# Shatin to Central Link - Tai Wai to Hung Hom Section [SCL(TAW – HUH)] and Stabling Sidings at Hung Hom Freight Yard [SCL(HHS)]

# Fixed Plant Noise Audit Report (Batch 5 – Kai Tak (KAT), Ma Chai Hang (MCV) and Sung Wong Toi (SUW))

(July 2019)

Fixed Plant Noise Audit Report (Batch 5A – Kai Tak Station (KAT))

# Shatin to Central Link – Tai Wai to Hung Hom Section and Stabling Sidings at Hung Hom Freight Yard

Fixed Plant Noise Audit Report

(Batch 5a – Kai Tak Station (KAT))

(July 2019)

Certified by:	Fredrick Leong	M	

Position: Independent Environmental Checker

Date:	(	Aug	2019	
		V		

# Shatin to Central Link – Tai Wai to Hung Hom Section and Stabling Sidings at Hung Hom Freight Yard

Fixed Plant Noise Audit Report

(Batch 5a - Kai Tak Station (KAT))

(July 2019)

Certified by:	Lisa Poon	A	
		V	

Position: Environmental Team Leader

Date:	T	Ang	2019	
		0	1	

### AECOM

### **MTR Corporation Limited**

#### Consultancy Agreement No. C11033

### Shatin to Central Link - Tai Wai to Hung Hom Section [SCL(TAW – HUH)] and Stabling Sidings at Hung Hom Freight Yard [SCL(HHS)]

Fixed Plant Noise Audit Report (Batch 5A – Kai Tak Station (KAT))

July 2019

	Name	Signature
Prepared & Checked:	Isaac Chu	
Reviewed & Approved:	Josh Lam	And
Version:	A Date	e: 30 July 2019
This Report is prepared for MTR Cor Consultancy Agreement No. C11033 a MTR Corporation Limited without our p possession a copy of this Report co Corporation Limited may not rely on it	poration Limited and is given for its s and may not be disclosed to, quoted to rior written consent. No person (other mes may rely on this Report withou or any purpose other than as described	tole benefit in relation to and pursuant to o or relied upon by any person other than than MTR Corporation Limited) into whose t our express written consent and MTR d above.

AECOM Asia Co. Ltd. 8/F, Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, NT, Hong Kong

Tel: (852) 3922 9000 Fax: (852) 3922 9797 www.aecom.com

#### **Table of Content**

#### Page

1	INTRO	DDUCTION1
	1.1 1.2	Background
2	UPDA	TED SOUND POWER LEVELS OF FIXED PLANT NOISE SOURCES
3	MEAS	UREMENT METHODOLOGY4
	3.1 3.2	Noise Measurement to obtain the SWLs of Fixed Plant Noise Sources
4	MEAS	UREMENT RESULTS
	4.1 4.2	Noise Measurement to obtain the SWLs of Fixed Plant Noise Sources
5	CONC	LUSION

#### List of Tables

 Table 2.1
 Summary of Updated Maximum Allowable SWLs for Fixed Plant Noise Sources at KAT

- Table 3.1
   Noise Measurement Equipment
- Table 3.2Measurement Schedule
- Table 3.3
   Noise Measurement Equipment
- Table 3.4
   Noise Measurement Locations
- Table 3.5Measurement Schedule
- Table 4.1Summary of Measured SWLs for Fixed Plants
- Table 4.2
   Noise Measurement Results at Measurement Locations

#### **List of Figures**

C1103/C/SCL/ACM/M52/051	Locations of NSRs and Fixed Noise Sources (Kai Tak Station)
C1103/C/SCL/ACM/M52/052	Locations of Noise Measurement Points (Kai Tak Station)

#### **List of Appendices**

Appendix A Appendix B	<ul> <li>A Proposal for Updating Maximum Allowable Sound Power Levels of Fixe Sources (Batch 5A – Kai Tak Station (KAT))</li> <li>B Noise Measurement to obtain the SWLs of Fixed Plant Noise Sources</li> </ul>				
	Appendix B1 Appendix B2 Appendix B3	Measurement Methodology Calibration Certificates – Noise Measurement for Fixed Plant Noise Photographs showing the Examples of Noise Measurement for Fixed Plant Noise			
	Appendix B4	Noise Measurement Results			
Appendix C	Noise Measure from the Fixed	ement to Confirm any Tonal, Impulsive and Intermittent Characteristics Plant Nose Sources at Representative NSRs			

Appendix C1	Calibration Certificates – Noise Measurement at Representative NSRs
Appendix C2	Photographs – Noise Measurement at Representative NSRs
Appendix C3	Noise Measurement Results at Representative NSRs

#### 1 INTRODUCTION

#### 1.1 Background

- 1.1.1 The Shatin to Central Link (SCL) is a 17km extension of the existing Ma On Shan Line (MOL) and East Rail Line (EAL) comprising (i) The East-West Corridor which extends the MOL from Tai Wai to Hung Hom via East Kowloon to connect with the West Rail Line (WRL) at Hung Hom Station (HUH) and Stabling Sidings at Hung Hom Freight Yard (HHS); and (ii) The North-South Corridor which is an extension of the EAL at Hung Hom across the harbour to Admiralty Station (ADM).
- 1.1.2 Environmental Impact Assessment (EIA) Reports for SCL Tai Wai to Hung Hom Section [SCL (TAW-HUH)] (Register No. AEIAR-167/2012) and SCL Stabling Sidings at Hung Hom Freight Yard [SCL (HHS)] (Register No. AEIAR-164/2012) (hereinafter referred to as "the EIA Reports") were approved on 17 February 2012 under the Environmental Impact Assessment Ordinance (EIAO). Following the approval of the EIA Reports, the Environmental Permit (EP) (EP No: EP-438/2012), covering the construction of both SCL (TAW-HUH) and SCL (HHS) (hereinafter referred to as "the Project"), was granted on 22 March 2012. Variations of Environmental Permit (VEP) were subsequently applied for EP-438/2012 and the latest Environmental Permit (EP No: EP-438/2012/K) was issued by Director of Environmental Protection (DEP) on 4 October 2016.
- 1.1.3 Pursuant to EP Condition 2.32, at least one month before commencement of operation of the Project, the Permit Holder, MTR Corporation Ltd (MTR), shall carry out fixed plant noise audit and deposit with the Director four hardcopies and one electronic copy of an audit report showing the design of the fixed plant noise sources associated with the Project complies with the maximum sound power levels determined in the approved SCL(TAW-HUH) EIA Report (Register No. AEIAR-167/2012) and SCL(HHS) EIA Report (Register No. AEIAR-164/2012) and all relevant documents in the Register, or otherwise approved by the Director in compliance with the requirements in Technical Memorandum on Environmental Impact Assessment Process having due regard to the characteristics of tonality, impulsiveness and intermittency.
- 1.1.4 Since the installation of fixed plant along the SCL (TAW-HUH) and SCL (HHS) would be completed in stages, the fixed plant noise audit will be conducted in stages according to the testing and commissioning programmes in each area.
- 1.1.5 AECOM Asia Co. Ltd was commissioned by the MTR to prepare the fixed plant noise audit report to check the compliance of the maximum sound power levels (SWLs) and to undertake noise measurement at the representative Noise Sensitive Receivers (NSRs) for investigation of any characteristics of tonality, impulsiveness and intermittency from the fixed plant noise sources associated with the Project.
- 1.1.6 Based on the latest design information, the maximum allowable SWLs of fixed plant items has been updated to reflect the latest design of the Project, and therefore Proposals were prepared to present the updated maximum allowable sound power levels (SWLs) of the fixed plant items at different stations of the Project. The Proposal for Updating Maximum Allowable Sound Power Levels of Fixed Plant Sources (Batch 5A Kai Tak Station (KAT)) (hereinafter referred to as "the Proposal (Batch 5A KAT)") (Appendix A refers) was approved by DEP on 17 July 2019.
- 1.1.7 This Fixed Plant Noise Audit Report (Batch 5A Kai Tak Station (KAT)) (hereinafter referred to as "the FPNAR (Batch 5A KAT)") presents the noise measurement methodology and measurement results at the fixed plant noise sources of KAT and at the representative NSRs near KAT, for checking compliance with the maximum allowable sound power levels (SWLs) determined in the Proposal (Batch 5A KAT).

#### 1.2 Purpose of This Report

- 1.2.1 This Report presents the noise measurement methodology and measurement results at the fixed plant noise sources of KAT and at the representative NSRs near KAT.
- 1.2.2 This Report comprises the following sections:
  - Section 1 presents the background information.
  - Section 2 presents the Updated SWL of fixed plant noise sources.
  - Section 3 presents the noise measurement methodology.
  - Section 4 presents the noise measurement results.
  - Section 5 presents the conclusions.

#### 2 UPDATED SOUND POWER LEVELS OF FIXED PLANT NOISE SOURCES

2.1.1 The updated maximum allowable SWL of fixed plant noise sources at KAT extracted from the Proposal (Batch 5A – KAT) are summarised in **Table 2.1**. The updated fixed plant noise sources locations at KAT are shown in **Figure No. C1103/C/SCL/ACM/M52/051**. The measured noise level of fixed plant noise sources during the commissioning test shall comply with the maximum allowable SWLs as summarised in **Table 2.1**. Appropriate corrections in tonal, impulsive or intermittent characteristics should be applied, where applicable, in accordance with the IND-TM during the commissioning test conducted at the representative NSRs.

Location	Fixed Plant	Fixed Plant Source	Maximum Allowable SWL, dB(A) <sup>(1)</sup>		
	ID.		Daytime & Evening <sup>(2)</sup>	Night-time <sup>(2)</sup>	
	KAT - 1A	Tunnel Ventilation Louver	95	85	
	KAT - 1B	Tunnel Ventilation Louver	92	82	
	KAT - 2	Tunnel Ventilation Louver	83	75	
	KAT - 3	Station Ventilation Louver	89	75	
	KAT - 4D	Station Ventilation Louver	78	68	
	KAT - 5	Station Ventilation Louver	83	73	
	KAT - 13	Station Ventilation Louver	87	77	
	KAT - 14	Tunnel Ventilation Louver	88	78	
	KAT - 15	Tunnel Ventilation Louver	89	79	
	KAT - 16	Tunnel Ventilation Louver	88	78	
KAT	KAT - 17	Station Ventilation Louver	84	74	
	KAT - 28	Station Ventilation Louver	83	73	
	KAT - 34	Station Ventilation Louver	97	94	
	KAT - 35	Tunnel Ventilation Louver	96	86	
	KAT - 38	Tunnel Ventilation Louver	86	76	
	KAT - 38A	Station Ventilation Louver	80	70	
	KAT - 39	Tunnel Ventilation Louver	100	93	
	KAT - 40	Tunnel Ventilation Louver	98	88	
	KAT - 41	Station Ventilation Louver	96	86	
	KAT - 42	Station Ventilation Louver	101	84	
	KAT - 44	Station Ventilation Louver	100	84	

### Table 2.1 Summary of Updated Maximum Allowable SWLs for Fixed Plant Noise Sources at KAT

Notes:

(1) The maximum allowable sound power levels have due regard to the characteristics of tonality, intermittency and impulsiveness.

(2) Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours.

#### 3 MEASUREMENT METHODOLOGY

#### 3.1 Noise Measurement to obtain the SWLs of Fixed Plant Noise Sources

#### Measurement Methodology

3.1.1 Details of measurement methodology for SCL are presented in **Appendix B1**. Noise measurements to obtain the SWLs of the fixed plant noise sources followed **Appendix B1** and were conducted by Wilson Acoustic Limited and Supreme Acoustics Research Ltd.

#### Measurement Equipment

3.1.2 The sound level meters and calibrators used for noise measurements are listed in the **Table 3.1**. The instruments used for the noise measurements complied with International Electrotechnical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1). The calibration certificates of equipment are provided in **Appendix B2**.

#### Table 3.1 Noise Measurement Equipment

Equipment	Model	Serial Number
	SVANTEK SVAN 958	20890
Sound Level Meter	SVANTEK SVAN 955	15234
	Rion NA-28	30431893
Calibrator	SVANTEK SV30A	29088
	CIRRUS CR-515	78572

3.1.3 Before and after each series of measurements, a calibration check was carried out on the sound level meter by the calibrator. The difference between the readings made before and after each series of measurements shall be less than or equal to 1.0 dB.

#### Measurement Date and Time

3.1.4 There will be daytime/evening and night-time operation modes for fixed plant sources at KAT. Nevertheless, the noise measurements at KAT were all conducted during night-time period at the fixed plant noise sources in order to minimise influence from background noise on measurement data. Details of the noise measurement schedule are shown in **Table 3.2**.

Location	Date
	20 September 2018
	4 October 2018
KAT	16 January 2019
KAT	11 & 13 February 2019
	20 March 2019
	11 April 2019

# 3.2 Noise Measurement to Confirm any Tonal, Impulsive and Intermittent Characteristics from the Fixed Plant Nose Sources at Representative NSRs

#### Measurement Parameters

- 3.2.1 L<sub>Aeq</sub> (30min) was measured at each designated measurement location. 1/3 octave band spectrum and time history over the measurement period was also be logged for determination of tonal, impulsiveness and intermittency characteristic.
- 3.2.2 Background noise level was measured at the same measurement location in term of L<sub>Aeq</sub> (5 min) immediate before or after the noise measurement when all Project's fixed plant equipment shut down. To minimise the measurement data being influenced by background noise, noise data obtained at an instance of minimal or no traffic on the road was used to evaluate the tonal characteristic. The corrections for tonality, impulsiveness or intermittency at the representative NSRs was determined in accordance with IND-TM. In addition, any noticeable characteristics of tonality, impulsiveness and intermittency from the fixed plant noise sources was recorded during the measurement. For the measurement was under unmanned condition, the investigator conducted visit in the vicinity of the measurement location to record any noticeable characteristics of tonality, impulsiveness and intermittency from the fixed plant noise sources during the measurement.

