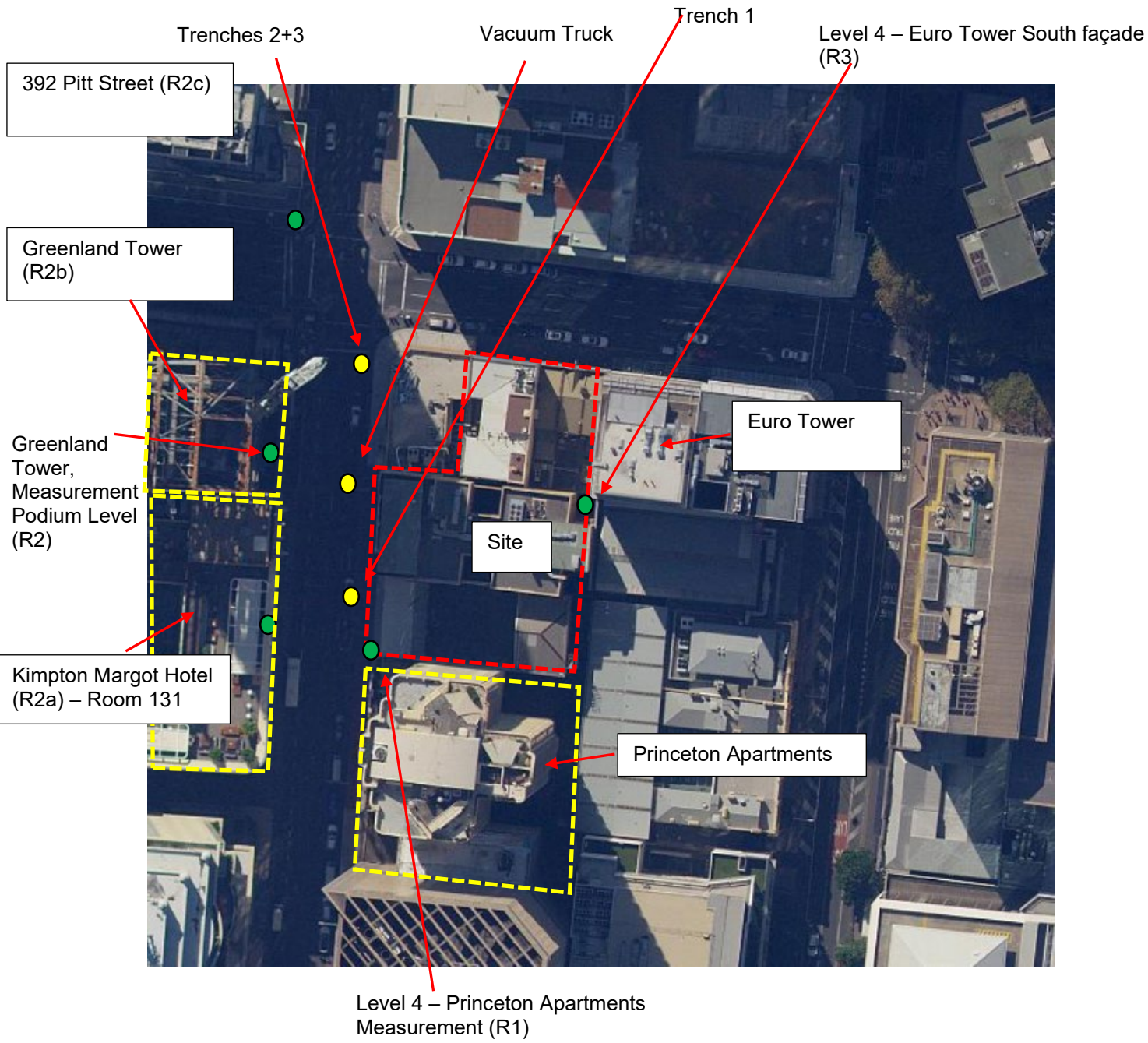
Table 2-20 Measured Noise Levels (329 Pitt St - R2c) – Construction Activities – Internal Noise Measurement

Work Location	Activity	Measured Noise Level (Ground Level)	Predicted Noise Level (Level 8 Facade)	Comment
Works after 12am				
Trench 2+3	Vacuum Truck (reduced pump speed – 1300RPM)	72dB(A)Leq when in use **72dB(A)Leq(15min)** 72dB(A)Lmax	69dB(A)Leq when in use **69dB(A)Leq(15min)** 70dB(A)Lmax	Complies CNVIS prediction to R2c (70dB(A)Leq(15min))

Table 2-21 Measured Noise Levels (Euro Tower – R3) – Construction Activities – Internal Noise Measurement

Work Location	Activity	Measured Noise Level	Comment
Works before 12am			
Trench 1	Road Saw	*South façade:* 68dB(A)L_{eq} when in use **65dB(A)$L_{eq(15min)}$** 70dB(A)L_{ma}	Complies CNVIS prediction to R3 (85dB(A)$L_{eq(15min)}$)
Works after 12am			
Trench 1	Vacuum Truck (reduced pump speed – 1300RPM)	*South façade:* 62dB(A)L_{eq} when in use **62dB(A)$L_{eq(15min)}$** 64dB(A)L_{ma}	Complies CNVIS prediction to R3 (75dB(A)$L_{eq(15min)}$)

See aerial photo on the following page for measurement locations.



2.3.8 Real-Time Monitoring Methodology

Real-time noise monitors have been maintained and monitored by Acoustic Consultants Renzo Tonin since November 2020. The real-time links to the monitoring data have been submitted to Sydney Metro, DPE and EPA and all records stored. Locations of these monitors are depicted in **Figure 2-1**.

It is noted that the noise monitoring locations are conservative and measure external noise levels and not internal noise levels. The noise and vibration consultant has provided advice to CPB that a 25 dB(A) (for the North) and 20dB(A) (for the South) noise reduction between the external noise level and the internal noise level has been determined following on-site outside/inside noise level measurements. This has been adopted by the project in assessing performance against the CoA E38 as approved in the CNVMP.

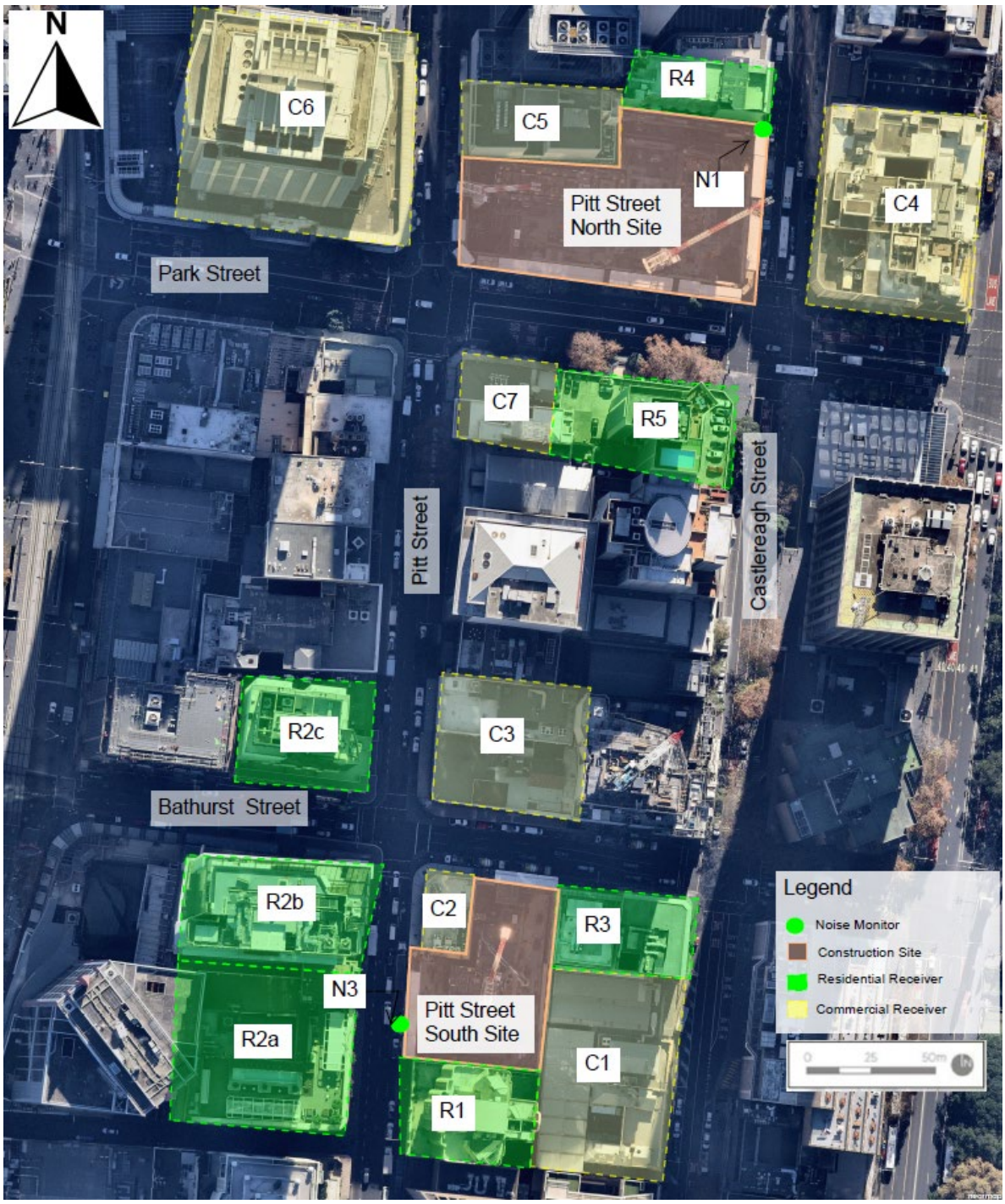


Figure 2-1 Pitt Street Station Real-Time Monitor Locations

Condition E28 of the CSSI 15_7400 requires that *vibration from construction activities does not exceed the vibration limits set out in the British Standard BS 7385-2:1993 Evaluation and measurement for vibration in buildings: Guide to damage levels from groundborne vibration* which was interpreted in the CNVIS to set a limit of 2.5 mm/s peak component particle velocity as a conservative approach for the project. There are no construction activities during the reporting period identified in Table 1-1 that would be expected to generate vibration levels exceeding 2.5m/s. All demolition works for capping beam were completed using concrete saws.

Condition E38 of the CSSI 15_7400 requires that *internal noise levels be less than L_{eq}(15 minute) 60 dB(A) for at least 6.5 hours between 7am and 8pm (Upper Limit), of which at least 3.25 hours must be below L_{Aeq}(15 minute) 55 dB(A) (Lower Limit). Within these hours, works are 'permitted' to generate noise greater than 60dB(A) for up to 6.5 hours (the equivalent of 26x15 minute periods), and 'requires' 3.25 hours of noise generated to be less than 55dB(A) (the equivalent of 13x15 minute periods).* A SMS/Email alert system has been set up to notify the project team that CoA E38 limits are approaching. Following receipt of an SMS / Email, site activities are reviewed and works with high noise are ceased. Compliance during the reporting period with this condition are shown below in **Tables 2-9 and 2-10.**

The equipment used for noise measurements was an NTi Audio Type XL2 precision sound level analyser which is a class 1 instrument having accuracy suitable for field and laboratory use. The instrument was calibrated prior and subsequent to measurements using a Bruel & Kjaer Type 4231 calibrator. No significant drift in calibration was observed. All instrumentation complies with IEC 61672 (parts 1-3) '*Electroacoustics - Sound Level Meters*' and IEC 60942 *'Electroacoustics - Sound calibrators'* and carries current NATA certification (or if less than 2 years old, manufacturers certification). **Table 2-8** outlines the noise monitoring equipment that has been used during the reporting period.

Photos of the real-time equipment are shown in **Appendix B** and calibration certificates for the equipment in **Table 2-8** can be seen in **Appendix C.**

Table 2-8 Monitoring Equipment Details

Monitoring Type / Location	Equipment Details	Serial Number	Last Calibration Date	Off Hire Date
Attended Noise	Rion NL-20	00143337	29/01/2021	N/A
Noise calibrator	Pulsar Model 106	93277	24/01/2022	N/A
Real-Time Noise – N1	NTi Audio Type XL2	RTA07-ATP3	26/02/2021	On site
Real-Time Noise – N3	NTi Audio Type XL2	RTA07-004	18/01/2021	On site

2.3.9 Real-Time Monitoring Results

Real-time noise monitors were operating at Pitt Street North and Pitt Street South during the reporting period. Summarised real-time noise monitoring results outlining compliance with CoA E38 are presented for the North site in **Table 2-9** and for the South site in **Table 2-10**. Noise levels in this reporting period were compliant with the predicted noise levels set out in the CNVIS.

The noise monitor at Pitt Street South site was offline from 10/06/2022 (08:40am) to 15/06/2022 (01:52pm) due to disconnection of power however there we no work activities on site during this period. In addition, the monitor was offline from 21/06/2022 (09:52am) to 21/06/2022 (03:25pm) as the power to the monitor was disconnected during this period.

All real-time vibration monitors were removed in Q3 2021, the removal process occurred in consultation with the AA, ER and in accordance with the planning approval and CNVMP.

Table 2-9 Condition E38 Compliance North Site (Pitt Street)

Monitoring Location (Address)	Monitoring Date	Start Time	End Time	Period below 60 $L_{eq(15minute)}$ dB(A) - (Hours)	Period below 55 $L_{eq(15minute)}$ dB(A) - (Hours)	Min 6.5 hrs below 60dB(A) $L_{eq(15min)}$	Min 3.25 hrs below 55dB(A) $L_{eq(15min)}$
Pitt Street (North)	1/04/2022	7am	8pm	13	12.25	Yes	Yes
Pitt Street (North)	2/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	3/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	4/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	5/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	6/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	7/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	8/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	9/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	10/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	11/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	12/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	13/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	14/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	15/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	16/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	17/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	18/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	19/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	20/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	21/04/2022	7am	8pm	13	13	Yes	Yes

Monitoring Location (Address)	Monitoring Date	Start Time	End Time	Period below 60 $L_{eq(15minute)}$ dB(A) - (Hours)	Period below 55 $L_{eq(15minute)}$ dB(A) - (Hours)	Min 6.5 hrs below 60dB(A) $L_{eq(15min)}$	Min 3.25 hrs below 55dB(A) $L_{eq(15min)}$
Pitt Street (North)	22/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	23/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	24/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	25/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	26/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	27/04/2022	7am	8pm	13	11.75	Yes	Yes
Pitt Street (North)	28/04/2022	7am	8pm	12.75	11.75	Yes	Yes
Pitt Street (North)	29/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	30/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	1/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	2/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	3/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	4/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	5/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	6/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	7/05/2022	7am	8pm	12.75	12.5	Yes	Yes
Pitt Street (North)	8/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	9/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	10/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	11/05/2022	7am	8pm	13	12.75	Yes	Yes
Pitt Street (North)	12/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	13/05/2022	7am	8pm	13	13	Yes	Yes

Monitoring Location (Address)	Monitoring Date	Start Time	End Time	Period below 60 $L_{eq(15minute)}$ dB(A) - (Hours)	Period below 55 $L_{eq(15minute)}$ dB(A) - (Hours)	Min 6.5 hrs below 60dB(A) $L_{eq(15min)}$	Min 3.25 hrs below 55dB(A) $L_{eq(15min)}$
Pitt Street (North)	14/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	15/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	16/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	17/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	18/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	19/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	20/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	21/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	22/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	23/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	24/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	25/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	26/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	27/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	28/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	29/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	30/05/2022	7am	8pm	13	12.75	Yes	Yes
Pitt Street (North)	31/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	1/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	2/06/2022	7am	8pm	12.5	11.75	Yes	Yes
Pitt Street (North)	3/06/2022	7am	8pm	13	12.25	Yes	Yes
Pitt Street (North)	4/06/2022	7am	8pm	13	12.5	Yes	Yes

Monitoring Location (Address)	Monitoring Date	Start Time	End Time	Period below 60 $L_{eq(15minute)}$ dB(A) - (Hours)	Period below 55 $L_{eq(15minute)}$ dB(A) - (Hours)	Min 6.5 hrs below 60dB(A) $L_{eq(15min)}$	Min 3.25 hrs below 55dB(A) $L_{eq(15min)}$
Pitt Street (North)	5/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	6/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	7/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	8/06/2022	7am	8pm	13	12.75	Yes	Yes
Pitt Street (North)	9/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	10/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	11/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	12/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	13/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	14/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	15/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	16/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	17/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	18/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	19/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	20/06/2022	7am	8pm	13	12.75	Yes	Yes
Pitt Street (North)	21/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	22/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	23/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	24/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	25/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (North)	26/06/2022	7am	8pm	13	13	Yes	Yes

Monitoring Location (Address)	Monitoring Date	Start Time	End Time	Period below 60 $L_{eq(15minute)}$ dB(A) - (Hours)	Period below 55 $L_{eq(15minute)}$ dB(A) - (Hours)	Min 6.5 hrs below 60dB(A) $L_{eq(15min)}$	Min 3.25 hrs below 55dB(A) $L_{eq(15min)}$
Pitt Street (North)	27/06/2022	7am	8pm	13	11.5	Yes	Yes
Pitt Street (North)	28/06/2022	7am	8pm	13	10	Yes	Yes
Pitt Street (North)	29/06/2022	7am	8pm	13	9	Yes	Yes
Pitt Street (North)	30/06/2022	7am	8pm	12.75	11	Yes	Yes

Table 2-10 Condition E38 Compliance South Site (Pitt Street)

Monitoring Location (Address)	Monitoring Date	Start Time	End Time	Period below 60 $L_{eq(15minute)}$ dB(A) - (Hours)	Period below 55 $L_{eq(15minute)}$ dB(A) - (Hours)	Min 6.5 hrs below 60dB(A) $L_{eq(15min)}$	Min 3.25 hrs below 55dB(A) $L_{eq(15min)}$
Pitt Street (South)	1/04/2022	7am	8pm	13	11.25	Yes	Yes
Pitt Street (South)	2/04/2022	7am	8pm	13	12.5	Yes	Yes
Pitt Street (South)	3/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	4/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	5/04/2022	7am	8pm	13	12.75	Yes	Yes
Pitt Street (South)	6/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	7/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	8/04/2022	7am	8pm	13	12.25	Yes	Yes
Pitt Street (South)	9/04/2022	7am	8pm	13	12.5	Yes	Yes
Pitt Street (South)	10/04/2022	7am	8pm	12.75	12.5	Yes	Yes
Pitt Street (South)	11/04/2022	7am	8pm	11.5	9.25	Yes	Yes
Pitt Street (South)	12/04/2022	7am	8pm	12.25	8.25	Yes	Yes
Pitt Street (South)	13/04/2022	7am	8pm	12.75	10	Yes	Yes
Pitt Street (South)	14/04/2022	7am	8pm	13	12	Yes	Yes
Pitt Street (South)	15/04/2022	7am	8pm	13	13	Yes	Yes

Monitoring Location (Address)	Monitoring Date	Start Time	End Time	Period below 60 $L_{eq(15minute)}$ dB(A) - (Hours)	Period below 55 $L_{eq(15minute)}$ dB(A) - (Hours)	Min 6.5 hrs below 60dB(A) $L_{eq(15min)}$	Min 3.25 hrs below 55dB(A) $L_{eq(15min)}$
Pitt Street (South)	16/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	17/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	18/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	19/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	20/04/2022	7am	8pm	12.75	10	Yes	Yes
Pitt Street (South)	21/04/2022	7am	8pm	9.5	5.25	Yes	Yes
Pitt Street (South)	22/04/2022	7am	8pm	11.75	7.75	Yes	Yes
Pitt Street (South)	23/04/2022	7am	8pm	13	12.25	Yes	Yes
Pitt Street (South)	24/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	25/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	26/04/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	27/04/2022	7am	8pm	12	10.5	Yes	Yes
Pitt Street (South)	28/04/2022	7am	8pm	11.5	8.75	Yes	Yes
Pitt Street (South)	29/04/2022	7am	8pm	11.75	5.25	Yes	Yes
Pitt Street (South)	30/04/2022	7am	8pm	13	11.25	Yes	Yes
Pitt Street (South)	1/05/2022	7am	8pm	13	12	Yes	Yes
Pitt Street (South)	2/05/2022	7am	8pm	13	11	Yes	Yes
Pitt Street (South)	3/05/2022	7am	8pm	12	8	Yes	Yes
Pitt Street (South)	4/05/2022	7am	8pm	8	5.5	Yes	Yes
Pitt Street (South)	5/05/2022	7am	8pm	12.5	11.5	Yes	Yes
Pitt Street (South)	6/05/2022	7am	8pm	11.75	6.75	Yes	Yes
Pitt Street (South)	7/05/2022	7am	8pm	12.75	11.25	Yes	Yes

Monitoring Location (Address)	Monitoring Date	Start Time	End Time	Period below 60 $L_{eq(15minute)}$ dB(A) - (Hours)	Period below 55 $L_{eq(15minute)}$ dB(A) - (Hours)	Min 6.5 hrs below 60dB(A) $L_{eq(15min)}$	Min 3.25 hrs below 55dB(A) $L_{eq(15min)}$
Pitt Street (South)	8/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	9/05/2022	7am	8pm	11.75	10.5	Yes	Yes
Pitt Street (South)	10/05/2022	7am	8pm	13	12.75	Yes	Yes
Pitt Street (South)	11/05/2022	7am	8pm	13	11.5	Yes	Yes
Pitt Street (South)	12/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	13/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	14/05/2022	7am	8pm	13	12.75	Yes	Yes
Pitt Street (South)	15/05/2022	7am	8pm	13	12.5	Yes	Yes
Pitt Street (South)	16/05/2022	7am	8pm	13	12	Yes	Yes
Pitt Street (South)	17/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	18/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	19/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	20/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	21/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	22/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	23/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	24/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	25/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	26/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	27/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	28/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	29/05/2022	7am	8pm	13	12.25	Yes	Yes

Monitoring Location (Address)	Monitoring Date	Start Time	End Time	Period below 60 $L_{eq(15minute)}$ dB(A) - (Hours)	Period below 55 $L_{eq(15minute)}$ dB(A) - (Hours)	Min 6.5 hrs below 60dB(A) $L_{eq(15min)}$	Min 3.25 hrs below 55dB(A) $L_{eq(15min)}$
Pitt Street (South)	30/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	31/05/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	1/06/2022	7am	8pm	13	10.25	Yes	Yes
Pitt Street (South)	2/06/2022	7am	8pm	13	12.75	Yes	Yes
Pitt Street (South)	3/06/2022	7am	8pm	13	12.75	Yes	Yes
Pitt Street (South)	4/06/2022	7am	8pm	13	12.75	Yes	Yes
Pitt Street (South)	5/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	6/06/2022	7am	8pm	13	12.75	Yes	Yes
Pitt Street (South)	7/06/2022	7am	8pm	13	11.75	Yes	Yes
Pitt Street (South)	8/06/2022	7am	8pm	13	12	Yes	Yes
Pitt Street (South)	9/06/2022	7am	8pm	13	12.75	Yes	Yes
Pitt Street (South)	10/06/2022	7am	8pm	Monitor offline	Monitor offline	-	-
Pitt Street (South)	11/06/2022	7am	8pm	Monitor offline	Monitor offline	-	-
Pitt Street (South)	12/06/2022	7am	8pm	Monitor offline	Monitor offline	-	-
Pitt Street (South)	13/06/2022	7am	8pm	Monitor offline	Monitor offline	-	-
Pitt Street (South)	14/06/2022	7am	8pm	Monitor offline	Monitor offline	-	-
Pitt Street (South)	15/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	16/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	17/06/2022	7am	8pm	13	11.75	Yes	Yes
Pitt Street (South)	18/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	19/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	20/06/2022	7am	8pm	13	13	Yes	Yes

Monitoring Location (Address)	Monitoring Date	Start Time	End Time	Period below 60 $L_{eq(15minute)}$ dB(A) - (Hours)	Period below 55 $L_{eq(15minute)}$ dB(A) - (Hours)	Min 6.5 hrs below 60dB(A) $L_{eq(15min)}$	Min 3.25 hrs below 55dB(A) $L_{eq(15min)}$
Pitt Street (South)	21/06/2022	7am	8pm	Monitor offline	12.75	-	Yes
Pitt Street (South)	22/06/2022	7am	8pm	13	12.5	Yes	Yes
Pitt Street (South)	23/06/2022	7am	8pm	13	12	Yes	Yes
Pitt Street (South)	24/06/2022	7am	8pm	13	12.5	Yes	Yes
Pitt Street (South)	25/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	26/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	27/06/2022	7am	8pm	13	12.5	Yes	Yes
Pitt Street (South)	28/06/2022	7am	8pm	13	13	Yes	Yes
Pitt Street (South)	29/06/2022	7am	8pm	13	12.75	Yes	Yes
Pitt Street (South)	30/06/2022	7am	8pm	13	13	Yes	Yes

Conclusion

Based on the monitoring results presented in this report, compliance with the monitoring programs and criteria for Water Quality and Groundwater has been verified.

Observed noise levels do not exceed the forecasted levels presented in the project CNVIS Rev 13.3 to 14.0.1. Based on the monitoring results and site investigations, CPB considers that the noise associated with the stated construction works was compliant with the project approvals and requirements during the monitoring period.

3. Appendices

A - Weather Data

B – Photos of Real-Time Equipment

Figure B-1 N1 Pitt Street North

Figure B-2 N3 Pitt Street South (facing Pitt Street)

C – Calibration Certificates

Acoustic Research Labs Pty Ltd
Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
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Sound Level Meter
IEC 61672-3.2013
Calibration Certificate

Calibration Number C21038

Client Details	CPB Contractors Level 4, 201 Elizabeth Street Sydney NSW 2000
Equipment Tested/ Model Number :	Rion NL-20
Instrument Serial Number :	00143337
Microphone Serial Number :	94478
Pre-amplifier Serial Number :	10094

Pre-Test Atmospheric Conditions		**Post-Test Atmospheric Conditions**	
Ambient Temperature :	23°C	**Ambient Temperature :**	22.6°C
Relative Humidity :	52.5%	**Relative Humidity :**	50.2%
Barometric Pressure :	100.78kPa	**Barometric Pressure :**	100.77kPa

Calibration Technician :	Jeff Yu	**Secondary Check:**	Max Moore
Calibration Date :	29 Jan 2021	**Report Issue Date :**	29 Jan 2021

Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*Pass*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*N/A*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 2 periodic tests of IEC 61672-3:2013, 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 61672-1:2013 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 61672-1:2013 and because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
125Hz	*±0.12dB*	*Temperature*	*±0.2°C*
1kHz	*±0.11dB*	*Relative Humidity*	*±2.4%*
8kHz	*±0.13dB*	*Barometric Pressure*	*±0.015kPa*
Electrical Tests	*±0.10dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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Sound Calibrator

IEC 60942:2017

Calibration Certificate

Calibration Number C22019

Client Details CPB Contractors
Level 4, 201 Elizabeth Street
Sydney NSW 2000

Equipment Tested/ Model Number : Pulsar Model 106
Instrument Serial Number : 93277

Atmospheric Conditions

Ambient Temperature : 23.5°C
Relative Humidity : 55.3%
Barometric Pressure : 100.4kPa

Calibration Technician : Lucky Jaiswal
Secondary Check: Max Moore
Calibration Date : 24 Jan 2022
Report Issue Date : 24 Jan 2022

Approved Signatory : Juan Aguero

Characteristic Tested	Result
Generated Sound Pressure Level	*Pass*
Frequency Generated	*Pass*
Total Distortion	*Pass*

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
	94	1000	93.96	1000.30

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2017 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed..

Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	*±0.11dB*	*Temperature*	*±0.1°C*
Frequency	*±0.07%*	*Relative Humidity*	*±1.9%*
Distortion	*±0.50%*	*Barometric Pressure*	*±0.014kPa*

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

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Accredited for compliance with ISO/IEC 17025 - Calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

NATacoustic
Acoustic Calibration & Testing Laboratory
Level 1, 418A Elizabeth Street., Surry Hills NSW 2010 AUSTRALIA
Ph: (02) 8218 0570 email: service@natacoustic.com.au website: www.natacoustic.com.au
A division of Renzo Tonin & Associates (NSW) Pty Ltd ABN 29 117 462 861

Certificate of Calibration
Sound Level Meter

Calibration Date	18/01/2021	**Job No**	RB844	**Operator**	AM
Client Name	RENZO TONIN & ASSOCIATES (NSW) PTY LTD				
Client Address	LEVEL 1 418A ELIZABETH ST SURRY HILLS 2010				

Test Item

Instrument Make	NTI	**Model**	XL2-TA	**Serial No**	#A2A-08038-E0 #RTA07-004
Microphone Make	NTI	**Model**	MC230	**Serial No**	#8045
Preamplifier Make	NTI	**Model**	MA220	**Serial No**	#3336
Ext'n Cable Make	NTI	**Model**	N/A	**Serial No**	N/A
Accessories	Nil			**Firmware**	4.20

SLM Type	1
Filters Class	1

Environmental Conditions	**Measured**	
	Start	**End**
Air Temp. (°C)	23.5	23.5
Rel. Humidity (%)	56.2	54.9
Air Pressure (kPa)	100.4	101.3

Applicable Standards:
Periodic tests were performed in accordance with procedures from IEC 61672-3 :2013 and IEC 61260-3 :2016

Applicable Work Instruction:
RWi-08 SLM & Calibrator Verification

Laboratory Equipment :
B&K4226 Multifunction Acoustic Calibrator SN 2288472
Agilent Function Generator Model 33220A SN MY43004013
Agilent Digital Multimeter Model 34401A SN MY41004386

Traceability:
The results of the tests and measurements included in this document are traceable via the test methods described under each test, and by the use of the above equipment, which has been calibrated by NATA accredited calibration facilities.
This document shall not be reproduced, except in full.

Scope:
This certificate is issued on the basis that the instrument complies with the manufacturer's specification.
See "Sound Level Meter Verification - Summary of Tests" page for an itemised list of results for each test.

Uncertainty:
The uncertainty is stated at a confidence level of 95% using a k factor of 2.

Calibration Statement:
The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013 and IEC 61260-3:2016, 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 specifications of IEC 61672-1:2013 and IEC 61260-1:2014 because (a) evidence was not publicly available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 and IEC 61260-1:2014 or correction data for acoustical test of frequency weighting were not provided in the Instruction Manual and (b) because the periodic tests of IEC 61672-3:2013 and IEC 61260-3:2016 cover only a limited subset of the specifications in IEC 61672-1:2013 and IEC 61260-1:2014.

NATA
WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory Number 14966

Accredited for compliance with ISO/IEC 17025 - Calibration

Authorized Signatory:

Print Name: Ariel Michael Date: 19/01/2021

Template Document Name: RQT-05 (rev 72) SLM ISO Verification

NATacoustic
Sound Level Meter Verification - Summary of Tests

Calibration Date	18/01/2021	**Job No**	RB844	**Operator**	AM
Client Name	RENZO TONIN & ASSOCIATES (NSW) PTY LTD				
Client Address	LEVEL 1 418A ELIZABETH ST SURRY HILLS 2010				

1. Instrument Information & Reference Conditions

Instrument Make	NTI	**Model**	XL2-TA	**Serial No**	#A2A-08038-E0 #RTA07-004
Microphone Make	NTI	**Model**	MC230	**Serial No**	#8045
Preamplifier Make	NTI	**Model**	MA220	**Serial No**	#3336
Ext'n Cable Make	NTI	**Model**	N/A	**Serial No**	N/A
Accessories	Nil			**Firmware**	4.20

Freq Weightings	**FLAT**	No	**A**	Yes	**C**	Yes	**Z**	Yes
Time Weightings	**Fast**	Yes	**Slow**	Yes	**Impulse**	Yes		

SLM Type	1
Filter Class	1

Instruction Manual is Available	Yes

2. Preliminary Inspection and Power Supply	**Logger Inspected**	Yes
	Calibration Equipment Okay	Yes
	Power Supply Ok (Start)	Yes
	Power Supply Ok (End)	Yes

		Measured	
3. Environmental Conditions	**Environmental Conditions**	**Start**	**End**
	Air Temp. (°C)	23.5	23.5
	Rel. Humidity (%)	56.2	54.9
	Air Pressure (kPa)	100.4	101.3
	Conforming	Yes	Yes

Test Description			**Value / Conforming**	**Uncert (+/-)**
4(a). Initial Calibration		**Calibration Frequency Hz**	1000.0	N/A
		Indicated Level Before Adjustment (dB)	114.1	0.11
		Indicated Level After Adjustment (dB)	114.0	0.11
		Stability During Continuous Operation (dB)	Yes	N/A
5(a). Self-Generated Noise, Microphone Installed		**A**	17.0	0.09
5(b). Self-Generated Noise, Electrical		**A**	10.7	0.09
		C	14.5	0.09
		Z	20.2	0.09
6. Acoustical Signal Test		**125 Hz**	Yes	0.42
		1 kHz	Yes	0.42
		8 kHz	Yes	0.60
7. Electrical Frequency Weighting		**A**	Yes	0.09
		C	Yes	0.09
		Z	Yes	0.09
8. Frequency & Time Weightings 1kHz	**8(a). Frequency Weighting**	**C**	Yes	0.09
		Z	Yes	0.09
		FLAT	N/A	0.09
	8(b). Time Weighting	**Slow**	Yes	0.09
		Leq	Yes	0.09
9(a). Level Linearity 8kHz (Increasing)		**Conforming**	Yes	0.13
9(b). Level Linearity 8kHz (Decreasing)		**Conforming**	Yes	0.13
10(a). Level Linearity Including the Level Range (Reference Signal)		**Conforming**	Yes	0.13
10(b). Level Linearity Including the Level range (5dB Above Under-range)		**Conforming**	Yes	0.13
11. Toneburst Response		**Fast**	Yes	0.13
		Slow	Yes	0.13
		SEL/Leq	Yes	0.13
12. Peak C sound level		**8 kHz**	Yes	0.09
		500 Hz	Yes	0.09
13. Overload indication		**Conforming**	Yes	0.09
		Latches	N/A	N/A
14. High-level Stability		**Conforming**	Yes	0.09
15(a). Octave Band Filter Relative Attenuation (≤2kHz)		**Conforming**	Yes	0.09
15(b). Octave Band Filter Relative Attenuation (>2kHz)		**Conforming**	Yes	0.09
16. Octave Band Filter Relative Attenuation at Midband Frequency		**Conforming**	Yes	0.09
17(a). Octave Band Filter Level Linearity 31.5Hz (Increasing)		**31.5Hz**	Yes	0.13
17(b). Octave Band Filter Level Linearity 1kHz (Increasing)		**1kHz**	Yes	0.13
17(c). Octave Band Filter Level Linearity 16kHz (Increasing)		**16kHz**	Yes	0.13
18(a). Octave Band Filter Level Linearity 31.5Hz (Decreasing)		**31.5Hz**	Yes	0.13
18(b). Octave Band Filter Level Linearity 1kHz (Decreasing)		**1kHz**	Yes	0.13
18(c). Octave Band Filter Level Linearity 16kHz (Decreasing)		**16kHz**	Yes	0.13
19(a). Octave Level Linearity Including the Level range (31.5Hz)		**31.5Hz**	Yes	0.13
19(b). Octave Level Linearity Including the Level range (1kHz)		**1kHz**	Yes	0.13
19(c). Octave Level Linearity Including the Level range (16kHz)		**16kHz**	Yes	0.13
20(a). Octave Band Filter Lower Limit (Reference Range)		**Conforming**	Yes	0.09
20(b). Octave Band Filter Lower Limit (Lowest Range)		**Conforming**	Yes	0.09
21(a). Third Octave Band Filter Relative Attenuation (≤31.5Hz)		**Conforming**	Yes	0.09
21(b). Third Octave Band Filter Relative Attenuation (40Hz-315Hz)		**Conforming**	Yes	0.09
21(c). Third Octave Band Filter Relative Attenuation (400Hz-3.15kHz)		**Conforming**	Yes	0.09
21(d). Third Octave Band Filter Relative Attenuation (≥4kHz)		**Conforming**	Yes	0.09
22. Third Octave Band Filter Relative Attenuation at Midband Frequency		**Conforming**	Yes	0.09

23(a). Third Octave Band Filter Level Linearity 31.5Hz (Increasing)	**31.5Hz**	Yes	0.13
23(b). Third Octave Band Filter Level Linearity 1kHz (Increasing)	**1kHz**	Yes	0.13
23(c). Third Octave Band Filter Level Linearity 16kHz (Increasing)	**16kHz**	Yes	0.13
24(a). Third Octave Band Filter Level Linearity 31.5Hz (Decreasing)	**31.5Hz**	Yes	0.13
24(b). Third Octave Band Filter Level Linearity 1kHz (Decreasing)	**1kHz**	Yes	0.13
24(c). Third Octave Band Filter Level Linearity 16kHz (Decreasing)	**16kHz**	Yes	0.13
25(a). Third Octave Level Linearity Including the Level range (31.5Hz)	**31.5Hz**	Yes	0.13
25(b). Third Octave Level Linearity Including the Level range (1kHz)	**1kHz**	Yes	0.13
25(c). Third Octave Level Linearity Including the Level range (16kHz)	**16kHz**	Yes	0.13
26(a). Octave Band Filter Lower Limit (Reference Range)	**Conforming**	Yes	0.09
26(b). Octave Band Filter Lower Limit (Lowest Range)	**Conforming**	Yes	0.09
SLM Overall Conforming		**Yes**	

☐ Checked

Template Document Name: RQT-05 (rev 72) SLM ISO Verification

1(a). Instrument Information

Calibration Date	18/01/2021	Job No	RB844	Operator	AM

Client Name	RENZO TONIN & ASSOCIATES (NSW) PTY LTD
Client Address	LEVEL 1 418A ELIZABETH ST SURRY HILLS 2010

1. Instrument Information

Instrument Make	NTI	Model	XL2-TA	Serial	#A2A-08038-E0 #RTA07-004		
Microphone Make	NTI	Model	MC230	Serial	#8045	pF	15
Preampifier Make	NTI	Model	MA220	Serial	#3336		
Ext'n Cable Make	NTI	Model		Serial			
Accessories	Nil			Firmware	4.20		

Freq Weightings	A	Yes
	C	Yes
	Z	Yes
	FLAT	No

Time Weightings	Fast	Yes
	Slow	Yes
	Impulse	Yes

Functions	Leq	Yes
	SEL	Yes
	Peak	Yes

Instrument Ranges	Range Name	Indicator Range		Primary Range	
		Low dB	High dB	Low dB	High dB
1	HIGH	40	140	60	134
2	MID	20	120	40	120
3	LOW	0	100	20	100
4					
5					
6					
7					
8					
9					
10					
Check List	OK				

Reference Range	MID
Ref. SPL @ 1kHz	114

Linearity Limits on Ref range	Low dB	High dB
1kHz Leq (A weighting)	40.0	120.0
4kHz Leq	40.0	120.0
8kHz Leq	40.0	120.0

Highest Range for 10(b),12,13	MID

SLM Class	1
Filter Class	1
Filter Base	2

Colour Legend	
Enter Value	110
Operator Action	110
Difference	1.0
Error/Outside Tolerance	2.0
Tolerance	+/-1
Select Toggle	Val
Informative	110
Conforming	Yes

Instruction Manual Title (Clause 3.1&3.2, IEC 61672-3:2013)	NTI XL2 Operating Manual
Version	2.5
Publication Date	2/11/2012
Source of Document (& Date of Download if Applicable)	N/A

Conforming	Yes

Pattern Evaluation Test Report (Clause 3.5, IEC 61672-3:2013)	
Reference Number or Page Number	
Publication Date	
Source of Document (& Date of Download if Applicable)	

Conforming	No

☑ Checked

1(b). Acoustic Corrections

	Absolute Corrections and Uncertainties									
Freq	Mic FF to Pressure		Case		Windscreen		Other *		Total	
(Hz)	dB	Uncert dB	dB	Uncert dB	dB	Uncert dB	dB	Uncert dB	dB	Uncert dB
31.5	0.00								0.00	0.41
63	0.00								0.00	0.41
125	0.00								0.00	0.41
250	0.00								0.00	0.41
500	0.00								0.00	0.41
1k	0.00								0.00	0.41
2k	0.30								0.30	0.41
4k	0.70								0.70	0.41
8k	2.60								2.60	0.58
12.5k	6.00								6.00	0.64
16k	7.30								7.30	0.64

Source of Mic FF to Pressure Correction	Nti Microphone Technical Specification
Source of Case Correction	Not Available
Source of Windscreen Correction	Not Available
***Description of Other Correction**	N/A

Descriptions of Tests

1(b). Acoustical signal tests of a frequency weighting (IEC 61672-3)
(Clause 12.2)
Correction data shall account for:
- the equivalent free-field or random-incidence frequency response of the sound level meter if the source of sound or simulated sound is the pressure field in a multi-frequency sound calibrator, in a comparison coupler, or from an electrostatic actuator; and,
- if applicable, the average influence on the frequency response of a typical microphone of a windscreen and any accessories that are part of the configuration of the sound level meter for normal use.

(Clause 12.3)
Correction data shall be obtained from tables in the Instruction Manual for the sound level meter.
(Clause 12.4)
If the necessary correction data are not available from the Instruction Manual, data from the manufacturer of the microphone, multi-frequency sound calibrator, comparison coupler, or electrostatic actuator may then be used. This data shall be publicly available
(Clause 12.5)
The source for the free-field or random-incidence correction data shall be stated in the documentation for the results of the periodic tests. The source for the associated uncertainties of measurement shall be the same as the source for the corresponding correction data. If the uncertainties of the corresponding free-field correction data are not available, the applicable maximum-permitted uncertainties given in IEC 62585 shall be used in the calculation of the laboratory's total uncertainty budget.

NOTE: Where the uncertainties due to the "Mic FF to Pressure", "Case" or "Windscreen" are omitted in the table above, the following statement applies:

No information on the uncertainty of measurement, required by IEC 61672-3:2013, for the correction data given in the Instruction Manual or obtained from the manufacturer or supplier of the sound level meter, or the manufacturer of the microphone, or the manufacturer of the multi-frequency sound calibrator was provided in the Instruction Manual or made available by the manufacturer or supplier of the sound level meter. 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 %.

☑ Checked

1(c). Electrical Corrections

	Absolute Corrections and Uncertainties									
Freq	Mic 0 deg FF Resp		Case		Windscreen		Other *		Total	
(Hz)	dB	Uncert dB	dB	Uncert dB	dB	Uncert dB	dB	Uncert dB	dB	Uncert dB
31.5			0.00		0.00		0.00		0.00	0.41
63			0.00		0.00		0.00		0.00	0.41
125			0.00		0.00		0.00		0.00	0.41
250			0.00		0.00		0.00		0.00	0.41
500			0.00		0.00		0.00		0.00	0.41
1k			0.00		0.00		0.00		0.00	0.41
2k			0.00		0.00		0.00		0.00	0.41
4k			0.00		0.00		0.00		0.00	0.41
8k			0.00		0.00		0.00		0.00	0.58
12.5k			0.00		0.00		0.00		0.00	0.64
16k			0.00		0.00		0.00		0.00	0.64

Source of Mic 0 deg Free-field Response	Not Available
Source of Case Correction	Not Available
Source of Windscreen Correction	Not Available
*Description of Other Correction	N/A

Descriptions of Tests

1(c). Acoustical signal tests of a frequency weighting (IEC 61672-3)
(Clause 13.6)
For each frequency weighting and at each test frequency, corrections shall be applied to the relative frequency weightings determined in 13.5 to account for:
– the deviation of the free-field or random-incidence frequency response of the microphone in the reference direction from a uniform frequency response;
– the average effects of reflections from the case of the sound level meter and of diffraction of sound around the microphone and preamplifier; and,
– if applicable, the average influence on the frequency response of a typical microphone of a windscreen and any accessories that are part of the configuration of the sound level meter for normal use.
(Clause 13.7)
Corrections for the effects of reflections and diffraction and for the influence of the windscreen and windscreen accessories on the free-field or random-incidence frequency response shall be the same as used for the frequency-weighting tests with acoustical signals.

NOTE: Where the uncertainties due to the "Mic FF to Pressure", "Case" or "Windscreen" are omitted in the table above, the following statement applies:

No information on the uncertainty of measurement, required by IEC 61672-3:2013, for the correction data given in the Instruction Manual or obtained from the manufacturer or supplier of the sound level meter, or the manufacturer of the microphone, or the manufacturer of the multi-frequency sound calibrator was provided in the Instruction Manual or made available by the manufacturer or supplier of the sound level meter. 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 %.

☑ Checked

2. Preliminary,3.Environmental Conditions & 4. Calibration

2. Preliminary Inspection and Power Supply

Instrument Inspected	Yes
Laboratory Calibration Equipment Ok	Yes
Power Supply Ok (Start)	Yes
Power Supply Ok (End)	Yes

3. Environmental Conditions

Environmental Conditions	Measured		Devn from Mid Limits		Uncert.	Expanded Deviation			Complies	Limits	
	Start	End	Start	End		Start	End	Tolerance		Min	Max
Air Temp. (°C)	23.5	23.5	0.5	0.5	0.5	1.00	1.00	3	Yes	20	26
Rel. Humidity (%)	56.2	54.9	8.7	7.4	4.8	13.50	12.20	22.5	Yes	25	70
Air Pressure (kPa)	100.4	101.3	7.8	8.8	0.63	8.48	9.45	12.5	Yes	80	105

Conforming	Yes

4(a). Initial Calibration

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Microphone / Windshield Correction	OFF
Polarization Voltage (V)	0
Microphone Sensitivity (mV/Pa)	43.6

B&K 4226 Calibrator Settings	
"Sound Field"	Pressure
"Microphone"	N/A
Calibration Level (Lin)	114
Calibration Frequency (Hz)	1000

Calibration	
Indicated Level before adjust. (dB)	114.1
Adjustment required	Yes
Indicated level after adjust. (dB)	114

4(b). Final Calibration

Level at conclusion of testing (dB)	114.0
Difference	0.0
Tolerance	± 0.1

Conforming	Yes

Uncertainty (+/-) dB	0.11

Descriptions of Tests

2. Preliminary Inspection and Power Supply (IEC 61672-3 Clause 5 "Preliminary Inspection" & Clause 6 "Power Supply")
Prior to any measurements, the sound level meter and all accessories shall be visually inspected, paying particular attention to damage to, or accumulation of foreign material on, the protection grid or diaphragm of the microphone. All relevant controls shall be operated to
ensure that they are in working order. If the controls, display, and other essential elements are not in proper working order, no periodic tests shall be performed.

For all tests, the sound level meter shall be powered from its preferred supply or a suitable alternative. Before and after conducting the set of tests with acoustical signals and before and after conducting the set of tests with electrical signals, the power supply for the sound level meter shall be checked by the method stated in the Instruction Manual to ensure that it is within the specified operating limits. If the voltage or the equivalent indication of the status of the power supply is not within the operating limits and the reason cannot be attributed to partially discharged batteries or an incorrect selection of the voltage of the public power supply, then no periodic tests shall be performed as a malfunction is indicated.

3. Environmental conditions (IEC 61672-3 Clause 7 "Environmental Conditions")
Periodic tests shall be performed within the following ranges of environmental conditions: 80 kPa to 105 kPa for static air pressure, 20 °C to 26 °C for air temperature and 25 % to 70 % for relative humidity. These conditions are recorded at the start and end of the testing.

4a. Calibration (IEC 61672-3 Clause 10 "Indication at the calibration check frequency")
The sound level meter shall be adjusted, if necessary, to indicate the required sound level for the environmental conditions under which the tests are performed. The indications of the sound level meter before and after adjustment shall be recorded.

4b. Long-term Stability (IEC 61672-3 Clause 15)
The long-term stability of a sound level meter is evaluated from the difference between the A-weighted sound levels indicated in response to steady 1 kHz signals applied at the beginning and end of a period of operation. For each indication, the level of the input signal shall be that which is required to display the reference sound pressure level on the reference level range for the first indication.

The period of continuous operation shall be between 25 min and 35 min during which any convenient set of tests that use electrical input signals are performed.

The measured difference between the initial and final indications of A-weighted sound level shall not exceed the acceptance limits given in IEC 61672-1.

☑ Checked

5. Self-Generated Noise

5(a). Self-Generated Noise, Microphone Installed

SLM Settings	
Time Weighting	Fast
Frequency Weighting	A
SLM Range	LOW
Measurement Function	Leq
Integration time (s)	30

Results		
Freq Wt	Observed	Quoted
A	17.0	16.6

Uncertainty (+/-) dB	0.09

Observed Values		
Leq	N/A	
17.0	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	
	Avg	

5(b). Self-Generated Noise, Electrical

SLM Settings	
Time Weighting	Fast
SLM Range	LOW
Measurement Function	Leq
Integration time (s)	30

Observed Values						
Leq			N/A			
A	C	Z	Obs	A	C	Z
10.7	14.5	20.2	1			
			2			
			3			
			4			
			5			
			6			
			7			
			8			
			9			
			10			
			Avg			

Results		
Freq Wt	Observed	Quoted
A	10.7	12.4
C	14.5	13.5
Z	20.2	18.3-25.5

Uncertainty (+/-) dB	0.09

Descriptions of Tests

5(a) Self-Generated Noise, Microphone Installed (IEC 61672-3 Clause 11.1)
Measurements of the level of self-generated noise shall be made in a location that is available to the testing laboratory and where the level of background noise is minimized. Any supplied windscreen and windscreen accessory need not be installed around the microphone for measurement of the level of self-generated noise. The sound level meter shall be in the configuration submitted for periodic testing and with the most-sensitive level range and frequency-weighting A selected.

The indicated level of the A-weighted self-generated noise on the most-sensitive level range shall be recorded and reported. The level of self-generated noise is preferably measured as a time-averaged sound level with an averaging time of at least 30 s. Time-averaged sound level may be measured directly or calculated from an indication of sound exposure level and integration time. If time-averaged sound level cannot be determined, the time-weighted sound level from the average of ten observations taken at random over a 60 s interval shall be measured. If the time-weighted sound level is recorded, the S time weighting shall be used if available; otherwise the F time weighting shall be used.

5(b) Self-Generated Noise - Electrical (IEC 61672-3 Clause 11.2)
With the microphone replaced by the electrical input-signal device (or using the specified means of inserting electrical signals), and with the device terminated in the manner specified in the Instruction Manual for measurements of the level of self-generated noise, the indicated level of the time-averaged or time-weighted self-generated noise, measured by the same procedure as with the microphone installed, shall be recorded and reported for all frequency weightings and for the most-sensitive level range.

☑ Checked

6. Acoustical Signal Test

SLM Settings	
Time Weighting	Fast
Frequency Weighting	C
SLM Range	MID
Microphone Compensation Filter	OFF
B&K 4226 Calibrator Settings	
"Sound Field"	Pressure
"Microphone"	N/A
Reference Setting (Lin)	114

Freq	Observed Values			Mean Meter Reading	4226 calibrator corrections	Corrected Mean Readings	Pressure to Free Field	Case Effect Correction	Windscreen Effect Correction	Other Effect Correction	Equivalent Free Field	Response re 1kHz	C Weighting Response	Deviation from Expected	Tolerance		Conforming	Uncertainty		
															Type 1	Type 2		Total	Lab	Corrections
(Hz)	Set 1	Set 2	Set 3															(+/-) dB	(+/-) dB	(+/-) dB
31.5	110.9	110.8	110.8	110.83	0.10	110.93	0.00	0.00	0.00	0.00	110.93	-3.01	-3.00	-0.01	± 1.5	± 3.0	Yes	0.43	0.14	0.41
63	113.2	113.2	113.2	113.20	0.01	113.21	0.00	0.00	0.00	0.00	113.21	-0.73	-0.80	0.07	± 1.0	± 2.0	Yes	0.42	0.12	0.41
125	113.9	113.9	114.0	113.93	-0.02	113.91	0.00	0.00	0.00	0.00	113.91	-0.03	-0.20	0.17	± 1.0	± 1.5	Yes	0.42	0.12	0.41
250	114.1	114.1	114.0	114.07	-0.03	114.04	0.00	0.00	0.00	0.00	114.04	0.10	0.00	0.10	± 1.0	± 1.5	Yes	0.42	0.12	0.41
500	114.1	114.1	114.1	114.10	-0.03	114.07	0.00	0.00	0.00	0.00	114.07	0.13	0.00	0.13	± 1.0	± 1.5	Yes	0.42	0.12	0.41
1k	**114.0**	**114.0**	**114.0**	**114.00**	**-0.06**	**113.94**	**0.00**	**0.00**	**0.00**	**0.00**	**113.94**	**0.00**	**0.00**	0.00	± 0.7	± 1.0	Yes	0.42	0.11	0.41
2k	113.6	113.5	113.6	113.57	-0.01	113.56	0.30	0.00	0.00	0.00	113.86	-0.08	-0.20	0.12	± 1.0	± 2.0	Yes	0.43	0.13	0.41
4k	112.4	112.3	112.4	112.37	-0.20	112.17	0.70	0.00	0.00	0.00	112.87	-1.07	-0.80	-0.27	± 1.0	± 3.0	Yes	0.43	0.14	0.41
8k	108.6	108.4	108.5	108.50	-0.19	108.31	2.60	0.00	0.00	0.00	110.91	-3.03	-3.00	-0.03	+1.5; -2.5	± 5.0	Yes	0.60	0.15	0.58
12.5k	101.7	102.1	101.7	101.83	-0.10	101.73	6.00	0.00	0.00	0.00	107.73	-6.21	-6.20	-0.01	+2.0; -5.0	+5,-inf	Yes	0.68	0.21	0.64
16k	97.6	97.6	97.4	97.53	0.05	97.58	7.30	0.00	0.00	0.00	104.88	-9.06	-8.50	-0.56	+2.5; -16.0	+5,-inf	Yes	0.74	0.37	0.64

Description of Tests

6. Acoustical signal tests of a frequency weighting (IEC 61672-3 Clause 12)
The sound level meter shall be set for frequency-weighting C, if available, otherwise for frequencyweighting A. The frequency weighting for tests with acoustical signals shall be determined at 125 Hz, 1 kHz, and 8 kHz. However, for information, this laboratory tests from 31.5Hz to 16kHz.

For frequency-weighting tests using a multi-frequency sound calibrator, the sound pressure level in the coupler of the sound calibrator shall preferably be set to the reference sound pressure level at 1 kHz, but shall be in the range from 70 dB to 125 dB at all frequencies.

At the discretion of the laboratory, the sound level meter shall be set to measure F-timeweighted sound level or S-time-weighted sound level. As a minimum, two repetitions of the coupling and measurements shall be performed to give a total of at least three tests.

The relative frequency weighting, relative to the response at 1 kHz, shall be determined from the average equivalent free-field or random-incidence sound level at a test frequency minus the average equivalent free-field or random-incidence sound level at 1 kHz. (Clause 12.15)

☑ Checked

7. Electrical Frequency Weighting

SLM Settings	
Time Weighting	Fast
Frequency Weighting	A
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	20
Generator Frequency (Hz)	1k
SPL Reference (dB)	75
Integration Time (s)	N/A
Generator Output (mVrms)	52.00

Freq Hz	Output (mV)	Indication A	Output (mV)	Indication C	Output (mV)	Indication Z	Tolerance	
63	1061.70	74.9	57.02	74.9	52.00	74.9		
125	331.90	74.9	53.21	75.0	52.00	75.0		
250	139.96	74.9	52.00	75.0	52.00	75.0		
500	75.16	75.0	52.00	75.0	52.00	75.0		
1k	52.00	**75.0**	52.00	**75.0**	52.00	**75.0**		
2k	45.29	75.0	53.21	75.0	52.00	75.0		
4k	46.35	75.0	57.02	75.0	52.00	75.0		
8k	59.02	75.0	73.45	75.0	52.00	75.0		
16k	111.17	74.8	138.36	74.8	52.00	75.0		
Typical Microphone 0deg Free Field Response		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		**0.00**		**0.00**		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
Case Effect Correction		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		**0.00**		**0.00**		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
Windscreen Effect Correction		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		**0.00**		**0.00**		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
OtherCorrection		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		**0.00**		**0.00**		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
Equivalent Free Field		74.90		74.90		74.90		
		74.90		75.00		75.00		
		74.90		75.00		75.00		
		75.00		75.00		75.00		
		75.00		**75.00**		**75.00**		
		75.00		75.00		75.00		
		75.00		75.00		75.00		
		75.00		75.00		75.00		
		74.80		74.80		75.00	Type 1	Type 2
Response re 1kHz (Deviation from Expected)		-0.10		-0.10		-0.10	± 1.0	± 2.0
		-0.10		0.00		0.00	± 1.0	± 1.5
		-0.10		0.00		0.00	± 1.0	± 1.5
		0.00		0.00		0.00	± 1.0	± 1.5
		0.00		**0.00**		**0.00**	± 0.7	± 1.0
		0.00		0.00		0.00	± 1.0	± 2.0
		0.00		0.00		0.00	± 1.0	± 3.0
		0.00		0.00		0.00	+1.5; -2.5	± 5.0
		-0.20		-0.20		0.00	+2.5; -16.0	+5,-inf
Conforming		**Yes**		**Yes**		**Yes**		

Uncertainty (+/-) dB	0.09

Description of Tests

7. Electrical signal tests of frequency weightings (IEC 61672-3 Clause 13)
Frequency weightings shall be determined using steady sinusoidal electrical input signals for all frequency weightings for which design goals and acceptance limits are specified in IEC 61672-1 and which are provided in the sound level meter. The sound level meter shall be set to display F-time-weighted sound level.

On the reference level range and for each frequency weighting to be tested, the level of a 1 kHz input signal shall be adjusted to yield an indication that is 45 dB less than the upper boundary stated in the Instruction Manual for the linear operating range at 1 kHz on the reference level range.

At test frequencies other than 1 kHz, the level of the input electrical signal shall be determined as the level of the input signal at 1 kHz minus the exact design-goal response, given in IEC 61672-1 for the selected frequency weighting at the test frequency.

☑ Checked

8. Frequency & Time Weightings 1kHz

SLM Settings	
Time Weighting	Fast
Frequency Weighting	A
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	0.0
Generator Frequency (Hz)	1k
SPL Reference (dB)	114.0
Output (mVrms)	464.4

8(a). Frequency Weightings 1kHz

Time Wt	Frequency Weighting				Tolerance	
Fast	A	C	Z	N/A		
1kHz	114.0	114.0	114.0		Type 1	Type 2
Difference		0.0	0.0		± 0.2	± 0.2

Conforming	Yes	Yes	N/A

Uncertainty (+/-) dB	0.09

8(b). Time Weightings 1kHz

Freq Wt	Time Weighting				Tolerance	
A	F	S	Leq			
1kHz	114.0	114.0	114.0		Type 1	Type 2
Difference		0.0	0.0		± 0.1	± 0.1

Conforming	Yes	Yes

Uncertainty (+/-) dB	0.09

Description of Tests

8. Frequency and time weightings at 1 kHz (IEC 61672-3 Clause 14)
For a steady sinusoidal electrical input signal at 1 kHz on the reference level range and with an input signal that yields an indication of the reference sound pressure level with frequency weighting A, the indications shall be recorded for frequency weightings C and Z, as available, with the sound level meter set to display F-time-weighted sound level, or timeaveraged sound level, as available. In addition, the indications with frequency weighting A shall be recorded with the sound level meter set to display F-time-weighted sound level, S-timeweighted sound level, and time-averaged sound level, as available.

The measured deviation of the indication of the sound level frequency weightings and time weightings shall not exceed the acceptance limits given in IEC 61672-1.

☑ Checked

9(a). Level Linearity 8kHz (Increasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	A
SLM Range	MID
Generator & Attenuator Settings	
Select dB Over SLM Range	5
Attenuation (dB)	31.0
Generator Frequency (Hz)	8k
SPL Reference Starting Point (dB)	94.0
Output (mVrms)	1878.0
Noise Floor (dB)	-99.0

Increasing level to Overload				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
26.0	99.0	99.0	0.0	± 0.8	± 1.1
21.0	104.0	104.0	0.0	± 0.8	± 1.1
16.0	109.0	109.0	0.0	± 0.8	± 1.1
11.0	114.0	114.0	0.0	± 0.8	± 1.1
10.0	115.0	115.0	0.0	± 0.8	± 1.1
9.0	116.0	116.0	0.0	± 0.8	± 1.1
8.0	117.0	117.0	0.0	± 0.8	± 1.1
7.0	118.0	118.0	0.0	± 0.8	± 1.1
6.0	119.0	119.0	0.0	± 0.8	± 1.1
5.0	120.0	120.0	0.0	± 0.8	± 1.1
4.0	121.0	121.0	0.0	± 0.8	± 1.1
3.0	122.0	122.0	0.0	± 0.8	± 1.1
2.0	123.0	123.0	0.0	± 0.8	± 1.1
1.0	124.0	124.0	0.0	± 0.8	± 1.1
0.0	125.0	125.0	0.0	± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

9(a). Level linearity on the reference level range (IEC 61672-3 Clause 16)
Level linearity shall be tested with steady sinusoidal electrical signals at a frequency of 8 kHz with the sound level meter set for frequency-weighting A. (61672-3 Clause 16.1).

Level linearity shall be measured in 5 dB steps of increasing input signal level from the starting point up to within 5 dB of the upper boundary stated in the Instruction Manual for the linear operating range at 8 kHz, then at 1 dB steps of increasing input signal level up to, but not including, the first indication of overload. The test of level linearity shall then be continued at 5 dB steps of decreasing input signal level from the starting point down to within 5 dB of the specified lower boundary, then at 1 dB steps of decreasing input signal level down to, but not including, the first indication of an under-range condition.

Measured level linearity deviations shall not exceed the applicable acceptance limits given in IEC 61672-1 from the specified upper boundary of the linear operating range up to, but not including, the first indication of overload and also from the specified lower boundary of the linear operating range down to, but not including, the first indication of an under-range condition.

"Y" means indicator over-range.

☑ Checked

9(b). Level Linearity 8kHz (Decreasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	A
SLM Range	MID
Generator & Attenuator Settings	
Select dB Under SLM Range	0
Attenuation (dB)	0.0
Generator Frequency (Hz)	8k
SPL Reference Starting Point (dB)	94
Output (mVrms)	52.9
Noise Floor (dB)	-99.0

Decreasing level to Underange				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
5.0	89.0	89.0	0.0	± 0.8	± 1.1
10.0	84.0	84.0	0.0	± 0.8	± 1.1
15.0	79.0	79.0	0.0	± 0.8	± 1.1
20.0	74.0	74.0	0.0	± 0.8	± 1.1
25.0	69.0	69.0	0.0	± 0.8	± 1.1
30.0	64.0	64.0	0.0	± 0.8	± 1.1
35.0	59.0	59.0	0.0	± 0.8	± 1.1
40.0	54.0	54.0	0.0	± 0.8	± 1.1
45.0	49.0	49.0	0.0	± 0.8	± 1.1
49.0	45.0	45.0	0.0	± 0.8	± 1.1
50.0	44.0	44.0	0.0	± 0.8	± 1.1
51.0	43.0	43.0	0.0	± 0.8	± 1.1
52.0	42.0	42.0	0.0	± 0.8	± 1.1
53.0	41.0	41.0	0.0	± 0.8	± 1.1
54.0	40.0	40.0	0.0	± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

9(b). Level linearity on the reference level range (IEC 61672-3 Clause 16)
Level linearity shall be tested with steady sinusoidal electrical signals at a frequency of 8 kHz with the sound level meter set for frequency-weighting A. (61672-3 Clause 16.1).

Level linearity shall be measured in 5 dB steps of increasing input signal level from the starting point up to within 5 dB of the upper boundary stated in the Instruction Manual for the linear operating range at 8 kHz, then at 1 dB steps of increasing input signal level up to, but not including, the first indication of overload. The test of level linearity shall then be continued at 5 dB steps of decreasing input signal level from the starting point down to within 5 dB of the specified lower boundary, then at 1 dB steps of decreasing input signal level down to, but not including, the first indication of an under-range condition.

Measured level linearity deviations shall not exceed the applicable acceptance limits given in IEC 61672-1 from the specified upper boundary of the linear operating range up to, but not including, the first indication of overload and also from the specified lower boundary of the linear operating range down to, but not including, the first indication of an under-range condition.

"Y" means indicator under-range. However, if 20dB above noise floor is reached then no results are reported.

☑ Checked

10. Level Linearity with Level Ranges 1kHz

10(a). Level Linearity Including the Level Range (Reference Signal)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	A
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	0
Generator Frequency (Hz)	1k
Reference SPL (dB)	114
Output (mVrms)	464.4

Settings	Level (dB)			Tolerance	
Range	Expected	Indicated	Difference	Type 1	Type 2
HIGH	114.0	114.0	0.0	± 0.8	± 1.1
MID	114.0	114.0	0.0	± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1

Conforming	Yes

Uncertainty (+/-) dB	0.13

10(b). Level Linearity Including the Level range (5dB Above Under-range)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	A
SLM Range	HIGH
Generator & Attenuator Settings	
Attenuation (dB)	30
Generator Frequency (Hz)	1k
Reference SPL (dB)	65
Output (mVrms)	51.9

Settings		Level (dB)			Tolerance	
Range	Atten	Expected	Indicated	Difference	Type 1	Type 2
HIGH	30.0	65.0	65.0	0.0	± 0.8	± 1.1
MID	50.0	45.0	44.9	-0.1	± 0.8	± 1.1
LOW	70.0	25.0	25.3	0.3	± 0.8	± 1.1
					± 0.8	± 1.1
					± 0.8	± 1.1
					± 0.8	± 1.1
					± 0.8	± 1.1
					± 0.8	± 1.1
					± 0.8	± 1.1
					± 0.8	± 1.1
					± 0.8	± 1.1

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

10. Level linearity including the level range control (IEC 61672-3 Clause 17)
For sound level meters that have more than one level range, tests of level linearity errors including errors introduced by the level range control shall be performed with steady sinusoidal electrical input signals at a frequency of 1 kHz and with the sound level meter set for frequency weighting A. For each test, signal levels shall be recorded as indications of F-time-weighted sound level or time-average sound level. (61672-3 Clause 17.1).

With the input signal level kept constant, the indicated signal level shall be recorded for all level ranges where the signal level is displayed. The indicated signal levels and the corresponding anticipated indications of signal levels shall be recorded. (61672-3 Clause 17.3).

For each level range, the level of the input signal shall then be adjusted to yield a signal level that is expected to be 5 dB greater than the signal level that first causes an indication of under-range on a level range. The indicated signal levels and the corresponding anticipated levels shall be recorded. (61672-3 Clause 17.4).

Level linearity deviations shall be calculated as an indicated signal level minus the corresponding anticipated signal level. Measured level linearity deviations shall not exceed the applicable acceptance limits given in IEC 61672-1.

☑ Checked

11. Toneburst Response

11(a). Fast ToneBurst

SLM Settings - Fast	
Time Weighting	Fast
Frequency Weighting	A
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	0.0
Generator Frequency (Hz)	4k
dB Down from Linearity Limit	3
Reference SPL (dB)	117.0
Output (mVrms)	585.7

Toneburst (ms)	# Cycles	LAFMax (dB)			Tolerance	
		Expected	Indicated	Difference	Type 1	Type 2
200	800	116.0	116.0	0.0	± 0.5	± 1.0
2	8	99.0	99.0	0.0	+ 1.0; -1.5	+ 1.0; -2.5
0.25	1	90.0	89.9	-0.1	+ 1.0; -3.0	+ 1.5; -5.0

Conforming	Yes

Uncertainty (+/-) dB	0.09

11(b). Slow ToneBurst

SLM Settings - Slow	
Time Weighting	Slow
Frequency Weighting	A
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	0.0
Generator Frequency (Hz)	4k
dB Down from Linearity Limit	3
Reference SPL (dB)	117.0
Output (mVrms)	585.7

Toneburst (ms)	# Cycles	LASMax (dB)			Tolerance	
		Expected	Indicated	Difference	Type 1	Type 2
200	800	109.6	109.6	0.0	± 0.5	± 1.0
2	8	90.0	90	0.0	+ 1.0; -3.0	+ 1.0; -5.0

Conforming	Yes

Uncertainty (+/-) dB	0.09

11(c). SEL ToneBurst

SLM Settings - SEL/Leq	
Function	SEL
Frequency Weighting	A
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	0.0
Generator Frequency (Hz)	4k
dB Down from Linearity Limit	3
Reference SPL (dB)	117.0
Output (mVrms)	585.7
Integration Time (if SEL not available) (s)	

Toneburst (ms)	# Cycles	SEL				Tolerance	
		Indicated	Calc'd	Expected	Difference	Type 1	Type 2
200	800	110.0	110.0	110.0	0.0	± 0.5	± 1.0
2	8	90.0	90.0	90.0	0.0	+ 1.0; -1.5	+ 1.0; -2.5
0.25	1	80.9	80.9	81.0	-0.1	+ 1.0; -3.0	+ 1.5; -5.0

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

11. Toneburst response (IEC 61672-3 Clause 18)
The response of the sound level meter to short-duration signals shall be tested on the reference level range with 4 kHz tonebursts. The sound level meter shall be set to frequency weighting A. (61672-3 Clause 18.1).