#### Measurement Equipment

3.2.3 The sound level meters and calibrators used for noise measurements at representative NSRs are listed in **Table 3.3**. The instruments used for the noise measurements complied with International Electrotechnical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1). The calibration certificates of equipment are shown in **Appendix C1**.

Equipment	Model	Serial Number
Sound Level Meter	B&K 2250	3001291
	B&K 2250L	2681366
	B&K 2250L	2718890
	B&K 2270	2644597
Calibrator	B&K 4231	3006428
	Rion NC-74	34246490

 Table 3.3
 Noise Measurement Equipment

3.2.4 Before and after each series of measurements, a calibration check was carried out on the sound level meter by the calibrator. The difference between the readings made before and after each series of measurements shall be less than or equal to 1.0 dB.

#### Measurement Locations

3.2.5 The proposed noise measurement locations were selected at the representative NSRs where have direct line of sight to the noise sources and were accessible for noise measurement. These measurement locations were agreed with EPD prior to noise measurement. The measurement locations are summarised in **Table 3.4** and shown in **Figure No. C1103/C/SCL/ACM/M52/054**. Photographs of measurement locations are shown in **Appendix C2**.

#### Table 3.4 Noise Measurement Locations

Measurement Location ID (NSR ID)	Туре	Measurement Height
----------------------------------	------	--------------------

Measurement Location ID	Representative NSR (NSR ID)	Туре	Measurement Height
KAT-FN1	Kai Long Court (KAT-P1-1)	Residential	A free field location at the retail block of Kai Long Court (KAT-P1-1) (approx. 3m above ground level)
KAT-FN2	One Kai Tak II (KAT-P1-2)	Residential	Podium level of Tower 5 of One Kai Tak II (1m from building façade)
KAT-FN3	Planned NSR (KAT-P1-3)	Residential	A free field location near KAT-P1-3 within the works area of Kai Tak Development (approx. 3m above ground)
KAT-FN4	Planned NSR (KAT-P1-4)	Residential	A free field location near KAT-P1-4 within the works area of Kai Tak Development (approx. 3m above ground)

#### Measurement Date and Time

3.2.6 For daytime/evening and night-time operation modes, noise measurement at representative NSRs was conducted during evening and night-time periods respectively. The measurement schedule is presented in **Table 3.5.** 

#### Table 3.5Measurement Schedule

Measurement Location ID	Date	
KAT-FN1, KAT-FN2, KAT-FN3 & KAT-FN4	28 & 29 June 2019	

#### 4 MEASUREMENT RESULTS

#### 4.1 Noise Measurement to obtain the SWLs of Fixed Plant Noise Sources

4.1.1 The measured SWLs for daytime and evening, and night-time periods are presented in Table
4.1. Photographs showing the examples of noise measurement for fixed plant noise are shown in Appendix B3. Details of the measurement results are shown in Appendix B4.

	Measured dB(/	SWL <sup>(1)</sup> , A)	Maximum SWL, o	allowable dB(A)	Complia	nce (Y/N)
Plant Item	Day / Evening- time <sup>(2)</sup>	Night- time <sup>(2)(3)</sup>	Day / Evening - time <sup>(2)</sup>	Night- time <sup>(2)</sup>	Day / Evening - time <sup>(2)</sup>	Night- time <sup>(2)</sup>
KAT - 1A	85	85	95	85	Y	Y
KAT - 1B	82	82	92	82	Y	Y
KAT - 2	73	73	83	75	Y	Y
KAT - 3	79	70	89	75	Y	Y
KAT - 4D	68	68	78	68	Y	Y
KAT - 5	73	73	83	73	Y	Y
KAT - 13	77	77	87	77	Y	Y
KAT - 14	78	78	88	78	Y	Y
KAT - 15	79	79	89	79	Y	Y
KAT - 16	78	78	88	78	Y	Y
KAT - 17	74	74	84	74	Y	Y
KAT - 28	73	73	83	73	Y	Y
KAT - 34	94	94	97	94	Y	Y
KAT - 35	86	86	96	86	Y	Y
KAT - 38	76	76	86	76	Y	Y
KAT - 38A	70	70	80	70	Y	Y
KAT - 39	90	90	100	93	Y	Y
KAT - 40	88	88	98	88	Y	Y
KAT - 41	86	86	96	86	Y	Y
KAT - 42	96	-	101	84	Y	-
KAT - 44	95	-	100	84	Y	-

 Table 4.1
 Summary of Measured SWLs for Fixed Plants

Notes:

(1) As discussed in Section 3.1.4, some plants would be operated in different modes, namely daytime/evening and night-time operation modes. For those plants operating in the same mode during daytime/evening and night-time periods, the measured SWL is same for both daytime/evening and night-time periods.

(2) Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours

(3) For those louvres that will not be under operation during night-time period, their measured SWL is presented as

## 4.2 Noise Measurement to Confirm any Tonal, Impulsive and Intermittent Characteristics from the Fixed Plant Nose Sources at NSRs

4.2.1 Noise measurement to confirm any characteristics of tonality, impulsiveness and intermittency at the representative NSRs were conducted during both evening and night-time periods. Measurement results are summarised in **Table 4.2** below. No characteristics of tonality, impulsiveness and intermittency from the fixed plant sources was observed at the selected NSRs. Data analysis has been carried out to determine the characteristics of tonality, impulsiveness and intermittency by assessing the logged 1/3 octave band spectra and time history profile. Result of data analysis indicated same characteristics of tonality, impulsiveness and intermittency were found during both the background and fixed plant noise

measurement periods. Based on site observation and findings of data analysis, it is concluded that no characteristics of tonality, impulsiveness and intermittency are expected from the fixed plant sources. Detailed noise measurements results are presented in **Appendix C3**.

#### Table 4.2 Noise Measurement Results at Measurement Locations

				Measurement Re	esults	Site Observation	Characteristics of
Measurement Location ID	Representing NSRs	Time Period <sup>(1)&amp;(2)</sup>	Measured Noise Level L <sub>Aeq(30mins)</sub> , dB(A)	Background Noise Level L <sub>Aeq(5mins)</sub> , dB(A)	Difference between Measured Noise Level and Background Level, dB(A) <sup>(3)</sup>		I onality, Impulsiveness and Intermittency at NSRs (Y/N)
KAT-FN1	Kai Long Court	Daytime & Evening	54.9	56.5	-1.6	Background noise was relatively low and sound of frogs or toads was occasionally	N <sup>(4)</sup>
	Night-time	52.8	52.5	0.3	observed. Noise from SCL fixed plant was not noticeable at the measurement location	N <sup>(4)</sup>	
KAT-FN2 <sup>(8)</sup> Kai Tak	Dayti Eve	Daytime & Evening	58.1	57.8	0.3	Background noise was dominated by sound of frogs or toads and the ventilation noise from the adjacent	N <sup>(5)</sup>
	Kai Tak One II	Kai Tak One II Night-time	56.9	56.6	0.3	building at Oasis Kai Tak. Noise from SCL fixed plant was not noticeable at the measurement location.	N <sup>(5)</sup>
	KAT-FN3 <sup>(9)</sup> Planned NSR	Daytime & Evening	50.4	50.9	-0.5	Background noise was relatively low	N <sup>(6)</sup>
KAT-FN3 <sup>(9)</sup>		Night-time	50.2	51.1	-0.9	and was dominated by buzzing sound	N <sup>(6)</sup>

				Measurement Re	esults	Site Observation	Characteristics of
Measurement Location ID	Representing NSRs	Time Period <sup>(1)&amp;(2)</sup>	Measured Noise Level L <sub>Aeq(30mins)</sub> , dB(A)	Background Noise Level L <sub>Aeq(5mins)</sub> , dB(A)	Difference between Measured Noise Level and Background Level, dB(A) <sup>(3)</sup>		Tonality, Impulsiveness and Intermittency at NSRs (Y/N)
		Daytime & Evening	54.6	55.8	-1.2	from insects and sound from frogs or	N <sup>(7)</sup>
KAT-FN4 <sup>(9)</sup>	Planned NSR	Night-time	54.4	54.4	0.0	toads. Noise from SCL fixed plant was not noticeable at the measurement locations	N <sup>(7)</sup>

Notes:

(1) Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours

(2) Fixed plant noise operation during daytime/evening and night-time periods have been included according to corresponding fixed plant noise measurement.

(3) The measured noise levels were dominated by background noise (i.e. buzzing sound from insects and sound from frogs or toads). Since buzzing sound from insects and sound from frogs or toads fluctuated during the daytime & evening measurement periods, leading to higher background noise levels than the measured noise levels of the fixed sources at few measurement locations.

(4) Tonal peaks at 50 Hz, 40 Hz & 50 Hz pair and 50 Hz & 63 Hz pair were found during both daytime & evening and night-time background and fixed plant noise measurement periods. Sound of frogs or toads was occasionally observed during the measurement periods and no noticeable low frequency source was identified on-site. No characteristics of tonality, impulsiveness and intermittency from the SCL fixed plant sources was observed during the measurement.

(5) Tonal peaks at 100 Hz and 2.5k Hz & 3.15k Hz pair were found during daytime & evening background and fixed plant noise measurement periods, while tonal peaks at 50 Hz, 100 Hz and 2.5k Hz & 3.15k Hz pair were found during night-time background and fixed plant noise measurement periods. Low frequency ventilation noise from the adjacent building at Oasis Kai Tak was observed throughout the measurement periods. Sound from frogs or toads was also observed throughout the measurement periods. No characteristics of tonality, impulsiveness and intermittency from the SCL fixed plant sources was observed during the measurement.

(6) Tonal peak at 6.3k Hz & 8k Hz pair was found during both daytime & evening and night-time background and fixed plant noise measurement periods. Buzzing sound from insects was observed throughout the measurement periods. The tonal peak is expected to be related to insect buzzing sound. No characteristics of tonality, impulsiveness and intermittency from the SCL fixed plant sources was observed during the measurement.

(7) Tonal peaks at 2.5k Hz & 3.15kHz pair and 6.3kHz & 8k Hz pair were found during both daytime & evening and night-time impact and background noise measurement periods. Buzzing sound from insects and sound from frogs or toads were observed throughout the measurement periods. The tonal peaks are expected to be related to insect buzzing sound and sound from frogs or toads. No characteristics of tonality, impulsiveness and intermittency from the SCL fixed plant sources was observed during the measurement.

(8) The measurement at KAT-FN2 was under unmanned condition as the podium level was locked by the management office of Kai Tak One II due to security reason. Nevertheless, occasion visits to the measurement point were allowed for measurement personnel to record any noticeable characteristics of tonality, impulsiveness and intermittency from the fixed plant noise sources during the measurement.

(9) The measurement at KAT-FN3 & KAT-FN4 were under unmanned condition due to safety reason. Nevertheless, visits to the measurement point were conducted to record any noticeable characteristics of tonality, impulsiveness and intermittency from the fixed plant noise sources during the measurement.

#### 5 CONCLUSION

5.1.1 The fixed plant noise verification was undertaken and the measurement results indicated all the fixed plant noise levels in KAT comply with the updated maximum allowable SWLs. Result of data analysis indicated same characteristics of tonality, impulsiveness and intermittency were found during both the background and fixed plant noise measurement periods, and also there were no characteristics of tonality, impulsiveness and intermittency from the fixed plant sources observed at the measurement locations. Therefore it is concluded that no characteristics of tonality, impulsiveness and intermittency are expected from the fixed plant sources.

Figures





Appendix A

Proposal for Updating Maximum Allowable Sound Power Levels of Fixed Plant Sources (Batch 5A – Kai Tak Station (KAT))

# Shatin to Central Link – Tai Wai to Hung Hom Section and Stabling Sidings at Hung Hom Freight Yard

Proposal for Updating Maximum Allowable

Sound Power Levels of Fixed Plant Sources

(Batch 5A – Kai Tak Station (KAT))

(Batch 5B – Ma Chai Hang Ventilation Building (MCV))

(Batch 5C – Sung Wong Toi Station (SUW))

(June 2019)

Certified by: Fredrick Leong

Position: Independent Environmental Checker

20 June 2019 Date:

# Shatin to Central Link – Tai Wai to Hung Hom Section and Stabling Sidings at Hung Hom Freight Yard

Proposal for Updating Maximum Allowable

Sound Power Levels of Fixed Plant Sources

(Batch 5 - Kai Tak (KAT), Ma Chai Hang (MCV) and Sung

Wong Toi (SUW))

(June 2019)

Certified by:	Lisa Poon	
		1

Position: Environmental Team Leader

Date: 20 June 2019

### AECOM

### **MTR Corporation Limited**

Consultancy Agreement No. C11033

### Shatin to Central Link - Tai Wai to Hung Hom Section [SCL(TAW – HUH)] and Stabling Sidings at Hung Hom Freight Yard [SCL(HHS)]

#### Proposal for Updating Maximum Allowable Sound Power Levels of Fixed Plant Sources (Batch 5A – Kai Tak Station (KAT))

#### May 2019

	Name	Signature
Prepared & Checked:	Isaac Chu	Tean
Reviewed & Approved:	Josh Lam	Angle
Version:	A Dat	e: 23 May 2019
This Report is prepared for MTR Co Consultancy Agreement No. C11033 MTR Corporation Limited without our p possession a copy of this Report come Limited may not rely on it for any purp	poration Limited and is given for its so and may not be disclosed to, quoted to rior written consent. No person (other t s may rely on this Report without our exp ose other than as described above.	ole benefit in relation to and pursuant to or relied upon by any person other than han MTR Corporation Limited) into whose ress written consent and MTR Corporation

AECOM Asia Co. Ltd. 8/F, Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, NT, Hong Kong Tel: (852) 3922 9000 Fax: (852) 3922 9797 www.aecom.com

#### Table of Content

1	INTR						
	1.1 1.2	Background Purpose of This Proposal	1 1				
2	NOIS	E CRITERIA AND NOISE SENSITIVE RECEIVERS	2				
	2.1	Environmental Legislation, Standard and Guidelines	2				
	2.2	Assessment Criteria and Representative Noise Sensitive Receivers	2				
	2.3	Review of Area Sensitivity Rating	2				
3	UPD/ LEVE	ATE OF FIXED PLANT SOURCES AND PREDICTION OF FIXED PLANT NOISE	4				
	3.1 3.2	Update of Fixed Plant Sources Prediction of Fixed Plant Noise	4 4				
4	CON	CLUSION	6				

#### List of Tables

Table 2.1	ANLs for Assessment of Noise from Fixed Sources
Table 2.2	Summary of noise criteria at representative NSRs for fixed noise sources (Reference
	from Table 8.8 of the approved EIA Report)
Table 3.1	Summary of Updated Maximum Allowable SWLs for Fixed Plant Sources
Table 3.2	Predicted Fixed Plant Noise Levels at Representative NSRs

#### List of Figure

C1103/C/SCL/ACM/M52/051 Locations of NSRs and Fixed Plant Noise Sources (Kai Tak Station)

#### **List of Appendices**

Annex A Detail Calculation of Fixed Plant Noise Assessment

#### 1 INTRODUCTION

#### 1.1 Background

- 1.1.1 The Shatin to Central Link (SCL) is a 17km extension of the existing Ma On Shan Line (MOL) and East Rail Line (EAL) comprising (i) The East-West Corridor which extends the MOL from Tai Wai to Hung Hom via East Kowloon to connect with the West Rail Line (WRL) at Hung Hom Station (HUH) and Stabling Sidings at Hung Hom Freight Yard (HHS); and (ii) The North-South Corridor which is an extension of the EAL at Hung Hom across the harbour to Admiralty Station (ADM).
- 1.1.2 Environmental Impact Assessment (EIA) Reports for SCL Tai Wai to Hung Hom Section [SCL (TAW-HUH)] (Register No. AEIAR-167/2012) and SCL Stabling Sidings at Hung Hom Freight Yard [SCL (HHS)] (Register No. AEIAR-164/2012) (hereinafter referred to as "the EIA Reports") were approved on 17 February 2012 under the Environmental Impact Assessment Ordinance (EIAO). Following the approval of the EIA Reports, the Environmental Permit (EP) (EP No: EP-438/2012), covering the construction of both SCL (TAW-HUH) and SCL (HHS) (hereinafter referred to as "the Project"), was granted on 22 March 2012. Variations of Environmental Permit (VEP) were subsequently applied for EP-438/2012 and the latest Environmental Permit (EP No: EP-438/2012/K) was issued by Director of Environmental Protection (DEP) on 4 October 2016.
- 1.1.3 Pursuant to EP Condition 2.32, at least one month before commencement of operation of the Project, the Permit Holder, MTR Corporation Ltd (MTR), shall carry out fixed plant noise audit and deposit with the Director four hardcopies and one electronic copy of an audit report showing the design of the fixed plant noise sources associated with the Project complies with the maximum sound power levels determined in the approved SCL(TAW-HUH) EIA Report (Register No. AEIAR-167/2012) and SCL(HHS) EIA Report (Register No. AEIAR-164/2012) and all relevant documents in the Register, or otherwise approved by the Director in compliance with the requirements in Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO) having due regard to the characteristics of tonality, impulsiveness and intermittency.
- 1.1.4 AECOM Asia Co. Ltd was commissioned by the MTR to prepare the fixed plant noise audit report to check the compliance of the maximum sound power levels (SWLs) and to undertake noise measurement at the identified Noise Sensitive Receivers (NSRs) for investigation of any characteristics of tonality, impulsiveness and intermittency from the fixed plant noise sources associated with the Project.
- 1.1.5 Based on the latest design information, the maximum allowable SWLs of fixed plant items has been updated to reflect the latest design of the Project, and therefore Proposal(s) will be prepared to present the updated maximum allowable sound power levels (SWLs) of the fixed plant items at different stations of the Project.

#### 1.2 Purpose of This Proposal

1.2.1 As discussed in **Section 1.1.5**, the maximum allowable SWLs of fixed plant items has been updated to reflect the latest design of the Project. This Proposal (Batch 5A – Kai Tak Station (KAT)) presents the updated maximum allowable SWLs of the fixed plant noise sources at KAT.

#### 2 NOISE CRITERIA AND NOISE SENSITIVE RECEIVERS

#### 2.1 Environmental Legislation, Standard and Guidelines

- 2.1.1 The Noise Control Ordinance, Cap. 400 (NCO) and Environmental Impact Assessment Ordinance, Cap. 499 (EIAO) provide the statutory framework for noise control. Operational noise from fixed noise sources is controlled by Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites (IND-TM) under NCO. To plan for a better environment, the Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO) under EIAO has specified the following requirements:
  - 5 dB below the appropriate ANLs in the IND-TM; or
  - the prevailing background noise levels (For quiet areas with level 5dB or more below the ANL).
- 2.1.2 The Acceptable Noise Levels (ANLs) for different Area Sensitivity Ratings (ASRs) during different periods are summarized in the **Table 2.1**.

Table 2.1	ANLs for Assessr	ment of Noise from	Fixed Sources
-----------	------------------	--------------------	---------------

Time Beried	ANL, dB(A)						
	ASR "A"	ASR "B"	ASR "C"				
Day (0700 to 1900 hours)	60	65	70				
Evening (1900 to 2300 hours)	60	65	70				
Night (2300 to 0700 hours)	50	55	60				

#### 2.2 Assessment Criteria and Representative Noise Sensitive Receivers

2.2.1 Table 8.8 of the approved SCL (TAW-HUH) EIA Report presents the identified Noise Sensitive Receivers (NSRs) and the adopted noise assessment criteria for fixed plant noise assessment. The assessment criteria at the NSRs selected for assessing the fixed plant noise impact from KAT are summarised in **Table 2.2**.

## Table 2.2Summary of noise criteria at representative NSRs for fixed noise sources<br/>(Reference from Table 8.8 of the approved EIA Report)

Area (NSR No.)	Time Period <sup>(1)</sup>	Prevailing Background Noise Levels, dB(A) <sup>(2)</sup>	ASR	ANL-5, dB(A) <sup>(3)</sup>	Criteria, dB(A) <sup>(4)</sup>				
Kai Tak Station	Kai Tak Station								
Planned NSR (KAT-P1-	Day & evening	70	В	60	60				
1, KAT-P1-2, KAT-P1-3, KAT-P1-4)	Night	56	В	50	50				

Notes:

(1) Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours.

(2) Prevailing background noise levels are extracted from Table 8.8 of approved EIA Report.

(3) A 5 dB(A) has been deducted from ANL as specified in requirement of TM-EIAO.

(4) The minimum of prevailing background noise level & ANL-5 is adopted.

#### 2.3 Review of Area Sensitivity Rating

2.3.1 Area Sensitive Ratings (ASR) as defined in the approved EIA Reports were determined by the existence of any influencing factors (IFs) (e.g. major road, industrial area) according to IND-TM at the time of preparation of the EIA Reports. During the preparation of this Proposal, it is revealed that there was no major change on the land use in the vicinity of representative NSRs,

and thus only the existence of any major road (i.e. annual average daily traffic flow in excess of 30,000) has been reviewed.

2.3.2 Based on best available information (i.e. The Annual Traffic Census 2017) during the preparation of this Proposal, there is no major road located in the vicinity of the identified NSRs and thus the ASR defined in **Table 2.2** remains unchanged.

## 3 UPDATE OF FIXED PLANT SOURCES AND PREDICTION OF FIXED PLANT NOISE LEVELS

#### 3.1 Update of Fixed Plant Sources

3.1.1 The locations of updated fixed plant noise sources at KAT are shown in **Figure No. C1103/C/SCL/ACM/M52/051**. Based on latest design information, the maximum allowable SWLs for ventilation louvers are updated and summarized in **Table 3.1**.

Location	Fixed Plant	Fixed Plant Source	Maximum Allowable SWL, dB(A) <sup>(1)</sup>			
Location	ID.	Fixed Plant Source	Daytime & Evening <sup>(2)</sup>	Night-time <sup>(2)</sup>		
	KAT - 1A	Tunnel Ventilation Louver	95	85		
	KAT - 1B	Tunnel Ventilation Louver	92	82		
	KAT - 2	Tunnel Ventilation Louver	83	75		
	KAT - 3	Station Ventilation Louver	89	75		
	KAT - 4D	Station Ventilation Louver	78	68		
	KAT - 5	Station Ventilation Louver	83	73		
	KAT - 13	Station Ventilation Louver	87	77		
	KAT - 14	Tunnel Ventilation Louver	88	78		
КАТ	KAT - 15	Tunnel Ventilation Louver	89	79		
	KAT - 16	Tunnel Ventilation Louver	88	78		
	KAT - 17	Station Ventilation Louver	84	74		
	KAT - 28	Station Ventilation Louver	83	73		
	KAT - 34	Station Ventilation Louver	97	94		
	KAT - 35	Tunnel Ventilation Louver	96	86		
	KAT - 38	Tunnel Ventilation Louver	86	76		
	KAT - 38A	Station Ventilation Louver	80	70		
	KAT - 39	Tunnel Ventilation Louver	100	93		
	KAT - 40	Tunnel Ventilation Louver	98	88		
	KAT - 41	Station Ventilation Louver	96	86		
	KAT - 42	Station Ventilation Louver	101	84		
	KAT - 44	Station Ventilation Louver	100	84		

 Table 3.1
 Summary of Updated Maximum Allowable SWLs for Fixed Plant Sources

Notes:

(1) The maximum allowable sound power levels have due regard to the characteristics of tonality, intermittency and impulsiveness.

(2) Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours.

#### 3.2 Prediction of Fixed Plant Noise

3.2.1 With the updated maximum allowable SWLs presented in **Table 3.1**, the predicted noise levels at the representative NSRs comply with both daytime/evening and night-time criteria as presented in **Table 2.2**. The predicted noise levels are summarised in **Table 3.2** with details of calculation shown in **Annex A**.

Table 3.2	Predicted Fixed Plant Noise Levels at Representative NSRs
-----------	---

	Decorintion	Criteri	a, dB(A)	Predicted Sound Pressure Level, L <sub>eq,30mins</sub> , dB(A) <sup>(1)</sup>		
NSK ID	Description	Daytime & Evening <sup>(2)</sup>	Night-time <sup>(2)</sup>	Daytime & Evening <sup>(2)</sup>	Night-time <sup>(2)</sup>	
KAT-P1-1	Kai Long Court	60	50	60	50	
KAT-P1-2	One Kai Tak II	60	50	60	50	
KAT-P1-3	Planned NSR	60	50	58	50	
KAT-P1-4	Planned NSR	60	50	60	50	

Notes:

(1) The predicted fixed plant noise levels have due regard to the characteristics of tonality, intermittency and impulsiveness. Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours.

(2)

#### 4 CONCLUSION

- 4.1.1 The maximum allowable SWLs of fixed plant noise sources at KAT has been updated based on the latest design information. The predicted noise levels at representative NSRs comply with the noise criteria based on the updated maximum allowable SWLs of fixed plant noise sources.
- 4.1.2 The measured SWLs at each fixed plant noise source during the fixed plant noise audit shall comply with the maximum allowable SWLs as stated in the **Table 3.1**. Appropriate corrections in tonal, impulsive or intermittent characteristics should be applied, where applicable, in accordance with the IND-TM during the commissioning test.