For the toneburst signals, indications of the sound level meter to be recorded are maximum F-time-weighted sound level, maximum S-time-weighted sound level and sound exposure level, as applicable.

The level of the steady input signal shall be adjusted to display an F-time-weighted, Stime-weighted, or time-averaged sound level, as appropriate, that is 3 dB less than the upper boundary stated in the Instruction Manual for the linear operating range at 4 kHz on the reference level range. (61672-3 Clause 18.4).

Tonebursts are tested at 200ms, 2ms and, 0.25ms durations (the latter for Fast and SEL only) and the LMax or SEL recorded.

Measured deviations of the measured toneburst responses from the corresponding reference toneburst responses given in IEC 61672-1 shall not exceed the applicable

☑ Checked

12. Peak C sound level

12(a). Peak C 8 KHz

SLM Settings	
Time Weighting	Fast
Frequency Weighting	C
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	0.0
Generator Frequency (Hz)	8k
Reference SPL (dB)	112.0
Output (mVrms)	523.5

Test Signal	dB LCpeak Hold				Tolerance	
8 kHz	Indication	O'Load?	Expected	Difference	Type 1	Type 2
1 Cycle	115.4	No	115.4	0.0	± 2.0	± 3.0

Conforming	Yes

Uncertainty (+/-) dB	0.09

12(b). Peak C 500 Hz

SLM Settings	
Time Weighting	Fast
Frequency Weighting	C
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	0.0
Generator Frequency (Hz)	500
Reference SPL (dB)	112.0
Output (mVrms)	367.7

Test Signal	dB LCpeak Hold				Tolerance	
500 Hz	Indication	O'Load?	Expected	Difference	Type 1	Type 2
One +ve 1/2 cycle	114.2	No	114.4	-0.2	± 1.0	± 2.0
One -ve 1/2 cycle	114.2	No	114.4	-0.2	± 1.0	± 2.0

Conforming	Yes

Uncertainty (+/-) dB	0.09

Description of Tests

12. Peak C sound level (IEC 61672-3 Clause 19)
Indications of C-weighted peak sound level shall be tested on the least-sensitive level range. The test signals consist of (a) a single complete cycle of an 8 kHz sinusoid starting and stopping at zero crossings and (b) positive and negative half cycles of a 500 Hz sinusoid that also start and stop at zero crossings.

The level of the steady sinusoidal 8 kHz electrical input signal, from which a single complete cycle is extracted, shall be adjusted to yield an indication of C-weighted, F-timeweighted sound level, or C-weighted, time-averaged sound level, that is 8 dB less than the upper boundary stated in the Instruction Manual for the peak level range at 8 kHz on the leastsensitive level range. The indication of steady sound level shall be recorded.

The indication of C-weighted peak sound level in response to a complete cycle of the 8 kHz signal shall be recorded. Application of the complete-cycle 8 kHz signal shall not cause indication of an overload condition.

The level of the steady sinusoidal 500 Hz electrical input signal, from which positive and negative half cycles are extracted, shall be adjusted to yield an indication of C-weighted, Ftime-weighted sound level, or C-weighted, time-averaged sound level, that is 8 dB less than the upper boundary stated in the Instruction Manual for the peak level range on the least-sensitive level range. The indications of steady sound levels shall be recorded.

The indications of C-weighted peak sound level in response to a single positive halfcycle 500 Hz signal and to a single negative half-cycle 500 Hz signal shall be recorded and reported. Applications of the 500 Hz half-cycle signals shall not cause indications of an overload condition.

☑ Checked

13. Overload indication

SLM Settings	
Function	Leq
Frequency Weighting	A
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	0.0
Generator Frequency (Hz)	4k
Reference SPL (dB)	119.0
Output (mVrms)	763.6

	Half-Cycle Signal			Tolerance	
	Positive	Negative	Difference	Type 1	Type 2
Level (dB)	125.1	125.1	0.0	± 1.5	± 1.5
Generator Output (mVrms)	1549.0	1548.0			

Conforming	Yes

Uncertainty (+/-) dB	0.09

Overload Indicated	No
Overload Indicator Latches	N/A

Conforming	N/A

Description of Tests

13. Overload Indication (IEC 61672-3 Clause 20)
The test of overload indication shall only be performed for sound level meters capable of displaying time-average sound level.

Overload indication shall be tested on the least-sensitive level range with the sound level meter set to display A-weighted, time-average sound level. Positive and negative one-half-cycle sinusoidal electrical signals at a frequency of 4 kHz shall be used.(IEC 61672-3 Clause 20.2)

The test shall begin at an indicated time-averaged level for the steady input signal that corresponds to 1 dB less than the upper boundary specified for the linear operating range at 4 kHz. The level of the single positive one-half-cycle input signal shall be increased to the first indication of overload, to a resolution of 0.1 dB. The process shall be repeated for the single negative one-half-cycle signal. The levels of the single one-half-cycle input signals that produced the first indications of overload shall be recorded to a resolution of 0.1 dB.

It shall be verified that the overload indicator latches on as specified in IEC 61672-1 when an overload condition occurs.

☑ Checked

14. High-level Stability

SLM Settings	
Time Weighting	F
Frequency Weighting	A
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	0.0
Generator Frequency (Hz)	1k
Reference SPL (dB)	119.0
Output (mVrms)	826.1

Time Period to Apply Signal (min)	5.0
Record SPL at Conclusion of Time Period (dB)	119.0
Difference	0.0
Tolerance	± 0.1

Conforming	Yes

Uncertainty (+/-) dB	0.09

Description of Tests

14. High-level Stability (IEC 61672-3 Clause 21)
The ability of a sound level meter to operate continuously in response to high signal levels without significant change in sensitivity is evaluated from the difference between the Aweighted sound levels indicated in response to a steady 1 kHz electrical signal at the beginning and end of a 5 min period of continuous exposure to the signal.

The level of the steady electrical input signal shall be that which is required to display the sound level that is 1 dB less than the upper boundary of the 1 kHz linear operating range on the least-sensitive level range.

☑ Checked

15(a). Octave Band Filter Relative Attenuation (≤2kHz)

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
Range	HIGH
Set dB Below Full Scale	-1
Attenuator dB	0.0
Reference SPL 1kHz	133.0
Output mVrms	3827.0
Noise Floor dB	-99.0

Ratio	1	2	3	4	5	6	7	8	9	10	Tolerance	
Freq	4 Hz	8 Hz	16 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz		
0.06				41.5					48.9			
0.13				50.3					50.3			
0.25				58.7					53.8			
0.50				74.4					70.9			
0.71												
0.77				132.9					133.0			
0.84				132.9					133.0			
0.92				132.8					133.0			
1.00				**132.9**					**133.0**			
1.09				132.9					133.0			
1.19				132.9					133.0			
1.30				132.9					133.0			
1.41												
2.00				45.8					39.4			
4.00				40.9					31.5			
8.00				23.2					33.4			
16.00				23.6					32.3		Class 1	Class 2
Attenuation dB				91.4					84.1		+70/inf	+60/inf
				82.6					82.7		+60/inf	+54/inf
				74.2					79.2		+40.5/inf	+39.5/inf
				58.5					62.1		+16.6/inf	+15.6/inf
											-0.4/+5.3	-0.6/+5.8
				0.0					0.0		-0.4/+1.4	-0.6/+1.7
				0.0					0.0		-0.4/+0.7	-0.6/+0.9
				0.1					0.0		-0.4/+0.5	-0.6/+0.7
				0.0					**0.0**		-0.4/+0.4	-0.6/+0.6
				0.0					0.0		-0.4/+0.5	-0.6/+0.7
				0.0					0.0		-0.4/+0.7	-0.6/+0.9
				0.0					0.0		-0.4/+1.4	-0.6/+1.7
											-0.4/+5.3	-0.6/+5.8
				87.1					93.6		+16.6/inf	+15.6/inf
				92.0					101.5		+40.5/inf	+39.5/inf
				109.7					99.6		+60/inf	+54/inf
				109.3					100.7		+70/inf	+60/inf
Ins Loss				-0.1					0.0			
Conforming	N/A	N/A	N/A	Yes	N/A	N/A	N/A	N/A	Yes	N/A		

Uncert (+/-) dB	≤80dB	0.09	>80dB	0.46

Description of Test

15(a) Octave Filter (IEC 61260-3 Clause 13)

13 Measurement of relative attenuation
13.1 The relative attenuation on the reference level range shall be tested for the same three filters as selected in Clause 11.
13.2 The measurements of relative attenuation are made as the response to constant amplitude sinusoidal signals at various frequencies. The level of the input signals shall be (1 ± 0,1) dB below the specified upper boundary of the linear operating range.
13.6 The measured relative attenuation shall not exceed the acceptance limits given in Table 1 for the appropriate class of filter.

Interpretation: The three filters specified in "Clause 11" are 31.5Hz, 1kHz and 16kHz. The limits in "Table 1" are the Tolerance values shown in green above. The yellow cells are the observed values. The "Attenuation dB" cells are the attenuation values of each filter with the filter's centre frequency attenuation assumed to be zero (i.e. the relative attenuation). The "Ins Loss" are the actual values of attenuation at the filter centre frequencies.

☑ Checked

15(b). Octave Band Filter Relative Attenuation (>2kHz)

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	HIGH
Set dB Below Full Scale	-1.0
Attenuator dB	0.0
Reference SPL 1kHz	133.0
Output mVrms	3827.0
Noise Floor dB	-99.0

Ratio	1	2	3	4	5	6	7	8	9	10	Tolerance	
Freq	4kHz	8kHz	16kHz	32kHz								
0.06			50.7									
0.13			54.5									
0.25			55.4									
0.50			70.7									
0.71												
0.77			133.0									
0.84			133.0									
0.92			132.9									
1.00			**133.0**									
1.09			133.0									
1.19			133.0									
1.30			133.0									
1.41												
2.00			52.0									
4.00			45.9									
8.00			53.8									
16.00			51.7								Class 1	Class 2
Attenuation dB			82.3								+70/inf	+60/inf
			78.5								+60/inf	+54/inf
			77.6								+40.5/inf	+39.5/inf
			62.3								+16.6/inf	+15.6/inf
											-0.4/+5.3	-0.6/+5.8
			0.0								-0.4/+1.4	-0.6/+1.7
			0.0								-0.4/+0.7	-0.6/+0.9
			0.1								-0.4/+0.5	-0.6/+0.7
			0.0								-0.4/+0.4	-0.6/+0.6
			0.0								-0.4/+0.5	-0.6/+0.7
			0.0								-0.4/+0.7	-0.6/+0.9
			0.0								-0.4/+1.4	-0.6/+1.7
											-0.4/+5.3	-0.6/+5.8
			81.0								+16.6/inf	+15.6/inf
			87.1								+40.5/inf	+39.5/inf
			79.2								+60/inf	+54/inf
			81.3								+70/inf	+60/inf

Ins Loss			0.0							
Conforming	N/A	N/A	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Uncert (+/-) dB	≤80dB	0.09	>80dB	0.46

Description of Test

15(b) Octave Filter (IEC 61260-3 Clause 13)

13 Measurement of relative attenuation
13.1 The relative attenuation on the reference level range shall be tested for the same three filters as selected in Clause 11.
13.2 The measurements of relative attenuation are made as the response to constant amplitude sinusoidal signals at various frequencies. The level of the input signals shall be (1 ± 0,1) dB below the specified upper boundary of the linear operating range.
13.6 The measured relative attenuation shall not exceed the acceptance limits given in Table 1 for the appropriate class of filter.

Interpretation: The three filters specified in "Clause 11" are 31.5Hz, 1kHz and 16kHz. The limits in "Table 1" are the Tolerance values shown in green above. The yellow cells are the observed values. The "Attenuation dB" cells are the attenuation values of each filter with the filter's centre frequency attenuation assumed to be zero (i.e. the relative attenuation). The "Ins Loss" are the actual values of attenuation at the filter centre frequencies.

☑ Checked

16. Octave Band Filter Relative Attenuation at Midband Frequency

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
Reference Range	MID
Attenuator dB	0.0
Reference SPL 1kHz	94.0
Output mVrms	42.9

	1	2	3	4	5	6	7	8	9	10	Tolerance	
Freq	**4 Hz**	**8 Hz**	**16 Hz**	**31.5 Hz**	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**Class 1**	**Class 2**
Measured			94.4	93.9	94.0	94.1	94.0	94.0	94.0	94.0		
Ins Loss			0.4	-0.1	0.0	0.1	0.0	0.0	0.0	0.0	-0.4/+0.4	-0.6/+0.6
Conforming	**N/A**	**N/A**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		

Freq	**4kHz**	**8kHz**	**16kHz**	**32kHz**							**Class 1**	**Class 2**
Measured	94.0	94.0	94.0									
Ins Loss	0.0	0.0	0.0								-0.4/+0.4	-0.6/+0.6
Conforming	**Yes**	**Yes**	**Yes**	**N/A**								

Uncert (+/-) dB	**0.09**

Description of Test

16. Octave Band Filter Relative Attenuation at Midband Frequency (IEC 61260-3 Clause 10.2)

10.2 Tests of relative attenuation at midband frequency
10.2.1 The relative attenuation at the exact midband frequency shall be measured for every filter in a set of filters. The relative attenuation $\Delta A(\Omega)$ at any midband frequency is determined from Formula (8) given in IEC 61260-1:2014. The reference level range shall be selected for the test. The level of the test signal shall be equal to the reference input signal level.
10.2.2 The measured relative attenuation shall not exceed the acceptance limits ± 0,4 dB for Class 1 filters or ± 0,6 dB for class 2 filters as specified in 5.10 in IEC 61260-1:2014.

Interpretation: The yellow cells are the observed values. The "Ins Loss" are the actual values of attenuation at the filter centre frequencies. The "Conforming" cells demonstrate compliance with the Tolerance limits depending upon the Class of filter.

☑ Checked

17(a). Octave Band Filter Level Linearity 31.5Hz (Increasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Over SLM Range	5
Attenuation (dB)	31.0
Generator Frequency (Hz)	31.5
SPL Reference Starting Point (dB)	94.0
Output (mVrms)	1669.0
Noise Floor (dB)	-99.0

Increasing level to Overload				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
26.0	99.0	99.0	0.0	±0.5	±0.6
21.0	104.0	104.0	0.0	±0.5	±0.6
16.0	109.0	109.0	0.0	±0.5	±0.6
11.0	114.0	114.0	0.0	±0.5	±0.6
10.0	115.0	115.0	0.0	±0.5	±0.6
9.0	116.0	116.0	0.0	±0.5	±0.6
8.0	117.0	117.0	0.0	±0.5	±0.6
7.0	118.0	118.0	0.0	±0.5	±0.6
6.0	119.0	119.0	0.0	±0.5	±0.6
5.0	120.0	120.0	0.0	±0.5	±0.6
4.0	121.0	121.0	0.0	±0.5	±0.6
3.0	122.0	122.0	0.0	±0.5	±0.6
2.0	123.0	123.0	0.0	±0.5	±0.6
1.0	124.0	124.0	0.0	±0.5	±0.6
0.0	125.0	125.0	0.0	±0.5	±0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

17(a). Filter Level linearity on the reference level range (IEC 61260-3 Clause 11)

The level linearity shall be tested for three filters in a set of filters. For a set of filters covering the audible range of frequencies, it is recommended to test filters with frequencies close to 31.5 Hz,1 kHz and 16 kHz.

The test shall be performed on the reference level range for levels from the specified lower boundary of the specified linear operating range up to a level where the overload indicator displays an overload. Adjust the level of the input signal with steps that are not greater than 5 dB. The difference between successive steps of the input signal level shall be reduced to 1 dB when the distance to the lower or upper boundaries of a linear operating range is less than 5 dB and when the level is above the upper boundary. The boundaries are as stated in the instruction manual for the filter. If no overload is displayed, the filter does not conform to the requirements.

The measured level linearity deviation shall not exceed the acceptance limits given in 5.13 in IEC 61260-1:2014 for all measured levels between the lower boundary of the linear operating range, as stated in the instruction manual for the filter, and up to the highest level, measured as described above, without an overload indication.

An overload shall not be indicated if the level of the input signal is below the stated upper boundary of each appropriate linear operating range.

"Y" means indicator over-range.

☑ Checked

17(b). Octave Band Filter Level Linearity 1kHz (Increasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Over SLM Range	5
Attenuation (dB)	31.0
Generator Frequency (Hz)	1k
SPL Reference Starting Point (dB)	94.0
Output (mVrms)	1644.0
Noise Floor (dB)	-99.0

Increasing level to Overload				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
26.0	99.0	99.0	0.0	±0.5	±0.6
21.0	104.0	104.0	0.0	±0.5	±0.6
16.0	109.0	109.0	0.0	±0.5	±0.6
11.0	114.0	114.0	0.0	±0.5	±0.6
10.0	115.0	115.0	0.0	±0.5	±0.6
9.0	116.0	116.0	0.0	±0.5	±0.6
8.0	117.0	117.0	0.0	±0.5	±0.6
7.0	118.0	118.0	0.0	±0.5	±0.6
6.0	119.0	119.0	0.0	±0.5	±0.6
5.0	120.0	120.0	0.0	±0.5	±0.6
4.0	121.0	121.0	0.0	±0.5	±0.6
3.0	122.0	122.0	0.0	±0.5	±0.6
2.0	123.0	123.0	0.0	±0.5	±0.6
1.0	124.0	124.0	0.0	±0.5	±0.6
0.0	125.0	125.0	0.0	±0.5	±0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

17(b). Filter Level linearity on the reference level range (IEC 61260-3 Clause 11)

The level linearity shall be tested for three filters in a set of filters. For a set of filters covering the audible range of frequencies, it is recommended to test filters with frequencies close to 31.5 Hz,1 kHz and 16 kHz.

The test shall be performed on the reference level range for levels from the specified lower boundary of the specified linear operating range up to a level where the overload indicator displays an overload. Adjust the level of the input signal with steps that are not greater than 5 dB. The difference between successive steps of the input signal level shall be reduced to 1 dB when the distance to the lower or upper boundaries of a linear operating range is less than 5 dB and when the level is above the upper boundary. The boundaries are as stated in the instruction manual for the filter. If no overload is displayed, the filter does not conform to the requirements.

The measured level linearity deviation shall not exceed the acceptance limits given in 5.13 in IEC 61260-1:2014 for all measured levels between the lower boundary of the linear operating range, as stated in the instruction manual for the filter, and up to the highest level, measured as described above, without an overload indication.

An overload shall not be indicated if the level of the input signal is below the stated upper boundary of each appropriate linear operating range.

"Y" means indicator over-range.

☑ Checked

17(c). Octave Band Filter Level Linearity 16kHz (Increasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Over SLM Range	5
Attenuation (dB)	31.0
Generator Frequency (Hz)	16k
SPL Reference Starting Point (dB)	94.0
Output (mVrms)	1641.0
Noise Floor (dB)	-99.0

Increasing level to Overload				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
26.0	99.0	99.0	0.0	±0.5	±0.6
21.0	104.0	104.0	0.0	±0.5	±0.6
16.0	109.0	109.0	0.0	±0.5	±0.6
11.0	114.0	114.0	0.0	±0.5	±0.6
10.0	115.0	115.0	0.0	±0.5	±0.6
9.0	116.0	116.0	0.0	±0.5	±0.6
8.0	117.0	117.0	0.0	±0.5	±0.6
7.0	118.0	118.0	0.0	±0.5	±0.6
6.0	119.0	119.0	0.0	±0.5	±0.6
5.0	120.0	120.0	0.0	±0.5	±0.6
4.0	121.0	121.0	0.0	±0.5	±0.6
3.0	122.0	122.0	0.0	±0.5	±0.6
2.0	123.0	123.0	0.0	±0.5	±0.6
1.0	124.0	124.0	0.0	±0.5	±0.6
0.0	125.0	125.0	0.0	±0.5	±0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

17(c). Filter Level linearity on the reference level range (IEC 61260-3 Clause 11)

The level linearity shall be tested for three filters in a set of filters. For a set of filters covering the audible range of frequencies, it is recommended to test filters with frequencies close to 31.5 Hz,1 kHz and 16 kHz.

The test shall be performed on the reference level range for levels from the specified lower boundary of the specified linear operating range up to a level where the overload indicator displays an overload. Adjust the level of the input signal with steps that are not greater than 5 dB. The difference between successive steps of the input signal level shall be reduced to 1 dB when the distance to the lower or upper boundaries of a linear operating range is less than 5 dB and when the level is above the upper boundary. The boundaries are as stated in the instruction manual for the filter. If no overload is displayed, the filter does not conform to the requirements.

The measured level linearity deviation shall not exceed the acceptance limits given in 5.13 in IEC 61260-1:2014 for all measured levels between the lower boundary of the linear operating range, as stated in the instruction manual for the filter, and up to the highest level, measured as described above, without an overload indication.

An overload shall not be indicated if the level of the input signal is below the stated upper boundary of each appropriate linear operating range.

"Y" means indicator over-range.

☑ Checked

18(a). Octave Band Filter Level Linearity 31.5Hz (Decreasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Under SLM Range	0
Attenuation (dB)	0.0
Generator Frequency (Hz)	31.5
SPL Reference Starting Point (dB)	94
Output (mVrms)	47.1
Noise Floor (dB)	-99.0

Decreasing level to Underange				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
5.0	89.0	89.0	0.0	±0.5	±0.6
10.0	84.0	84.0	0.0	±0.5	±0.6
15.0	79.0	79.0	0.0	±0.7	±0.9
20.0	74.0	74.0	0.0	±0.7	±0.9
25.0	69.0	69.0	0.0	±0.7	±0.9
30.0	64.0	64.0	0.0	±0.7	±0.9
35.0	59.0	59.0	0.0	±0.7	±0.9
40.0	54.0	54.0	0.0	±0.7	±0.9
45.0	49.0	49.0	0.0	±0.7	±0.9
49.0	45.0	45.1	0.1	±0.7	±0.9
50.0	44.0	44.1	0.1	±0.7	±0.9
51.0	43.0	43.0	0.0	±0.7	±0.9
52.0	42.0	42.0	0.0	±0.7	±0.9
53.0	41.0	40.9	-0.1	±0.7	±0.9
54.0	40.0	39.9	-0.1	±0.7	±0.9

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

18(a). Filter Level linearity on the reference level range (IEC 61260-3 Clause 11)

The level linearity shall be tested for three filters in a set of filters. For a set of filters covering the audible range of frequencies, it is recommended to test filters with frequencies close to 31.5 Hz,1 kHz and 16 kHz.

The test shall be performed on the reference level range for levels from the specified lower boundary of the specified linear operating range up to a level where the overload indicator displays an overload. Adjust the level of the input signal with steps that are not greater than 5 dB. The difference between successive steps of the input signal level shall be reduced to 1 dB when the distance to the lower or upper boundaries of a linear operating range is less than 5 dB and when the level is above the upper boundary. The boundaries are as stated in the instruction manual for the filter. If no overload is displayed, the filter does not conform to the requirements.

The measured level linearity deviation shall not exceed the acceptance limits given in 5.13 in IEC 61260-1:2014 for all measured levels between the lower boundary of the linear operating range, as stated in the instruction manual for the filter, and up to the highest level, measured as described above, without an overload indication.

An overload shall not be indicated if the level of the input signal is below the stated upper boundary of each appropriate linear operating range.

"Y" means indicator over-range.

☑ Checked

18(b). Octave Band Filter Level Linearity 1kHz (Decreasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Under SLM Range	0
Attenuation (dB)	0.0
Generator Frequency (Hz)	1kHz
SPL Reference Starting Point (dB)	94
Output (mVrms)	46.4
Noise Floor (dB)	-99.0

Decreasing level to Underange				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
5.0	89.0	89.0	0.0	±0.5	±0.6
10.0	84.0	84.0	0.0	±0.5	±0.6
15.0	79.0	79.0	0.0	±0.7	±0.9
20.0	74.0	74.0	0.0	±0.7	±0.9
25.0	69.0	69.0	0.0	±0.7	±0.9
30.0	64.0	64.0	0.0	±0.7	±0.9
35.0	59.0	59.0	0.0	±0.7	±0.9
40.0	54.0	54.0	0.0	±0.7	±0.9
45.0	49.0	49.0	0.0	±0.7	±0.9
49.0	45.0	45.0	0.0	±0.7	±0.9
50.0	44.0	44.0	0.0	±0.7	±0.9
51.0	43.0	42.9	-0.1	±0.7	±0.9
52.0	42.0	41.9	-0.1	±0.7	±0.9
53.0	41.0	41.0	0.0	±0.7	±0.9
54.0	40.0	39.9	-0.1	±0.7	±0.9

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

18(b). Filter Level linearity on the reference level range (IEC 61260-3 Clause 11)

The level linearity shall be tested for three filters in a set of filters. For a set of filters covering the audible range of frequencies, it is recommended to test filters with frequencies close to 31.5 Hz,1 kHz and 16 kHz.

The test shall be performed on the reference level range for levels from the specified lower boundary of the specified linear operating range up to a level where the overload indicator displays an overload. Adjust the level of the input signal with steps that are not greater than 5 dB. The difference between successive steps of the input signal level shall be reduced to 1 dB when the distance to the lower or upper boundaries of a linear operating range is less than 5 dB and when the level is above the upper boundary. The boundaries are as stated in the instruction manual for the filter. If no overload is displayed, the filter does not conform to the requirements.

The measured level linearity deviation shall not exceed the acceptance limits given in 5.13 in IEC 61260-1:2014 for all measured levels between the lower boundary of the linear operating range, as stated in the instruction manual for the filter, and up to the highest level, measured as described above, without an overload indication.

An overload shall not be indicated if the level of the input signal is below the stated upper boundary of each appropriate linear operating range.

"Y" means indicator over-range.

☑ Checked

18(c). Octave Band Filter Level Linearity 16kHz (Decreasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Under SLM Range	0
Attenuation (dB)	0.0
Generator Frequency (Hz)	16kHz
SPL Reference Starting Point (dB)	94
Output (mVrms)	46.3
Noise Floor (dB)	-99.0

Decreasing level to Underange				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
5.0	89.0	89.0	0.0	±0.5	±0.6
10.0	84.0	84.0	0.0	±0.5	±0.6
15.0	79.0	79.0	0.0	±0.7	±0.9
20.0	74.0	74.0	0.0	±0.7	±0.9
25.0	69.0	69.0	0.0	±0.7	±0.9
30.0	64.0	64.0	0.0	±0.7	±0.9
35.0	59.0	59.0	0.0	±0.7	±0.9
40.0	54.0	54.0	0.0	±0.7	±0.9
45.0	49.0	49.0	0.0	±0.7	±0.9
49.0	45.0	45.0	0.0	±0.7	±0.9
50.0	44.0	44.0	0.0	±0.7	±0.9
51.0	43.0	43.0	0.0	±0.7	±0.9
52.0	42.0	42.0	0.0	±0.7	±0.9
53.0	41.0	41.0	0.0	±0.7	±0.9
54.0	40.0	40.0	0.0	±0.7	±0.9

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

18(c). Filter Level linearity on the reference level range (IEC 61260-3 Clause 11)

The level linearity shall be tested for three filters in a set of filters. For a set of filters covering the audible range of frequencies, it is recommended to test filters with frequencies close to 31.5 Hz,1 kHz and 16 kHz.

The test shall be performed on the reference level range for levels from the specified lower boundary of the specified linear operating range up to a level where the overload indicator displays an overload. Adjust the level of the input signal with steps that are not greater than 5 dB. The difference between successive steps of the input signal level shall be reduced to 1 dB when the distance to the lower or upper boundaries of a linear operating range is less than 5 dB and when the level is above the upper boundary. The boundaries are as stated in the instruction manual for the filter. If no overload is displayed, the filter does not conform to the requirements.

The measured level linearity deviation shall not exceed the acceptance limits given in 5.13 in IEC 61260-1:2014 for all measured levels between the lower boundary of the linear operating range, as stated in the instruction manual for the filter, and up to the highest level, measured as described above, without an overload indication.

An overload shall not be indicated if the level of the input signal is below the stated upper boundary of each appropriate linear operating range.

"Y" means indicator over-range.

☑ Checked

19. Octave Level Ranges

19(a). Octave Level Linearity Including the Level range (31.5Hz)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	10
Generator Frequency (Hz)	31.5
Reference SPL (dB)	94
Output (mVrms)	148.7

Settings		Level (dB)			Tolerance	
Range	Atten	Expected	Indicated	Difference	Type 1	Type 2
HIGH	0.0	104.0	104.0	0.0	± 0.5	± 0.6
MID	14.0	90.0	90.0	0.0	± 0.5	± 0.6
LOW	34.0	70.0	70.0	0.0	± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

19(b). Octave Level Linearity Including the Level range (1kHz)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	10
Generator Frequency (Hz)	1k
Reference SPL (dB)	94
Output (mVrms)	146.5

Settings		Level (dB)			Tolerance	
Range	Atten	Expected	Indicated	Difference	Type 1	Type 2
HIGH	0.0	104.0	104.0	0.0	± 0.5	± 0.6
MID	14.0	90.0	90.0	0.0	± 0.5	± 0.6
LOW	34.0	70.0	70.0	0.0	± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

19(c). Octave Level Linearity Including the Level range (16kHz)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	10
Generator Frequency (Hz)	16k
Reference SPL (dB)	94
Output (mVrms)	146.0

Settings		Level (dB)			Tolerance	
Range	Atten	Expected	Indicated	Difference	Type 1	Type 2
HIGH	0.0	104.0	103.9	-0.1	± 0.5	± 0.6
MID	14.0	90.0	90.0	0.0	± 0.5	± 0.6
LOW	34.0	70.0	70.0	0.0	± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

19. Filter Level linearity including the level range control (IEC 61260-3 Clause 11.9)

11.9 For the same three filters as selected above, test each available level range in the following way: based on the same reference level, adjust the input level to be 30 dB below upper boundary of the linear operating range for each of the selected range settings. The measured level linearity deviation shall not exceed the acceptance limits given in 5.13.3 and 5.13.4 of IEC 61260-1:2014

The three filter frequencies are 31.5Hz, 1kHz and 16kHz.

The level linearity differences are calculated as the indicated signal level minus the corresponding expected signal level.

☑ Checked

20. Octave Band Filter Lower Limit

20(a). Octave Band Filter Lower Limit (Reference Range)

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
Reference Range	MID
Lower Limit for the Range	40

	1	2	3	4	5	6	7	8	9	10
Freq	4 Hz	8 Hz	16 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz
Measured		15.4	12.8	9.3	7.3	6.4	6.2	6.3	7.2	9.0
Conforming	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Freq	4kHz	8kHz	16kHz	32kHz						
Measured	11.2	14.0	17.4							
Conforming	Yes	Yes	Yes	N/A						

Conforming	Yes

Uncert (+/-) dB	0.09

20(b). Octave Band Filter Lower Limit (Lowest Range)

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
Lowest Range	LOW
Lower Limit for the Range	20

	1	2	3	4	5	6	7	8	9	10
Freq	4 Hz	8 Hz	16 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz
Measured		14.4	11.7	8.8	8.5	5.5	4.6	3.8	3.3	2.9
Conforming	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Freq	4kHz	8kHz	16kHz	32kHz						
Measured	3.1	4.3	6.3							
Conforming	Yes	Yes	Yes	N/A						

Conforming	Yes

Uncert (+/-) dB	0.09

20. Octave Band Filter Lower LImit (IEC 61260-3 Clause 12)

12.2 Short-circuit the input terminal or use similar means to ensure that the level of the input signal is below the lower limit of the specified linear operating range. Record the output level from each filter in the set. The output level shall not exceed the specified lower limit for the appropriate filter and range.

Interpretation: The yellow cells are the observed values. The measured value must not exceed the Lower LImit for the Range.

☑ Checked

21(a). Third Octave Band Filter Relative Attenuation (≤31.5Hz)

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	HIGH
Set dB Below Full Scale	-1
Attenuator dB	0.0
Reference SPL 1kHz	133.0
Output mVrms	3827.0
Noise Floor dB	-99.0

Ratio	1	2	3	4	5	6	7	8	9	10	Tolerance	
Freq	4Hz	5Hz	6.3Hz	8Hz	10Hz	12.5Hz	16Hz	20Hz	25Hz	31.5Hz		
0.18										48.7		
0.33										57.5		
0.53										70.3		
0.77										69.6		
0.89												
0.92										132.4		
0.95										132.9		
0.97										132.9		
1.00										**132.8**		
1.03										132.9		
1.06										132.9		
1.09										132.2		
1.12												
1.30										66.2		
1.89										20.3		
3.07										18.8		
5.43										20.5	Class 1	Class 2
Attenuation dB										84.1	+70/inf	+60/inf
										75.3	+60/inf	+54/inf
										62.5	+40.5/inf	+39.5/inf
										63.2	+16.6/inf	+15.6/inf
											-0.4/+5.3	-0.6/+5.8
										0.4	-0.4/+1.4	-0.6/+1.7
										-0.1	-0.4/+0.7	-0.6/+0.9
										-0.1	-0.4/+0.5	-0.6/+0.7
										0.0	-0.4/+0.4	-0.6/+0.6
										-0.1	-0.4/+0.5	-0.6/+0.7
										-0.1	-0.4/+0.7	-0.6/+0.9
										0.6	-0.4/+1.4	-0.6/+1.7
											-0.4/+5.3	-0.6/+5.8
										66.6	+16.6/inf	+15.6/inf
										112.5	+40.5/inf	+39.5/inf
										114.0	+60/inf	+54/inf
										112.3	+70/inf	+60/inf
Ins Loss										**-0.2**		
Conforming	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes		

Uncert (+/-) dB	≤80dB	0.09	>80dB	0.46

Description of Test

21(a) Octave Filter (IEC 61260-3 Clause 13)

13 Measurement of relative attenuation
13.1 The relative attenuation on the reference level range shall be tested for the same three filters as selected in Clause 11.
13.2 The measurements of relative attenuation are made as the response to constant amplitude sinusoidal signals at various frequencies. The level of the input signals shall be (1 ± 0,1) dB below the specified upper boundary of the linear operating range.
13.6 The measured relative attenuation shall not exceed the acceptance limits given in Table 1 for the appropriate class of filter.