Figure



Annex A

**Detail Calculation of Fixed Plant Noise Assessment** 

#### Annex A Detail Calculation of Fixed Plant Noise Assessment

#### Fixed Plant Noise Calculation - KAT NSRs (Daytime Period)

Noise Assessment Points	Description	Plant item	Direction Facing	Horizontal Distance , m	SWL, dB(A)	Correction for line of sight <sup>[1]</sup> , dB(A)	Distance Correction of Point Source, dB(A)	Façade Correction, dB(A)	Predicted SPL, dB(A)	Total SPL, dB(A)	Daytime and Evening Noise Criteria, dB(A)
Kai Tak Station Ver	ntilation Shaft										
KAT-P1-1	Kai Lang Court	KAT - 1A	South	226	05	-10	-55	3	22		
KAT-FI-I	Kai Long Court	KAT - 1B	South	236	93	-10	-55	3	30		
		KAT - 2	West	230	83	-10	-55	3	21		
		KAT - 3	West	226	89	-10	-55	3	27		
		KAT - 4D	West	219	78	-10	-55	3	16		
		KAT - 13	West	112	87	-10	-33	3	31		
		KAT - 14	West	110	88	-10	-49	3	32		
		KAT - 15	West	105	89	-10	-48	3	34		
		KAT - 16	North	103	88	0	-48	3	43		
		KAT - 17	West	58	83	-10	-40	3	39		
		KAT - 34	South	220	97	-10	-55	3	35		
		KAT - 35	Тор	225	96	0	-55	3	44		
		KAT - 38	Top	214	86	0	-55	3	34		
		KAT - 39	Top	113	100	0	-33	3	54		
		KAT - 40	Тор	106	98	0	-49	3	52		
		KAT - 41	Тор	102	96	0	-48	3	51		
		KAT - 42	Top	100	101	0	-48	3	56	60	60
KAT-P1-2		KAT - 44	vvest	116	100	-10	-49	3	44	60	60
KAT-P1-2	One Kai Tak II	KAT - 1A	South	136	95	-10	-51	3	37		
		KAT - 1B	South	132	92	-10	-50	3	35		
		KAT - 2	West	133	83	-10	-51	3	25		
		KAT - 3	West	130	89 78	-10	-50	3	32		
		KAT - 5	West	124	83	-10	-50	3	26		
		KAT - 13	West	121	87	-10	-50	3	30		
		KAT - 14	West	125	88	-10	-50	3	31		
		KAT - 15 KAT - 16	Vvest North	132	89	-10	-50	3	32		
		KAT - 17	North	127	84	-10	-50	3	27		
		KAT - 28	West	150	83	-10	-52	3	24		
		KAT - 34	South	121	97	-10	-50	3	40		
		KAT - 35	Top	120	96	0	-50	3	49		
		KAT - 38A	North	116	80	0	-49	3	34		
		KAT - 39	Тор	108	100	0	-49	3	54		
		KAT - 40	Тор	112	98	0	-49	3	52		
		KAT - 41 KAT - 42	Top	115	96	0	-49	3	50		
		KAT - 44	West	114	100	-10	-49	3	44	60	60
KAT-P1-3		1	<b>I a</b> 4					-			
KAT-P1-3	Residential premises	KAT - 1A	South	104	95	0	-48	3	50 47		
	near IXAT	KAT - 2	West	112	83	-10	-49	3	27		
		KAT - 3	West	116	89	-10	-49	3	33		
		KAT - 4D	West	122	78	-10	-50	3	21		
		ΚΑΤ - 13	West	250	87	-10	-50	3	20		
		KAT - 14	West	257	88	-10	-56	3	25		
		KAT - 15	West	267	89	-10	-57	3	25		
		KAT - 16	North	269	88	-10	-57	3	24		
		KAT - 17 KAT - 28	West	312	83	-10	-57	3	20		
		KAT - 34	South	109	97	0	-49	3	51		
		KAT - 35	Тор	108	96	0	-49	3	50		
		KAT - 38	Top	117	86	0	-49	3	40		
		KAT - 39	Top	236	100	-10	-55	3	48	1	
		KAT - 40	Тор	245	98	0	-56	3	45	1	
		KAT - 41	Тор	251	96	0	-56	3	43		
		KAT - 42	l op Wost	261	101	-10	-56	3	48	58	60
KAT-P1-4		1041 - 44	West	233	100	-10	-50	<u> </u>	57		00
KAT-P1-4	Residential premises	KAT - 1A	South	71	95	-5	-45	3	48		
	near KAT	KAT - 1B	South	76	92	-5	-46	3	44		
		KAT - 2	West	63	89	0	-44 -44	3	42		
		KAT - 4D	West	61	78	0	-44	3	37		
		KAT - 5	West	62	83	0	-44	3	42		
		KAT - 13 KAT - 14	West	151	87	0	-52	3	38	4	
		KAT - 15	West	168	89	0	-52	3	39	1	
		KAT - 16	North	170	88	-10	-53	3	28	1	
		KAT - 17	North	173	84	-10	-53	3	24		
		KAT - 28	West	237	83	0	-56	3	30	1	
		KAT - 34	Top	72	96	-10	-45	3	45 54	1	
		KAT - 38	Тор	71	86	0	-45	3	44	1	
		KAT - 38A	North	71	80	0	-45	3	38	1	
		KAT - 39	Top	142	100	0	-51	3	52	1	
		KAT - 40	Тор	152	96	0	-52	3	49 47	1	
		KAT - 42	Тор	166	101	Ō	-52	3	52	1	
1	1	KAT 44	Weet	140	100	0	E1		F.2	60	60

Remark: [1] A negative correction of 10 dB(A) has been adopted to the direction facing of the ventilation shaft totally screened by buildings and negative correction of 5 dB(A) for NSR do not have direct line of sight to the louver.
## Annex A Detail Calculation of Fixed Plant Noise Assessment

## Fixed Plant Noise Calculation - KAT NSRs (Night-time Period)

Noise Assessment Points	Description	Plant item	Direction Facing	Horizontal Distance , m	SWL, dB(A)	Correction for line of sight <sup>[1]</sup> , dB(A)	Distance Correction of Point Source, dB(A)	Façade Correction, dB(A)	Predicted SPL, dB(A)	Total SPL, dB(A)	Night-time Noise Criteria, dB(A)
Kai Tak Station Ver	ntilation Shaft										
KAT-P1-1 KAT-P1-1	Kai Long Court	KAT - 1A	South	236	85	-10	-55	3	23	1	r
	····· = ···g = · · · ·	KAT - 1B	South	234	82	-10	-55	3	20		
		KAT - 2	West	230	75	-10	-55	3	13		
		KAT - 3	West	226	75	-10	-55	3	13		
		KAT - 4D KAT - 5	West	219	73	-10	-55	3	11		
		KAT - 13	West	112	77	-10	-49	3	21		
		KAT - 14	West	110	78	-10	-49	3	22		
		KAT - 15	West	105	79	-10	-48	3	24		
		KAT - 16 KAT - 17	North	97	78	0	-48	3	29	-	
		KAT - 28	West	58	73	-10	-43	3	23		
		KAT - 34	South	220	94	-10	-55	3	32		
		KAT - 35	Тор	225	86	0	-55	3	34		
		KAT - 384	North	214	76	0	-00	3	24	-	
		KAT - 39	Тор	113	93	ő	-49	3	47		
		KAT - 40	Тор	106	88	0	-49	3	42		
		KAT - 41	Тор	102	86	0	-48	3	41		
		KAT - 42 KAT - 44	l op West	100	84 84	-10	-48	3	39	50	50
KAT-P1-2		1011 44	West	110	04	10	40	<u> </u>	20	50	50
KAT-P1-2	One Kai Tak II	KAT - 1A	South	136	85	-10	-51	3	27		
		KAT - 1B	South	132	82	-10	-50	3	25	-	
		KAT - 3	West	133	/5 75	-10	-51 -50	3	1/	1	
		KAT - 4D	West	126	68	-10	-50	3	10		
		KAT - 5	West	124	73	-10	-50	3	16		
		KAT - 13	West	121	77	-10	-50	3	20		
		KAT - 14	West	125	78	-10	-50	3	21		
		KAT - 15 KAT - 16	North	132	79	-10	-50	3	22		
		KAT - 17	North	127	74	-10	-50	3	17		
		KAT - 28	West	150	73	-10	-52	3	14		
		KAT - 34	South	121	94	-10	-50	3	37		
		KAT - 35 KAT - 38	Top	126	86	0	-50	3	39		
		KAT - 38A	North	116	70	0	-49	3	24		
		KAT - 39	Тор	108	93	0	-49	3	47		
		KAT - 40	Тор	112	88	0	-49	3	42		
		KAT - 41 KAT - 42	Top	115	86	0	-49	3	40		
		KAT - 42	West	114	84	-10	-49	3	28	50	50
KAT-P1-3		•									
KAT-P1-3	Residential premises	KAT - 1A	South	104	85	0	-48	3	40		
	near KA I	KAT - 1B	South	100	82	-10	-48	3	37		
		KAT - 3	West	112	75	-10	-49	3	19		
		KAT - 4D	West	122	68	-10	-50	3	11		
		KAT - 5	West	124	73	-10	-50	3	16		
		KAT - 13	West	250	77	-10	-56	3	14		
		KAT - 15	West	267	79	-10	-57	3	15		
		KAT - 16	North	269	78	-10	-57	3	14		
		KAT - 17	North	267	74	-10	-57	3	10		
		KAT - 28	West	312	73	-10	-58	3	8		
		KAT - 34 KAT - 35	Top	109	94 86	0	-49	3	48		
		KAT - 38	Тор	117	76	0	-49	3	30		
		KAT - 38A	North	119	70	-10	-50	3	13		
		KAT - 39	Top	236	93	0	-55	3	41	-	
		KAT - 40 KAT - 41	Top	243	86	0	-56	3	33		
		KAT - 42	Тор	261	84	0	-56	3	31		
		KAT - 44	West	239	84	-10	-56	3	21	50	50
KAT-P1-4	Desidential exemines	KAT 4A	Courth	74	05	5	45	2	20	1	1
KAT-P1-4	Residential premises	KAT - 1A KAT - 1B	South	71	85	-5	-45 -46	3	38		
	nearion	KAT - 2	West	65	75	0	-44	3	34		
		KAT - 3	West	63	75	0	-44	3	34		
		KAT - 4D	West	61	68	0	-44	3	27		
		KAT - 13	VVESI West	0∠ 151	77	0	-44	3	32	1	
		KAT - 14	West	157	78	0	-52	3	29	1	
		KAT - 15	West	168	79	0	-53	3	29	1	
		KAT - 16	North	170	78	-10	-53	3	18	4	
		KAT - 17 KAT - 28	North	173	74	-10	-53	3	14	1	
		KAT - 34	South	74	94	-10	-45	3	42	1	
		KAT - 35	Тор	72	86	0	-45	3	44	]	
		KAT - 38	Тор	71	76	0	-45	3	34		
		KAT - 38A	North	71	70	0	-45	3	28	-	
		KAT - 39	гор Тор	142	93 88	0	-51 -52	3	45 39	1	
		KAT - 41	Тор	158	86	0	-52	3	37	]	
		KAT - 42	Тор	166	84	0	-52	3	35	_	
		KAT - 44	West	142	84	0	-51	3	36	50	50

Remark: [1] A negative correction of 10 dB(A) has been adopted to the direction facing of the ventilation shaft totally screened by buildings and negative correction of 5 dB(A) for NSR do not have direct line of sight to the louver.

Appendix B

Noise Measurement to obtain the SWLs of Fixed Plant Noise Sources

Appendix B1

Measurement Methodology

# Method 1: Far-Field Testing Method for Louver



a: Short side of the louver

b: Long side of the louver

D: Measurement distance (separation between louver and microphone), where D must be greater than (2b) and rounded up to interger.

# Louver opening

Proposed measurement point (microphone pointing perpendicular to the center of the louvre)

For method 1,

- "D" must be greater than 2b and round up to integer.
- The microphone must point to the center of the louver.
- At least 3 sets of LAeq, 1 min should be obtained.
- Background noise measurement should be obtained for determination of background correction factor.
- Any reason causing this method cannot be performed, noise measurement should then be conducted at near field in accordance with Method 2.
- If results of measurement reveal that difference in noise levels measured at far field with and without operation of fixed plant item is less than 3.0dB(A), noise measurement should then be conducted at near field in accordance with Method 2.
- Noise measurement to confirm any tonal, impulsive and intermittent characheristics at representative NSRs.

 $SWL = Mean \ measured \ L_{Aeq, \ 1 \ min} + 20log(D) + 8 + background \ noise \ correction \ factor$ 

# Method 2: Near-Field Testing Method for Louver



# D: Measurement distance

- Louver opening
- Measurement box
- Proposed measurement point (microphone pointing perpendicular to the louvre)

For method 2 (developed based on the principle of ISO3746:2010),

- First step is to determine a hypothetical measurement surfaces with at least 1m separation (D, measured from the centre of the louvre or its nearest edges as appropriate) from the louver.
- For louvre with largest dimension ≤3D, at least one measurement at the centre of the measurement surface parallel to the louvre should be conducted.
- Minimum 10 seconds of measurement interval should be obtained at each measurement point.
- Extra localized microphone positions on the measurement surfaces in the region of high radiation should be considered. In this case follow the procedures of ISO3744.
- For louver with largest dimension > 3D, measurement surface and measurement position should follow ISO3746.
- Background noise level should be taken at each measurement point for determining the background correction (K1A).
- If the difference between the background noise and the measured noise level is less than 3.0dB, K1A should be capped to 3.0dB.
- If necessary to obtain less conservative results, D should be reduced according to ISO3746 to obtain higher measured noise levels.
- Noise measurement to confirm any tonal, impulsive and intermittent characheristics at representative NSRs.

 $SWL = Mean \ LAeq \ over \ all \ measurement \ points + 10 \ log \ (total surface \ area \ over \ the \ measurement \ box) + K1A + K2A$ 

K1A refers to background noise correction factor K2A refers to environmental correction for sound absorption and reflection

# Method 3 – Far Field Testing Method for Plant Item



"L" is the longest side of the plant item

"D, Center" is the separation between center of the plant item and microphone

"D, Surface" is the separation between surface of the plant item and microphone

- "D, Surface" must be greater than twice of L (2L) and roundup to integer (e.g 6m, 7m, 8m...).
- The microphone must be pointing to the center of the plant.
- Measurement should be carried out at the direction toward all NSRs.
- At least 3 sets of  $L_{Aeq, 1}$  min should be obtained at each the measurement point.
- Background noise measurement should be obtained for determination of background correction factor.
- Any reason causing this method cannot be performed, noise measurement should then be conducted at near field in accordance with latest edition of ISO3746 (Method 4).
- If results of measurement reveal that difference in noise levels measured at far field with and without operation of fixed plant item is less than 3.0 dB(A), noise measurement should then be conducted at near field in accordance with latest edition of ISO3746 (Method 4).
- Noise measurement to confirm any tonal, impulsive and intermittent characheristics at representative NSRs.

 $SWL = Mean measured L_{Aeq, 1 min} + 20 log (D,Center) + 8 + background noise correction factor$ 

# Method 4 – Near Field Testing Method for Plant Item

P2 P2 P1 20 2 11+220 A

Kev

For Method 4 (based on ISO3746:2010),

- Please refer to latest edition of ISO3746 for measurement requirement.
- The locations of measurement points are depended on the size of the plant, which cannot be easily generalized (see figure for example)
- Background noise measurement should be obtained for determination of background correction factor (K1A). According to ISO3746, if the source under test radiates noise predominantly in one direction or if the noise from a large source is emitted only from a small portion of the source, the usage of extra localized microphone positions on the measurement surface in the region of high radiation should be considered. In this case, follow the procedures specified in ISO3744.
- Minimum 10 seconds of measurement interval should be obtained at each measurement point.
- Detail calculation of the SWL should refer to the latest edition of ISO3746.
- Noise measurement to confirm any tonal, impulsive and intermittent characheristics at representative NSRs.