Interpretation: The three filters specified in "Clause 11" are 31.5Hz, 1kHz and 16kHz unless the client expands this range. The limits in "Table 1" are the Tolerance values shown in green above. The yellow cells are the observed values. The "Attenuation dB" cells are the attenuation values of each filter with the filter's centre frequency attenuation assumed to be zero (i.e. the relative attenuation). The "Ins Loss" are the actual values of attenuation at the filter centre frequencies.

☑ Checked

21(b). Third Octave Band Filter Relative Attenuation (40Hz-315Hz)

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	HIGH
Set dB Below Full Scale	-1.0
Attenuator dB	0.0
Reference SPL 1kHz	133.0
Output mVrms	3827.0
Noise Floor dB	-99.0

Ratio	1	2	3	4	5	6	7	8	9	10	Tolerance	
Freq	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz		
0.18									48.9			
0.33									54.3			
0.53									65.9			
0.77									70.9			
0.89												
0.92									132.7			
0.95									133.1			
0.97									133.0			
1.00									**133.0**			
1.03									133.0			
1.06									133.0			
1.09									132.3			
1.12												
1.30									58.1			
1.89									51.6			
3.07									23.2			
5.43									23.2		Class 1	Class 2
Attenuation dB									84.1		+70/inf	+60/inf
									78.7		+60/inf	+54/inf
									67.1		+40.5/inf	+39.5/inf
									62.1		+16.6/inf	+15.6/inf
											-0.4/+5.3	-0.6/+5.8
									0.3		-0.4/+1.4	-0.6/+1.7
									-0.1		-0.4/+0.7	-0.6/+0.9
									0.0		-0.4/+0.5	-0.6/+0.7
									0.0		-0.4/+0.4	-0.6/+0.6
									0.0		-0.4/+0.5	-0.6/+0.7
									0.0		-0.4/+0.7	-0.6/+0.9
									0.7		-0.4/+1.4	-0.6/+1.7
											-0.4/+5.3	-0.6/+5.8
									74.9		+16.6/inf	+15.6/inf
									81.4		+40.5/inf	+39.5/inf
									109.8		+60/inf	+54/inf
									109.8		+70/inf	+60/inf

Ins Loss									0.0	
Conforming	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes	N/A

Uncert (+/-) dB	≤80dB	0.09	>80dB	0.46

Description of Test

21(b) Octave Filter (IEC 61260-3 Clause 13)

13 Measurement of relative attenuation
13.1 The relative attenuation on the reference level range shall be tested for the same three filters as selected in Clause 11.
13.2 The measurements of relative attenuation are made as the response to constant amplitude sinusoidal signals at various frequencies. The level of the input signals shall be (1 ± 0,1) dB below the specified upper boundary of the linear operating range.
13.6 The measured relative attenuation shall not exceed the acceptance limits given in Table 1 for the appropriate class of filter.

Interpretation: The three filters specified in "Clause 11" are 31.5Hz, 1kHz and 16kHz unless the client expands this range. The limits in "Table 1" are the Tolerance values shown in green above. The yellow cells are the observed values. The "Attenuation dB" cells are the attenuation values of each filter with the filter's centre frequency attenuation assumed to be zero (i.e. the relative attenuation). The "Ins Loss" are the actual values of attenuation at the filter centre frequencies.

☑ Checked

21(c). Third Octave Band Filter Relative Attenuation (400Hz-3.15kHz)

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	HIGH
Set dB Below Full Scale	-1.0
Attenuator dB	0.0
Reference SPL 1kHz	133.0
Output mVrms	3827.0
Noise Floor dB	-99.0

Ratio	1	2	3	4	5	6	7	8	9	10	Tolerance	
Freq	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz		
0.18					45.6							
0.33					48.8							
0.53					58.6							
0.77					70.6							
0.89												
0.92					132.7							
0.95					133.0							
0.97					133.0							
1.00					**133.0**							
1.03					133.0							
1.06					133.0							
1.09					132.2							
1.12												
1.30					58.1							
1.89					51.6							
3.07					26.9							
5.43					27.4						Class 1	Class 2
Attenuation dB					87.4						+70/inf	+60/inf
					84.2						+60/inf	+54/inf
					74.4						+40.5/inf	+39.5/inf
					62.4						+16.6/inf	+15.6/inf
											-0.4/+5.3	-0.6/+5.8
					0.3						-0.4/+1.4	-0.6/+1.7
					0.0						-0.4/+0.7	-0.6/+0.9
					0.0						-0.4/+0.5	-0.6/+0.7
					0.0						-0.4/+0.4	-0.6/+0.6
					0.0						-0.4/+0.5	-0.6/+0.7
					0.0						-0.4/+0.7	-0.6/+0.9
					0.8						-0.4/+1.4	-0.6/+1.7
											-0.4/+5.3	-0.6/+5.8
					74.9						+16.6/inf	+15.6/inf
					81.4						+40.5/inf	+39.5/inf
					106.1						+60/inf	+54/inf
					105.6						+70/inf	+60/inf

Ins Loss					0.0					
Conforming	N/A	N/A	N/A	N/A	Yes	N/A	N/A	N/A	N/A	N/A

Uncert (+/-) dB	≤80dB	0.09	>80dB	0.46

Description of Test

21(c) Octave Filter (IEC 61260-3 Clause 13)

13 Measurement of relative attenuation
13.1 The relative attenuation on the reference level range shall be tested for the same three filters as selected in Clause 11.
13.2 The measurements of relative attenuation are made as the response to constant amplitude sinusoidal signals at various frequencies. The level of the input signals shall be (1 ± 0,1) dB below the specified upper boundary of the linear operating range.
13.6 The measured relative attenuation shall not exceed the acceptance limits given in Table 1 for the appropriate class of filter.

Interpretation: The three filters specified in "Clause 11" are 31.5Hz, 1kHz and 16kHz unless the client expands this range. The limits in "Table 1" are the Tolerance values shown in green above. The yellow cells are the observed values. The "Attenuation dB" cells are the attenuation values of each filter with the filter's centre frequency attenuation assumed to be zero (i.e. the relative attenuation). The "Ins Loss" are the actual values of attenuation at the filter centre frequencies.

☑ Checked

21(d). Third Octave Band Filter Relative Attenuation (≥4kHz)

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	HIGH
Set dB Below Full Scale	-1.0
Attenuator dB	0.0
Reference SPL 1kHz	133.0
Output mVrms	3827.0
Noise Floor dB	-99.0

Ratio	1	2	3	4	5	6	7	8	9	10	Tolerance	
Freq	4kHz	5kHz	6.3kHz	8kHz	10kHz	12.5kHz	16kHz	20kHz	25kHz	31.5kHz		
0.18							49.7					
0.33							53.9					
0.53							53.3					
0.77							70.5					
0.89												
0.92							132.7					
0.95							133.0					
0.97							133.0					
1.00							**133.0**					
1.03							133.0					
1.06							133.0					
1.09							132.2					
1.12												
1.30							58.3					
1.89							42.4					
3.07							38.1					
5.43							55.1				Class 1	Class 2
Attenuation dB							83.3				+70/inf	+60/inf
							79.1				+60/inf	+54/inf
							79.7				+40.5/inf	+39.5/inf
							62.5				+16.6/inf	+15.6/inf
											-0.4/+5.3	-0.6/+5.8
							0.3				-0.4/+1.4	-0.6/+1.7
							0.0				-0.4/+0.7	-0.6/+0.9
							0.0				-0.4/+0.5	-0.6/+0.7
							0.0				-0.4/+0.4	-0.6/+0.6
							0.0				-0.4/+0.5	-0.6/+0.7
							0.0				-0.4/+0.7	-0.6/+0.9
							0.8				-0.4/+1.4	-0.6/+1.7
											-0.4/+5.3	-0.6/+5.8
							74.7				+16.6/inf	+15.6/inf
							90.6				+40.5/inf	+39.5/inf
							94.9				+60/inf	+54/inf
							77.9				+70/inf	+60/inf

Ins Loss							0.0			
Conforming	N/A	N/A	N/A	N/A	N/A	N/A	Yes	N/A	N/A	N/A

Uncert (+/-) dB	≤80dB	0.09	>80dB	0.46

Description of Test

21(d) Octave Filter (IEC 61260-3 Clause 13)

13 Measurement of relative attenuation
13.1 The relative attenuation on the reference level range shall be tested for the same three filters as selected in Clause 11.
13.2 The measurements of relative attenuation are made as the response to constant amplitude sinusoidal signals at various frequencies. The level of the input signals shall be (1 ± 0,1) dB below the specified upper boundary of the linear operating range.
13.6 The measured relative attenuation shall not exceed the acceptance limits given in Table 1 for the appropriate class of filter.

Interpretation: The three filters specified in "Clause 11" are 31.5Hz, 1kHz and 16kHz unless the client expands this range. The limits in "Table 1" are the Tolerance values shown in green above. The yellow cells are the observed values. The "Attenuation dB" cells are the attenuation values of each filter with the filter's centre frequency attenuation assumed to be zero (i.e. the relative attenuation). The "Ins Loss" are the actual values of attenuation at the filter centre frequencies.

☑ Checked

22. Third Octave Band Filter Relative Attenuation at Midband Frequency

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
Reference Range	MID
Attenuator dB	0.0
Reference SPL 1kHz	94.0
Output mVrms	42.9

	1	2	3	4	5	6	7	8	9	10	Tolerance	
Freq	**4Hz**	**5Hz**	**6.3Hz**	**8Hz**	**10Hz**	**12.5Hz**	**16Hz**	**20Hz**	**25Hz**	**31.5Hz**	**Class 1**	**Class 2**
Measured							94.3	94.1	93.9	93.8		
Ins Loss							0.3	0.1	-0.1	-0.2	-0.4/+0.4	-0.6/+0.6
Conforming	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**Yes**	**Yes**	**Yes**	**Yes**		

Freq	**40Hz**	**50Hz**	**63Hz**	**80Hz**	**100Hz**	**125Hz**	**160Hz**	**200Hz**	**250Hz**	**315Hz**	**Class 1**	**Class 2**
Measured	93.9	93.9	94.0	94.0	94.0	94.1	94.1	94.0	94.0	94.0		
Ins Loss	-0.1	-0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	-0.4/+0.4	-0.6/+0.6
Conforming	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		

Freq	**400Hz**	**500Hz**	**630Hz**	**800Hz**	**1kHz**	**1.25kHz**	**1.6kHz**	**2kHz**	**2.5kHz**	**3.15kHz**	**Class 1**	**Class 2**
Measured	94.0	94.0	94.0	94.0	94.0	94.0	94.0	94.0	94.0	94.0		
Ins Loss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4/+0.4	-0.6/+0.6
Conforming	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		

Freq	**4kHz**	**5kHz**	**6.3kHz**	**8kHz**	**10kHz**	**12.5kHz**	**16kHz**	**20kHz**	**25kHz**	**31.5kHz**	**Class 1**	**Class 2**
Measured	94.0	94.0	94.0	94.0	94.0	94.0	94.0	94.1				
Ins Loss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1			-0.4/+0.4	-0.6/+0.6
Conforming	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**N/A**	**N/A**		

Uncert (+/-) dB	**0.09**

Description of Test

22. Octave Band Filter Relative Attenuation at Midband Frequency (IEC 61260-3 Clause 10.2)

10.2 Tests of relative attenuation at midband frequency
10.2.1 The relative attenuation at the exact midband frequency shall be measured for every filter in a set of filters. The relative attenuation $\Delta A(\Omega)$ at any midband frequency is determined from Formula (8) given in IEC 61260-1:2014. The reference level range shall be selected for the test. The level of the test signal shall be equal to the reference input signal level.
10.2.2 The measured relative attenuation shall not exceed the acceptance limits ± 0,4 dB for Class 1 filters or ± 0,6 dB for class 2 filters as specified in 5.10 in IEC 61260-1:2014.

Interpretation: The yellow cells are the observed values. The "Ins Loss" are the actual values of attenuation at the filter centre frequencies. The "Conforming" cells demonstrate compliance with the Tolerance limits depending upon the Class of filter.

☑ Checked

23(a). Third Octave Band Filter Level Linearity 31.5Hz (Increasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Over SLM Range	5
Attenuation (dB)	31.0
Generator Frequency (Hz)	31.5
SPL Reference Starting Point (dB)	94.0
Output (mVrms)	1669.0
Noise Floor (dB)	-99.0

Increasing level to Overload				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
26.0	99.0	99.0	0.0	±0.5	±0.6
21.0	104.0	104.0	0.0	±0.5	±0.6
16.0	109.0	109.0	0.0	±0.5	±0.6
11.0	114.0	114.0	0.0	±0.5	±0.6
10.0	115.0	115.0	0.0	±0.5	±0.6
9.0	116.0	116.0	0.0	±0.5	±0.6
8.0	117.0	117.0	0.0	±0.5	±0.6
7.0	118.0	118.0	0.0	±0.5	±0.6
6.0	119.0	119.0	0.0	±0.5	±0.6
5.0	120.0	120.0	0.0	±0.5	±0.6
4.0	121.0	121.0	0.0	±0.5	±0.6
3.0	122.0	122.0	0.0	±0.5	±0.6
2.0	123.0	123.0	0.0	±0.5	±0.6
1.0	124.0	124.0	0.0	±0.5	±0.6
0.0	125.0	125.0	0.0	±0.5	±0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

23(a). Filter Level linearity on the reference level range (IEC 61260-3 Clause 11)

The level linearity shall be tested for three filters in a set of filters. For a set of filters covering the audible range of frequencies, it is recommended to test filters with frequencies close to 31.5 Hz,1 kHz and 16 kHz.

The test shall be performed on the reference level range for levels from the specified lower boundary of the specified linear operating range up to a level where the overload indicator displays an overload. Adjust the level of the input signal with steps that are not greater than 5 dB. The difference between successive steps of the input signal level shall be reduced to 1 dB when the distance to the lower or upper boundaries of a linear operating range is less than 5 dB and when the level is above the upper boundary. The boundaries are as stated in the instruction manual for the filter. If no overload is displayed, the filter does not conform to the requirements.

The measured level linearity deviation shall not exceed the acceptance limits given in 5.13 in IEC 61260-1:2014 for all measured levels between the lower boundary of the linear operating range, as stated in the instruction manual for the filter, and up to the highest level, measured as described above, without an overload indication.

An overload shall not be indicated if the level of the input signal is below the stated upper boundary of each appropriate linear operating range.

"Y" means indicator over-range.

☑ Checked

23(b). Third Octave Band Filter Level Linearity 1kHz (Increasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Over SLM Range	5
Attenuation (dB)	31.0
Generator Frequency (Hz)	1k
SPL Reference Starting Point (dB)	94.0
Output (mVrms)	1644.0
Noise Floor (dB)	-99.0

Increasing level to Overload				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
26.0	99.0	99.0	0.0	±0.5	±0.6
21.0	104.0	104.0	0.0	±0.5	±0.6
16.0	109.0	109.0	0.0	±0.5	±0.6
11.0	114.0	114.0	0.0	±0.5	±0.6
10.0	115.0	115.0	0.0	±0.5	±0.6
9.0	116.0	116.0	0.0	±0.5	±0.6
8.0	117.0	117.0	0.0	±0.5	±0.6
7.0	118.0	118.0	0.0	±0.5	±0.6
6.0	119.0	119.0	0.0	±0.5	±0.6
5.0	120.0	120.0	0.0	±0.5	±0.6
4.0	121.0	121.0	0.0	±0.5	±0.6
3.0	122.0	122.0	0.0	±0.5	±0.6
2.0	123.0	123.0	0.0	±0.5	±0.6
1.0	124.0	124.0	0.0	±0.5	±0.6
0.0	125.0	125.0	0.0	±0.5	±0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

23(b). Filter Level linearity on the reference level range (IEC 61260-3 Clause 11)

The level linearity shall be tested for three filters in a set of filters. For a set of filters covering the audible range of frequencies, it is recommended to test filters with frequencies close to 31.5 Hz,1 kHz and 16 kHz.

The test shall be performed on the reference level range for levels from the specified lower boundary of the specified linear operating range up to a level where the overload indicator displays an overload. Adjust the level of the input signal with steps that are not greater than 5 dB. The difference between successive steps of the input signal level shall be reduced to 1 dB when the distance to the lower or upper boundaries of a linear operating range is less than 5 dB and when the level is above the upper boundary. The boundaries are as stated in the instruction manual for the filter. If no overload is displayed, the filter does not conform to the requirements.

The measured level linearity deviation shall not exceed the acceptance limits given in 5.13 in IEC 61260-1:2014 for all measured levels between the lower boundary of the linear operating range, as stated in the instruction manual for the filter, and up to the highest level, measured as described above, without an overload indication.

An overload shall not be indicated if the level of the input signal is below the stated upper boundary of each appropriate linear operating range.

"Y" means indicator over-range.

☑ Checked

23(c). Third Octave Band Filter Level Linearity 16kHz (Increasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Over SLM Range	5
Attenuation (dB)	31.0
Generator Frequency (Hz)	16k
SPL Reference Starting Point (dB)	94.0
Output (mVrms)	1641.0
Noise Floor (dB)	-99.0

Increasing level to Overload				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
26.0	99.0	99.0	0.0	±0.5	±0.6
21.0	104.0	104.0	0.0	±0.5	±0.6
16.0	109.0	109.0	0.0	±0.5	±0.6
11.0	114.0	114.0	0.0	±0.5	±0.6
10.0	115.0	115.0	0.0	±0.5	±0.6
9.0	116.0	116.0	0.0	±0.5	±0.6
8.0	117.0	117.0	0.0	±0.5	±0.6
7.0	118.0	118.0	0.0	±0.5	±0.6
6.0	119.0	119.0	0.0	±0.5	±0.6
5.0	120.0	120.0	0.0	±0.5	±0.6
4.0	121.0	121.0	0.0	±0.5	±0.6
3.0	122.0	122.0	0.0	±0.5	±0.6
2.0	123.0	123.0	0.0	±0.5	±0.6
1.0	124.0	124.0	0.0	±0.5	±0.6
0.0	125.0	125.0	0.0	±0.5	±0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

23(c). Level linearity on the reference level range (IEC 61672-3 Clause 16)
Level linearity shall be tested with steady sinusoidal electrical signals at a frequency of 8 kHz with the sound level meter set for frequency-weighting A. (61672-3 Clause 16.1).

Level linearity shall be measured in 5 dB steps of increasing input signal level from the starting point up to within 5 dB of the upper boundary stated in the Instruction Manual for the linear operating range at 8 kHz, then at 1 dB steps of increasing input signal level up to, but not including, the first indication of overload. The test of level linearity shall then be continued at 5 dB steps of decreasing input signal level from the starting point down to within 5 dB of the specified lower boundary, then at 1 dB steps of decreasing input signal level down to, but not including, the first indication of an under-range condition.

Measured level linearity deviations shall not exceed the applicable acceptance limits given in IEC 61672-1 from the specified upper boundary of the linear operating range up to, but not including, the first indication of overload and also from the specified lower boundary of the linear operating range down to, but not including, the first indication of an under-range condition.

"Y" means indicator over-range.

☑ Checked

24(a). Third Octave Band Filter Level Linearity 31.5Hz (Decreasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Under SLM Range	0
Attenuation (dB)	0.0
Generator Frequency (Hz)	31.5
SPL Reference Starting Point (dB)	94
Output (mVrms)	47.1
Noise Floor (dB)	-99.0

Decreasing level to Underange				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
5.0	89.0	89.0	0.0	±0.5	±0.6
10.0	84.0	84.0	0.0	±0.5	±0.6
15.0	79.0	79.0	0.0	±0.7	±0.9
20.0	74.0	74.0	0.0	±0.7	±0.9
25.0	69.0	69.0	0.0	±0.7	±0.9
30.0	64.0	64.0	0.0	±0.7	±0.9
35.0	59.0	59.0	0.0	±0.7	±0.9
40.0	54.0	54.0	0.0	±0.7	±0.9
45.0	49.0	49.0	0.0	±0.7	±0.9
49.0	45.0	45.1	0.1	±0.7	±0.9
50.0	44.0	44.1	0.1	±0.7	±0.9
51.0	43.0	43.0	0.0	±0.7	±0.9
52.0	42.0	42.0	0.0	±0.7	±0.9
53.0	41.0	40.9	-0.1	±0.7	±0.9
54.0	40.0	39.9	-0.1	±0.7	±0.9

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

24(a). Level linearity on the reference level range (IEC 61672-3 Clause 16)
Level linearity shall be tested with steady sinusoidal electrical signals at a frequency of 8 kHz with the sound level meter set for frequency-weighting A. (61672-3 Clause 16.1).

Level linearity shall be measured in 5 dB steps of increasing input signal level from the starting point up to within 5 dB of the upper boundary stated in the Instruction Manual for the linear operating range at 8 kHz, then at 1 dB steps of increasing input signal level up to, but not including, the first indication of overload. The test of level linearity shall then be continued at 5 dB steps of decreasing input signal level from the starting point down to within 5 dB of the specified lower boundary, then at 1 dB steps of decreasing input signal level down to, but not including, the first indication of an under-range condition.

Measured level linearity deviations shall not exceed the applicable acceptance limits given in IEC 61672-1 from the specified upper boundary of the linear operating range up to, but not including, the first indication of overload and also from the specified lower boundary of the linear operating range down to, but not including, the first indication of an under-range condition.

"Y" means indicator under-range. However, if 20dB above noise floor is reached then no results are reported.

☑ Checked

24(b). Third Octave Band Filter Level Linearity 1kHz (Decreasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Under SLM Range	0
Attenuation (dB)	0.0
Generator Frequency (Hz)	1kHz
SPL Reference Starting Point (dB)	94
Output (mVrms)	46.4
Noise Floor (dB)	-99.0

Decreasing level to Underange				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
5.0	89.0	89.0	0.0	±0.5	±0.6
10.0	84.0	84.0	0.0	±0.5	±0.6
15.0	79.0	79.0	0.0	±0.7	±0.9
20.0	74.0	74.0	0.0	±0.7	±0.9
25.0	69.0	69.0	0.0	±0.7	±0.9
30.0	64.0	64.0	0.0	±0.7	±0.9
35.0	59.0	59.0	0.0	±0.7	±0.9
40.0	54.0	54.0	0.0	±0.7	±0.9
45.0	49.0	49.0	0.0	±0.7	±0.9
49.0	45.0	45.0	0.0	±0.7	±0.9
50.0	44.0	44.0	0.0	±0.7	±0.9
51.0	43.0	42.9	-0.1	±0.7	±0.9
52.0	42.0	41.9	-0.1	±0.7	±0.9
53.0	41.0	40.9	-0.1	±0.7	±0.9
54.0	40.0	39.9	-0.1	±0.7	±0.9

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

24(b). Level linearity on the reference level range (IEC 61672-3 Clause 16)
Level linearity shall be tested with steady sinusoidal electrical signals at a frequency of 8 kHz with the sound level meter set for frequency-weighting A. (61672-3 Clause 16.1).

Level linearity shall be measured in 5 dB steps of increasing input signal level from the starting point up to within 5 dB of the upper boundary stated in the Instruction Manual for the linear operating range at 8 kHz, then at 1 dB steps of increasing input signal level up to, but not including, the first indication of overload. The test of level linearity shall then be continued at 5 dB steps of decreasing input signal level from the starting point down to within 5 dB of the specified lower boundary, then at 1 dB steps of decreasing input signal level down to, but not including, the first indication of an under-range condition.

Measured level linearity deviations shall not exceed the applicable acceptance limits given in IEC 61672-1 from the specified upper boundary of the linear operating range up to, but not including, the first indication of overload and also from the specified lower boundary of the linear operating range down to, but not including, the first indication of an under-range condition.

"Y" means indicator under-range. However, if 20dB above noise floor is reached then no results are reported.

☑ Checked

24(c). Third Octave Band Filter Level Linearity 16kHz (Decreasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Under SLM Range	0
Attenuation (dB)	0.0
Generator Frequency (Hz)	16kHz
SPL Reference Starting Point (dB)	94
Output (mVrms)	46.2
Noise Floor (dB)	-99.0

Decreasing level to Underange				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
5.0	89.0	89.0	0.0	±0.5	±0.6
10.0	84.0	84.0	0.0	±0.5	±0.6
15.0	79.0	79.0	0.0	±0.7	±0.9
20.0	74.0	74.0	0.0	±0.7	±0.9
25.0	69.0	69.0	0.0	±0.7	±0.9
30.0	64.0	64.0	0.0	±0.7	±0.9
35.0	59.0	59.0	0.0	±0.7	±0.9
40.0	54.0	54.0	0.0	±0.7	±0.9
45.0	49.0	49.0	0.0	±0.7	±0.9
49.0	45.0	45.0	0.0	±0.7	±0.9
50.0	44.0	44.0	0.0	±0.7	±0.9
51.0	43.0	43.0	0.0	±0.7	±0.9
52.0	42.0	42.0	0.0	±0.7	±0.9
53.0	41.0	41.0	0.0	±0.7	±0.9
54.0	40.0	40.0	0.0	±0.7	±0.9

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

24(c). Level linearity on the reference level range (IEC 61672-3 Clause 16)
Level linearity shall be tested with steady sinusoidal electrical signals at a frequency of 8 kHz with the sound level meter set for frequency-weighting A. (61672-3 Clause 16.1).

Level linearity shall be measured in 5 dB steps of increasing input signal level from the starting point up to within 5 dB of the upper boundary stated in the Instruction Manual for the linear operating range at 8 kHz, then at 1 dB steps of increasing input signal level up to, but not including, the first indication of overload. The test of level linearity shall then be continued at 5 dB steps of decreasing input signal level from the starting point down to within 5 dB of the specified lower boundary, then at 1 dB steps of decreasing input signal level down to, but not including, the first indication of an under-range condition.

Measured level linearity deviations shall not exceed the applicable acceptance limits given in IEC 61672-1 from the specified upper boundary of the linear operating range up to, but not including, the first indication of overload and also from the specified lower boundary of the linear operating range down to, but not including, the first indication of an under-range condition.

"Y" means indicator under-range. However, if 20dB above noise floor is reached then no results are reported.

☑ Checked

25. Third Octave Level Ranges

25(a). Third Octave Level Linearity Including the Level range (31.5Hz)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	10
Generator Frequency (Hz)	31.5
Reference SPL (dB)	94
Output (mVrms)	148.6

Settings		Level (dB)			Tolerance	
Range	Atten	Expected	Indicated	Difference	Type 1	Type 2
HIGH	0.0	104.0	104.0	0.0	± 0.5	± 0.6
MID	14.0	90.0	90.0	0.0	± 0.5	± 0.6
LOW	34.0	70.0	70.0	0.0	± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

25(b). Third Octave Level Linearity Including the Level range (1kHz)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	10
Generator Frequency (Hz)	1k
Reference SPL (dB)	94
Output (mVrms)	146.4

Settings		Level (dB)			Tolerance	
Range	Atten	Expected	Indicated	Difference	Type 1	Type 2
HIGH	0.0	104.0	104.0	0.0	± 0.5	± 0.6
MID	14.0	90.0	90.0	0.0	± 0.5	± 0.6
LOW	34.0	70.0	70.0	0.0	± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

25(c). Third Octave Level Linearity Including the Level range (16kHz)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	10
Generator Frequency (Hz)	16k
Reference SPL (dB)	94
Output (mVrms)	145.9

Settings		Level (dB)			Tolerance	
Range	Atten	Expected	Indicated	Difference	Type 1	Type 2
HIGH	0.0	104.0	103.9	-0.1	± 0.5	± 0.6
MID	14.0	90.0	90.0	0.0	± 0.5	± 0.6
LOW	34.0	70.0	70.0	0.0	± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

25. Filter Level linearity including the level range control (IEC 61260-3 Clause 11.9)

11.9 For the same three filters as selected above, test each available level range in the following way: based on the same reference level, adjust the input level to be 30 dB below upper boundary of the linear operating range for each of the selected range settings. The measured level linearity deviation shall not exceed the acceptance limits given in 5.13.3 and 5.13.4 of IEC 61260-1:2014

The three filter frequencies are 31.5Hz, 1kHz and 16kHz.

The level linearity differences are calculated as the indicated signal level minus the corresponding expected signal level.

☑ Checked

26. Third Octave Band Filter Lower Limit

26(a). Octave Band Filter Lower Limit (Reference Range)

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
Lowest Range	MID
Lower Limit for the Range	40

	1	2	3	4	5	6	7	8	9	10
Freq	4Hz	5Hz	6.3Hz	8Hz	10Hz	12.5Hz	16Hz	20Hz	25Hz	31.5Hz
Measured			12.0	9.2	8.3	8.7	7.9	8.8	4.7	4.6
Conforming	N/A	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Freq	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz
Measured	4.4	5.1	2.8	2.6	2.1	1.2	1.9	1.4	1.3	1.0
Conforming	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Freq	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz
Measured	0.9	1.6	1.2	1.8	2.1	3.0	3.5	4.1	4.8	5.5
Conforming	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Freq	4kHz	5kHz	6.3kHz	8kHz	10kHz	12.5kHz	16kHz	20kHz	25kHz	31.5kHz
Measured	6.3	7.3	8.2	9.0	10.2	11.2	12.5	13.8		
Conforming	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A

Conforming	Yes

Uncert (+/-) dB	0.09

26(b). Octave Band Filter Lower Limit (Lowest Range)

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
Lowest Range	LOW
Lower Limit for the Range	20

	1	2	3	4	5	6	7	8	9	10
Freq	4Hz	5Hz	6.3Hz	8Hz	10Hz	12.5Hz	16Hz	20Hz	25Hz	31.5Hz
Measured			6.5	8.8	10.1	9.2	8.7	5.6	4.4	4.2
Conforming	N/A	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Freq	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz
Measured	2.7	4.6	1.4	1.7	1.3	0.7	0.1	0.3	0.0	0.0
Conforming	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Freq	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz
Measured	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Conforming	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Freq	4kHz	5kHz	6.3kHz	8kHz	10kHz	12.5kHz	16kHz	20kHz	25kHz	31.5kHz
Measured	0.0	0.0	0.0	0.0	0.1	0.7	1.5	2.3		
Conforming	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A

Conforming	Yes

Uncert (+/-) dB	0.09

26. Third Octave Band Filter Lower LImit (IEC 61260-3 Clause 12)
12.2 Short-circuit the input terminal or use similar means to ensure that the level of the input signal is below the lower limit of the specified linear operating range. Record the output level from each filter in the set. The output level shall not exceed the specified lower limit for the appropriate filter and range.
Interpretation: The yellow cells are the observed values. The measured value must not exceed the Lower LImit for the Range.

☑ Checked

NATacoustic
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A division of Renzo Tonin & Associates (NSW) Pty Ltd ABN 29 117 462 861

Certificate of Calibration
Sound Level Meter

Calibration Date	26/02/2021	**Job No**	RB858	**Operator**	AH
Client Name	RENZO TONIN & ASSOCIATES (NSW) PTY LTD				
Client Address	LEVEL 1 418A ELIZABETH ST SURRY HILLS 2010				

Test Item

Instrument Make	NTI	**Model**	XL2-TA	**Serial No**	#A2A-12491-E0 #RTA07-ATP0
Microphone Make	NTI	**Model**	MC230	**Serial No**	#9681
Preamplifier Make	NTI	**Model**	MA220	**Serial No**	#6476
Ext'n Cable Make	NTI	**Model**	N/A	**Serial No**	N/A
Accessories	Nil			**Firmware**	4.21

SLM Type	1
Filters Class	1

Environmental Conditions	**Measured**	
	Start	**End**
Air Temp. (°C)	23.5	23.6
Rel. Humidity (%)	65.0	63.7
Air Pressure (kPa)	100.5	100.4

Applicable Standards:
Periodic tests were performed in accordance with procedures from IEC 61672-3 :2013 and IEC 61260-3 :2016

Applicable Work Instruction:
RWi-08 SLM & Calibrator Verification

Laboratory Equipment :
B&K4226 Multifunction Acoustic Calibrator SN 2288472
Agilent Function Generator Model 33220A SN MY43004013
Agilent Digital Multimeter Model 34401A SN MY41004386

Traceability:
The results of the tests and measurements included in this document are traceable via the test methods described under each test, and by the use of the above equipment, which has been calibrated by NATA accredited calibration facilities.
This document shall not be reproduced, except in full.

Scope:
This certificate is issued on the basis that the instrument complies with the manufacturer's specification.
See "Sound Level Meter Verification - Summary of Tests" page for an itemised list of results for each test.

Uncertainty:
The uncertainty is stated at a confidence level of 95% using a k factor of 2.

Calibration Statement:
The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013 and IEC 61260-3:2016, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2017 and IEC 61260-2:2017, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013 and IEC 61260-1:2014, the sound level meter submitted for testing conforms to the class 1 specifications of IEC 61672-1:2013 and IEC 61260-1:2014.