 $SWL = Mean \ L_{Aeq} \ over \ all \ measurement \ points + 10 \ log \ (total surface \ area \ over \ the \ measurement \ box) + K1A + K2A$ 

K1A refers to background noise correction factor K2A refers to environmental correction for sound absorption and reflection Shatin to Central Link Proposal of Measurement methodology for Fixed Plant Noise Measurement

# Method 5 – Near Field Testing Method for Plant Room or other source



For Method 5 (developed based on the principle of ISO3746 -2010),

- First step is to determine a measurement box with at least 1m separation (measured from the centre of the louvre or its nearest edges as appropriate) from the louver.
- Secondly, is to determine the location of measurement points on the measurement surface of the hypothetical box.
- Extra localized microphone positions on the measurement surface in the region of high radiation should be considered. In this case follow the procedures of ISO 3744.
- Background noise level should be taken for determination of background correction (K1A.
- Minimum 10 seconds of measurement interval should be obtained at each measurement point.
- If the difference between the BGL and the measured noise level (MNL) is less than 3.0dB, K1A should be capped to 3.0dB.
- If necessary to obtain less conservative results. D should be reduced according to ISO3746 to obtain higher MNLs.
- Noise measurement to confirm any tonal, impulsive and intermittent characheristics at representative NSRs.

 $SWL = Mean \ L_{Aeq} \ over \ all \ measurement \ points \ + \ 10 \ log \ (total \ surface area \ over \ the \ measurement \ box) \ + \ K1A \ + \ K2A$ 

K1A refers to background noise correction factor K2A refers to environmental correction for sound absorption and reflection Appendix B2

Calibration Certificates – Noise Measurement for Fixed Plant Noise

## Appendix B2 Calibration Certificates – Noise Measurement for Fixed Plant Noise

Cert B1: Calibration Certificate of Sound Level Meter SVANTEK 958 (SN: 20890)



## **CALIBRATION CERTIFICATE**

Certificate Informati	on			
Date of Issue	23-Jun-2017	]	Certificate Numb	MLCN171137S
Customer Informatio	on and a second s			a second second
Company Name Address	Wilson Accoust Unit 601, Block Yuen Shun Circ Shatin, N. T., Hong Kong	ies Limited A, Shatin Industrial G uit,	Centre,	
Equipment-under-Te	est (EUT)			
Description Manufacturer Model Number Serial Number Equipment Number	Sound & Vibrat Svantek SVAN 958 20890 	ion Analyser		
Calibration Particul	ar			
Date of Calibration Calibration Equipment	23-Jun-2017 4231(MLTE008	8) / PA160059 / 20-M	ay-2018	
Calibration Procedure	MLCG00, MLC	CG15		
Calibration Conditions	Laboratory EUT Calibration data	Temperature Relative Humidity Stabilizing Time Warm-up Time Power Supply a were detailed in the o	23 °C ± 5 °C 55% ± 25% Over 3 hours 10 minutes Internal battery continuation pages.	
Approved By & Date	2			
		10	- K.O. Lo	23-Jun-2017
Statements Calibration equipment used The results on this Calibrat not include allowance for t overloading, mishandling, MaxLab Calibration Centr The copy of this Certificat prior written approval of M	d for this calibration ion Certificate only whe EUT long term dr misuse, and the capa E Limited shall not b b is owned by MaxLa laxLab Calibration C	are traceable to national / relate to the values measu ifl, variation with environ keity of any other laborator l iable for any loss or dan ab Calibration Centre Lim 'entre Limited.	international standards. red at the time of the calibration and mental changes, vibration and shocl y to repeat the measurement. nage resulting from the use of the E tited. No part of this Certificate may	I the uncertainties quoted will during transportation, UT. be reproduced without the





萬 儀 校 正 中 心 有 限 公 司 MaxLab Calibration Centre Limited 香港新界葵涌華星街 16-18 號保盈工業大廈 9 樓 B2 室 Unit B2, 9/F., Boldwin Industrial Bldg., 16-18 Wah Sing Street, Kwai Chung, N.T., Hong Kong Tel: (852) 2116 1380 Fax: (852) 2264 6480 Email: info@maxlab.com.hk



#### Certificate No.MLCN171137S

Calibration	Data							Real Contraction	and the state of the
Channel / Mode	Filter / Detector	Rang	ge	EUT Readi	ng	Stand Read	lard ling	EUT Error	Calibration Uncertainty
CH4 / Sound	A / FAST	105	dB	94.0	dB	94.0	dB	0.0 dB	0.2 dB
	(1 kHz Input)	130	dB	94.1	dB	94.0	dB	0.1 dB	0.2 dB
				114.1	dB	114.0	dB	0.1 dB	0.2 dB
	C / FAST	105	dB	94.0	dB	94.0	dB	0.0 dB	0.2 dB
	(1 kHz Input)	130	dB	94.1	dB	94.0	dB	0.1 dB	0.2 dB
				114.1	dB	114.0	dB	0.1 dB	0.2 dB
	LIN / FAST	105	dB	94.0	dB	94.0	dB	0.0 dB	0.2 dB
	(1 kHz Input)	130	dB	94.1	dB	94.0	dB	0.1 dB	0.2 dB
				114.1	dB	114.0	dB	0.1 dB	0.2 dB
	A / SLOW	105	dB	94.0	dB	94.0	dB	0.0 dB	0.2 dB
	(1 kHz Input)	130	dB	114.1	dB	114.0	dB	0.1 dB	0.2 dB
	C / SLOW	105	dB	94.0	dB	94.0	dB	0.0 dB	0.2 dB
	(1 kHz Input)	130	dB	114.1	dB	114.0	dB	0.1 dB	0.2 dB
	LIN / SLOW	105	dB	94.0	dB	94.0	dB	0.0 dB	0.2 dB
	(1 kHz Input)	130	dB	114.1	dB	114.0	dB	0.1 dB	0.2 dB
	A / IMPULSE	105	dB	94.0	dB	94.0	dB	0.0 dB	0.2 dB
	(1 kHz Input)	130	dB	114.1	dB	114.0	dB	0.1 dB	0.2 dB
	C / IMPULSE	105	dB	94.0	dB	94.0	dB	0.0 dB	0.2 dB
	(1 kHz Input)	130	dB	114.1	dB	114.0	dB	0.1 dB	0.2 dB
	LIN / IMPULSE	105	dB	94.0	dB	94.0	dB	0.0 dB	0.2 dB
	(1 kHz Input)	130	dB	114.1	dB	114.0	dB	0.1 dB	0.2 dB

- END -

Calibrated By :	Patrick	Checked By :	K.O. Lo
Date :	23-Jun-2017	Date :	23-Jun-2017
			Page 2 of 2

萬儀校正中心有限公司 MaxLab Calibration Centre Limited 香港新界葵涌華星街 16-18 號保盈工業大廈 9 樓 B2 室 Unit B2, 9/F., Boldwin Industrial Bldg., 16-18 Wah Sing Street, Kwai Chung, N.T., Hong Kong Tel: (852) 2116 1380 Fax: (852) 2264 6480 Email: info@maxlab.com.hk

Contificanto Informati	CALI	BRATION C	ERTIFIC	CATE	
Date of Issue	6-Feb-2018		С	ertificate Number	MLCN180200S
Customer Informatio	n	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -			
Company Name Address	Wilson Acousti Unit 601, Block Yuen Shun Circ Shatin, N. T.	cs Limited x A, Shatin Industrial Ce cuit,	ntre,		
Equipment-under-Te	st (EUT)				
Description Manufacturer Model Number Serial Number Equipment Number	Sound Level M Svantek SVAN 955 15234 	eter			
Calibration Particula	ur -				
Date of Calibration Calibration Equipment	6-Feb-2018 4231(MLTE00	8) / PA160059 / 20-May	-2018		
Calibration Procedure	MLCG00, MLC	CG15			
Calibration Conditions	Laboratory EUT	Temperature Relative Humidity Stabilizing Time Warm-up Time Power Supply	$23 \text{ °C} \pm 5 \text{ °C}$ $55\% \pm 25\%$ Over 3 hours 10 minutes Internal batter	лу	
Calibration Results	Calibration data	a were detailed in the co	ntinuation page	s.	
Approved By & Date					
		16		K.O. Lo	6-Feb-2018
Statements Calibration equipment used The results on this Calibrati include allowance for the El mishandling, misuse, and th MaxLab Calibration Centre The copy of this Certificate written approval of MaxLab	for this calibration a on Certificate only re UT long term drift, va te capacity of any oth Limited shall not be is owned by MaxLab Calibration Centre I	re traceable to national / inte late to the values measured i arriation with environmental of er laboratory to repeat the m liable for any loss or damagg o Calibration Centre Limited. .imited.	rnational standard at the time of the c changes, vibration easurement. resulting from the No part of this C	s. alibration and the uncert and shock during transp e use of the EUT. ertificate may be reprod	tainties quoted will not ortation, overloading, uced without the prior

Cert B2: Calibration Certificate of Sound Level Meter SVANTEK 955 (SN: 15234)



Certificate No. MLCN180200S

Parameter	Frequency Weighting	Range (dB)	Time Weighting	EU	T ing	Standa Readi	ng	EUT E	rror	Calibration Uncertainty	
SPL	Α	25 - 130	F	94	dB	94.0	dB	0.0	dB	0.2 dB	
	(1 kHz Input)		S	94	dB	94.0	dB	0.0	dB	0.2 dB	
			Ι	94	dB	94.0	dB	0.0	dB	0.2 dB	
	С	25 - 130	F	94	dB	94.0	dB	0.0	dB	0.2 dB	
	(1 kHz Input)		S	94	dB	94.0	dB	0.0	dB	0.2 dB	
		and the second	Ι	94	dB	94.0	dB	0.0	dB	0.2 dB	
	Z	25 - 130	F	94	dB	94.0	dB	0.0	dB	0.2 dB	
	(1 kHz Input)		S	94	dB	94.0	dB	0.0	dB	0.2 dB	
			I	94	dB	94.0	dB	0.0	dB	0.2 dB	
	A	25 - 130	F	114	dB	114.0	dB	0.0	dB	0.2 dB	
	(1 kHz Input)		S	114	dB	114.0	dB	0.0	dB	0.2 dB	
			I	114	dB	114.0	dB	0.0	dB	0.2 dB	
	C	25 - 130	F	114	dB	114.0	dB	0.0	dB	0.2 dB	
	(1 kHz Input)		S	114	dB	114.0	dB	0.0	dB	0.2 dB	
			I	114	dB	114.0	dB	0.0	dB	0.2 dB	
	Z	25 - 130	F	114	dB	114.0	dB	0.0	dB	0.2 dB	
	(1 kHz Input)		S	114	dB	114.0	dB	0.0	dB	0.2 dB	
			I	114	dB	114.0	dB	0.0	dB	0.2 dB	
				-	END -						
Calibrated B Date :	sy:		Patri 6-	ck Feb-201	8				1	Checked By : Date :	K. 6-
											Р

萬儀校正中心有限公司 MaxLab Calibration Centre Limited 香港新界藝涌華星街 16-18 號保盈工業大廈 9 樓 B2 室 Unit B2, 9/F., Boldwin Industrial Bldg., 16-18 Wah Sing Street, Kwai Chung, N.T., Hong Kong Tel: (852) 2116 1380 Fax: (852) 2264 6480 Email: info@maxlab.com.hk

## Cert B3: Calibration Certificate of Sound Level Meter Rion NA-28 (SN: 30431893)





## CERTIFICATE OF CALIBRATION

Certificate No.:	trificate No.: 17CA0624 01-02 m tested scription: Sound Level Meter (Type 1) nufacturer: Rion Co., Ltd. perModel No.: NA-28 ial/Equipment No.: 30431893 aptors used: m submitted by tempor Name: CM_SELL kint Venture			Page	1	of	2
Item tested	rtificate No.: 17CA0624 01-02 m tested scription: Sound Level Meter (Type 1) nufacturer: Rion Co., Ltd. pe/Model No.: NA-28 rial/Equipment No.: 30431893 aptors used: - m submitted by stomer Name: CW - SELI Joint Venture dress of Customer: 5C, Horg Kong Spinners Industrial Building quest No.: 2000072119 te of receipt: 24-Jun-2017 ate of test: 28-Jun-2017 ate of test: 28						
Description: Manufacturer: Type/Model No.: Serial/Equipment No.: Adaptors used:	Sound Level Mete Rion Co., Ltd. NA-28 30431893	r (Type 1)	• • • •	Microphone Rion Co., Ltd. UC-59 04956 -		Preamp Rion Co NH-23 21956	., Ltd.
Item submitted by			·				
Customer Name: Address of Customer: Request No.: Date of receipt:	CW - SELI Joint V 5C, Hong Kong Spinners 2000072119 24-Jun-2017	/enture industrial Building, Phase	e 1, 601-6	03 Tai Nan West Street, C	heung	Sha Wan, Ko	owloon, Hong Kon
Date of test:	28-Jun-2017						
Reference equipment	used in the calib	ration					
Description: Multi function sound calibrator Signal generator Signal generator	Model: B&K 4226 DS 360 DS 360	Serial No. 2288444 33873 61227		Expiry Date: 17-Jun-2018 25-Apr-2018 01-Apr-2018		Tracea CIGISM CEPREI CEPREI	ble to: EC
Ambient conditions							
Temperature: Relative humidity: Air pressure:	24 ± 1 °C 50 ± 10 % 1010 ± 5 hPa						

#### **Test specifications**

 The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.

 The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.

replaced by an equivalent capacitance within a tolerance of ±20%.
 The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

#### Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets.

Approved Signatory:

Huang Jian Min/Feng Jun Qi

29-Jun-2017 Company Chop:



Comments: The results reported whis certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

© Soils & Materials Engineering Co., Ltd.