NATA WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory Number 14966

Accredited for compliance with ISO/IEC 17025 - Calibration

Authorized Signatory:

Print Name: Ariel Michael Date: 26/02/2021

Template Document Name: RQT-05 (rev 72) SLM ISO Verification

NATacoustic
Sound Level Meter Verification - Summary of Tests

Calibration Date	26/02/2021	**Job No**	RB858	**Operator**	AH
Client Name	RENZO TONIN & ASSOCIATES (NSW) PTY LTD				
Client Address	LEVEL 1 418A ELIZABETH ST SURRY HILLS 2010				

1. Instrument Information & Reference Conditions

Instrument Make	NTI	**Model**	XL2-TA	**Serial No**	#A2A-12491-E0 #RTA07-ATP03
Microphone Make	NTI	**Model**	MC230	**Serial No**	#9681
Preamplifier Make	NTI	**Model**	MA220	**Serial No**	#6476
Ext'n Cable Make	NTI	**Model**	N/A	**Serial No**	N/A
Accessories	Nil			**Firmware**	4.21

Freq Weightings	**FLAT**	No	**A**	Yes	**C**	Yes	**Z**	Yes	
Time Weightings	**Fast**	Yes	**Slow**	Yes	**Impulse**	Yes			

SLM Type	1
Filter Class	1

Instruction Manual is Available	Yes

2. Preliminary Inspection and Power Supply	**Logger Inspected**	Yes
	Calibration Equipment Okay	Yes
	Power Supply Ok (Start)	Yes
	Power Supply Ok (End)	Yes

		Measured	
3. Environmental Conditions	**Environmental Conditions**	**Start**	**End**
	Air Temp. (°C)	23.5	23.6
	Rel. Humidity (%)	65.0	63.7
	Air Pressure (kPa)	100.5	100.4
	Conforming	Yes	Yes

Test Description			**Value / Conforming**	**Uncert (+/-)**
4(a). Initial Calibration		**Calibration Frequency Hz**	1000.0	N/A
		Indicated Level Before Adjustment (dB)	113.9	0.11
		Indicated Level After Adjustment (dB)	114.0	0.11
		Stability During Continuous Operation (dB)	Yes	N/A
5(a). Self-Generated Noise, Microphone Installed		**A**	16.2	0.09
5(b). Self-Generated Noise, Electrical		**A**	8.5	0.09
		C	12.9	0.09
		Z	18.6	0.09
6. Acoustical Signal Test		**125 Hz**	Yes	0.42
		1 kHz	Yes	0.42
		8 kHz	Yes	0.60
7. Electrical Frequency Weighting		**A**	Yes	0.09
		C	Yes	0.09
		Z	Yes	0.09
8. Frequency & Time Weightings 1kHz	**8(a). Frequency Weighting**	**C**	Yes	0.09
		Z	Yes	0.09
		FLAT	N/A	0.09
	8(b). Time Weighting	**Slow**	Yes	0.09
		Leq	Yes	0.09
9(a). Level Linearity 8kHz (Increasing)		**Conforming**	Yes	0.13
9(b). Level Linearity 8kHz (Decreasing)		**Conforming**	Yes	0.13
10(a). Level Linearity Including the Level Range (Reference Signal)		**Conforming**	Yes	0.13
10(b). Level Linearity Including the Level range (5dB Above Under-range)		**Conforming**	Yes	0.13
11. Toneburst Response		**Fast**	Yes	0.13
		Slow	Yes	0.13
		SEL/Leq	Yes	0.13
12. Peak C sound level		**8 kHz**	Yes	0.09
		500 Hz	Yes	0.09
13. Overload indication		**Conforming**	Yes	0.09
		Latches	N/A	N/A
14. High-level Stability		**Conforming**	Yes	0.09
15(a). Octave Band Filter Relative Attenuation (≤2kHz)		**Conforming**	Yes	0.09
15(b). Octave Band Filter Relative Attenuation (>2kHz)		**Conforming**	Yes	0.09
16. Octave Band Filter Relative Attenuation at Midband Frequency		**Conforming**	Yes	0.09
17(a). Octave Band Filter Level Linearity 31.5Hz (Increasing)		**31.5Hz**	Yes	0.13
17(b). Octave Band Filter Level Linearity 1kHz (Increasing)		**1kHz**	Yes	0.13
17(c). Octave Band Filter Level Linearity 16kHz (Increasing)		**16kHz**	Yes	0.13
18(a). Octave Band Filter Level Linearity 31.5Hz (Decreasing)		**31.5Hz**	Yes	0.13
18(b). Octave Band Filter Level Linearity 1kHz (Decreasing)		**1kHz**	Yes	0.13
18(c). Octave Band Filter Level Linearity 16kHz (Decreasing)		**16kHz**	Yes	0.13
19(a). Octave Level Linearity Including the Level range (31.5Hz)		**31.5Hz**	Yes	0.13
19(b). Octave Level Linearity Including the Level range (1kHz)		**1kHz**	Yes	0.13
19(c). Octave Level Linearity Including the Level range (16kHz)		**16kHz**	Yes	0.13
20(a). Octave Band Filter Lower Limit (Reference Range)		**Conforming**	Yes	0.09
20(b). Octave Band Filter Lower Limit (Lowest Range)		**Conforming**	Yes	0.09
21(a). Third Octave Band Filter Relative Attenuation (≤31.5Hz)		**Conforming**	Yes	0.09
21(b). Third Octave Band Filter Relative Attenuation (40Hz-315Hz)		**Conforming**	Yes	0.09
21(c). Third Octave Band Filter Relative Attenuation (400Hz-3.15kHz)		**Conforming**	Yes	0.09
21(d). Third Octave Band Filter Relative Attenuation (≥4kHz)		**Conforming**	Yes	0.09
22. Third Octave Band Filter Relative Attenuation at Midband Frequency		**Conforming**	Yes	0.09

23(a). Third Octave Band Filter Level Linearity 31.5Hz (Increasing)	**31.5Hz**	Yes	0.13
23(b). Third Octave Band Filter Level Linearity 1kHz (Increasing)	**1kHz**	Yes	0.13
23(c). Third Octave Band Filter Level Linearity 16kHz (Increasing)	**16kHz**	Yes	0.13
24(a). Third Octave Band Filter Level Linearity 31.5Hz (Decreasing)	**31.5Hz**	Yes	0.13
24(b). Third Octave Band Filter Level Linearity 1kHz (Decreasing)	**1kHz**	Yes	0.13
24(c). Third Octave Band Filter Level Linearity 16kHz (Decreasing)	**16kHz**	Yes	0.13
25(a). Third Octave Level Linearity Including the Level range (31.5Hz)	**31.5Hz**	Yes	0.13
25(b). Third Octave Level Linearity Including the Level range (1kHz)	**1kHz**	Yes	0.13
25(c). Third Octave Level Linearity Including the Level range (16kHz)	**16kHz**	Yes	0.13
26(a). Octave Band Filter Lower Limit (Reference Range)	**Conforming**	Yes	0.09
26(b). Octave Band Filter Lower Limit (Lowest Range)	**Conforming**	Yes	0.09
SLM Overall Conforming		**Yes**	

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Template Document Name: RQT-05 (rev 72) SLM ISO Verification

1(a). Instrument Information

Calibration Date	26/02/2021	Job No	RB858	Operator	AH

Client Name	RENZO TONIN & ASSOCIATES (NSW) PTY LTD
Client Address	LEVEL 1 418A ELIZABETH ST SURRY HILLS 2010

1. Instrument Information

Instrument Make	NTI	Model	XL2-TA	Serial	#A2A-12491-E0 #RTA07-ATP03		
Microphone Make	NTI	Model	MC230	Serial	#9681	pF	15
Preampifier Make	NTI	Model	MA220	Serial	#6476		
Ext'n Cable Make	NTI	Model		Serial			
Accessories	Nil			Firmware	4.21		

Freq Weightings		
	A	Yes
	C	Yes
	Z	Yes
	FLAT	No

Time Weightings		
	Fast	Yes
	Slow	Yes
	Impulse	Yes

Functions		
	Leq	Yes
	SEL	Yes
	Peak	Yes

Instrument Ranges	Range Name	Indicator Range		Primary Range	
		Low dB	High dB	Low dB	High dB
1	HIGH	40	140	60	134
2	MID	20	120	40	120
3	LOW	0	100	20	100
4					
5					
6					
7					
8					
9					
10					
Check List	OK				

Reference Range	MID
Ref. SPL @ 1kHz	114

Linearity Limits on Ref range	Low dB	High dB
1kHz Leq (A weighting)	35.0	120.0
4kHz Leq	35.0	120.0
8kHz Leq	35.0	120.0

Highest Range for 10(b),12,13	MID

SLM Class	1
Filter Class	1
Filter Base	2

Colour Legend	
Enter Value	110
Operator Action	110
Difference	1.0
Error/Outside Tolerance	2.0
Tolerance	+/-1
Select Toggle	Val
Informative	110
Conforming	Yes

Instruction Manual Title (Clause 3.1&3.2, IEC 61672-3:2013)	NTI XL2 Operating Manual
Version	2.5
Publication Date	2/11/2012
Source of Document (& Date of Download if Applicable)	N/A

Conforming	Yes

Pattern Evaluation Test Report (Clause 3.5, IEC 61672-3:2013)	Type Approval Certificate
Reference Number or Page Number	1.63-4093096
Publication Date	3/09/2019
Source of Document (& Date of Download if Applicable)	PTB

Conforming	Yes

☑ Checked

1(b). Acoustic Corrections

	Absolute Corrections and Uncertainties									
Freq	Mic FF to Pressure		Case		Windscreen		Other *		Total	
(Hz)	dB	Uncert dB	dB	Uncert dB	dB	Uncert dB	dB	Uncert dB	dB	Uncert dB
31.5	0.00								0.00	0.41
63	0.00								0.00	0.41
125	0.00								0.00	0.41
250	0.00								0.00	0.41
500	0.00								0.00	0.41
1k	0.00								0.00	0.41
2k	0.30								0.30	0.41
4k	0.70								0.70	0.41
8k	2.60								2.60	0.58
12.5k	6.00								6.00	0.64
16k	7.30								7.30	0.64

Source of Mic FF to Pressure Correction	Nti Microphone Specifications M2230
Source of Case Correction	Not Available
Source of Windscreen Correction	Not Available
***Description of Other Correction**	N/A

Descriptions of Tests

1(b). Acoustical signal tests of a frequency weighting (IEC 61672-3)
(Clause 12.2)
Correction data shall account for:
- the equivalent free-field or random-incidence frequency response of the sound level meter if the source of sound or simulated sound is the pressure field in a multi-frequency sound calibrator, in a comparison coupler, or from an electrostatic actuator; and,
- if applicable, the average influence on the frequency response of a typical microphone of a windscreen and any accessories that are part of the configuration of the sound level meter for normal use.

(Clause 12.3)
Correction data shall be obtained from tables in the Instruction Manual for the sound level meter.
(Clause 12.4)
If the necessary correction data are not available from the Instruction Manual, data from the manufacturer of the microphone, multi-frequency sound calibrator, comparison coupler, or electrostatic actuator may then be used. This data shall be publicly available
(Clause 12.5)
The source for the free-field or random-incidence correction data shall be stated in the documentation for the results of the periodic tests. The source for the associated uncertainties of measurement shall be the same as the source for the corresponding correction data. If the uncertainties of the corresponding free-field correction data are not available, the applicable maximum-permitted uncertainties given in IEC 62585 shall be used in the calculation of the laboratory's total uncertainty budget.

NOTE: Where the uncertainties due to the "Mic FF to Pressure", "Case" or "Windscreen" are omitted in the table above, the following statement applies:

No information on the uncertainty of measurement, required by IEC 61672-3:2013, for the correction data given in the Instruction Manual or obtained from the manufacturer or supplier of the sound level meter, or the manufacturer of the microphone, or the manufacturer of the multi-frequency sound calibrator was provided in the Instruction Manual or made available by the manufacturer or supplier of the sound level meter. 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 %.

☑ Checked

1(c). Electrical Corrections

	Absolute Corrections and Uncertainties									
Freq	Mic 0 deg FF Resp		Case		Windscreen		Other *		Total	
(Hz)	dB	Uncert dB	dB	Uncert dB	dB	Uncert dB	dB	Uncert dB	dB	Uncert dB
31.5			0.00		0.00		0.00		0.00	0.41
63			0.00		0.00		0.00		0.00	0.41
125			0.00		0.00		0.00		0.00	0.41
250			0.00		0.00		0.00		0.00	0.41
500			0.00		0.00		0.00		0.00	0.41
1k			0.00		0.00		0.00		0.00	0.41
2k			0.00		0.00		0.00		0.00	0.41
4k			0.00		0.00		0.00		0.00	0.41
8k			0.00		0.00		0.00		0.00	0.58
12.5k			0.00		0.00		0.00		0.00	0.64
16k			0.00		0.00		0.00		0.00	0.64

Source of Mic 0 deg Free-field Response	Not Available
Source of Case Correction	Not Available
Source of Windscreen Correction	Not Available
*Description of Other Correction	N/A

Descriptions of Tests

1(c). Acoustical signal tests of a frequency weighting (IEC 61672-3)
(Clause 13.6)
For each frequency weighting and at each test frequency, corrections shall be applied to the relative frequency weightings determined in 13.5 to account for:
– the deviation of the free-field or random-incidence frequency response of the microphone in the reference direction from a uniform frequency response;
– the average effects of reflections from the case of the sound level meter and of diffraction of sound around the microphone and preamplifier; and,
– if applicable, the average influence on the frequency response of a typical microphone of a windscreen and any accessories that are part of the configuration of the sound level meter for normal use.
(Clause 13.7)
Corrections for the effects of reflections and diffraction and for the influence of the windscreen and windscreen accessories on the free-field or random-incidence frequency response shall be the same as used for the frequency-weighting tests with acoustical signals.

NOTE: Where the uncertainties due to the "Mic FF to Pressure", "Case" or "Windscreen" are omitted in the table above, the following statement applies:

No information on the uncertainty of measurement, required by IEC 61672-3:2013, for the correction data given in the Instruction Manual or obtained from the manufacturer or supplier of the sound level meter, or the manufacturer of the microphone, or the manufacturer of the multi-frequency sound calibrator was provided in the Instruction Manual or made available by the manufacturer or supplier of the sound level meter. 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 %.

☑ Checked

2. Preliminary,3.Environmental Conditions & 4. Calibration

2. Preliminary Inspection and Power Supply

Instrument Inspected	Yes
Laboratory Calibration Equipment Ok	Yes
Power Supply Ok (Start)	Yes
Power Supply Ok (End)	Yes

3. Environmental Conditions

Environmental Conditions	Measured		Devn from Mid Limits		Uncert.	Expanded Deviation			Complies	Limits	
	Start	End	Start	End		Start	End	Tolerance		Min	Max
Air Temp. (°C)	23.5	23.6	0.5	0.6	0.5	1.00	1.10	3	Yes	20	26
Rel. Humidity (%)	65.0	63.7	17.5	16.2	4.8	22.30	21.00	22.5	Yes	25	70
Air Pressure (kPa)	100.5	100.4	8.0	7.9	0.63	8.63	8.53	12.5	Yes	80	105

Conforming	Yes

4(a). Initial Calibration

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Microphone / Windshield Correction	OFF
Polarization Voltage (V)	0
Microphone Sensitivity (mV/Pa)	45.8

B&K 4226 Calibrator Settings	
"Sound Field"	Pressure
"Microphone"	N/A
Calibration Level (Lin)	114
Calibration Frequency (Hz)	1000

Calibration	
Indicated Level before adjust. (dB)	113.9
Adjustment required	Yes
Indicated level after adjust. (dB)	114

4(b). Final Calibration

Level at conclusion of testing (dB)	114.1
Difference	0.1
Tolerance	± 0.1

Conforming	Yes

Uncertainty (+/-) dB	0.11

Descriptions of Tests

2. Preliminary Inspection and Power Supply (IEC 61672-3 Clause 5 "Preliminary Inspection" & Clause 6 "Power Supply")
Prior to any measurements, the sound level meter and all accessories shall be visually inspected, paying particular attention to damage to, or accumulation of foreign material on, the protection grid or diaphragm of the microphone. All relevant controls shall be operated to
ensure that they are in working order. If the controls, display, and other essential elements are not in proper working order, no periodic tests shall be performed.

For all tests, the sound level meter shall be powered from its preferred supply or a suitable alternative. Before and after conducting the set of tests with acoustical signals and before and after conducting the set of tests with electrical signals, the power supply for the sound level meter shall be checked by the method stated in the Instruction Manual to ensure that it is within the specified operating limits. If the voltage or the equivalent indication of the status of the power supply is not within the operating limits and the reason cannot be attributed to partially discharged batteries or an incorrect selection of the voltage of the public power supply, then no periodic tests shall be performed as a malfunction is indicated.

3. Environmental conditions (IEC 61672-3 Clause 7 "Environmental Conditions")
Periodic tests shall be performed within the following ranges of environmental conditions: 80 kPa to 105 kPa for static air pressure, 20 °C to 26 °C for air temperature and 25 % to 70 % for relative humidity. These conditions are recorded at the start and end of the testing.

4a. Calibration (IEC 61672-3 Clause 10 "Indication at the calibration check frequency")
The sound level meter shall be adjusted, if necessary, to indicate the required sound level for the environmental conditions under which the tests are performed. The indications of the sound level meter before and after adjustment shall be recorded.

4b. Long-term Stability (IEC 61672-3 Clause 15)
The long-term stability of a sound level meter is evaluated from the difference between the A-weighted sound levels indicated in response to steady 1 kHz signals applied at the beginning and end of a period of operation. For each indication, the level of the input signal shall be that which is required to display the reference sound pressure level on the reference level range for the first indication.

The period of continuous operation shall be between 25 min and 35 min during which any convenient set of tests that use electrical input signals are performed.

The measured difference between the initial and final indications of A-weighted sound level shall not exceed the acceptance limits given in IEC 61672-1.

☑ Checked

5. Self-Generated Noise

5(a). Self-Generated Noise, Microphone Installed

SLM Settings	
Time Weighting	Fast
Frequency Weighting	A
SLM Range	LOW
Measurement Function	Leq
Integration time (s)	30

Results		
Freq Wt	Observed	Quoted
A	16.2	16.6

Uncertainty (+/-) dB	0.09

Observed Values		
Leq	N/A	
16.2	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	
	Avg	

5(b). Self-Generated Noise, Electrical

SLM Settings	
Time Weighting	Fast
SLM Range	LOW
Measurement Function	Leq
Integration time (s)	30

Observed Values						
Leq			N/A			
A	C	Z	Obs	A	C	Z
8.5	12.9	18.6	1			
			2			
			3			
			4			
			5			
			6			
			7			
			8			
			9			
			10			
			Avg			

Results		
Freq Wt	Observed	Quoted
A	8.5	12.4
C	12.9	13.5
Z	18.6	18.3-25.5

Uncertainty (+/-) dB	0.09

Descriptions of Tests

5(a) Self-Generated Noise, Microphone Installed (IEC 61672-3 Clause 11.1)
Measurements of the level of self-generated noise shall be made in a location that is available to the testing laboratory and where the level of background noise is minimized. Any supplied windscreen and windscreen accessory need not be installed around the microphone for measurement of the level of self-generated noise. The sound level meter shall be in the configuration submitted for periodic testing and with the most-sensitive level range and frequency-weighting A selected.

The indicated level of the A-weighted self-generated noise on the most-sensitive level range shall be recorded and reported. The level of self-generated noise is preferably measured as a time-averaged sound level with an averaging time of at least 30 s. Time-averaged sound level may be measured directly or calculated from an indication of sound exposure level and integration time. If time-averaged sound level cannot be determined, the time-weighted sound level from the average of ten observations taken at random over a 60 s interval shall be measured. If the time-weighted sound level is recorded, the S time weighting shall be used if available; otherwise the F time weighting shall be used.

5(b) Self-Generated Noise - Electrical (IEC 61672-3 Clause 11.2)
With the microphone replaced by the electrical input-signal device (or using the specified means of inserting electrical signals), and with the device terminated in the manner specified in the Instruction Manual for measurements of the level of self-generated noise, the indicated level of the time-averaged or time-weighted self-generated noise, measured by the same procedure as with the microphone installed, shall be recorded and reported for all frequency weightings and for the most-sensitive level range.

☑ Checked

6. Acoustical Signal Test

SLM Settings	
Time Weighting	Fast
Frequency Weighting	C
SLM Range	MID
Microphone Compensation Filter	OFF
B&K 4226 Calibrator Settings	
"Sound Field"	Pressure
"Microphone"	N/A
Reference Setting (Lin)	114

Freq	Observed Values			Mean Meter Reading	4226 calibrator corrections	Corrected Mean Readings	Pressure to Free Field	Case Effect Correction	Windscreen Effect Correction	Other Effect Correction	Equivalent Free Field	Response re 1kHz	C Weighting Response	Deviation from Expected	Tolerance		Conforming	Uncertainty		
															Type 1	Type 2		Total	Lab	Corrections
(Hz)	Set 1	Set 2	Set 3															(+/-) dB	(+/-) dB	(+/-) dB
31.5	110.9	110.9	110.8	110.87	0.10	110.97	0.00	0.00	0.00	0.00	110.97	-3.04	-3.00	-0.04	± 1.5	± 3.0	Yes	0.43	0.14	0.41
63	113.2	113.2	113.2	113.20	0.01	113.21	0.00	0.00	0.00	0.00	113.21	-0.80	-0.80	0.00	± 1.0	± 2.0	Yes	0.42	0.12	0.41
125	114.0	113.9	114.0	113.97	-0.02	113.95	0.00	0.00	0.00	0.00	113.95	-0.06	-0.20	0.14	± 1.0	± 1.5	Yes	0.42	0.12	0.41
250	114.1	114.1	114.1	114.10	-0.03	114.07	0.00	0.00	0.00	0.00	114.07	0.06	0.00	0.06	± 1.0	± 1.5	Yes	0.42	0.12	0.41
500	114.1	114.1	114.1	114.10	-0.03	114.07	0.00	0.00	0.00	0.00	114.07	0.06	0.00	0.06	± 1.0	± 1.5	Yes	0.42	0.12	0.41
1k	**114.1**	**114.1**	**114.0**	**114.07**	**-0.06**	**114.01**	**0.00**	**0.00**	**0.00**	**0.00**	**114.01**	**0.00**	**0.00**	0.00	± 0.7	± 1.0	Yes	0.42	0.11	0.41
2k	113.7	113.7	113.7	113.70	-0.01	113.69	0.30	0.00	0.00	0.00	113.99	-0.02	-0.20	0.18	± 1.0	± 2.0	Yes	0.43	0.13	0.41
4k	112.7	112.7	112.7	112.70	-0.20	112.50	0.70	0.00	0.00	0.00	113.20	-0.81	-0.80	-0.01	± 1.0	± 3.0	Yes	0.43	0.14	0.41
8k	108.7	108.8	108.8	108.77	-0.19	108.58	2.60	0.00	0.00	0.00	111.18	-2.83	-3.00	0.17	+1.5; -2.5	± 5.0	Yes	0.60	0.15	0.58
12.5k	102.5	102.5	102.6	102.53	-0.10	102.43	6.00	0.00	0.00	0.00	108.43	-5.57	-6.20	0.63	+2.0; -5.0	+5,-inf	Yes	0.68	0.21	0.64
16k	97.1	97.0	97.5	97.20	0.05	97.25	7.30	0.00	0.00	0.00	104.55	-9.46	-8.50	-0.96	+2.5; -16.0	+5,-inf	Yes	0.74	0.37	0.64

Description of Tests

6. Acoustical signal tests of a frequency weighting (IEC 61672-3 Clause 12)
The sound level meter shall be set for frequency-weighting C, if available, otherwise for frequencyweighting A. The frequency weighting for tests with acoustical signals shall be determined at 125 Hz, 1 kHz, and 8 kHz. However, for information, this laboratory tests from 31.5Hz to 16kHz.

For frequency-weighting tests using a multi-frequency sound calibrator, the sound pressure level in the coupler of the sound calibrator shall preferably be set to the reference sound pressure level at 1 kHz, but shall be in the range from 70 dB to 125 dB at all frequencies.

At the discretion of the laboratory, the sound level meter shall be set to measure F-timeweighted sound level or S-time-weighted sound level. As a minimum, two repetitions of the coupling and measurements shall be performed to give a total of at least three tests.

The relative frequency weighting, relative to the response at 1 kHz, shall be determined from the average equivalent free-field or random-incidence sound level at a test frequency minus the average equivalent free-field or random-incidence sound level at 1 kHz. (Clause 12.15)

☑ Checked

7. Electrical Frequency Weighting

SLM Settings	
Time Weighting	Fast
Frequency Weighting	A
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	20
Generator Frequency (Hz)	1k
SPL Reference (dB)	75
Integration Time (s)	N/A
Generator Output (mVrms)	54.60

Freq Hz	Output (mV)	Indication A	Output (mV)	Indication C	Output (mV)	Indication Z	Tolerance	
63	1114.79	74.9	59.87	74.9	54.60	74.9		
125	348.49	74.9	55.87	75.0	54.60	75.0		
250	146.96	74.9	54.60	75.0	54.60	75.0		
500	78.92	74.9	54.60	75.0	54.60	75.0		
1k	54.60	**75.0**	54.60	**75.0**	54.60	**75.0**		
2k	47.55	75.0	55.87	75.0	54.60	75.0		
4k	48.66	75.0	59.87	75.0	54.60	75.0		
8k	61.97	75.0	77.12	75.0	54.60	75.0		
16k	116.73	74.8	145.28	74.8	54.60	75.0		
Typical Microphone 0deg Free Field Response		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		**0.00**		**0.00**		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
Case Effect Correction		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		**0.00**		**0.00**		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
Windscreen Effect Correction		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		**0.00**		**0.00**		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
OtherCorrection		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		**0.00**		**0.00**		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
		0.00		0.00		0.00		
Equivalent Free Field		74.90		74.90		74.90		
		74.90		75.00		75.00		
		74.90		75.00		75.00		
		74.90		75.00		75.00		
		75.00		**75.00**		**75.00**		
		75.00		75.00		75.00		
		75.00		75.00		75.00		
		75.00		75.00		75.00		
		74.80		74.80		75.00	Type 1	Type 2
Response re 1kHz (Deviation from Expected)		-0.10		-0.10		-0.10	± 1.0	± 2.0
		-0.10		0.00		0.00	± 1.0	± 1.5
		-0.10		0.00		0.00	± 1.0	± 1.5
		-0.10		0.00		0.00	± 1.0	± 1.5
		0.00		**0.00**		**0.00**	± 0.7	± 1.0
		0.00		0.00		0.00	± 1.0	± 2.0
		0.00		0.00		0.00	± 1.0	± 3.0
		0.00		0.00		0.00	+1.5; -2.5	± 5.0
		-0.20		-0.20		0.00	+2.5; -16.0	+5,-inf
Conforming		**Yes**		**Yes**		**Yes**		

Uncertainty (+/-) dB	0.09

Description of Tests

7. Electrical signal tests of frequency weightings (IEC 61672-3 Clause 13)
Frequency weightings shall be determined using steady sinusoidal electrical input signals for all frequency weightings for which design goals and acceptance limits are specified in IEC 61672-1 and which are provided in the sound level meter. The sound level meter shall be set to display F-time-weighted sound level.

On the reference level range and for each frequency weighting to be tested, the level of a 1 kHz input signal shall be adjusted to yield an indication that is 45 dB less than the upper boundary stated in the Instruction Manual for the linear operating range at 1 kHz on the reference level range.

At test frequencies other than 1 kHz, the level of the input electrical signal shall be determined as the level of the input signal at 1 kHz minus the exact design-goal response, given in IEC 61672-1 for the selected frequency weighting at the test frequency.

☑ Checked

8. Frequency & Time Weightings 1kHz

SLM Settings	
Time Weighting	Fast
Frequency Weighting	A
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	0.0
Generator Frequency (Hz)	1k
SPL Reference (dB)	114.0
Output (mVrms)	487.7

8(a). Frequency Weightings 1kHz

Time Wt	Frequency Weighting				Tolerance	
Fast	A	C	Z	N/A		
1kHz	114.0	114.0	114.0		Type 1	Type 2
Difference		0.0	0.0		± 0.2	± 0.2

Conforming	Yes	Yes	N/A

Uncertainty (+/-) dB	0.09

8(b). Time Weightings 1kHz

Freq Wt	Time Weighting				Tolerance	
A	F	S	Leq			
1kHz	114.0	114.0	114.0		Type 1	Type 2
Difference		0.0	0.0		± 0.1	± 0.1

Conforming	Yes	Yes

Uncertainty (+/-) dB	0.09

Description of Tests

8. Frequency and time weightings at 1 kHz (IEC 61672-3 Clause 14)
For a steady sinusoidal electrical input signal at 1 kHz on the reference level range and with an input signal that yields an indication of the reference sound pressure level with frequency weighting A, the indications shall be recorded for frequency weightings C and Z, as available, with the sound level meter set to display F-time-weighted sound level, or timeaveraged sound level, as available. In addition, the indications with frequency weighting A shall be recorded with the sound level meter set to display F-time-weighted sound level, S-timeweighted sound level, and time-averaged sound level, as available.

The measured deviation of the indication of the sound level frequency weightings and time weightings shall not exceed the acceptance limits given in IEC 61672-1.

☑ Checked

9(a). Level Linearity 8kHz (Increasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	A
SLM Range	MID
Generator & Attenuator Settings	
Select dB Over SLM Range	5
Attenuation (dB)	31.0
Generator Frequency (Hz)	8k
SPL Reference Starting Point (dB)	94.0
Output (mVrms)	1972.0
Noise Floor (dB)	-99.0

Increasing level to Overload				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
26.0	99.0	99.0	0.0	± 0.8	± 1.1
21.0	104.0	104.0	0.0	± 0.8	± 1.1
16.0	109.0	109.0	0.0	± 0.8	± 1.1
11.0	114.0	114.0	0.0	± 0.8	± 1.1
10.0	115.0	115.0	0.0	± 0.8	± 1.1
9.0	116.0	116.0	0.0	± 0.8	± 1.1
8.0	117.0	117.0	0.0	± 0.8	± 1.1
7.0	118.0	118.0	0.0	± 0.8	± 1.1
6.0	119.0	119.0	0.0	± 0.8	± 1.1
5.0	120.0	120.0	0.0	± 0.8	± 1.1
4.0	121.0	121.0	0.0	± 0.8	± 1.1
3.0	122.0	122.0	0.0	± 0.8	± 1.1
2.0	123.0	123.0	0.0	± 0.8	± 1.1
1.0	124.0	124.0	0.0	± 0.8	± 1.1
0.0	125.0	Y		± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

9(a). Level linearity on the reference level range (IEC 61672-3 Clause 16)
Level linearity shall be tested with steady sinusoidal electrical signals at a frequency of 8 kHz with the sound level meter set for frequency-weighting A. (61672-3 Clause 16.1).

Level linearity shall be measured in 5 dB steps of increasing input signal level from the starting point up to within 5 dB of the upper boundary stated in the Instruction Manual for the linear operating range at 8 kHz, then at 1 dB steps of increasing input signal level up to, but not including, the first indication of overload. The test of level linearity shall then be continued at 5 dB steps of decreasing input signal level from the starting point down to within 5 dB of the specified lower boundary, then at 1 dB steps of decreasing input signal level down to, but not including, the first indication of an under-range condition.

Measured level linearity deviations shall not exceed the applicable acceptance limits given in IEC 61672-1 from the specified upper boundary of the linear operating range up to, but not including, the first indication of overload and also from the specified lower boundary of the linear operating range down to, but not including, the first indication of an under-range condition.

"Y" means indicator over-range.

☑ Checked

9(b). Level Linearity 8kHz (Decreasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	A
SLM Range	MID
Generator & Attenuator Settings	
Select dB Under SLM Range	0
Attenuation (dB)	0.0
Generator Frequency (Hz)	8k
SPL Reference Starting Point (dB)	94
Output (mVrms)	55.6
Noise Floor (dB)	-99.0

Decreasing level to Underange				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
5.0	89.0	89.0	0.0	± 0.8	± 1.1
10.0	84.0	84.0	0.0	± 0.8	± 1.1
15.0	79.0	79.0	0.0	± 0.8	± 1.1
20.0	74.0	74.0	0.0	± 0.8	± 1.1
25.0	69.0	69.0	0.0	± 0.8	± 1.1
30.0	64.0	64.0	0.0	± 0.8	± 1.1
35.0	59.0	59.0	0.0	± 0.8	± 1.1
40.0	54.0	54.0	0.0	± 0.8	± 1.1
45.0	49.0	49.0	0.0	± 0.8	± 1.1
50.0	44.0	44.0	0.0	± 0.8	± 1.1
54.0	40.0	40.0	0.0	± 0.8	± 1.1
55.0	39.0	39.0	0.0	± 0.8	± 1.1
56.0	38.0	38.0	0.0	± 0.8	± 1.1
57.0	37.0	37.0	0.0	± 0.8	± 1.1
58.0	36.0	36.0	0.0	± 0.8	± 1.1
59.0	35.0	35.0	0.0	± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

9(b). Level linearity on the reference level range (IEC 61672-3 Clause 16)
Level linearity shall be tested with steady sinusoidal electrical signals at a frequency of 8 kHz with the sound level meter set for frequency-weighting A. (61672-3 Clause 16.1).

Level linearity shall be measured in 5 dB steps of increasing input signal level from the starting point up to within 5 dB of the upper boundary stated in the Instruction Manual for the linear operating range at 8 kHz, then at 1 dB steps of increasing input signal level up to, but not including, the first indication of overload. The test of level linearity shall then be continued at 5 dB steps of decreasing input signal level from the starting point down to within 5 dB of the specified lower boundary, then at 1 dB steps of decreasing input signal level down to, but not including, the first indication of an under-range condition.

Measured level linearity deviations shall not exceed the applicable acceptance limits given in IEC 61672-1 from the specified upper boundary of the linear operating range up to, but not including, the first indication of overload and also from the specified lower boundary of the linear operating range down to, but not including, the first indication of an under-range condition.

"Y" means indicator under-range. However, if 20dB above noise floor is reached then no results are reported.

☑ Checked

10. Level Linearity with Level Ranges 1kHz

10(a). Level Linearity Including the Level Range (Reference Signal)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	A
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	0
Generator Frequency (Hz)	1k
Reference SPL (dB)	114
Output (mVrms)	487.6

Settings	Level (dB)			Tolerance	
Range	Expected	Indicated	Difference	Type 1	Type 2
HIGH	114.0	114.0	0.0	± 0.8	± 1.1
MID	114.0	114.0	0.0	± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1
				± 0.8	± 1.1

Conforming	Yes

Uncertainty (+/-) dB	0.13

10(b). Level Linearity Including the Level range (5dB Above Under-range)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	A
SLM Range	HIGH
Generator & Attenuator Settings	
Attenuation (dB)	30
Generator Frequency (Hz)	1k
Reference SPL (dB)	65
Output (mVrms)	54.7

Settings		Level (dB)			Tolerance	
Range	Atten	Expected	Indicated	Difference	Type 1	Type 2
HIGH	30.0	65.0	64.9	-0.1	± 0.8	± 1.1
MID	50.0	45.0	44.9	-0.1	± 0.8	± 1.1
LOW	70.0	25.0	25.0	0.0	± 0.8	± 1.1
					± 0.8	± 1.1
					± 0.8	± 1.1
					± 0.8	± 1.1
					± 0.8	± 1.1
					± 0.8	± 1.1
					± 0.8	± 1.1
					± 0.8	± 1.1

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

10. Level linearity including the level range control (IEC 61672-3 Clause 17)
For sound level meters that have more than one level range, tests of level linearity errors including errors introduced by the level range control shall be performed with steady sinusoidal electrical input signals at a frequency of 1 kHz and with the sound level meter set for frequency weighting A. For each test, signal levels shall be recorded as indications of F-time-weighted sound level or time-average sound level. (61672-3 Clause 17.1).

With the input signal level kept constant, the indicated signal level shall be recorded for all level ranges where the signal level is displayed. The indicated signal levels and the corresponding anticipated indications of signal levels shall be recorded. (61672-3 Clause 17.3).

For each level range, the level of the input signal shall then be adjusted to yield a signal level that is expected to be 5 dB greater than the signal level that first causes an indication of under-range on a level range. The indicated signal levels and the corresponding anticipated levels shall be recorded. (61672-3 Clause 17.4).

Level linearity deviations shall be calculated as an indicated signal level minus the corresponding anticipated signal level. Measured level linearity deviations shall not exceed the applicable acceptance limits given in IEC 61672-1.

☑ Checked

11. Toneburst Response

11(a). Fast ToneBurst

SLM Settings - Fast	
Time Weighting	Fast
Frequency Weighting	A
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	0.0
Generator Frequency (Hz)	4k
dB Down from Linearity Limit	3
Reference SPL (dB)	117.0
Output (mVrms)	615.0

Toneburst (ms)	# Cycles	LAFMax (dB)			Tolerance	
		Expected	Indicated	Difference	Type 1	Type 2
200	800	116.0	116.0	0.0	± 0.5	± 1.0
2	8	99.0	98.9	-0.1	+ 1.0; -1.5	+ 1.0; -2.5
0.25	1	90.0	89.9	-0.1	+ 1.0; -3.0	+ 1.5; -5.0

Conforming	Yes

Uncertainty (+/-) dB	0.09

11(b). Slow ToneBurst

SLM Settings - Slow	
Time Weighting	Slow
Frequency Weighting	A
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	0.0
Generator Frequency (Hz)	4k
dB Down from Linearity Limit	3
Reference SPL (dB)	117.0
Output (mVrms)	615.0

Toneburst (ms)	# Cycles	LASMax (dB)			Tolerance	
		Expected	Indicated	Difference	Type 1	Type 2
200	800	109.6	109.6	0.0	± 0.5	± 1.0
2	8	90.0	89.9	-0.1	+ 1.0; -3.0	+ 1.0; -5.0

Conforming	Yes

Uncertainty (+/-) dB	0.09

11(c). SEL ToneBurst

SLM Settings - SEL/Leq	
Function	SEL
Frequency Weighting	A
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	0.0
Generator Frequency (Hz)	4k
dB Down from Linearity Limit	3
Reference SPL (dB)	117.0
Output (mVrms)	615.0
Integration Time (if SEL not available) (s)	

Toneburst (ms)	# Cycles	SEL				Tolerance	
		Indicated	Calc'd	Expected	Difference	Type 1	Type 2
200	800	109.8	109.8	110.0	-0.2	± 0.5	± 1.0
2	8	90.0	90.0	90.0	0.0	+ 1.0; -1.5	+ 1.0; -2.5
0.25	1	80.9	80.9	81.0	-0.1	+ 1.0; -3.0	+ 1.5; -5.0

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

11. Toneburst response (IEC 61672-3 Clause 18)
The response of the sound level meter to short-duration signals shall be tested on the reference level range with 4 kHz tonebursts. The sound level meter shall be set to frequency weighting A. (61672-3 Clause 18.1).

For the toneburst signals, indications of the sound level meter to be recorded are maximum F-time-weighted sound level, maximum S-time-weighted sound level and sound exposure level, as applicable.

The level of the steady input signal shall be adjusted to display an F-time-weighted, Stime-weighted, or time-averaged sound level, as appropriate, that is 3 dB less than the upper boundary stated in the Instruction Manual for the linear operating range at 4 kHz on the reference level range. (61672-3 Clause 18.4).

Tonebursts are tested at 200ms, 2ms and, 0.25ms durations (the latter for Fast and SEL only) and the LMax or SEL recorded.

Measured deviations of the measured toneburst responses from the corresponding reference toneburst responses given in IEC 61672-1 shall not exceed the applicable

☑ Checked

12. Peak C sound level

12(a). Peak C 8 KHz

SLM Settings	
Time Weighting	Fast
Frequency Weighting	C
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	0.0
Generator Frequency (Hz)	8k
Reference SPL (dB)	112.0
Output (mVrms)	549.7

Test Signal	dB LCpeak Hold				Tolerance	
8 kHz	Indication	O'Load?	Expected	Difference	Type 1	Type 2
1 Cycle	115.4	No	115.4	0.0	± 2.0	± 3.0

Conforming	Yes

Uncertainty (+/-) dB	0.09

12(b). Peak C 500 Hz

SLM Settings	
Time Weighting	Fast
Frequency Weighting	C
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	0.0
Generator Frequency (Hz)	500
Reference SPL (dB)	112.0
Output (mVrms)	386.3

Test Signal	dB LCpeak Hold				Tolerance	
500 Hz	Indication	O'Load?	Expected	Difference	Type 1	Type 2
One +ve 1/2 cycle	114.2	No	114.4	-0.2	± 1.0	± 2.0
One -ve 1/2 cycle	114.2	No	114.4	-0.2	± 1.0	± 2.0

Conforming	Yes

Uncertainty (+/-) dB	0.09

Description of Tests

12. Peak C sound level (IEC 61672-3 Clause 19)
Indications of C-weighted peak sound level shall be tested on the least-sensitive level range. The test signals consist of (a) a single complete cycle of an 8 kHz sinusoid starting and stopping at zero crossings and (b) positive and negative half cycles of a 500 Hz sinusoid that also start and stop at zero crossings.

The level of the steady sinusoidal 8 kHz electrical input signal, from which a single complete cycle is extracted, shall be adjusted to yield an indication of C-weighted, F-timeweighted sound level, or C-weighted, time-averaged sound level, that is 8 dB less than the upper boundary stated in the Instruction Manual for the peak level range at 8 kHz on the leastsensitive level range. The indication of steady sound level shall be recorded.

The indication of C-weighted peak sound level in response to a complete cycle of the 8 kHz signal shall be recorded. Application of the complete-cycle 8 kHz signal shall not cause indication of an overload condition.

The level of the steady sinusoidal 500 Hz electrical input signal, from which positive and negative half cycles are extracted, shall be adjusted to yield an indication of C-weighted, Ftime-weighted sound level, or C-weighted, time-averaged sound level, that is 8 dB less than the upper boundary stated in the Instruction Manual for the peak level range on the least-sensitive level range. The indications of steady sound levels shall be recorded.

The indications of C-weighted peak sound level in response to a single positive halfcycle 500 Hz signal and to a single negative half-cycle 500 Hz signal shall be recorded and reported. Applications of the 500 Hz half-cycle signals shall not cause indications of an overload condition.

☑ Checked

13. Overload indication

SLM Settings	
Function	Leq
Frequency Weighting	A
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	0.0
Generator Frequency (Hz)	4k
Reference SPL (dB)	119.0
Output (mVrms)	774.6

	Half-Cycle Signal			Tolerance	
	Positive	Negative	Difference	Type 1	Type 2
Level (dB)	124.6	124.6	0.0	± 1.5	± 1.5
Generator Output (mVrms)	1531.0	1530.0			

Conforming	Yes

Uncertainty (+/-) dB	0.09

Overload Indicated	No
Overload Indicator Latches	N/A

Conforming	N/A

Description of Tests

13. Overload Indication (IEC 61672-3 Clause 20)
The test of overload indication shall only be performed for sound level meters capable of displaying time-average sound level.

Overload indication shall be tested on the least-sensitive level range with the sound level meter set to display A-weighted, time-average sound level. Positive and negative one-half-cycle sinusoidal electrical signals at a frequency of 4 kHz shall be used.(IEC 61672-3 Clause 20.2)

The test shall begin at an indicated time-averaged level for the steady input signal that corresponds to 1 dB less than the upper boundary specified for the linear operating range at 4 kHz. The level of the single positive one-half-cycle input signal shall be increased to the first indication of overload, to a resolution of 0.1 dB. The process shall be repeated for the single negative one-half-cycle signal. The levels of the single one-half-cycle input signals that produced the first indications of overload shall be recorded to a resolution of 0.1 dB.

It shall be verified that the overload indicator latches on as specified in IEC 61672-1 when an overload condition occurs.

☑ Checked

14. High-level Stability

SLM Settings	
Time Weighting	F
Frequency Weighting	A
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	0.0
Generator Frequency (Hz)	1k
Reference SPL (dB)	119.0
Output (mVrms)	846.8

Time Period to Apply Signal (min)	5.0
Record SPL at Conclusion of Time Period (dB)	119.0
Difference	0.0
Tolerance	± 0.1

Conforming	Yes

Uncertainty (+/-) dB	0.09

Description of Tests

14. High-level Stability (IEC 61672-3 Clause 21)
The ability of a sound level meter to operate continuously in response to high signal levels without significant change in sensitivity is evaluated from the difference between the Aweighted sound levels indicated in response to a steady 1 kHz electrical signal at the beginning and end of a 5 min period of continuous exposure to the signal.

The level of the steady electrical input signal shall be that which is required to display the sound level that is 1 dB less than the upper boundary of the 1 kHz linear operating range on the least-sensitive level range.

☑ Checked

15(a). Octave Band Filter Relative Attenuation (≤2kHz)

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
Range	HIGH
Set dB Below Full Scale	-1
Attenuator dB	0.0
Reference SPL 1kHz	133.0
Output mVrms	4028.0
Noise Floor dB	-99.0

Ratio	1	2	3	4	5	6	7	8	9	10	Tolerance	
Freq	4 Hz	8 Hz	16 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz		
0.06				61.5					49.3			
0.13				69.3					50.4			
0.25				67.0					54.2			
0.50				82.1					71.1			
0.71												
0.77				132.8					133.0			
0.84				133.0					133.0			
0.92				132.8					133.0			
1.00				**132.9**					**133.0**			
1.09				132.9					133.0			
1.19				132.9					133.0			
1.30				132.9					133.0			
1.41												
2.00				72.5					40.3			
4.00				68.3					36.1			
8.00				64.9					37.5			
16.00				61.6					36.7		Class 1	Class 2
Attenuation dB				71.4					83.7		+70/inf	+60/inf
				63.6					82.6		+60/inf	+54/inf
				65.9					78.8		+40.5/inf	+39.5/inf
				50.8					61.9		+16.6/inf	+15.6/inf
											-0.4/+5.3	-0.6/+5.8
				0.1					0.0		-0.4/+1.4	-0.6/+1.7
				-0.1					0.0		-0.4/+0.7	-0.6/+0.9
				0.1					0.0		-0.4/+0.5	-0.6/+0.7
				0.0					**0.0**		-0.4/+0.4	-0.6/+0.6
				0.0					0.0		-0.4/+0.5	-0.6/+0.7
				0.0					0.0		-0.4/+0.7	-0.6/+0.9
				0.0					0.0		-0.4/+1.4	-0.6/+1.7
											-0.4/+5.3	-0.6/+5.8
				60.4					92.7		+16.6/inf	+15.6/inf
				64.6					96.9		+40.5/inf	+39.5/inf
				68.0					95.5		+60/inf	+54/inf
				71.3					96.3		+70/inf	+60/inf
Ins Loss				-0.1					0.0			
Conforming	N/A	N/A	N/A	Yes	N/A	N/A	N/A	N/A	Yes	N/A		

Uncert (+/-) dB	≤80dB	0.09	>80dB	0.46

Description of Test

15(a) Octave Filter (IEC 61260-3 Clause 13)

13 Measurement of relative attenuation
13.1 The relative attenuation on the reference level range shall be tested for the same three filters as selected in Clause 11.
13.2 The measurements of relative attenuation are made as the response to constant amplitude sinusoidal signals at various frequencies. The level of the input signals shall be (1 ± 0,1) dB below the specified upper boundary of the linear operating range.
13.6 The measured relative attenuation shall not exceed the acceptance limits given in Table 1 for the appropriate class of filter.

Interpretation: The three filters specified in "Clause 11" are 31.5Hz, 1kHz and 16kHz. The limits in "Table 1" are the Tolerance values shown in green above. The yellow cells are the observed values. The "Attenuation dB" cells are the attenuation values of each filter with the filter's centre frequency attenuation assumed to be zero (i.e. the relative attenuation). The "Ins Loss" are the actual values of attenuation at the filter centre frequencies.

☑ Checked

15(b). Octave Band Filter Relative Attenuation (>2kHz)

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	HIGH
Set dB Below Full Scale	-1.0
Attenuator dB	0.0
Reference SPL 1kHz	133.0
Output mVrms	4028.0
Noise Floor dB	-99.0

Ratio	1	2	3	4	5	6	7	8	9	10	Tolerance	
Freq	4kHz	8kHz	16kHz	32kHz								
0.06			50.4									
0.13			54.3									
0.25			55.3									
0.50			70.7									
0.71												
0.77			133.0									
0.84			133.0									
0.92			133.0									
1.00			**133.0**									
1.09			133.0									
1.19			133.0									
1.30			133.0									
1.41												
2.00			51.8									
4.00			44.8									
8.00			43.7									
16.00			58.5								Class 1	Class 2
Attenuation dB			82.6								+70/inf	+60/inf
			78.7								+60/inf	+54/inf
			77.7								+40.5/inf	+39.5/inf
			62.3								+16.6/inf	+15.6/inf
											-0.4/+5.3	-0.6/+5.8
			0.0								-0.4/+1.4	-0.6/+1.7
			0.0								-0.4/+0.7	-0.6/+0.9
			0.0								-0.4/+0.5	-0.6/+0.7
			0.0								-0.4/+0.4	-0.6/+0.6
			0.0								-0.4/+0.5	-0.6/+0.7
			0.0								-0.4/+0.7	-0.6/+0.9
			0.0								-0.4/+1.4	-0.6/+1.7
											-0.4/+5.3	-0.6/+5.8
			81.2								+16.6/inf	+15.6/inf
			88.2								+40.5/inf	+39.5/inf
			89.3								+60/inf	+54/inf
			74.5								+70/inf	+60/inf

Ins Loss			0.0							
Conforming	N/A	N/A	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Uncert (+/-) dB	≤80dB	0.09	>80dB	0.46

Description of Test

15(b) Octave Filter (IEC 61260-3 Clause 13)

13 Measurement of relative attenuation
13.1 The relative attenuation on the reference level range shall be tested for the same three filters as selected in Clause 11.
13.2 The measurements of relative attenuation are made as the response to constant amplitude sinusoidal signals at various frequencies. The level of the input signals shall be (1 ± 0,1) dB below the specified upper boundary of the linear operating range.
13.6 The measured relative attenuation shall not exceed the acceptance limits given in Table 1 for the appropriate class of filter.

Interpretation: The three filters specified in "Clause 11" are 31.5Hz, 1kHz and 16kHz. The limits in "Table 1" are the Tolerance values shown in green above. The yellow cells are the observed values. The "Attenuation dB" cells are the attenuation values of each filter with the filter's centre frequency attenuation assumed to be zero (i.e. the relative attenuation). The "Ins Loss" are the actual values of attenuation at the filter centre frequencies.

☑ Checked

16. Octave Band Filter Relative Attenuation at Midband Frequency

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
Reference Range	MID
Attenuator dB	0.0
Reference SPL 1kHz	94.0
Output mVrms	45.0

	1	2	3	4	5	6	7	8	9	10	Tolerance	
Freq	**4 Hz**	**8 Hz**	**16 Hz**	**31.5 Hz**	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**Class 1**	**Class 2**
Measured			94.3	93.8	93.9	94.0	94.0	94.0	94.0	94.0		
Ins Loss			0.3	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	-0.4/+0.4	-0.6/+0.6
Conforming	**N/A**	**N/A**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		

Freq	**4kHz**	**8kHz**	**16kHz**	**32kHz**							**Class 1**	**Class 2**
Measured	94.0	94.0	94.0									
Ins Loss	0.0	0.0	0.0								-0.4/+0.4	-0.6/+0.6
Conforming	**Yes**	**Yes**	**Yes**	**N/A**								

Uncert (+/-) dB	**0.09**

Description of Test

16. Octave Band Filter Relative Attenuation at Midband Frequency (IEC 61260-3 Clause 10.2)

10.2 Tests of relative attenuation at midband frequency
10.2.1 The relative attenuation at the exact midband frequency shall be measured for every filter in a set of filters. The relative attenuation $\Delta A(\Omega)$ at any midband frequency is determined from Formula (8) given in IEC 61260-1:2014. The reference level range shall be selected for the test. The level of the test signal shall be equal to the reference input signal level.
10.2.2 The measured relative attenuation shall not exceed the acceptance limits ± 0,4 dB for Class 1 filters or ± 0,6 dB for class 2 filters as specified in 5.10 in IEC 61260-1:2014.

Interpretation: The yellow cells are the observed values. The "Ins Loss" are the actual values of attenuation at the filter centre frequencies. The "Conforming" cells demonstrate compliance with the Tolerance limits depending upon the Class of filter.

☑ Checked

17(a). Octave Band Filter Level Linearity 31.5Hz (Increasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Over SLM Range	5
Attenuation (dB)	31.0
Generator Frequency (Hz)	31.5
SPL Reference Starting Point (dB)	94.0
Output (mVrms)	1753.0
Noise Floor (dB)	-99.0

Increasing level to Overload				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
26.0	99.0	99.0	0.0	±0.5	±0.6
21.0	104.0	104.0	0.0	±0.5	±0.6
16.0	109.0	109.0	0.0	±0.5	±0.6
11.0	114.0	114.0	0.0	±0.5	±0.6
10.0	115.0	115.0	0.0	±0.5	±0.6
9.0	116.0	116.0	0.0	±0.5	±0.6
8.0	117.0	117.0	0.0	±0.5	±0.6
7.0	118.0	118.0	0.0	±0.5	±0.6
6.0	119.0	119.0	0.0	±0.5	±0.6
5.0	120.0	120.0	0.0	±0.5	±0.6
4.0	121.0	121.0	0.0	±0.5	±0.6
3.0	122.0	122.0	0.0	±0.5	±0.6
2.0	123.0	123.0	0.0	±0.5	±0.6
1.0	124.0	124.0	0.0	±0.5	±0.6
0.0	125.0	125.0	0.0	±0.5	±0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

17(a). Filter Level linearity on the reference level range (IEC 61260-3 Clause 11)

The level linearity shall be tested for three filters in a set of filters. For a set of filters covering the audible range of frequencies, it is recommended to test filters with frequencies close to 31.5 Hz,1 kHz and 16 kHz.

The test shall be performed on the reference level range for levels from the specified lower boundary of the specified linear operating range up to a level where the overload indicator displays an overload. Adjust the level of the input signal with steps that are not greater than 5 dB. The difference between successive steps of the input signal level shall be reduced to 1 dB when the distance to the lower or upper boundaries of a linear operating range is less than 5 dB and when the level is above the upper boundary. The boundaries are as stated in the instruction manual for the filter. If no overload is displayed, the filter does not conform to the requirements.

The measured level linearity deviation shall not exceed the acceptance limits given in 5.13 in IEC 61260-1:2014 for all measured levels between the lower boundary of the linear operating range, as stated in the instruction manual for the filter, and up to the highest level, measured as described above, without an overload indication.

An overload shall not be indicated if the level of the input signal is below the stated upper boundary of each appropriate linear operating range.

"Y" means indicator over-range.

☑ Checked

17(b). Octave Band Filter Level Linearity 1kHz (Increasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Over SLM Range	5
Attenuation (dB)	31.0
Generator Frequency (Hz)	1k
SPL Reference Starting Point (dB)	94.0
Output (mVrms)	1727.0
Noise Floor (dB)	-99.0

Increasing level to Overload				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
26.0	99.0	99.0	0.0	±0.5	±0.6
21.0	104.0	104.0	0.0	±0.5	±0.6
16.0	109.0	109.0	0.0	±0.5	±0.6
11.0	114.0	114.0	0.0	±0.5	±0.6
10.0	115.0	115.0	0.0	±0.5	±0.6
9.0	116.0	116.0	0.0	±0.5	±0.6
8.0	117.0	117.0	0.0	±0.5	±0.6
7.0	118.0	118.0	0.0	±0.5	±0.6
6.0	119.0	119.0	0.0	±0.5	±0.6
5.0	120.0	120.0	0.0	±0.5	±0.6
4.0	121.0	121.0	0.0	±0.5	±0.6
3.0	122.0	122.0	0.0	±0.5	±0.6
2.0	123.0	123.0	0.0	±0.5	±0.6
1.0	124.0	124.0	0.0	±0.5	±0.6
0.0	125.0	125.0	0.0	±0.5	±0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

17(b). Filter Level linearity on the reference level range (IEC 61260-3 Clause 11)

The level linearity shall be tested for three filters in a set of filters. For a set of filters covering the audible range of frequencies, it is recommended to test filters with frequencies close to 31.5 Hz,1 kHz and 16 kHz.

The test shall be performed on the reference level range for levels from the specified lower boundary of the specified linear operating range up to a level where the overload indicator displays an overload. Adjust the level of the input signal with steps that are not greater than 5 dB. The difference between successive steps of the input signal level shall be reduced to 1 dB when the distance to the lower or upper boundaries of a linear operating range is less than 5 dB and when the level is above the upper boundary. The boundaries are as stated in the instruction manual for the filter. If no overload is displayed, the filter does not conform to the requirements.

The measured level linearity deviation shall not exceed the acceptance limits given in 5.13 in IEC 61260-1:2014 for all measured levels between the lower boundary of the linear operating range, as stated in the instruction manual for the filter, and up to the highest level, measured as described above, without an overload indication.

An overload shall not be indicated if the level of the input signal is below the stated upper boundary of each appropriate linear operating range.

"Y" means indicator over-range.

☑ Checked

17(c). Octave Band Filter Level Linearity 16kHz (Increasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Over SLM Range	5
Attenuation (dB)	31.0
Generator Frequency (Hz)	16k
SPL Reference Starting Point (dB)	94.0
Output (mVrms)	1722.0
Noise Floor (dB)	-99.0

Increasing level to Overload				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
26.0	99.0	99.0	0.0	±0.5	±0.6
21.0	104.0	104.0	0.0	±0.5	±0.6
16.0	109.0	109.0	0.0	±0.5	±0.6
11.0	114.0	114.0	0.0	±0.5	±0.6
10.0	115.0	115.0	0.0	±0.5	±0.6
9.0	116.0	116.0	0.0	±0.5	±0.6
8.0	117.0	117.0	0.0	±0.5	±0.6
7.0	118.0	118.0	0.0	±0.5	±0.6
6.0	119.0	119.0	0.0	±0.5	±0.6
5.0	120.0	120.0	0.0	±0.5	±0.6
4.0	121.0	121.0	0.0	±0.5	±0.6
3.0	122.0	122.0	0.0	±0.5	±0.6
2.0	123.0	123.0	0.0	±0.5	±0.6
1.0	124.0	124.0	0.0	±0.5	±0.6
0.0	125.0	125.0	0.0	±0.5	±0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

17(c). Filter Level linearity on the reference level range (IEC 61260-3 Clause 11)

The level linearity shall be tested for three filters in a set of filters. For a set of filters covering the audible range of frequencies, it is recommended to test filters with frequencies close to 31.5 Hz,1 kHz and 16 kHz.

The test shall be performed on the reference level range for levels from the specified lower boundary of the specified linear operating range up to a level where the overload indicator displays an overload. Adjust the level of the input signal with steps that are not greater than 5 dB. The difference between successive steps of the input signal level shall be reduced to 1 dB when the distance to the lower or upper boundaries of a linear operating range is less than 5 dB and when the level is above the upper boundary. The boundaries are as stated in the instruction manual for the filter. If no overload is displayed, the filter does not conform to the requirements.

The measured level linearity deviation shall not exceed the acceptance limits given in 5.13 in IEC 61260-1:2014 for all measured levels between the lower boundary of the linear operating range, as stated in the instruction manual for the filter, and up to the highest level, measured as described above, without an overload indication.

An overload shall not be indicated if the level of the input signal is below the stated upper boundary of each appropriate linear operating range.

"Y" means indicator over-range.

☑ Checked

18(a). Octave Band Filter Level Linearity 31.5Hz (Decreasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Under SLM Range	0
Attenuation (dB)	0.0
Generator Frequency (Hz)	31.5
SPL Reference Starting Point (dB)	94
Output (mVrms)	46.3
Noise Floor (dB)	-99.0

Decreasing level to Underange				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
5.0	89.0	89.0	0.0	±0.5	±0.6
10.0	84.0	84.0	0.0	±0.5	±0.6
15.0	79.0	79.0	0.0	±0.7	±0.9
20.0	74.0	74.0	0.0	±0.7	±0.9
25.0	69.0	69.0	0.0	±0.7	±0.9
30.0	64.0	64.0	0.0	±0.7	±0.9
35.0	59.0	59.0	0.0	±0.7	±0.9
40.0	54.0	54.0	0.0	±0.7	±0.9
45.0	49.0	49.0	0.0	±0.7	±0.9
50.0	44.0	44.0	0.0	±0.7	±0.9
54.0	40.0	40.0	0.0	±0.7	±0.9
55.0	39.0	39.2	0.2	±0.7	±0.9
56.0	38.0	38.3	0.3	±0.7	±0.9
57.0	37.0	37.3	0.3	±0.7	±0.9
58.0	36.0	36.4	0.4	±0.7	±0.9
59.0	35.0	35.4	0.4	±0.7	±0.9

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

18(a). Filter Level linearity on the reference level range (IEC 61260-3 Clause 11)

The level linearity shall be tested for three filters in a set of filters. For a set of filters covering the audible range of frequencies, it is recommended to test filters with frequencies close to 31.5 Hz,1 kHz and 16 kHz.

The test shall be performed on the reference level range for levels from the specified lower boundary of the specified linear operating range up to a level where the overload indicator displays an overload. Adjust the level of the input signal with steps that are not greater than 5 dB. The difference between successive steps of the input signal level shall be reduced to 1 dB when the distance to the lower or upper boundaries of a linear operating range is less than 5 dB and when the level is above the upper boundary. The boundaries are as stated in the instruction manual for the filter. If no overload is displayed, the filter does not conform to the requirements.

The measured level linearity deviation shall not exceed the acceptance limits given in 5.13 in IEC 61260-1:2014 for all measured levels between the lower boundary of the linear operating range, as stated in the instruction manual for the filter, and up to the highest level, measured as described above, without an overload indication.

An overload shall not be indicated if the level of the input signal is below the stated upper boundary of each appropriate linear operating range.

"Y" means indicator over-range.

☑ Checked

18(b). Octave Band Filter Level Linearity 1kHz (Decreasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Under SLM Range	0
Attenuation (dB)	0.0
Generator Frequency (Hz)	1kHz
SPL Reference Starting Point (dB)	94
Output (mVrms)	48.9
Noise Floor (dB)	-99.0

Decreasing level to Underange				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
5.0	89.0	89.0	0.0	±0.5	±0.6
10.0	84.0	84.0	0.0	±0.5	±0.6
15.0	79.0	79.0	0.0	±0.7	±0.9
20.0	74.0	74.0	0.0	±0.7	±0.9
25.0	69.0	69.0	0.0	±0.7	±0.9
30.0	64.0	64.0	0.0	±0.7	±0.9
35.0	59.0	59.0	0.0	±0.7	±0.9
40.0	54.0	54.0	0.0	±0.7	±0.9
45.0	49.0	49.0	0.0	±0.7	±0.9
50.0	44.0	44.0	0.0	±0.7	±0.9
54.0	40.0	40.0	0.0	±0.7	±0.9
55.0	39.0	39.2	0.2	±0.7	±0.9
56.0	38.0	38.2	0.2	±0.7	±0.9
57.0	37.0	37.3	0.3	±0.7	±0.9
58.0	36.0	36.4	0.4	±0.7	±0.9
59.0	35.0	35.4	0.4	±0.7	±0.9

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

18(b). Filter Level linearity on the reference level range (IEC 61260-3 Clause 11)

The level linearity shall be tested for three filters in a set of filters. For a set of filters covering the audible range of frequencies, it is recommended to test filters with frequencies close to 31.5 Hz,1 kHz and 16 kHz.

The test shall be performed on the reference level range for levels from the specified lower boundary of the specified linear operating range up to a level where the overload indicator displays an overload. Adjust the level of the input signal with steps that are not greater than 5 dB. The difference between successive steps of the input signal level shall be reduced to 1 dB when the distance to the lower or upper boundaries of a linear operating range is less than 5 dB and when the level is above the upper boundary. The boundaries are as stated in the instruction manual for the filter. If no overload is displayed, the filter does not conform to the requirements.

The measured level linearity deviation shall not exceed the acceptance limits given in 5.13 in IEC 61260-1:2014 for all measured levels between the lower boundary of the linear operating range, as stated in the instruction manual for the filter, and up to the highest level, measured as described above, without an overload indication.

An overload shall not be indicated if the level of the input signal is below the stated upper boundary of each appropriate linear operating range.

"Y" means indicator over-range.

☑ Checked

18(c). Octave Band Filter Level Linearity 16kHz (Decreasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Under SLM Range	0
Attenuation (dB)	0.0
Generator Frequency (Hz)	16kHz
SPL Reference Starting Point (dB)	94
Output (mVrms)	48.6
Noise Floor (dB)	-99.0

Decreasing level to Underange				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
5.0	89.0	89.0	0.0	±0.5	±0.6
10.0	84.0	84.0	0.0	±0.5	±0.6
15.0	79.0	79.0	0.0	±0.7	±0.9
20.0	74.0	74.0	0.0	±0.7	±0.9
25.0	69.0	69.0	0.0	±0.7	±0.9
30.0	64.0	64.0	0.0	±0.7	±0.9
35.0	59.0	59.0	0.0	±0.7	±0.9
40.0	54.0	54.0	0.0	±0.7	±0.9
45.0	49.0	49.0	0.0	±0.7	±0.9
50.0	44.0	44.0	0.0	±0.7	±0.9
54.0	40.0	40.0	0.0	±0.7	±0.9
55.0	39.0	39.0	0.0	±0.7	±0.9
56.0	38.0	38.1	0.1	±0.7	±0.9
57.0	37.0	37.1	0.1	±0.7	±0.9
58.0	36.0	36.2	0.2	±0.7	±0.9
59.0	35.0	35.2	0.2	±0.7	±0.9

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

18(c). Filter Level linearity on the reference level range (IEC 61260-3 Clause 11)

The level linearity shall be tested for three filters in a set of filters. For a set of filters covering the audible range of frequencies, it is recommended to test filters with frequencies close to 31.5 Hz,1 kHz and 16 kHz.

The test shall be performed on the reference level range for levels from the specified lower boundary of the specified linear operating range up to a level where the overload indicator displays an overload. Adjust the level of the input signal with steps that are not greater than 5 dB. The difference between successive steps of the input signal level shall be reduced to 1 dB when the distance to the lower or upper boundaries of a linear operating range is less than 5 dB and when the level is above the upper boundary. The boundaries are as stated in the instruction manual for the filter. If no overload is displayed, the filter does not conform to the requirements.

The measured level linearity deviation shall not exceed the acceptance limits given in 5.13 in IEC 61260-1:2014 for all measured levels between the lower boundary of the linear operating range, as stated in the instruction manual for the filter, and up to the highest level, measured as described above, without an overload indication.

An overload shall not be indicated if the level of the input signal is below the stated upper boundary of each appropriate linear operating range.

"Y" means indicator over-range.

☑ Checked

19. Octave Level Ranges

19(a). Octave Level Linearity Including the Level range (31.5Hz)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	10
Generator Frequency (Hz)	31.5
Reference SPL (dB)	94
Output (mVrms)	156.8

Settings		Level (dB)			Tolerance	
Range	Atten	Expected	Indicated	Difference	Type 1	Type 2
HIGH	0.0	104.0	104.0	0.0	± 0.5	± 0.6
MID	14.0	90.0	90.0	0.0	± 0.5	± 0.6
LOW	34.0	70.0	70.0	0.0	± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

19(b). Octave Level Linearity Including the Level range (1kHz)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	10
Generator Frequency (Hz)	1k
Reference SPL (dB)	94
Output (mVrms)	154.0

Settings		Level (dB)			Tolerance	
Range	Atten	Expected	Indicated	Difference	Type 1	Type 2
HIGH	0.0	104.0	104.0	0.0	± 0.5	± 0.6
MID	14.0	90.0	90.0	0.0	± 0.5	± 0.6
LOW	34.0	70.0	70.0	0.0	± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

19(c). Octave Level Linearity Including the Level range (16kHz)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	10
Generator Frequency (Hz)	16k
Reference SPL (dB)	94
Output (mVrms)	153.4

Settings		Level (dB)			Tolerance	
Range	Atten	Expected	Indicated	Difference	Type 1	Type 2
HIGH	0.0	104.0	104.0	0.0	± 0.5	± 0.6
MID	14.0	90.0	90.0	0.0	± 0.5	± 0.6
LOW	34.0	70.0	70.0	0.0	± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

19. Filter Level linearity including the level range control (IEC 61260-3 Clause 11.9)

11.9 For the same three filters as selected above, test each available level range in the following way: based on the same reference level, adjust the input level to be 30 dB below upper boundary of the linear operating range for each of the selected range settings. The measured level linearity deviation shall not exceed the acceptance limits given in 5.13.3 and 5.13.4 of IEC 61260-1:2014

The three filter frequencies are 31.5Hz, 1kHz and 16kHz.