Form No CARP152-1/Issue 1/Rev.C/01/02/2007

Hong Kong Accreditation Service (HKAS) has accredited this laboratory (Reg. No. HOKLAS 028 - CAL) under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific calibration activities as listed in the HOKLAS Directory of Accredited Laboratories. The results shown in this certificate were determined by this laboratory in accordance with its terms of accreditation. Such terms of accreditation stipulate that the results shall be traceable to the International System of Units (S.I.) or recognised measurement standards. This certificate shall not be reproduced except in full.



综合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



# CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:		17CA0624 01-02	Pag	Page		of	2	
1.	Electrical Tests							

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

Test:	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor
Self-generated noise	A	Pass	0.3	
	С	Pass	0.8	2.1
	Lin	Pass	1.6	2.2
Linearity range for Leq	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	С	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

#### 2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Fest: Acoustic response	Subtest	Status	Expanded Uncertanity (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 8000 Hz	Pass	0.5	

3, Response to associated sound calibrator

N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.



Hong Kong Accreditation Service (HKAS) has accredited this laboratory (Reg. No. HOKLAS 028 - CAL) under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific calibration activities as listed in the HOKLAS Directory of Accredited Laboratories. The results shown in this certificate were determined by this laboratory in accordance with its terms of accreditation. Such terms of accreditation stipulate that the results shall be traceable to the International System of Units (S.I.) or recognised measurement standards. This certificate shall not be reproduced except in full.

# Cert B4: Calibration Certificate of Acoustic Calibrator SV30A (SN: 29088)



# **CALIBRATION CERTIFICATE**

Date of Issue	5-Mar-2018		Certif	icate Number	MLCN180297
Customer Informatio	on	the second second			
Company Name	Wilson Accoust	ics Limited			
ddress	Unit 601, Block	A. Shatin Industrial Ce	ntre.		
ruur coo	Yuen Shun Circ	mit			
	Shatin N T	and,			
	Hong Kong				
Equipment-under-Te	est (EUT)				
Description	Acoustic Calibr	ator			
/anufacturer	Svantek				
Iodel Number	SV 30A				
Serial Number	29088				
Equipment Number					
Calibration Particul	ar	and the second second	a la sta a la sta	a national de la compañía de la comp	
Date of Calibration	5-Mar-2018				
Calibration Equipment	4231(MLTE008	8) / PA160059 / 20-May	-18		
1-	1351(MLTE049	9) / MLEC17/06/02 / 6	un-18		
Calibration Procedure	MLCG00, MLC	CG15			
Calibration Conditions	Laboratory	Temperature	23 °C ± 5 °C		
		<b>Relative Humidity</b>	$55\% \pm 25\%$		
	EUT	Stabilizing Time	Over 3 hours		
		Warm-up Time	Not applicable		
		Power Supply	Internal battery		
elibration Results	Calibration data	were detailed in the co	ntinuation nages		
and atton results	All calibration	results were within FUT	specification		
	in cunoration i	courts were within 201	speemeuron		
Approved By & Date					
			K.	O. Lo	5-Mar-20
		Carlotter and the second second second			
tatements					
Calibration equipment used The results on this Calibrat	for this calibration ar	e traceable to national / inter late to the values measured a	national standards. I the time of the calibra	tion and the uncertainti	es quoted will not
include allowance for the E	UT long term drift, va	riation with environmental c	hanges, vibration and si	hock during transportat	ion, overloading,
mishandling, misuse, and the	he capacity of any othe	er laboratory to repeat the me	asurement.		
MaxLab Calibration Centre	Limited shall not be l	iable for any loss or damage	resulting from the use	of the EUT.	
The copy of this Certificate	is owned by MaxLab	Calibration Centre Limited.	No part of this Certific	ate may be reproduced	without the prior
written approval of MaxLat	5 Calibration Centre L	imited.			
					Page 1 o
					Page 1 o
					Page 1 o

香港新界葵涌華星街 16-18 號保盈工業大廈 9 樓 B2 室 Unit B2, 9/F., Boldwin Industrial Bldg., 16-18 Wah Sing Street, Kwai Chung, N.T., Hong Kong Tel: (852) 2116 1380 Fax: (852) 2264 6480 Email: info@maxlab.com.hk



Certificate No. MLCN180297S

Calibration Da	na	Standard Reading		EUT E.	EUT Error		ion	EUT			
EUT Setting		Stanuar & Keaung		LUILI	LUI EIIOI		Uncertainty		Specification		
94	dB	93.7	dB	0.3	dB	0.15	dB	±	0.3	dB	
114	dB	113.7	dB	0.3	dB	0.15	dB	±	0.3	dB	
			- END	-							
Calibrated By :		Patrick			С	hecked By :		k	.0. L	0	
Date :		5-Mar-18			D	ate :		5-	Mar-1	8	

Page 2 of 2

萬儀校正中心有限公司 MaxLab Calibration Centre Limited 香港新界藝涌華星街 16-18 號保盈工業大度 9 樓 B2 室 Unit B2, 9/F., Boldwin Industrial Bldg., 16-18 Wah Sing Street, Kwai Chung, N.T., Hong Kong Tel: (852) 2116 1380 Fax: (852) 2264 6480 Email: info@maxlab.com.hk

•

## Cert B5: Calibration Certificate of Acoustic Calibrator CIRRUS CR-515 (SN: 78572)



Hong Kong Calibration Ltd. / 香港校正有限公司

# Calibration Certificate

Certificate No.	811336	Page	1	of 2	2 Pages		
Customer :	Leighton M&E Limited						
Address :	3 Dakota Drive, Kowloon City, Kowl	loon, Hong Kong					
Order No. :	Q84453		Date of receip	: :		14-Nov-18	
Item Tested							
Description	: Sound Level Calibrator						
Manufacturer	CIRRUS		I.D.	:			
Model :	CR:515		Serial No.	:	78572	9	
Test Condit	ions						
Date of Test :	16-Nov-18		Supply Voltage	e :			
Ambient Temp	erature: (23 ± 3)°C		Relative Humidity : (50 ± 25) %				
Test Specifi	cations						
Calibration che	ck.						
Ref. Document	/Procedure : Z02.						
		540 S.4			-		
Test Results	3						
All results were	within the IEC 60942 Type1 spec	ifications.					
The results are	shown in the attached page(s).						
Main Test equip	oment used:						
Equipment No.	Description	Cert. No.		Trac	eable	to	
S014	Spectrum Analyzer	805025		NIM	-PRC 8	& SCL-HKSAR	
S041	Universal Counter	802061		SCL	-HKSA	R	
S240	Sound Level Calibrator	803357		NIM	-PRC 8	& SCL-HKSAR	
S206	Sound Level Meter	805027		SCL	-HKSA	R	
			- C 03/43k				

The values given in this Calibration Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Hong Kong Calibration Ltd. shall not be liable for any loss or damage resulting from the use of the equipment.

The test equipment used for calibration are traceable to International System of Units (SI), or by reference to a natural constant. The test results apply to the above Unit-Under-Test only

Calibrated by :	Appro	oved by :	Kin Wong	
This Certificate is issued by: Hong Kong Calibration Ltd. Unit 88, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street,Kwai Chung, NT,Hong K Tach 2425 RML Face 2425 RML	Date:	16-Nov-18		
The copyright of this certificate is owned by Hong Kong Calibration Ltd., It may not be reproduced exce	ept in full.			E



.Hong Kong Calibration Ltd. 香港校正有限公司

**Calibration Certificate** 



Certificate No. 811336

Page 2 of 2 Pages

Results :

1. Generated Sound Pressure Level

UUT Nominal Value (dB)	Measured Value (dB)	IEC 60942 Class 1 Spec.
94.0	93.9	± 0.4 dB

Uncertainty :  $\pm 0.2 \text{ dB}$ 

- 2. Short-term Level Fluctuation : 0.0 dB IEC 60942 Class 1 Spec. :  $\pm$  0.1 dB Uncertainty :  $\pm 0.01 \text{ dB}$
- 3. Frequency

UUT Nominal Value (kHz)	Measured Value (kHz)	IEC 60942 Class 1 Spec.
1	1.000	±1%

Uncertainty :  $\pm$  3.6 x 10 <sup>-6</sup>

- 4. Total Distortion : < 0.3 % IEC 60942 Class 1 Spec. : < 4 % Uncertainty : ± 2.3 % of reading
- Remark : 1. UUT : Unit-Under-Test
  - 2. The uncertainty claimed is for a confidence probability of not less than 95%.
  - 3. Atmospheric Pressure : 1 001 hPa.

----- END ------

The copyright of this certificate is owned by Hong Kong Calibration Ltd., It may not be reproduced except in full.

Appendix B3

Photographs showing the Examples of Noise Measurement for Fixed Plant Noise



Appendix B3 Photographs showing the Examples of Noise Measurement for Fixed Plant Noise



Appendix B3 - Page 2



Appendix B4

**Noise Measurement Results** 

# **Appendix B4 Noise Measurement Results**

			S	ize of Louvre (mn	n)						
Fixed Plant Source ID	Plant Type	Method	Length	Width	Height	Measurement Distance (m) D <sup>(a)</sup>	Averaged Measured L <sub>Aeq</sub> ,dB(A) <sup>(b)</sup>	Background L <sub>Aeq</sub> ,dB(A)	Difference L <sub>Aeq</sub> ,dB(A)	Background Corrected L <sub>Aeq</sub> ,dB(A) <sup>(c)</sup>	Calculated SWL <sub>,</sub> dB(A)
KAT-1A	Louvre	2	6020	4785	N/A	1.0	65.6	54.4	11.2	65.6	85
KAT-1B	Louvre	2	2445	4785	N/A	1.0	65.3	51.8	13.5	65.3	82
KAT-2	Louvre	2	5300	4785	N/A	1.0	56.7	54.5	2.2	53.7	73
KAT-03 <sup>(d)</sup>	Louvre	2	4785	3680	N/A	1.0	61.5	52.8	8.7	60.9	79
KAT-03	Louvre	2	4785	3680	N/A	1.0	54.9	52.8	2.1	51.9	70
KAT-04D	Louvre	2	4785	1330	N/A	1.0	54.6	53.7	0.9	51.6	68
KAT-05	Louvre	2	4785	1750	N/A	1.0	58.7	54.7	4.0	56.4	73
KAT-13	Louvre	2	4785	6230	N/A	1.0	60.0	56.7	3.3	57.3	77
KAT-14	Louvre	2	5500	4800	N/A	1.0	60.0	54.1	5.9	58.7	78
KAT-15	Louvre	2	4800	3100	N/A	1.0	61.8	54.5	7.3	61.0	79
KAT-16	Louvre	2	4800	1900	N/A	1.0	61.9	54.9	7.0	61.0	78
KAT-17	Louvre	2	4785	2450	N/A	1.0	59.4	57.7	1.7	56.4	74
KAT-28	Louvre	2	800	800	N/A	1.0	62.1	57.4	4.7	60.3	73
KAT-34	Louvre	2	2300	1100	N/A	1.0	79.7	50.0	29.7	79.7	94
KAT-35	Louvre	2	4405	7825	N/A	1.0	66.3	53.2	13.1	66.3	86
KAT-38	Louvre	2	5225	5200	N/A	1.0	58.9	53.9	5.0	57.3	76
KAT-38A	Louvre	2	850	2330	N/A	1.0	58.6	58.5	0.1	55.6	70
KAT-39	Louvre	2	9150	4050	N/A	1.0	77.1	51.1	26.0	77.1	90
KAT-40	Louvre	2	5900	4800	N/A	1.0	69.2	56.1	13.1	69.2	88
KAT-41	Louvre	2	6100	2410	N/A	1.0	68.0	55.9	12.1	68.0	86
KAT-42	Louvre	2	3600	4200	N/A	1.0	78.7	54.4	24.3	78.7	96
KAT-44	Louvre	2	1000	2000	N/A	1.0	80.9	59.5	21.4	80.9	95

Remarks:

a) Measurement Distance between louvre and microphone.

b) Results are averaged from number of points in accordance with ISO3746.

c) If the difference between the background and the measured noise level is less than 3.0 dB, background noise correction factor should be capped to 3.0dB.

d) Operation scenario during daytime/evening period only and the measured SWL will be checked against the respective noise criterion.

Appendix C

Noise Measurement to Confirm any Tonal, Impulsive and Intermittent Characteristics from the Fixed Plant Nose Sources at Representative NSRs Appendix C1

Calibration Certificates – Noise Measurement at Representative NSRs



#### 综合試驗 有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



# **CERTIFICATE OF CALIBRATION**

Certificate No.:	18CA1019 01-01		Page	1	of	2	
Item tested							
Description:	Sound Level Mete	r (Type 1)	Microphone		Preamp		
Manufacturer:	B & K		B & K		B & K		
Type/Model No.:	2250		4950		ZC0032		
Serial/Equipment No.:	3001291		2665582		17190		
Adaptors used:	-		-		-		
Item submitted by			t.				
Customer Name:	AECOM ASIA CO	LIMITED					
Address of Customer:	-						
Request No.:	-						
Date of receipt:	19-Oct-2018						
Date of test:	19-Oct-2018						
Reference equipment	used in the calib	ration					
Description:	Model:	Serial No.	Expiry Date:		Traceat	le to:	
Multi function sound calibrator	B&K 4226	2288444	23-Aug-2019		CIGISME	С	
Signal generator	DS 360	33873	24-Apr-2019		CEPREI		
Signal generator	DS 360	61227	23-Apr-2019		CEPREI		
Ambient conditions							
Temperature:	20 ± 1 °C						
Relative humidity:	50 ± 10 %						
Air pressure:	1005 ± 5 hPa						
				_			

#### **Test specifications**

- 1, The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- 2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

#### **Test results**

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets.

Approved Signatory:

Fend Junai





**Comments:** The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

Date:

© Soils & Materials Engineering Co., Ltd.