The level linearity differences are calculated as the indicated signal level minus the corresponding expected signal level.

☑ Checked

20. Octave Band Filter Lower Limit

20(a). Octave Band Filter Lower Limit (Reference Range)

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
Reference Range	MID
Lower Limit for the Range	40

	1	2	3	4	5	6	7	8	9	10
Freq	4 Hz	8 Hz	16 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz
Measured		14.5	11.6	8.7	7.6	6.1	5.0	4.8	6.6	8.1
Conforming	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Freq	4kHz	8kHz	16kHz	32kHz						
Measured	10.5	13.5	17.0							
Conforming	Yes	Yes	Yes	N/A						

Conforming	Yes

Uncert (+/-) dB	0.09

20(b). Octave Band Filter Lower Limit (Lowest Range)

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
Lowest Range	LOW
Lower Limit for the Range	20

	1	2	3	4	5	6	7	8	9	10
Freq	4 Hz	8 Hz	16 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz
Measured		12.5	13.3	5.2	7.0	4.7	2.9	1.7	0.3	0.2
Conforming	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Freq	4kHz	8kHz	16kHz	32kHz						
Measured	1.2	2.7	5.1							
Conforming	Yes	Yes	Yes	N/A						

Conforming	Yes

Uncert (+/-) dB	0.09

20. Octave Band Filter Lower LImit (IEC 61260-3 Clause 12)

12.2 Short-circuit the input terminal or use similar means to ensure that the level of the input signal is below the lower limit of the specified linear operating range. Record the output level from each filter in the set. The output level shall not exceed the specified lower limit for the appropriate filter and range.

Interpretation: The yellow cells are the observed values. The measured value must not exceed the Lower LImit for the Range.

☑ Checked

21(a). Third Octave Band Filter Relative Attenuation (≤31.5Hz)

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	HIGH
Set dB Below Full Scale	-1
Attenuator dB	0.0
Reference SPL 1kHz	133.0
Output mVrms	4028.0
Noise Floor dB	-99.0

Ratio	1	2	3	4	5	6	7	8	9	10	Tolerance	
Freq	4Hz	5Hz	6.3Hz	8Hz	10Hz	12.5Hz	16Hz	20Hz	25Hz	31.5Hz		
0.18										56.8		
0.33										58.1		
0.53										73.1		
0.77										70.6		
0.89												
0.92										132.4		
0.95										132.9		
0.97										132.9		
1.00										**132.9**		
1.03										132.9		
1.06										132.9		
1.09										132.2		
1.12												
1.30										66.7		
1.89										54.9		
3.07										60.7		
5.43										59.5	Class 1	Class 2
Attenuation dB										76.1	+70/inf	+60/inf
										74.8	+60/inf	+54/inf
										59.8	+40.5/inf	+39.5/inf
										62.3	+16.6/inf	+15.6/inf
											-0.4/+5.3	-0.6/+5.8
										0.5	-0.4/+1.4	-0.6/+1.7
										0.0	-0.4/+0.7	-0.6/+0.9
										0.0	-0.4/+0.5	-0.6/+0.7
										0.0	-0.4/+0.4	-0.6/+0.6
										0.0	-0.4/+0.5	-0.6/+0.7
										0.0	-0.4/+0.7	-0.6/+0.9
										0.7	-0.4/+1.4	-0.6/+1.7
											-0.4/+5.3	-0.6/+5.8
										66.2	+16.6/inf	+15.6/inf
										78.0	+40.5/inf	+39.5/inf
										72.2	+60/inf	+54/inf
										73.4	+70/inf	+60/inf
Ins Loss										**-0.1**		
Conforming	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes		

Uncert (+/-) dB	≤80dB	0.09	>80dB	0.46

Description of Test

21(a) Octave Filter (IEC 61260-3 Clause 13)

13 Measurement of relative attenuation
13.1 The relative attenuation on the reference level range shall be tested for the same three filters as selected in Clause 11.
13.2 The measurements of relative attenuation are made as the response to constant amplitude sinusoidal signals at various frequencies. The level of the input signals shall be (1 ± 0,1) dB below the specified upper boundary of the linear operating range.
13.6 The measured relative attenuation shall not exceed the acceptance limits given in Table 1 for the appropriate class of filter.

Interpretation: The three filters specified in "Clause 11" are 31.5Hz, 1kHz and 16kHz unless the client expands this range. The limits in "Table 1" are the Tolerance values shown in green above. The yellow cells are the observed values. The "Attenuation dB" cells are the attenuation values of each filter with the filter's centre frequency attenuation assumed to be zero (i.e. the relative attenuation). The "Ins Loss" are the actual values of attenuation at the filter centre frequencies.

☑ Checked

21(b). Third Octave Band Filter Relative Attenuation (40Hz-315Hz)

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	HIGH
Set dB Below Full Scale	-1.0
Attenuator dB	0.0
Reference SPL 1kHz	133.0
Output mVrms	4028.0
Noise Floor dB	-99.0

Ratio	1	2	3	4	5	6	7	8	9	10	Tolerance	
Freq	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz		
0.18									50.1			
0.33									55.8			
0.53									66.9			
0.77									70.8			
0.89												
0.92									132.7			
0.95									133.1			
0.97									133.0			
1.00									**133.0**			
1.03									133.0			
1.06									133.0			
1.09									132.3			
1.12												
1.30									58.1			
1.89									52.4			
3.07									42.4			
5.43									39.3		Class 1	Class 2
Attenuation dB									82.9		+70/inf	+60/inf
									77.2		+60/inf	+54/inf
									66.1		+40.5/inf	+39.5/inf
									62.2		+16.6/inf	+15.6/inf
											-0.4/+5.3	-0.6/+5.8
									0.3		-0.4/+1.4	-0.6/+1.7
									-0.1		-0.4/+0.7	-0.6/+0.9
									0.0		-0.4/+0.5	-0.6/+0.7
									0.0		-0.4/+0.4	-0.6/+0.6
									0.0		-0.4/+0.5	-0.6/+0.7
									0.0		-0.4/+0.7	-0.6/+0.9
									0.7		-0.4/+1.4	-0.6/+1.7
											-0.4/+5.3	-0.6/+5.8
									74.9		+16.6/inf	+15.6/inf
									80.6		+40.5/inf	+39.5/inf
									90.6		+60/inf	+54/inf
									93.7		+70/inf	+60/inf
Ins Loss									**0.0**			
Conforming	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes	N/A		

Uncert (+/-) dB	≤80dB	0.09	>80dB	0.46

Description of Test

21(b) Octave Filter (IEC 61260-3 Clause 13)

13 Measurement of relative attenuation
13.1 The relative attenuation on the reference level range shall be tested for the same three filters as selected in Clause 11.
13.2 The measurements of relative attenuation are made as the response to constant amplitude sinusoidal signals at various frequencies. The level of the input signals shall be (1 ± 0,1) dB below the specified upper boundary of the linear operating range.
13.6 The measured relative attenuation shall not exceed the acceptance limits given in Table 1 for the appropriate class of filter.

Interpretation: The three filters specified in "Clause 11" are 31.5Hz, 1kHz and 16kHz unless the client expands this range. The limits in "Table 1" are the Tolerance values shown in green above. The yellow cells are the observed values. The "Attenuation dB" cells are the attenuation values of each filter with the filter's centre frequency attenuation assumed to be zero (i.e. the relative attenuation). The "Ins Loss" are the actual values of attenuation at the filter centre frequencies.

☑ Checked

21(c). Third Octave Band Filter Relative Attenuation (400Hz-3.15kHz)

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	HIGH
Set dB Below Full Scale	-1.0
Attenuator dB	0.0
Reference SPL 1kHz	133.0
Output mVrms	4028.0
Noise Floor dB	-99.0

Ratio	1	2	3	4	5	6	7	8	9	10	Tolerance	
Freq	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz		
0.18					45.8							
0.33					48.1							
0.53					59.2							
0.77					70.6							
0.89												
0.92					132.7							
0.95					133.0							
0.97					133.0							
1.00					**133.0**							
1.03					133.0							
1.06					133.0							
1.09					132.2							
1.12												
1.30					58.0							
1.89					51.6							
3.07					32.3							
5.43					31.4						Class 1	Class 2
Attenuation dB					87.2						+70/inf	+60/inf
					84.9						+60/inf	+54/inf
					73.8						+40.5/inf	+39.5/inf
					62.4						+16.6/inf	+15.6/inf
											-0.4/+5.3	-0.6/+5.8
					0.3						-0.4/+1.4	-0.6/+1.7
					0.0						-0.4/+0.7	-0.6/+0.9
					0.0						-0.4/+0.5	-0.6/+0.7
					0.0						-0.4/+0.4	-0.6/+0.6
					0.0						-0.4/+0.5	-0.6/+0.7
					0.0						-0.4/+0.7	-0.6/+0.9
					0.8						-0.4/+1.4	-0.6/+1.7
											-0.4/+5.3	-0.6/+5.8
					75.0						+16.6/inf	+15.6/inf
					81.4						+40.5/inf	+39.5/inf
					100.7						+60/inf	+54/inf
					101.6						+70/inf	+60/inf

Ins Loss					0.0					
Conforming	N/A	N/A	N/A	N/A	Yes	N/A	N/A	N/A	N/A	N/A

Uncert (+/-) dB	≤80dB	0.09	>80dB	0.46

Description of Test

21(c) Octave Filter (IEC 61260-3 Clause 13)

13 Measurement of relative attenuation
13.1 The relative attenuation on the reference level range shall be tested for the same three filters as selected in Clause 11.
13.2 The measurements of relative attenuation are made as the response to constant amplitude sinusoidal signals at various frequencies. The level of the input signals shall be (1 ± 0,1) dB below the specified upper boundary of the linear operating range.
13.6 The measured relative attenuation shall not exceed the acceptance limits given in Table 1 for the appropriate class of filter.

Interpretation: The three filters specified in "Clause 11" are 31.5Hz, 1kHz and 16kHz unless the client expands this range. The limits in "Table 1" are the Tolerance values shown in green above. The yellow cells are the observed values. The "Attenuation dB" cells are the attenuation values of each filter with the filter's centre frequency attenuation assumed to be zero (i.e. the relative attenuation). The "Ins Loss" are the actual values of attenuation at the filter centre frequencies.

☑ Checked

21(d). Third Octave Band Filter Relative Attenuation (≥4kHz)

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	HIGH
Set dB Below Full Scale	-1.0
Attenuator dB	0.0
Reference SPL 1kHz	133.0
Output mVrms	4028.0
Noise Floor dB	-99.0

Ratio	1	2	3	4	5	6	7	8	9	10	Tolerance	
Freq	4kHz	5kHz	6.3kHz	8kHz	10kHz	12.5kHz	16kHz	20kHz	25kHz	31.5kHz		
0.18							49.5					
0.33							53.3					
0.53							52.8					
0.77							70.5					
0.89												
0.92							132.7					
0.95							133.0					
0.97							133.0					
1.00							**133.0**					
1.03							133.0					
1.06							133.0					
1.09							132.2					
1.12												
1.30							58.2					
1.89							42.7					
3.07							38.2					
5.43							36.5				Class 1	Class 2
Attenuation dB							83.5				+70/inf	+60/inf
							79.7				+60/inf	+54/inf
							80.2				+40.5/inf	+39.5/inf
							62.5				+16.6/inf	+15.6/inf
											-0.4/+5.3	-0.6/+5.8
							0.3				-0.4/+1.4	-0.6/+1.7
							0.0				-0.4/+0.7	-0.6/+0.9
							0.0				-0.4/+0.5	-0.6/+0.7
							0.0				-0.4/+0.4	-0.6/+0.6
							0.0				-0.4/+0.5	-0.6/+0.7
							0.0				-0.4/+0.7	-0.6/+0.9
							0.8				-0.4/+1.4	-0.6/+1.7
											-0.4/+5.3	-0.6/+5.8
							74.8				+16.6/inf	+15.6/inf
							90.3				+40.5/inf	+39.5/inf
							94.8				+60/inf	+54/inf
							96.5				+70/inf	+60/inf

Ins Loss							0.0			
Conforming	N/A	N/A	N/A	N/A	N/A	N/A	Yes	N/A	N/A	N/A

Uncert (+/-) dB	≤80dB	0.09	>80dB	0.46

Description of Test

21(d) Octave Filter (IEC 61260-3 Clause 13)

13 Measurement of relative attenuation
13.1 The relative attenuation on the reference level range shall be tested for the same three filters as selected in Clause 11.
13.2 The measurements of relative attenuation are made as the response to constant amplitude sinusoidal signals at various frequencies. The level of the input signals shall be (1 ± 0,1) dB below the specified upper boundary of the linear operating range.
13.6 The measured relative attenuation shall not exceed the acceptance limits given in Table 1 for the appropriate class of filter.

Interpretation: The three filters specified in "Clause 11" are 31.5Hz, 1kHz and 16kHz unless the client expands this range. The limits in "Table 1" are the Tolerance values shown in green above. The yellow cells are the observed values. The "Attenuation dB" cells are the attenuation values of each filter with the filter's centre frequency attenuation assumed to be zero (i.e. the relative attenuation). The "Ins Loss" are the actual values of attenuation at the filter centre frequencies.

☑ Checked

22. Third Octave Band Filter Relative Attenuation at Midband Frequency

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
Reference Range	MID
Attenuator dB	0.0
Reference SPL 1kHz	94.0
Output mVrms	45.0

	1	2	3	4	5	6	7	8	9	10	Tolerance	
Freq	**4Hz**	**5Hz**	**6.3Hz**	**8Hz**	**10Hz**	**12.5Hz**	**16Hz**	**20Hz**	**25Hz**	**31.5Hz**	**Class 1**	**Class 2**
Measured			93.7	94.0	94.1	93.9	94.0	94.0	94.0	94.0		
Ins Loss			-0.3	0.0	0.1	-0.1	0.0	0.0	0.0	0.0	-0.4/+0.4	-0.6/+0.6
Conforming	**N/A**	**N/A**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		

Freq	**40Hz**	**50Hz**	**63Hz**	**80Hz**	**100Hz**	**125Hz**	**160Hz**	**200Hz**	**250Hz**	**315Hz**	**Class 1**	**Class 2**
Measured	94.0	94.0	94.0	94.0	94.0	94.0	94.0	94.0	94.0	94.0		
Ins Loss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4/+0.4	-0.6/+0.6
Conforming	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		

Freq	**400Hz**	**500Hz**	**630Hz**	**800Hz**	**1kHz**	**1.25kHz**	**1.6kHz**	**2kHz**	**2.5kHz**	**3.15kHz**	**Class 1**	**Class 2**
Measured	94.0	94.0	94.0	94.0	94.0	94.0	94.0	94.0	94.0	94.0		
Ins Loss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4/+0.4	-0.6/+0.6
Conforming	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**		

Freq	**4kHz**	**5kHz**	**6.3kHz**	**8kHz**	**10kHz**	**12.5kHz**	**16kHz**	**20kHz**	**25kHz**	**31.5kHz**	**Class 1**	**Class 2**
Measured	94.0	94.0	94.0	94.0	94.0	94.0	94.0	94.0				
Ins Loss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			-0.4/+0.4	-0.6/+0.6
Conforming	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**N/A**	**N/A**		

Uncert (+/-) dB	**0.09**

Description of Test

22. Octave Band Filter Relative Attenuation at Midband Frequency (IEC 61260-3 Clause 10.2)

10.2 Tests of relative attenuation at midband frequency
10.2.1 The relative attenuation at the exact midband frequency shall be measured for every filter in a set of filters. The relative attenuation $\Delta A(\Omega)$ at any midband frequency is determined from Formula (8) given in IEC 61260-1:2014. The reference level range shall be selected for the test. The level of the test signal shall be equal to the reference input signal level.
10.2.2 The measured relative attenuation shall not exceed the acceptance limits ± 0,4 dB for Class 1 filters or ± 0,6 dB for class 2 filters as specified in 5.10 in IEC 61260-1:2014.

Interpretation: The yellow cells are the observed values. The "Ins Loss" are the actual values of attenuation at the filter centre frequencies. The "Conforming" cells demonstrate compliance with the Tolerance limits depending upon the Class of filter.

☑ Checked

23(a). Third Octave Band Filter Level Linearity 31.5Hz (Increasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Over SLM Range	5
Attenuation (dB)	31.0
Generator Frequency (Hz)	31.5
SPL Reference Starting Point (dB)	94.0
Output (mVrms)	1753.0
Noise Floor (dB)	-99.0

Increasing level to Overload				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
26.0	99.0	99.0	0.0	±0.5	±0.6
21.0	104.0	104.0	0.0	±0.5	±0.6
16.0	109.0	109.0	0.0	±0.5	±0.6
11.0	114.0	114.0	0.0	±0.5	±0.6
10.0	115.0	115.0	0.0	±0.5	±0.6
9.0	116.0	116.0	0.0	±0.5	±0.6
8.0	117.0	117.0	0.0	±0.5	±0.6
7.0	118.0	118.0	0.0	±0.5	±0.6
6.0	119.0	119.0	0.0	±0.5	±0.6
5.0	120.0	120.0	0.0	±0.5	±0.6
4.0	121.0	121.0	0.0	±0.5	±0.6
3.0	122.0	122.0	0.0	±0.5	±0.6
2.0	123.0	123.0	0.0	±0.5	±0.6
1.0	124.0	124.0	0.0	±0.5	±0.6
0.0	125.0	125.0	0.0	±0.5	±0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

23(a). Filter Level linearity on the reference level range (IEC 61260-3 Clause 11)

The level linearity shall be tested for three filters in a set of filters. For a set of filters covering the audible range of frequencies, it is recommended to test filters with frequencies close to 31.5 Hz,1 kHz and 16 kHz.

The test shall be performed on the reference level range for levels from the specified lower boundary of the specified linear operating range up to a level where the overload indicator displays an overload. Adjust the level of the input signal with steps that are not greater than 5 dB. The difference between successive steps of the input signal level shall be reduced to 1 dB when the distance to the lower or upper boundaries of a linear operating range is less than 5 dB and when the level is above the upper boundary. The boundaries are as stated in the instruction manual for the filter. If no overload is displayed, the filter does not conform to the requirements.

The measured level linearity deviation shall not exceed the acceptance limits given in 5.13 in IEC 61260-1:2014 for all measured levels between the lower boundary of the linear operating range, as stated in the instruction manual for the filter, and up to the highest level, measured as described above, without an overload indication.

An overload shall not be indicated if the level of the input signal is below the stated upper boundary of each appropriate linear operating range.

"Y" means indicator over-range.

☑ Checked

23(b). Third Octave Band Filter Level Linearity 1kHz (Increasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Over SLM Range	5
Attenuation (dB)	31.0
Generator Frequency (Hz)	1k
SPL Reference Starting Point (dB)	94.0
Output (mVrms)	1727.0
Noise Floor (dB)	-99.0

Increasing level to Overload				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
26.0	99.0	99.0	0.0	±0.5	±0.6
21.0	104.0	104.0	0.0	±0.5	±0.6
16.0	109.0	109.0	0.0	±0.5	±0.6
11.0	114.0	114.0	0.0	±0.5	±0.6
10.0	115.0	115.0	0.0	±0.5	±0.6
9.0	116.0	116.0	0.0	±0.5	±0.6
8.0	117.0	117.0	0.0	±0.5	±0.6
7.0	118.0	118.0	0.0	±0.5	±0.6
6.0	119.0	119.0	0.0	±0.5	±0.6
5.0	120.0	120.0	0.0	±0.5	±0.6
4.0	121.0	121.0	0.0	±0.5	±0.6
3.0	122.0	122.0	0.0	±0.5	±0.6
2.0	123.0	123.0	0.0	±0.5	±0.6
1.0	124.0	124.0	0.0	±0.5	±0.6
0.0	125.0	125.0	0.0	±0.5	±0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

23(b). Filter Level linearity on the reference level range (IEC 61260-3 Clause 11)

The level linearity shall be tested for three filters in a set of filters. For a set of filters covering the audible range of frequencies, it is recommended to test filters with frequencies close to 31.5 Hz,1 kHz and 16 kHz.

The test shall be performed on the reference level range for levels from the specified lower boundary of the specified linear operating range up to a level where the overload indicator displays an overload. Adjust the level of the input signal with steps that are not greater than 5 dB. The difference between successive steps of the input signal level shall be reduced to 1 dB when the distance to the lower or upper boundaries of a linear operating range is less than 5 dB and when the level is above the upper boundary. The boundaries are as stated in the instruction manual for the filter. If no overload is displayed, the filter does not conform to the requirements.

The measured level linearity deviation shall not exceed the acceptance limits given in 5.13 in IEC 61260-1:2014 for all measured levels between the lower boundary of the linear operating range, as stated in the instruction manual for the filter, and up to the highest level, measured as described above, without an overload indication.

An overload shall not be indicated if the level of the input signal is below the stated upper boundary of each appropriate linear operating range.

"Y" means indicator over-range.

☑ Checked

23(c). Third Octave Band Filter Level Linearity 16kHz (Increasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Over SLM Range	5
Attenuation (dB)	31.0
Generator Frequency (Hz)	16k
SPL Reference Starting Point (dB)	94.0
Output (mVrms)	1722.0
Noise Floor (dB)	-99.0

Increasing level to Overload				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
26.0	99.0	99.0	0.0	±0.5	±0.6
21.0	104.0	104.0	0.0	±0.5	±0.6
16.0	109.0	109.0	0.0	±0.5	±0.6
11.0	114.0	114.0	0.0	±0.5	±0.6
10.0	115.0	115.0	0.0	±0.5	±0.6
9.0	116.0	116.0	0.0	±0.5	±0.6
8.0	117.0	117.0	0.0	±0.5	±0.6
7.0	118.0	118.0	0.0	±0.5	±0.6
6.0	119.0	119.0	0.0	±0.5	±0.6
5.0	120.0	120.0	0.0	±0.5	±0.6
4.0	121.0	121.0	0.0	±0.5	±0.6
3.0	122.0	122.0	0.0	±0.5	±0.6
2.0	123.0	123.0	0.0	±0.5	±0.6
1.0	124.0	124.0	0.0	±0.5	±0.6
0.0	125.0	125.0	0.0	±0.5	±0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

23(c). Level linearity on the reference level range (IEC 61672-3 Clause 16)
Level linearity shall be tested with steady sinusoidal electrical signals at a frequency of 8 kHz with the sound level meter set for frequency-weighting A. (61672-3 Clause 16.1).

Level linearity shall be measured in 5 dB steps of increasing input signal level from the starting point up to within 5 dB of the upper boundary stated in the Instruction Manual for the linear operating range at 8 kHz, then at 1 dB steps of increasing input signal level up to, but not including, the first indication of overload. The test of level linearity shall then be continued at 5 dB steps of decreasing input signal level from the starting point down to within 5 dB of the specified lower boundary, then at 1 dB steps of decreasing input signal level down to, but not including, the first indication of an under-range condition.

Measured level linearity deviations shall not exceed the applicable acceptance limits given in IEC 61672-1 from the specified upper boundary of the linear operating range up to, but not including, the first indication of overload and also from the specified lower boundary of the linear operating range down to, but not including, the first indication of an under-range condition.

"Y" means indicator over-range.

☑ Checked

24(a). Third Octave Band Filter Level Linearity 31.5Hz (Decreasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Under SLM Range	0
Attenuation (dB)	0.0
Generator Frequency (Hz)	31.5
SPL Reference Starting Point (dB)	94
Output (mVrms)	46.3
Noise Floor (dB)	-99.0

Decreasing level to Underange				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
5.0	89.0	89.0	0.0	±0.5	±0.6
10.0	84.0	84.0	0.0	±0.5	±0.6
15.0	79.0	79.0	0.0	±0.7	±0.9
20.0	74.0	74.0	0.0	±0.7	±0.9
25.0	69.0	69.0	0.0	±0.7	±0.9
30.0	64.0	64.0	0.0	±0.7	±0.9
35.0	59.0	59.0	0.0	±0.7	±0.9
40.0	54.0	54.0	0.0	±0.7	±0.9
45.0	49.0	49.0	0.0	±0.7	±0.9
50.0	44.0	44.0	0.0	±0.7	±0.9
54.0	40.0	40.0	0.0	±0.7	±0.9
55.0	39.0	39.0	0.0	±0.7	±0.9
56.0	38.0	38.0	0.0	±0.7	±0.9
57.0	37.0	37.0	0.0	±0.7	±0.9
58.0	36.0	36.0	0.0	±0.7	±0.9
59.0	35.0	35.0	0.0	±0.7	±0.9

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

24(a). Level linearity on the reference level range (IEC 61672-3 Clause 16)
Level linearity shall be tested with steady sinusoidal electrical signals at a frequency of 8 kHz with the sound level meter set for frequency-weighting A. (61672-3 Clause 16.1).

Level linearity shall be measured in 5 dB steps of increasing input signal level from the starting point up to within 5 dB of the upper boundary stated in the Instruction Manual for the linear operating range at 8 kHz, then at 1 dB steps of increasing input signal level up to, but not including, the first indication of overload. The test of level linearity shall then be continued at 5 dB steps of decreasing input signal level from the starting point down to within 5 dB of the specified lower boundary, then at 1 dB steps of decreasing input signal level down to, but not including, the first indication of an under-range condition.

Measured level linearity deviations shall not exceed the applicable acceptance limits given in IEC 61672-1 from the specified upper boundary of the linear operating range up to, but not including, the first indication of overload and also from the specified lower boundary of the linear operating range down to, but not including, the first indication of an under-range condition.

"Y" means indicator under-range. However, if 20dB above noise floor is reached then no results are reported.

☑ Checked

24(b). Third Octave Band Filter Level Linearity 1kHz (Decreasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Under SLM Range	0
Attenuation (dB)	0.0
Generator Frequency (Hz)	1kHz
SPL Reference Starting Point (dB)	94
Output (mVrms)	48.9
Noise Floor (dB)	-99.0

Decreasing level to Underange				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
5.0	89.0	89.0	0.0	±0.5	±0.6
10.0	84.0	84.0	0.0	±0.5	±0.6
15.0	79.0	79.0	0.0	±0.7	±0.9
20.0	74.0	74.0	0.0	±0.7	±0.9
25.0	69.0	69.0	0.0	±0.7	±0.9
30.0	64.0	64.0	0.0	±0.7	±0.9
35.0	59.0	59.0	0.0	±0.7	±0.9
40.0	54.0	54.0	0.0	±0.7	±0.9
45.0	49.0	49.0	0.0	±0.7	±0.9
50.0	44.0	44.0	0.0	±0.7	±0.9
54.0	40.0	40.0	0.0	±0.7	±0.9
55.0	39.0	39.0	0.0	±0.7	±0.9
56.0	38.0	38.0	0.0	±0.7	±0.9
57.0	37.0	37.0	0.0	±0.7	±0.9
58.0	36.0	36.0	0.0	±0.7	±0.9
59.0	35.0	35.0	0.0	±0.7	±0.9

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

24(b). Level linearity on the reference level range (IEC 61672-3 Clause 16)
Level linearity shall be tested with steady sinusoidal electrical signals at a frequency of 8 kHz with the sound level meter set for frequency-weighting A. (61672-3 Clause 16.1).

Level linearity shall be measured in 5 dB steps of increasing input signal level from the starting point up to within 5 dB of the upper boundary stated in the Instruction Manual for the linear operating range at 8 kHz, then at 1 dB steps of increasing input signal level up to, but not including, the first indication of overload. The test of level linearity shall then be continued at 5 dB steps of decreasing input signal level from the starting point down to within 5 dB of the specified lower boundary, then at 1 dB steps of decreasing input signal level down to, but not including, the first indication of an under-range condition.

Measured level linearity deviations shall not exceed the applicable acceptance limits given in IEC 61672-1 from the specified upper boundary of the linear operating range up to, but not including, the first indication of overload and also from the specified lower boundary of the linear operating range down to, but not including, the first indication of an under-range condition.

"Y" means indicator under-range. However, if 20dB above noise floor is reached then no results are reported.

☑ Checked

24(c). Third Octave Band Filter Level Linearity 16kHz (Decreasing)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Select dB Under SLM Range	0
Attenuation (dB)	0.0
Generator Frequency (Hz)	16kHz
SPL Reference Starting Point (dB)	94
Output (mVrms)	48.6
Noise Floor (dB)	-99.0

Decreasing level to Underange				Tolerance	
Atten	Expected	Indicator	Diff	Type 1	Type 2
5.0	89.0	89.0	0.0	±0.5	±0.6
10.0	84.0	84.0	0.0	±0.5	±0.6
15.0	79.0	79.0	0.0	±0.7	±0.9
20.0	74.0	74.0	0.0	±0.7	±0.9
25.0	69.0	69.0	0.0	±0.7	±0.9
30.0	64.0	64.0	0.0	±0.7	±0.9
35.0	59.0	59.0	0.0	±0.7	±0.9
40.0	54.0	54.0	0.0	±0.7	±0.9
45.0	49.0	49.0	0.0	±0.7	±0.9
50.0	44.0	44.0	0.0	±0.7	±0.9
54.0	40.0	40.0	0.0	±0.7	±0.9
55.0	39.0	39.0	0.0	±0.7	±0.9
56.0	38.0	38.0	0.0	±0.7	±0.9
57.0	37.0	37.0	0.0	±0.7	±0.9
58.0	36.0	36.0	0.0	±0.7	±0.9
59.0	35.0	35.0	0.0	±0.7	±0.9

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

24(c). Level linearity on the reference level range (IEC 61672-3 Clause 16)
Level linearity shall be tested with steady sinusoidal electrical signals at a frequency of 8 kHz with the sound level meter set for frequency-weighting A. (61672-3 Clause 16.1).

Level linearity shall be measured in 5 dB steps of increasing input signal level from the starting point up to within 5 dB of the upper boundary stated in the Instruction Manual for the linear operating range at 8 kHz, then at 1 dB steps of increasing input signal level up to, but not including, the first indication of overload. The test of level linearity shall then be continued at 5 dB steps of decreasing input signal level from the starting point down to within 5 dB of the specified lower boundary, then at 1 dB steps of decreasing input signal level down to, but not including, the first indication of an under-range condition.

Measured level linearity deviations shall not exceed the applicable acceptance limits given in IEC 61672-1 from the specified upper boundary of the linear operating range up to, but not including, the first indication of overload and also from the specified lower boundary of the linear operating range down to, but not including, the first indication of an under-range condition.

"Y" means indicator under-range. However, if 20dB above noise floor is reached then no results are reported.

☑ Checked

25. Third Octave Level Ranges

25(a). Third Octave Level Linearity Including the Level range (31.5Hz)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	10
Generator Frequency (Hz)	31.5
Reference SPL (dB)	94
Output (mVrms)	156.8

Settings		Level (dB)			Tolerance	
Range	Atten	Expected	Indicated	Difference	Type 1	Type 2
HIGH	0.0	104.0	103.9	-0.1	± 0.5	± 0.6
MID	14.0	90.0	89.9	-0.1	± 0.5	± 0.6
LOW	34.0	70.0	70.0	0.0	± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

25(b). Third Octave Level Linearity Including the Level range (1kHz)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	10
Generator Frequency (Hz)	1k
Reference SPL (dB)	94
Output (mVrms)	154.0

Settings		Level (dB)			Tolerance	
Range	Atten	Expected	Indicated	Difference	Type 1	Type 2
HIGH	0.0	104.0	104.0	0.0	± 0.5	± 0.6
MID	14.0	90.0	89.9	-0.1	± 0.5	± 0.6
LOW	34.0	70.0	69.8	-0.2	± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

25(c). Third Octave Level Linearity Including the Level range (16kHz)

SLM Settings	
Time Weighting	Fast
Frequency Weighting	Z
SLM Range	MID
Generator & Attenuator Settings	
Attenuation (dB)	10
Generator Frequency (Hz)	16k
Reference SPL (dB)	94
Output (mVrms)	153.4

Settings		Level (dB)			Tolerance	
Range	Atten	Expected	Indicated	Difference	Type 1	Type 2
HIGH	0.0	104.0	104.0	0.0	± 0.5	± 0.6
MID	14.0	90.0	90.0	0.0	± 0.5	± 0.6
LOW	34.0	70.0	69.9	-0.1	± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6
					± 0.5	± 0.6

Conforming	Yes

Uncertainty (+/-) dB	0.13

Description of Tests

25. Filter Level linearity including the level range control (IEC 61260-3 Clause 11.9)

11.9 For the same three filters as selected above, test each available level range in the following way: based on the same reference level, adjust the input level to be 30 dB below upper boundary of the linear operating range for each of the selected range settings. The measured level linearity deviation shall not exceed the acceptance limits given in 5.13.3 and 5.13.4 of IEC 61260-1:2014

The three filter frequencies are 31.5Hz, 1kHz and 16kHz.

The level linearity differences are calculated as the indicated signal level minus the corresponding expected signal level.

☑ Checked

26. Third Octave Band Filter Lower Limit

26(a). Octave Band Filter Lower Limit (Reference Range)

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
Lowest Range	MID
Lower Limit for the Range	40

	1	2	3	4	5	6	7	8	9	10
Freq	4Hz	5Hz	6.3Hz	8Hz	10Hz	12.5Hz	16Hz	20Hz	25Hz	31.5Hz
Measured			7.1	10.9	4.7	6.4	12.7	6.1	5.6	5.3
Conforming	N/A	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Freq	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz
Measured	0.1	6.4	0.0	1.2	1.9	1.8	0.0	0.2	0.5	0.0
Conforming	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Freq	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz
Measured	0.8	0.6	0.7	1.4	2.6	1.6	2.6	3.5	4.4	4.5
Conforming	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Freq	4kHz	5kHz	6.3kHz	8kHz	10kHz	12.5kHz	16kHz	20kHz	25kHz	31.5kHz
Measured	6.1	6.5	8.0	8.8	9.8	10.8	12.1	13.3		
Conforming	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A

Conforming	Yes

Uncert (+/-) dB	0.09

26(b). Octave Band Filter Lower Limit (Lowest Range)

SLM, Attenuator & Generator Settings	
Time Weighting	Fast
Frequency Weighting	Z
Lowest Range	LOW
Lower Limit for the Range	20

	1	2	3	4	5	6	7	8	9	10
Freq	4Hz	5Hz	6.3Hz	8Hz	10Hz	12.5Hz	16Hz	20Hz	25Hz	31.5Hz
Measured			6.2	7.4	5.8	6.7	5.8	4.3	5.4	5.1
Conforming	N/A	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Freq	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz
Measured	2.0	4.7	0.0	2.7	0.0	0.1	0.0	0.0	0.0	0.0
Conforming	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Freq	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz
Measured	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Conforming	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Freq	4kHz	5kHz	6.3kHz	8kHz	10kHz	12.5kHz	16kHz	20kHz	25kHz	31.5kHz
Measured	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.1		
Conforming	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	N/A	N/A

Conforming	Yes

Uncert (+/-) dB	0.09

26. Third Octave Band Filter Lower LImit (IEC 61260-3 Clause 12)
12.2 Short-circuit the input terminal or use similar means to ensure that the level of the input signal is below the lower limit of the specified linear operating range. Record the output level from each filter in the set. The output level shall not exceed the specified lower limit for the appropriate filter and range.
Interpretation: The yellow cells are the observed values. The measured value must not exceed the Lower LImit for the Range.

☑ Checked

Yeo-Kal Electronics Pty Ltd 18/26 Wattle Road, Brookvale NSW Australia
Telephone +61 2 9939 2616 Fax +61 2 9905 1100

CERTIFICATE OF CALIBRATION

Model: 611

Make: Yeo-Kal Electronics Pty Ltd.

Serial Number 426
Date/s of Calibration 15/07/21

Standards:

Temperature: Mercury in glass thermometer. Certified thermometer R246

Salinity: 35.00ppt seawater standardised with a model 610MK1V Salinometer against IAPSO Standard Seawater P101 K15= 1.00002 (Chlorinity 19.377). The conversion between conductivity and salinity is performed using the Practical Salinity Scale. UNESCO Technical Papers in marine Science 1983.

Conductivity: 1413us/cm. The conversion of low conductivity raw data to conductivity referenced to 25Deg C is performed using constants derived from the HANDBOOK OF CHEMISTRY AND PHYSICS 1963, Chemical Rubber Publishing Company, Page 2691, Conductivity of Standard Solutions using KCL, 0.001M Solution.

Dissolved Oxygen: 100% saturated distilled water. The YK611 measures dissolved oxygen as % saturation and then it automatically converts the reading to milligrams per litre. This conversion is calculated from the dissolved oxygen solubility tables found in International Oceanographic Tables vol.2. National Institute of Oceanography 1972. Zero oxygen achieved by purging probe with nitrogen/ or zero dummy plug.

Turbidity: Formazin 200ntu prepared as per Standard Methods. 0ntu prepared using distilled water.

pH: 4 and 10 buffers prepared as per Standard Methods. Ref: Durst, R.A. 1975 Standard Reference Materials: Standardization of pH Measurements NBS Spec Publ.260-53, National Bur. Standards, Washington D.C.

ORP: Buffers 7 and 10 with quinhydrone prepared as per standard methods and American Society for Testing and Materials. The redox potential conforms to International Standard IEC 746-5 "Expressions of Performance of Electrochemical Analyzers, Part 5: Oxidation-Reduction potential". In accordance with this standard, the Redox potential is referred to the standard ("normal") hydrogen electrode (NHE) and is expressed in mV.

Depth: Calibrated using a Druck DPI 610 pressure calibrator / 2.0 meter water column.

SERIAL NUMBER: 426

CAL DATE/TIME	SENSOR	OFFSET	SLOPE
15/07/21 08:25	TEMPERATURE	2412.842	115.513
15/07/21 09:05	SAL/COND MSCM	1.000	20665.807
15/07/21 09:00	COND USCM	9.651	4.826
15/07/21 09:22	DISSOLVED OXYGEN	-18.000	2.922
15/07/21 09:14	PH	3998.747	-581.728
15/07/21 09:18	ORP	515.000	2.881
15/07/21 09:25	TURBIDITY	-280.000	3.440

Model 611- Serial 426

At the time of calibration the sensors were calibrated to the following accuracy.

Temperature: $^{+}/_{-}$ 0.05 ^{o} C

Salinity: +/-0.1ppt

Conductivity: +/- 5us/cm

pH: +/- 0.03

ORP: +/- 3mv

Dissolved Oxygen: Normally ($^{+}/_{-}$ 0.5%).

Turbidity: +/- 0.3ntu for range of 0-200ntu.

Yeo-Kal Reference: RFS 2714

Calibrated by: G. Yeomans

Yeo-Kal Electronics Pty Ltd 18 / 26 Wattle Road, Brookvale NSW Australia
Telephone +61 2 9939 2616 Fax +61 2 9905 1100

CERTIFICATE OF CALIBRATION

Model: 618

Make: Yeo-Kal Electronics Pty Ltd.

Serial Number 638
Date/s of Calibration 01,05,28/03/22

Temperature checked did not need calibration.

Standards:

Temperature: Mercury in glass thermometer. Certified thermometer R246

Salinity: 35.00ppt seawater standardised with a model 610MK1V Salinometer against IAPSO Standard Seawater P101 K15= 1.00002 (Chlorinity 19.377). The conversion between conductivity and salinity is performed using the Practical Salinity Scale. UNESCO Technical Papers in marine Science 1983.

Conductivity: 1413us/cm. The conversion of low conductivity raw data to conductivity referenced to 25Deg C is performed using constants derived from the HANDBOOK OF CHEMISTRY AND PHYSICS 1963, Chemical Rubber Publishing Company, Page 2691, Conductivity of Standard Solutions using KCL, 0.001M Solution.

Dissolved Oxygen: 100% saturated distilled water. The YK611 measures dissolved oxygen as % saturation and then it automatically converts the reading to milligrams per litre. This conversion is calculated from the dissolved oxygen solubility tables found in International Oceanographic Tables vol.2. National Institute of Oceanography 1972. Zero oxygen achieved by purging probe with nitrogen/ or zero dummy plug.

Turbidity: Formazin 200ntu prepared as per Standard Methods. 0ntu prepared using distilled water.

pH: 4 and 10 buffers prepared as per Standard Methods. Ref: Durst, R.A. 1975 Standard Reference Materials: Standardization of pH Measurements NBS Spec Publ.260-53, National Bur. Standards, Washington D.C.

ORP: Buffers 7 and 10 with quinhydrone prepared as per standard methods and American Society for Testing and Materials. The redox potential conforms to International Standard IEC 746-5 “Expressions of Performance of Electrochemical Analyzers, Part 5: Oxidation-Reduction potential”. In accordance with this standard, the Redox potential is referred to the standard (“normal”) hydrogen electrode (NHE) and is expressed in mV.

Depth: Calibrated using a Druck DPI 610 pressure calibrator / 2.0 meter water column.

Model 618- Serial 638

At the time of calibration the sensors were calibrated to the following accuracy.

Temperature: +/- 0.05 ° C

Salinity: +/-0.1ppt

Conductivity: +/- 5us/cm

pH: +/- 0.03

ORP: +/- 3mv

Dissolved Oxygen: Normally (+/- 0.5%).

Turbidity: +/- 0.3ntu for range of 0-200ntu.

Yeo-Kal Reference: RFS 2755

Calibrated by: G. Yeomans

CALIBRATION PARAMETERS

Ver: 4.18
$H
YEO-KAL MODEL R618
SERIAL NUMBER: 638
DATE OF DOWNLOAD: 28/03/22 07:35
DATE FORMAT: DD/MM/YY HH:MM

Param	Date	Time	lo_dat	lo_sp	lo_temp	hi_dat	hi_sp	hi_temp	offset	slope
Temp (C)	05/03/21	11:35	276511	11.60	11.51	367022	36.80	36.80	234847.2	3591.706
E.C (uscm)	01/03/22	09:38	298082	0	29.58	309235	1413	24.05	298082.0	8.046043
Turb (ntu)	28/03/22	07:26	298195	0	22.06	308618	200	22.16	298195.0	52.11500
pH (pH)	28/03/22	07:13	355438	4	22.16	271637	10	22.09	411328.9	-14100.6
ORP (mv)	01/03/22	09:36	294944	295	23.97	313468	472	23.87	264070.6	104.6553
Sal (ppt)	01/03/22	09:42	298063	0	0.00	338099	35	24.12	298063.0	767466.4
D.O.(%sat)	28/03/22	07:17	297517	0	0.00	317290	100	21.88	297517.0	102.5544
Depth (M)	05/03/21	12:04	307063	0	20.48	308973	2	23.93	307063.0	955.0000

$D
$H

YEO-KAL

Yeo-Kal Electronics Pty Ltd 18/26 Wattle Road, Brookvale NSW Australia
Telephone +61 2 9939 2616 Fax +61 2 9905 1100

CERTIFICATE OF CALIBRATION

Model: 618

Make: Yeo-Kal Electronics Pty Ltd.

Serial Number 676
Date/s of Calibration 04/03/22

Standards:

Temperature: Mercury in glass thermometer. Certified thermometer R246

Salinity: 35.00ppt seawater standardised with a model 610MK1V Salinometer against IAPSO Standard Seawater P101 K15= 1.00002 (Chlorinity 19.377). The conversion between conductivity and salinity is performed using the Practical Salinity Scale. UNESCO Technical Papers in marine Science 1983.

Conductivity: 1413us/cm. The conversion of low conductivity raw data to conductivity referenced to 25Deg C is performed using constants derived from the HANDBOOK OF CHEMISTRY AND PHYSICS 1963, Chemical Rubber Publishing Company, Page 2691, Conductivity of Standard Solutions using KCL, 0.001M Solution.

Dissolved Oxygen: 100% saturated distilled water. The YK611 measures dissolved oxygen as % saturation and then it automatically converts the reading to milligrams per litre. This conversion is calculated from the dissolved oxygen solubility tables found in International Oceanographic Tables vol.2. National Institute of Oceanography 1972. Zero oxygen achieved by purging probe with nitrogen/ or zero dummy plug.

Turbidity: Formazin 200ntu prepared as per Standard Methods. 0ntu prepared using distilled water.

pH: 4 and 10 buffers prepared as per Standard Methods. Ref: Durst, R.A. 1975 Standard Reference Materials: Standardization of pH Measurements NBS Spec Publ.260-53, National Bur. Standards, Washington D.C.

ORP: Buffers 7 and 10 with quinhydrone prepared as per standard methods and American Society for Testing and Materials. The redox potential conforms to International Standard IEC 746-5 "Expressions of Performance of Electrochemical Analyzers, Part 5: Oxidation-Reduction potential". In accordance with this standard, the Redox potential is referred to the standard ("normal") hydrogen electrode (NHE) and is expressed in mV.

Depth: Calibrated using a Druck DPI 610 pressure calibrator / 2.0 meter water column.

Model 618- Serial676

At the time of calibration the sensors were calibrated to the following accuracy.

Temperature: $^{+}/_{-}$ 0.05 $^{\circ}$ C

Salinity: +/-0.1ppt

Conductivity: +/- 5us/cm

pH: +/- 0.03

ORP: +/- 3mv

Dissolved Oxygen: Normally ($^{+}/_{-}$ 0.5%).

Turbidity: +/- 0.3ntu for range of 0-200ntu.

Yeo-Kal Reference: RFS 2749

Calibrated by: G. Yeomans

CALIBRATION PARAMETERS

Ver: 4.26
$H
YEO-KAL MODEL R618
SERIAL NUMBER: 676
DATE OF DOWNLOAD: 07/03/22 08:21
DATE FORMAT: DD/MM/YY HH:MM

Param	Date	Time	lo_dat	lo_sp	lo_temp	hi_dat	hi_sp	hi_temp	offset	slope
Temp (C)	04/03/22	11:27	281574	14.27	14.62	364578	41.40	31.15	237915.0	3059.491
E.C (uscm)	04/03/22	11:31	299884	0	35.44	304558	1413	24.64	299884.0	3.331799
Turb (ntu)	04/03/22	12:14	300936	0	23.40	307690	200	24.06	300936.0	33.77000
pH (pH)	04/03/22	11:58	348028	4	24.31	271481	10	23.78	399205.4	-12822.5
ORP (mv)	04/03/22	12:02	307432	295	23.35	318730	472	24.68	288602.0	63.83050
Sal (ppt)	04/03/22	11:34	299955	0	0.00	316194	35	24.13	299955.0	311236.4
D.O.(%sat)	04/03/22	12:08	299908	0	0.00	313586	100	23.71	299908.0	66.91729

$D
$H

D – Laboratory Results

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Certificate of Analysis

CPB Contractors Pty Ltd
Level 4, 177 Pacific Highway
North Sydney
NSW 2060

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Emma Eveleigh**

Report **881317-W**
Project name PITT ST ISD
Project ID N01070
Received Date Apr 20, 2022

Client Sample ID			**S01**
Sample Matrix			**Water**
Eurofins Sample No.			**S22-Ap0040022**
Date Sampled			**Apr 20, 2022**
Test/Reference	LOR	Unit	
Oil & Grease (HEM)	10	mg/L	< 10
pH (at 25 °C)	0.1	pH Units	7.5
Total Suspended Solids Dried at 103°C–105°C	5	mg/L	< 5
Turbidity	1	NTU	< 1
Heavy Metals			
Copper (filtered)	0.001	mg/L	< 0.001
Zinc (filtered)	0.005	mg/L	0.012

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Oil & Grease (HEM)	Melbourne	Apr 22, 2022	28 Days
- Method: LTM-INO-4180 Oil and Grease (APHA 5520B)			
pH (at 25 °C)	Sydney	Apr 21, 2022	0 Hour
- Method: LTM-GEN-7090 pH in water by ISE			
Total Suspended Solids Dried at 103°C–105°C	Sydney	Apr 21, 2022	7 Days
- Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry			
Turbidity	Sydney	Apr 21, 2022	2 Days
- Method: LTM-INO-4140 Turbidity by Nephelometric Method			
Heavy Metals (filtered)	Sydney	Apr 21, 2022	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			

eurofins | Environment Testing

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NATA # 1261 Site # 1254

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Girraween NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
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Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

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Mayfield East NSW 2304
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Phone : +61 2 4968 8448
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IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name: CPB Contractors Pty Ltd
Address: Level 4, 177 Pacific Highway
North Sydney
NSW 2060

Project Name: PITT ST ISD
Project ID: N01070

Order No.: 6406177
Report #: 881317
Phone: 02 9035 5007
Fax:

Received: Apr 20, 2022 5:57 PM
Due: Apr 21, 2022
Priority: Overnight
Contact Name: Emma Eveleigh

Eurofins Analytical Services Manager : John Nguyen

Sample Detail						Copper (filtered)	Oil & Grease (HEM)	pH (at 25 °C)	Total Suspended Solids Dried at 103°C–105°C	Turbidity	Zinc (filtered)
Melbourne Laboratory - NATA # 1261 Site # 1254							X				
Sydney Laboratory - NATA # 1261 Site # 18217						X		X	X	X	X
Brisbane Laboratory - NATA # 1261 Site # 20794											
Mayfield Laboratory - NATA # 1261 Site # 25079											
Perth Laboratory - NATA # 2377 Site # 2370											
External Laboratory											
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**						
1	S01	Apr 20, 2022		Water	S22-Ap0040022	X	X	X	X	X	X
Test Counts						1	1	1	1	1	1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
µg/L: micrograms per litre
ppm: parts per million
ppb: parts per billion
%: Percentage
org/100 mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100 mL: Most Probable Number of organisms per 100 millilitres

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Suspended Solids Dried at 103°C–105°C	mg/L	< 5			5	Pass	
Turbidity	NTU	< 1			1	Pass	
Method Blank							
Heavy Metals							
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.005			0.005	Pass	
LCS - % Recovery							
Total Suspended Solids Dried at 103°C–105°C	%	118			70-130	Pass	
Turbidity	%	95			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Copper (filtered)	%	117			80-120	Pass	
Zinc (filtered)	%	115			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Total Suspended Solids Dried at 103°C–105°C	S22-Ap0040022	CP	%	109			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Copper (filtered)	S22-Ap0040022	CP	%	88			75-125	Pass	
Zinc (filtered)	S22-Ap0040022	CP	%	84			75-125	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Total Suspended Solids Dried at 103°C–105°C	S22-Ap0040022	CP	mg/L	< 5	< 5	<1	30%	Pass	
Turbidity	S22-Ap0040022	CP	NTU	< 1	< 1	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Copper (filtered)	S22-Ap0040022	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Zinc (filtered)	S22-Ap0040022	CP	mg/L	0.012	0.012	4.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Robert Biviano	Analytical Services Manager
Gabriele Cordero	Senior Analyst (NSW)
Ryan Phillips	Senior Analyst (NSW)
Scott Beddoes	Senior Analyst (NSW)

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

eurofins | Environment Testing

Certificate of Analysis

CPB Contractors Pty Ltd
Level 4, 177 Pacific Highway
North Sydney
NSW 2060

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Emma Eveleigh**

Report **889751-W-V2**
Project name PITT ST ISD
Project ID N01070
Received Date May 18, 2022

Client Sample ID			**PSS_01**
Sample Matrix			**Water**
Eurofins Sample No.			**S22-My0044252**
Date Sampled			**May 17, 2022**
Test/Reference	LOR	Unit	
Oil & Grease (HEM)	10	mg/L	< 10
pH (at 25 °C)	0.1	pH Units	7.8
Total Suspended Solids Dried at 103°C–105°C	5	mg/L	< 5
Turbidity	1	NTU	1.5
Heavy Metals			
Copper (filtered)	0.001	mg/L	0.015
Zinc (filtered)	0.005	mg/L	0.024

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Oil & Grease (HEM)	Melbourne	May 20, 2022	28 Days
- Method: LTM-INO-4180 Oil and Grease (APHA 5520B)			
pH (at 25 °C)	Sydney	May 18, 2022	0 Hour
- Method: LTM-GEN-7090 pH in water by ISE			
Total Suspended Solids Dried at 103°C–105°C	Sydney	May 18, 2022	7 Days
- Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry			
Turbidity	Sydney	May 18, 2022	2 Days
- Method: LTM-INO-4140 Turbidity by Nephelometric Method			
Heavy Metals (filtered)	Sydney	May 18, 2022	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			

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NATA # 1261 Site # 1254

Sydney
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Girraween NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
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Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Newcastle
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Mayfield East NSW 2304
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NATA # 1261 Site # 25079

Eurofins ARL Pty Ltd
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Perth
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Welshpool WA 6106
Phone : +61 8 6253 4444
NATA # 2377 Site # 2370

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Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name: CPB Contractors Pty Ltd
Address: Level 4, 177 Pacific Highway
North Sydney
NSW 2060

Project Name: PITT ST ISD
Project ID: N01070

Order No.: 6406177
Report #: 889751
Phone: 02 9035 5007
Fax:

Received: May 18, 2022 8:30 PM
Due: May 19, 2022
Priority: 1 Day
Contact Name: Emma Eveleigh

Eurofins Analytical Services Manager : Robert Biviano

Sample Detail						Copper (filtered)	Oil & Grease (HEM)	pH (at 25 °C)	Total Suspended Solids Dried at 103°C–105°C	Turbidity	Zinc (filtered)
Melbourne Laboratory - NATA # 1261 Site # 1254							X				
Sydney Laboratory - NATA # 1261 Site # 18217						X		X	X	X	X
Brisbane Laboratory - NATA # 1261 Site # 20794											
Mayfield Laboratory - NATA # 1261 Site # 25079											
Perth Laboratory - NATA # 2377 Site # 2370											
External Laboratory											
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**						
1	PSN_01	May 17, 2022		Water	S22-My0044251	X	X	X	X	X	X
2	PSS_01	May 17, 2022		Water	S22-My0044252	X	X	X	X	X	X
Test Counts						2	2	2	2	2	2

Internal Quality Control Review and Glossary

General

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6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
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SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
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Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
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TEQ	Toxic Equivalency Quotient or Total Equivalence
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US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

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Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Heavy Metals							
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.005			0.005	Pass	
LCS - % Recovery							
Heavy Metals							
Copper (filtered)	%	102			80-120	Pass	
Zinc (filtered)	%	105			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Heavy Metals				Result 1					
Copper (filtered)	S22-My0044252	CP	%	93			75-125	Pass	
Zinc (filtered)	S22-My0044252	CP	%	120			75-125	Pass	

Comments

V2 - samples split into two reports (new 891208)

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Robert Biviano	Analytical Services Manager
Charl Du Preez	Senior Analyst-Metal
Dilani Samarakoon	Senior Analyst-Inorganic

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

eurofins | Environment Testing

Certificate of Analysis

CPB Contractors Pty Ltd
Level 4, 177 Pacific Highway
North Sydney
NSW 2060

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Andrew Brajlih**

Report **891143-W**
Project name PITT ST ISD
Project ID N01070
Received Date May 23, 2022

Client Sample ID			**N01**
Sample Matrix			**Water**
Eurofins Sample No.			**S22-My0057117**
Date Sampled			**May 23, 2022**
Test/Reference	LOR	Unit	
Oil & Grease (HEM)	10	mg/L	< 10
pH (at 25 °C)	0.1	pH Units	7.6
Total Suspended Solids Dried at 103°C–105°C	5	mg/L	< 5
Turbidity	1	NTU	4.7
Heavy Metals			
Copper (filtered)	0.001	mg/L	0.002
Zinc (filtered)	0.005	mg/L	< 0.005

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Oil & Grease (HEM)	Melbourne	May 25, 2022	28 Days
- Method: LTM-INO-4180 Oil and Grease (APHA 5520B)			
pH (at 25 °C)	Sydney	May 24, 2022	0 Hour
- Method: LTM-GEN-7090 pH in water by ISE			
Total Suspended Solids Dried at 103°C–105°C	Sydney	May 24, 2022	7 Days
- Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry			
Turbidity	Sydney	May 24, 2022	2 Days
- Method: LTM-INO-4140 Turbidity by Nephelometric Method			
Heavy Metals (filtered)	Sydney	May 24, 2022	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			

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NATA # 1261 Site # 1254

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Girraween NSW 2066
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NATA # 1261 Site # 18217

Brisbane
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Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

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NATA # 1261 Site # 25079

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Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name: CPB Contractors Pty Ltd
Address: Level 4, 177 Pacific Highway
North Sydney
NSW 2060

Project Name: PITT ST ISD
Project ID: N01070

Order No.: 6406177
Report #: 891143
Phone: 02 9035 5007
Fax:

Received: May 23, 2022 5:20 PM
Due: May 23, 2022
Priority: Same day
Contact Name: Andrew Brajlih

Eurofins Analytical Services Manager : Robert Biviano

Sample Detail						Copper (filtered)	Oil & Grease (HEM)	pH (at 25 °C)	Total Suspended Solids Dried at 103°C–105°C	Turbidity	Zinc (filtered)
Melbourne Laboratory - NATA # 1261 Site # 1254							X				
Sydney Laboratory - NATA # 1261 Site # 18217						X		X	X	X	X
Brisbane Laboratory - NATA # 1261 Site # 20794											
Mayfield Laboratory - NATA # 1261 Site # 25079											
Perth Laboratory - NATA # 2377 Site # 2370											
External Laboratory											
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**						
1	N01	May 23, 2022		Water	S22-My0057117	X	X	X	X	X	X
Test Counts						1	1	1	1	1	1

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WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Oil & Grease (HEM)	mg/L	< 10			10	Pass	
Turbidity	NTU	< 1			1	Pass	
Method Blank							
Heavy Metals							
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.005			0.005	Pass	
LCS - % Recovery							
Turbidity	%	85			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Copper (filtered)	%	86			80-120	Pass	
Zinc (filtered)	%	85			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Heavy Metals				Result 1					
Copper (filtered)	S22-My0048294	NCP	%	103			75-125	Pass	
Zinc (filtered)	S22-My0048294	NCP	%	80			75-125	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Total Suspended Solids Dried at 103°C–105°C	S22-My0053563	NCP	mg/L	18	17	7.0	30%	Pass	
Turbidity	S22-My0057117	CP	NTU	4.7	4.9	3.0	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Copper (filtered)	S22-My0057162	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Zinc (filtered)	S22-My0057162	NCP	mg/L	0.005	< 0.005	23	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Robert Biviano	Analytical Services Manager
Dilani Samarakoon	Senior Analyst-Inorganic
Gabriele Cordero	Senior Analyst-Metal
Ryan Phillips	Senior Analyst-Inorganic

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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Certificate of Analysis

CPB Contractors Pty Ltd
Level 4, 177 Pacific Highway
North Sydney
NSW 2060

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
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Attention: **Andrew Brajlih**

Report **891149-W**
Project name PITT ST ISD
Project ID N01070
Received Date May 23, 2022

Client Sample ID			**S01**
Sample Matrix			**Water**
Eurofins Sample No.			**S22-My0057162**
Date Sampled			**May 23, 2022**
Test/Reference	LOR	Unit	
Heavy Metals			
Copper (filtered)	0.001	mg/L	< 0.001

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Heavy Metals (filtered)	Sydney	May 24, 2022	180 Days

- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS

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Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
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Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Newcastle
4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

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43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name:	CPB Contractors Pty Ltd	**Order No.:**	6406177
Address:	Level 4, 177 Pacific Highway North Sydney NSW 2060	**Report #:**	891149
		Phone:	02 9035 5007
		Fax:	
Project Name:	PITT ST ISD		
Project ID:	N01070		

Received:	May 23, 2022 5:20 PM	
Due:	May 23, 2022	
Priority:	Same day	
Contact Name:	Andrew Brajlih	

Eurofins Analytical Services Manager : Robert Biviano

Sample Detail						Copper (filtered)
Melbourne Laboratory - NATA # 1261 Site # 1254						
Sydney Laboratory - NATA # 1261 Site # 18217						X
Brisbane Laboratory - NATA # 1261 Site # 20794						
Mayfield Laboratory - NATA # 1261 Site # 25079						
Perth Laboratory - NATA # 2377 Site # 2370						
External Laboratory						
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**	
1	S01	May 23, 2022		Water	S22-My0057162	X
Test Counts						1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
µg/L: micrograms per litre
ppm: parts per million
ppb: parts per billion
%: Percentage
org/100 mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100 mL: Most Probable Number of organisms per 100 millilitres

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Method Blank									
Heavy Metals									
Copper (filtered)			mg/L	< 0.001			0.001	Pass	
LCS - % Recovery									
Heavy Metals									
Copper (filtered)			%	86			80-120	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Heavy Metals				Result 1					
Copper (filtered)	S22-My0048294	NCP	%	103			75-125	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Copper (filtered)	S22-My0057162	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Robert Biviano	Analytical Services Manager
Gabriele Cordero	Senior Analyst-Metal

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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Certificate of Analysis

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Attention: **Emma Eveleigh**

Report **898201-W**
Project name PITT ST ISD
Project ID N01070
Received Date Jun 16, 2022

Client Sample ID			**PSS_01**	**PSN_01**
Sample Matrix			**Water**	**Water**
Eurofins Sample No.			**S22-Jn0037564**	**S22-Jn0037565**
Date Sampled			**Jun 16, 2022**	**Jun 16, 2022**
Test/Reference	LOR	Unit		
pH (at 25 °C)	0.1	pH Units	7.7	7.9
Turbidity	1	NTU	< 1	3.3
Heavy Metals				
Copper (filtered)	0.001	mg/L	< 0.001	< 0.001
Zinc (filtered)	0.005	mg/L	< 0.005	0.006

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
pH (at 25 °C)	Sydney	Jun 16, 2022	0 Hour
- Method: LTM-GEN-7090 pH in water by ISE			
Turbidity	Sydney	Jun 16, 2022	2 Days
- Method: LTM-INO-4140 Turbidity by Nephelometric Method			
Heavy Metals (filtered)	Sydney	Jun 16, 2022	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			

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NATA # 1261 Site # 18217

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NATA # 1261 Site # 20794

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Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

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IANZ # 1290

Company Name: CPB Contractors Pty Ltd
Address: Level 4, 177 Pacific Highway
North Sydney
NSW 2060

Project Name: PITT ST ISD
Project ID: N01070

Order No.: 6406177
Report #: 898201
Phone: 02 9035 5007
Fax:

Received: Jun 16, 2022 5:50 PM
Due: Jun 16, 2022
Priority: Same day
Contact Name: Emma Eveleigh

Eurofins Analytical Services Manager : Robert Biviano

Sample Detail						Copper (filtered)	pH (at 25 °C)	Turbidity	Zinc (filtered)
Melbourne Laboratory - NATA # 1261 Site # 1254									
Sydney Laboratory - NATA # 1261 Site # 18217						X	X	X	X
Brisbane Laboratory - NATA # 1261 Site # 20794									
Mayfield Laboratory - NATA # 1261 Site # 25079									
Perth Laboratory - NATA # 2377 Site # 2370									
External Laboratory									
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**				
1	PSS_01	Jun 16, 2022		Water	S22-Jn0037564	X	X	X	X
2	PSN_01	Jun 16, 2022		Water	S22-Jn0037565	X	X	X	X
Test Counts						2	2	2	2

Internal Quality Control Review and Glossary

General

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2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

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Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
µg/L: micrograms per litre
ppm: parts per million
ppb: parts per billion
%: Percentage
org/100 mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100 mL: Most Probable Number of organisms per 100 millilitres

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
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RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

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Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Turbidity	NTU	< 1			1	Pass	
Method Blank							
Heavy Metals							
Copper (filtered)	mg/L	0.004			0.001	Fail	
Zinc (filtered)	mg/L	0.010			0.005	Fail	
LCS - % Recovery							
Turbidity	%	89			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Copper (filtered)	%	87			80-120	Pass	
Zinc (filtered)	%	88			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Heavy Metals				Result 1					
Copper (filtered)	S22-Jn0017389	NCP	%	83			75-125	Pass	
Zinc (filtered)	S22-Jn0017389	NCP	%	85			75-125	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Turbidity	S22-Jn0037564	CP	NTU	< 1	< 1	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Copper (filtered)	R22-Jn0015641	NCP	mg/L	0.003	0.003	3.0	30%	Pass	
Zinc (filtered)	R22-Jn0015641	NCP	mg/L	0.059	0.056	6.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Robert Biviano	Analytical Services Manager
Dilani Samarakoon	Senior Analyst-Inorganic
Gabriele Cordero	Senior Analyst-Metal

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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Certificate of Analysis

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Attention: **Emma Eveleigh**

Report **898204-W**
Project name PITT ST ISD
Project ID N01070
Received Date Jun 16, 2022

Client Sample ID			**PSS_01**	**PSN_01**
Sample Matrix			**Water**	**Water**
Eurofins Sample No.			**S22-Jn0037578**	**S22-Jn0037579**
Date Sampled			**Jun 16, 2022**	**Jun 16, 2022**
Test/Reference	LOR	Unit		
Oil & Grease (HEM)	10	mg/L	< 10	< 10
Total Suspended Solids Dried at 103°C–105°C	5	mg/L	< 5	< 5

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Oil & Grease (HEM)	Melbourne	Jun 18, 2022	28 Days
- Method: LTM-INO-4180 Oil and Grease (APHA 5520B)			
Total Suspended Solids Dried at 103°C–105°C	Sydney	Jun 16, 2022	7 Days
- Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry			

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Project Name: PITT ST ISD
Project ID: N01070

Order No.: 6406177
Report #: 898204
Phone: 02 9035 5007
Fax:

Received: Jun 16, 2022 5:50 PM
Due: Jun 17, 2022
Priority: 1 Day
Contact Name: Emma Eveleigh

Eurofins Analytical Services Manager : Robert Biviano

Sample Detail						Oil & Grease (HEM)	Total Suspended Solids Dried at 103°C–105°C
Melbourne Laboratory - NATA # 1261 Site # 1254						X	
Sydney Laboratory - NATA # 1261 Site # 18217							X
Brisbane Laboratory - NATA # 1261 Site # 20794							
Mayfield Laboratory - NATA # 1261 Site # 25079							
Perth Laboratory - NATA # 2377 Site # 2370							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	PSS_01	Jun 16, 2022		Water	S22-Jn0037578	X	X
2	PSN_01	Jun 16, 2022		Water	S22-Jn0037579	X	X
Test Counts						2	2

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
µg/L: micrograms per litre
ppm: parts per million
ppb: parts per billion
%: Percentage
org/100 mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100 mL: Most Probable Number of organisms per 100 millilitres

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

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QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank									
Oil & Grease (HEM)			mg/L	< 10			10	Pass	
Total Suspended Solids Dried at 103°C–105°C			mg/L	< 5			5	Pass	
LCS - % Recovery									
Total Suspended Solids Dried at 103°C–105°C			%	98			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
				Result 1					
Total Suspended Solids Dried at 103°C–105°C	R22-Jn0022299	NCP	%	93			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
Total Suspended Solids Dried at 103°C–105°C	R22-Jn0022299	NCP	mg/L	44	44	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Robert Biviano	Analytical Services Manager
Ryan Phillips	Senior Analyst-Inorganic

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

APPROVAL
CITY & SOUTHWEST ACOUSTICS ADVISOR

Review of	**Quarterly Environment Construction Monitoring Report Q1 (PS-ISD)**	**Document reference:**	**Quarterly Environment Construction Monitoring Report Q2 2022 – April to June 2022 Pitt Street Integrated Station Development Prepared by CPB.** *Project Number: N01070* *Document number: SMCSWSPS-CPB-STA-EM-REP-000021* *TeamBinder: SMCSWSPU-CPB-SPS-EM-REP-008821* *Revision date: 9/6/2022* *Revision: 2*
Prepared by:	Carl Fokkema Alternate Acoustics Advisor		
Date of issue:	19 September 2022		

As approved Alternate Acoustics Advisor for the Sydney Metro City & Southwest project, I have reviewed and provided comment on the Quarterly Environmental Construction Monitoring Report (CMR) for the Pitt Street Integrated Station Development, as required under A27 (d) of the project approval conditions (SSI 15-7400).

I reviewed and commented on previous revision (Rev 1) of the CMR Q2 2022. This revision 2 includes minor amendments that required updating or were of an administrative or minor nature and are consistent with the terms of approval and the document approved by the Secretary.

I am satisfied that such amendments are necessary, approve revision 2 of the CMR Q2 (dated 8 September 2022), and consider that the document is appropriate for submission to the Secretary for information.

Carl Fokkema, City & Southwest Alternate Acoustics Advisor