Form No.CARP152-1/Issue 1/Rev.C/01/02/2007



## 综合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD.

香港黃竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



# **CERTIFICATE OF CALIBRATION**

(Continuation Page)

Certificate No.:

18CA1019 01-01

Page 2

of

2

#### 1, Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

			Expanded	Coverage
Test:	Subtest:	Status:	Uncertanity (dB)	Factor
Call and the last	2	Deres	0.0	
Self-generated noise	A	Pass	0.3	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	С	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
A	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
200529 genella – odre Meno 🗢 Handa suor 🗢 otre	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

#### 2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Expanded Uncertanity (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 8000 Hz	Pass	0.5	

#### 3, Response to associated sound calibrator

### N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

End Calibrated by: Checked by: Fung Chi Yip shek Kwong Tat Date: 19-Oct-2018 Date: 20-Oct-2018

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

© Soils & Materials Engineering Co., Ltd

Form No CARP152-2/Issue 1/Rev C/01/02/2007



#### 综合試驗 有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



# **CERTIFICATE OF CALIBRATION**

Certificate No.:	19CA0311 02		Page	1 of 2	
Item tested					
Description:	Sound Level Mete	er (Type 1)	Microphone	Preamp	
Manufacturer:	B & K		B & K	B&K	
Type/Model No.:	2250-L		4189	ZC0032	
Serial/Equipment No.:	2681366		3005374	23853	
Adaptors used:	- (	N.01.01)	-	-	
Item submitted by					
Customer Name:	AECOM ASIA CO	LTD			
Address of Customer:	-				
Request No.:	-				
Date of receipt:	11-Mar-2019				
Date of test:	18-Mar-2019				
Reference equipment	used in the calib	ration			
Description:	Model:	Serial No.	Expiry Date:	Traceable to:	
Multi function sound calibrator	B&K 4226	2288444	23-Aug-2019	CIGISMEC	
Signal generator	DS 360	33873	24-Apr-2019	CEPREI	
Signal generator	DS 360	61227	26-Dec-2019	CEPREI	
Ambient conditions					
Temperature:	21 ± 1 °C				
Relative humidity:	55 ± 10 %				
Air pressure:	1005 + 5 hPa				
	1000 1 0 11 0				

## Test specifications

- 1, The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- 2, The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

## **Test results**

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets.

**Approved Signatory:** Feng. ungi

19-Mar-2019 Company Chop:



**Comments:** The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

Date:

© Soils & Materials Engineering Co., Ltd.

Form No.CARP152-1/Issue 1/Rev.C/01/02/2007



## 綜合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD.

香港黄竹坑道37號利達中心12樓

12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



# **CERTIFICATE OF CALIBRATION**

(Continuation Page)

Certificate No.:

19CA0311 02

Page 2

of

2

#### 1, Electrical Tests

The electrical tests were perfomed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

			Expanded	Coverage
Test:	Subtest:	Status:	Uncertanity (dB)	Factor
Self generated poice	٥	5		
Sell-generated hoise	A	Pass	0.3	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	С	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

## 2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Expanded Uncertanity (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz Weighting A at 8000 Hz	Pass Pass	0.3 0.5	

## Response to associated sound calibrator

#### N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.



calibrated on a schedule to maintain the required accuracy level.

© Soils & Materials Engineering Co., Ltd.

Form No.CARP152-2/Issue 1/Rev.C/01/02/2007



## 综合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.

E-mail: smec@cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



# **CERTIFICATE OF CALIBRATION**

Website: www.cigismec.com

Certificate No.:	17CA0902 02-02		Page	1 of 2
Item tested			2	
Description:	Sound Level Mete	r (Type 1)	Microphone	Preamp
Manufacturer:	В&К		B & K	B&K
Type/Model No.:	2250		4950	ZC0032
Serial/Equipment No.:	2718890		2827088	24967
Adaptors used:	17			-
Item submitted by				
Customer Name:	Anewr Consulting	Limited		
Address of Customer:	Unit 517, 5/F Towe	er A, Regent Centre, 63	3 Wo Yip Hop Road, Kw	ai Chung
Request No.:				
Date of receipt:	02-Sep-2017			
Date of test:	09-Sep-2017			
Reference equipment	used in the calib	ration		
Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	08-Sep-2018	CIGISMEC
Signal generator	DS 360	33873	25-Apr-2018	CEPREI
Signal generator	DS 360	61227	01-Apr-2018	CEPREI
Ambient conditions				
Temperature:	21 ± 1 °C			
Relative humidity:	50 ± 10 %			
Air pressure:	1010 ± 5 hPa			
Test specifications				

- 1, The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- 2, The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of +20%.
- 3, The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

### **Test results**

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets.

Min/Feng Jun Qi Huang Jia

09-Sep-2017



**Comments:** The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

Date:

© Soils & Materials Engineering Co., Ltd.

Approved Signatory:

Form No.CARP152-1/Issue 1/Rev.C/01/02/2007

**Company Chop:** 

Hong Kong Accreditation Service (HKAS) has accredited this laboratory (Reg. No. HOKLAS 028 - CAL) under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific calibration activities as listed in the HOKLAS Directory of Accredited Laboratories. The results shown in this certificate were determined by this laboratory in accordance with its terms of accreditation. Such terms of accreditation stipulate that the results shall be traceable to the International System of Units (S.I.) or recognised measurement standards. This certificate shall not be reproduced except in full.



## 综合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓

12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533

Page



# **CERTIFICATE OF CALIBRATION**

(Continuation Page)

Certificate No.:

17CA0902 02-02

2 of

of 2

#### 1, Electrical Tests

The electrical tests were perfomed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

			Expanded	Coverage
Test:	Subtest:	Status:	Uncertanity (dB)	Factor
		Deee	0.2	
Self-generated noise	A	Pass	0.3	
	С	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
1 9 0 0	С	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

#### 2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Expanded Uncertanity (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 8000 Hz	Pass	0.5	

3, Response to associated sound calibrator

#### N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

	7	- End -	
Calibrated by:		Checked by:	
Date:	09-Sep-2017	Date: 09-Sep-2017	

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

© Soils & Materials Engineering Co., Ltd.

Form No.CARP152-2/Issue 1/Rev.C/01/02/2007

Hong Kong Accreditation Service (HKAS) has accredited this laboratory (Reg. No. HOKLAS 028 - CAL) under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific calibration activities as listed in the HOKLAS Directory of Accredited Laboratories. The results shown in this certificate were determined by this laboratory in accordance with its terms of accreditation. Such terms of accreditation stipulate that the results shall be traceable to the International System of Units (S.I.) or recognised measurement standards. This certificate shall not be reproduced except in full.



#### 综合試驗 有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 . Fax: (852) 2555 7533



# **CERTIFICATE OF CALIBRATION**

Certificate No.:	19CA0228 02		Page	1	of	2
Item tested						
Description:	Sound Level Mete	r (Type 1)	Microphone		Pream	
Manufacturer:	B & K		B&K		B & K	
Type/Model No.:	2270		4950		ZC0032	
Serial/Equipment No.:	2644597		2879980		19428	
Adaptors used:	- ( <sub>N</sub> .	( 10.210	-		÷.	
Item submitted by	5					
Customer Name:	AECOM ASIA CO	LTD				
Address of Customer:	-					
Request No	12					
Date of receipt:	28-Feb-2019					
Date of test:	01-Mar-2019					
Reference equipment	used in the calib	ration				
Description:	Model:	Serial No.	Expiry Date:		Traceat	ole to:
Multi function sound calibrator	B&K 4226	2288444	23-Aug-2019		CIGISME	C
Signal generator	DS 360	33873	24-Apr-2019		CEPREI	
Signal generator	DS 360	61227	26-Dec-2019		CEPREI	
Ambient conditions						
Temperature:	21 ± 1 °C					
Relative humidity:	55 ± 10 %					
Air pressure:	$1005 \pm 5 hPa$					

### **Test specifications**

- 1, The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- 2, The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- 3, The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

#### **Test results**

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets

Approved Signatory:

Feng Junqi

02-Mar-2019

**Company Chop:** 



**Comments:** The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

Date:

© Soils & Materials Engineering Co., Ltd.

Form No.CARP152-1/Issue 1/Rev.C/01/02/2007



# 綜合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD.

香港黃竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.

E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



# CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 19CA

19CA0228 02

Page 2 of 2

## 1, Electrical Tests

Test

The electrical tests were perfomed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

Test.	Subtest:	Status:	Uncertanity (dB) / Coverage Factor		
Self-generated noise Linearity range for Leq	A C Lin At reference range , Step 5 dB at 4 kHz Reference SPL on all other ranges 2 dB below upper limit of each range	Pass Pass Pass Pass Pass Pass	0.3 1.0 2.0 0.3 0.3 0.3 0.3	2.1 2.2	
Linearity range for SPL Frequency weightings	At reference range , Step 5 dB at 4 kHz A C Lin	Pass Pass Pass Pass Pass	0.3 0.3 0.3 0.3		
Time weightings Peak response R.M.S. accuracy Time weighting I Time averaging	Single Burst Fast Single Burst Slow Single 100µs rectangular pulse Crest factor of 3 Single burst 5 ms at 2000 Hz Repeated at frequency of 100 Hz 1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass Pass Pass Pass Pass Pass Pass Pass	0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3		
Pulse range Sound exposure level Overload indication	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz Single burst 10 ms at 4 kHz Single burst 10 ms at 4 kHz SPL Leq	Pass Pass Pass Pass Pass	0.3 0.4 0.4 0.3 0.4		

## 2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

		Uncertainty (dB) / Coverage Factor
Weighting A at 125 Hz Weighting A at 8000 Hz	Pass Pass	0.3 0.5
	ng A at 125 Hz ng A at 8000 Hz	ng A at 125 Hz Pass ng A at 8000 Hz Pass

# 3, Response to associated sound calibrator

#### N/A

The uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95 %. A coverage factor of 2 is

	c l	- End -	Λ
Calibrated by:	-U	Checked by:	$1 \sim 6$
Date:	Fong Chun Wai 01-Mar-2019	Doto:	Fung Chi Yip
		Date:	02-Mar-2019

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

© Soils & Materials Engineering Co., Ltd

Form No.CARP152-2/Issue 1/Rev.C/01/02/2007



# 综合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓

12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



# CERTIFICATE OF CALIBRATION

Certificate No.:	19CA0327 01-02		Page:	1	of	2
Item tested						
Description: Manufacturer: Type/Model No.: Serial/Equipment No.: Adaptors used:	Acoustical Calibrat B & K 4231 3006428 / N004.03	tor (Class 1) 3				
Item submitted by						
Curstomer: Address of Customer: Request No.: Date of receipt:	AECOM ASIA CO - - 27-Mar-2019	(N.004.03	)			
Date of test:	27-Mar-2019					
Reference equipment	used in the calib	ration				
Description: Lab standard microphone Preamplifier Measuring amplifier Signal generator Digital multi-meter Audio analyzer Universal counter	Model: B&K 4180 B&K 2673 B&K 2610 DS 360 34401A 8903B 53132A	Serial No. 2341427 2743150 2346941 33873 US36087050 GB41300350 MY40003662	Expiry Date: 20-Apr-2019 27-Apr-2019 08-May-2019 24-Apr-2019 23-Apr-2019 23-Apr-2019 24-Apr-2019		Traceable SCL CEPREI CEPREI CEPREI CEPREI CEPREI CEPREI	e to:
Ambient conditions						
Temperature: Relative humidity: Air pressure:	22 ± 1 °C 55 ± 10 % 1005 ± 5 hPa					
Test specifications						
<ol> <li>The Sound Calibrato and the lab calibratio</li> <li>The calibrator was te</li> </ol>	or has been calibrated on procedure SMTP0( ested with its axis vert	in accordance with the 04-CA-156. ical facing downwards	requirements as speci at the specific frequenc	fied in y usin	n IEC 6094 ng insert vo	2 1997 Anr Iltage techr

3, The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

#### **Test results**

This is to certify that the sound calibrator conforms to the requirements of annex B of IEC 60942: 1997 for the conditions under which the test was performed. This does not imply that the sound calibrator meets IEC 60942 under any other conditions.

Details of the performed measurements are presented on page 2 of this certificate.



20 Feng Jungi

29-Mar-2019 Company Chop:



**Comments:** The results reported in this certificate refer to the conditon of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

Date:

© Soils & Materials Engineering Co., Ltd.

Form No.CARP156-1/Issue 1/Rev.D/01/03/2007


ふ 驗 有 限 公 司 MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心19棟

12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



### **CERTIFICATE OF CALIBRATION**

(Continuation Page)

Certificate No.:

19CA0327 01-02

Page: 2 of

of 2

#### 1, Measured Sound Pressure Level

The output Sound Pressure Level in the calibrator head was measured at the setting and frequency shown using a calibrated laboratory standard microphone and insert voltage technique. The results are given in below with the estimated uncertainties.

Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	Estimated Expanded Uncertainty dB
1000	94.00	94.23	0.10

#### 2, Sound Pressure Level Stability - Short Term Fluctuations

The Short Term Fluctuations was determined by measuring the maximum and minimum of the fast weighted DC output of the B&K 2610 measuring amplifier over a 20 second time interval as required in the standard. The Short Term Fluctuation was found to be:

At 1000 Hz	STF = 0.014 dB
Estimated expanded uncertainty	0.005 dB

#### 3, Actual Output Frequency

The determination of actual output frequency was made using a B&K 4180 microphone together with a B&K 2673 preamplifier connected to a B&K 2610 measuring amplifier. The AC output of the B&K 2610 was taken to an universal counter which was used to determine the frequency averaged over 20 second of operation as required by the standard. The actual output frequency at 1 KHz was:

At 1000 Hz	Actual Frequency = 1000.0 Hz	
Estimated expanded uncertainty	0.1 Hz	Coverage factor k = 2.2

#### 4, Total Noise and Distortion

For the Total Noise and Distortion measurement, the unfiltered AC output of the B&K 2610 measuring amplifier was connected to an Agilent Type 8903 B distortion analyser. The TND result at 1 KHz was:

At 1000 Hz	TND = 0.3 %
Estimated expanded uncertainty	0.7 %

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

/	- End -	
$\sim \langle$	Checked by:	El
Fung Chi Yip∬ 7-Mar-2019	Date:	Fong Chun Wai 29-Mar-2019
	Fung Chi Yip 7-Mar-2019	Fung Chi Yip 7-Mar-2019 Date:

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

© Soils & Materials Engineering Co., Ltd.

Form No.CARP156-2/Issue 1/Rev.C/01/05/2005

Hong Kong Accreditation Service (HKAS) has accredited this laboratory (Reg. No. HOKLAS 028) under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific calibration activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this certificate are traceable to the International System of Units (SI) or recognised measurement standards. This certificate shall not be reproduced except in full.



#### 综合試驗 有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



## CERTIFICATE OF CALIBRATION

Certificate No.:	18CA1008 02		Page:	1	of	2
Item tested						
Description: Manufacturer: Type/Model No.:	Acoustical Calibra Rion Co., Ltd. NC-74	tor (Class 1)				
Adaptors used:	34246490 / N.004 -	.10				
Item submitted by						
Curstomer:	AECOM ASIA CO	LIMITED				
Address of Customer:	-					
Request No.:	-			э.		
Date of receipt:	08-Oct-2018					
Date of test:	10-Oct-2018					
Reference equipment	used in the calib	oration				
Description:	Model:	Serial No.	Expiry Date:	т	raceable	e to:
Lab standard microphone	B&K 4180	2341427	20-Apr-2019	S	CL	
Preamplifier	B&K 2673	2743150	27-Apr-2019	C	EPREI	
Measuring amplifier	B&K 2610	2346941	08-May-2019	C	EPREI	
Signal generator	DS 360	61227	24-Apr-2019	C	EPREI	
Digital multi-meter	34401A	US36087050	23-Apr-2019	C	EPREI	
Audio analyzer	8903B	GB41300350	23-Apr-2019	C	EPREI	
Universal counter	53132A	MY40003662	24-Apr-2019	С	EPREI	
Ambient conditions						
Temperature:	21 ± 1 °C					
Relative humidity:	50 ± 10 %	27				
Air pressure:	1005 ± 5 hPa					

#### **Test specifications**

1, The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B and the lab calibration procedure SMTP004-CA-156.

2. The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.

 The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

#### **Test results**

This is to certify that the sound calibrator conforms to the requirements of annex B of IEC 60942: 1997 for the conditions under which the test was performed. This does not imply that the sound calibrator meets IEC 60942 under any other conditions.

Details of the performed measurements are presented on page 2 of this certificate.



Approved Signatory:

Feng Jungi

10-Oct-2018 Company Chop:

Comments: The results reported in this certificate refer to the conditon of the instrument on the date of calibration and carry no implication regarding the long term stability of the instrument.

Date:

© Soils & Materials Engineering Co., Ltd.

Form No CARP156-1/Issue 1/Rev D/01/03/2007

Hong Kong Accreditation Service (HKAS) has accredited this laboratory (Reg. No. HOKLAS 028) under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific calibration activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this certificate are traceable to the International System of Units (SI) or recognised measurement standards. This certificate shall not be reproduced except in full.



#### 綜合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD.

香港黄竹坑道37號利達中心12樓

12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



## **CERTIFICATE OF CALIBRATION**

(Continuation Page)

Certificate No.:

18CA1008 02

Page: 2 of 2

2 01 2

#### 1, Measured Sound Pressure Level

The output Sound Pressure Level in the calibrator head was measured at the setting and frequency shown using a calibrated laboratory standard microphone and insert voltage technique. The results are given in below with the estimated uncertainties.

Frequency	Output Sound Pressure	Measured Output	Estimated Expanded
Shown	Level Setting	Sound Pressure Level	Uncertainty
Hz	dB	dB	dB
1000	94.00	93.89	0.10

#### 2, Sound Pressure Level Stability - Short Term Fluctuations

The Short Term Fluctuations was determined by measuring the maximum and minimum of the fast weighted DC output of the B&K 2610 measuring amplifier over a 20 second time interval as required in the standard. The Short Term Fluctuation was found to be:

At 1000 Hz	STF = 0.030 dB
Estimated expanded uncertainty	0.005 dB

#### 3, Actual Output Frequency

The determination of actual output frequency was made using a B&K 4180 microphone together with a B&K 2673 preamplifier connected to a B&K 2610 measuring amplifier. The AC output of the B&K 2610 was taken to an universal counter which was used to determine the frequency averaged over 20 second of operation as required by the standard. The actual output frequency at 1 KHz was:

At 1000 Hz	Actual Frequency = 1002.0 Hz	
Estimated expanded uncertainty	0.1 Hz	Coverage factor k = 2.2

#### 4, Total Noise and Distortion

For the Total Noise and Distortion measurement, the unfiltered AC output of the B&K 2610 measuring amplifier was connected to an Agilent Type 8903 B distortion analyser. The TND result at 1 KHz was:

At 1000 Hz	TND = 2.3 %
Estimated expanded uncertainty	0.7 %

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.



The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

© Soils & Materials Engineering Co., Ltd

Form No.CARP156-2/Issue 1/Rev C/01/05/2005

Hong Kong Accreditation Service (HKAS) has accredited this laboratory (Reg. No. HOKLAS 028) under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific calibration activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this certificate are traceable to the International System of Units (SI) or recognised measurement standards. This certificate shall not be reproduced except in full. Appendix C2

Photographs – Noise Measurement at Representative NSRs





Appendix C2 - Page 1



Appendix C2 - Page 2

Appendix C3

Measurement Results at Representative NSRs

			Fixed Plant Noise Background Noise		Background Noise		oise Difference between	
				Measured Noise		Background Noise	Measured Noise Level	
Location ID	Measurement Date	Operation Scenario <sup>(1)(2)</sup>	Measurement Time	dB(A)	Measurement Time	dB(A)	dB(A)	
		Daytime and Evening	22:29:00 - 22:58:59	54.9	21:57:00 - 22:01:59	56.5	-1.6	
KAT-FN1	28/6/2019 - 29/6/2019	Night-time	23:01:00 - 23:30:59	52.8	23:57:00 - 00:01:59	52.5	0.3	
		Daytime and Evening	22:29:00 - 22:58:59	58.1	21:57:00 - 22:01:59	57.8	0.3	
KAT-FN2	28/6/2019 - 29/6/2019	Night-time	23:01:00 - 23:30:59	56.9	23:57:00 - 00:01:59	56.6	0.3	
		Daytime and Evening	22:29:00 - 22:58:59	50.4	21:57:00 - 22:01:59	50.9	-0.5	
KAT-FN3	28/6/2019 - 29/6/2019	Night-time	23:01:00 - 23:30:59	50.2	23:57:00 - 00:01:59	51.1	-0.9	
		Daytime and Evening	22:29:00 - 22:58:59	54.6	21:57:00 - 22:01:59	55.8	-1.2	
KAT-FN4	28/6/2019 - 29/6/2019	Night-time	23:01:00 - 23:30:59	54.4	23:51:00 - 23:55:59	54.4	0.0	

Notes:

(1) Daytime and evening period (i.e 0700 to 2300 hours) and night-time period (i.e. Night: 2300 to 0700 hours).

(2) Fixed plant noise operation during daytime/evening and nigth-time periods have been included according to corresponding fixed plant noise measurement.

Fixed Plant Noise Audit Report (Batch 5B – Ma Chai Hang Ventilation Building (MCV))

# Shatin to Central Link – Tai Wai to Hung Hom Section and Stabling Sidings at Hung Hom Freight Yard

Fixed Plant Noise Audit Report

(Batch 5b – Ma Chai Hang Ventilation Building (MCV))

(July 2019)

Certified by:	Fredrick Leong	

Position: Independent Environmental Checker

Date: 1 Aug 2017

# Shatin to Central Link – Tai Wai to Hung Hom Section and Stabling Sidings at Hung Hom Freight Yard

Fixed Plant Noise Audit Report

(Batch 5b - Ma Chai Hang Ventilation Building (MCV))

(July 2019)

Certified by:	Lisa Poon	Q.	
		- Cr-	

Position: Environmental Team Leader

Date:	1 Aug	2019	
	0		

## AECOM

#### MTR Corporation Limited

Consultancy Agreement No. C11033

### Shatin to Central Link - Tai Wai to Hung Hom Section [SCL(TAW – HUH)] and Stabling Sidings at Hung Hom Freight Yard [SCL(HHS)]

#### Fixed Plant Noise Audit Report (Batch 5B – Ma Chai Hang Ventilation Building (MCV))

#### July 2019

	Name	Signature			
Prepared & Checked:	pp Isaac Chu	4~~			
Reviewed & Approved:	Josh Lam	Angeli			
Version:	A Date:	31 July 2019			
This Report is prepared for MTR Corporation Limited and is given for its sole benefit in relation to and pursuant to Consultancy Agreement No. C11033 and may not be disclosed to, quoted to or relied upon by any person other than MTR Corporation Limited without our prior written consent. No person (other than MTR Corporation Limited) into whose possession a copy of this Report comes may rely on this Report without our express written consent and MTR Corporation Limited may not rely on it for any purpose other than as described above.					

AECOM Asia Co. Ltd. 8/F, Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, NT, Hong Kong Tel: (852) 3922 9000 Fax: (852) 3922 9797 www.aecom.com

#### **Table of Content**

#### Page

1	INTRO	DDUCTION1	i
	1.1 1.2	Background	2
2	UPDA	TED SOUND POWER LEVELS OF FIXED PLANT NOISE SOURCES	\$
3	MEAS	UREMENT METHODOLOGY4	ŀ
	3.1 3.2	Noise Measurement to obtain the SWLs of Fixed Plant Noise Sources	ł
4	MEAS	SUREMENT RESULTS	7
	4.1 4.2	Noise Measurement to obtain the SWLs of Fixed Plant Noise Sources	7
5	CONC	CLUSION9	•

#### List of Tables

Table 2.1 Summary of Updated Maximum Allowable SWLs for Fixed Plant Noise Sources at MCV

- Table 3.1 Noise Measurement Equipment
- Table 3.2Measurement Schedule
- Table 3.3
   Noise Measurement Equipment
- Table 3.4Noise Measurement Locations
- Table 3.5 Measurement Schedule
- Table 4.1Summary of Measured SWLs for Fixed Plants
- Table 4.2
   Noise Measurement Results at Measurement Locations

#### List of Figures

C1103/C/SCL/ACM/M52/053	Locations	of	NSRs	s and	Fixed	Noise	Sources	(Ma	Chai	Hang
	Ventilation	Bu	ilding)							
C1103/C/SCL/ACM/M52/054	Locations	of I	Noise I	Measu	rement	Points	(Ma Chai	Hang	g Vent	tilation
	Building)									

#### **List of Appendices**

#### Appendix A Proposal for Updating Maximum Allowable Sound Power Levels of Fixed Plant Sources (Batch 5B – Ma Chai Hang Ventilation Building (MCV))

Appendix B Noise Measurement to obtain the SWLs of Fixed Plant Noise Sources

Appendix B1	Measurement Methodology
Appendix B2	Calibration Certificates – Noise Measurement for Fixed Plant Noise
Appendix B3	Photographs showing the Examples of Noise Measurement for Fixed
	Plant Noise
Appendix B4	Noise Measurement Results

Appendix CNoise Measurement to Confirm any Tonal, Impulsive and Intermittent Characteristics<br/>from the Fixed Plant Nose Sources at Representative NSRsAppendix C1Calibration Certificates – Noise Measurement at Representative<br/>NSRsAppendix C2Photographs – Noise Measurement at Representative NSRs<br/>Noise Measurement Results at Representative NSRs

#### 1 INTRODUCTION

#### 1.1 Background

- 1.1.1 The Shatin to Central Link (SCL) is a 17km extension of the existing Ma On Shan Line (MOL) and East Rail Line (EAL) comprising (i) The East-West Corridor which extends the MOL from Tai Wai to Hung Hom via East Kowloon to connect with the West Rail Line (WRL) at Hung Hom Station (HUH) and Stabling Sidings at Hung Hom Freight Yard (HHS); and (ii) The North-South Corridor which is an extension of the EAL at Hung Hom across the harbour to Admiralty Station (ADM).
- 1.1.2 Environmental Impact Assessment (EIA) Reports for SCL Tai Wai to Hung Hom Section [SCL (TAW-HUH)] (Register No. AEIAR-167/2012) and SCL Stabling Sidings at Hung Hom Freight Yard [SCL (HHS)] (Register No. AEIAR-164/2012) (hereinafter referred to as "the EIA Reports") were approved on 17 February 2012 under the Environmental Impact Assessment Ordinance (EIAO). Following the approval of the EIA Reports, the Environmental Permit (EP) (EP No: EP-438/2012), covering the construction of both SCL (TAW-HUH) and SCL (HHS) (hereinafter referred to as "the Project"), was granted on 22 March 2012. Variations of Environmental Permit (VEP) were subsequently applied for EP-438/2012 and the latest Environmental Permit (EP No: EP-438/2012/K) was issued by Director of Environmental Protection (DEP) on 4 October 2016.
- 1.1.3 Pursuant to EP Condition 2.32, at least one month before commencement of operation of the Project, the Permit Holder, MTR Corporation Ltd (MTR), shall carry out fixed plant noise audit and deposit with the Director four hardcopies and one electronic copy of an audit report showing the design of the fixed plant noise sources associated with the Project complies with the maximum sound power levels determined in the approved SCL(TAW-HUH) EIA Report (Register No. AEIAR-167/2012) and SCL(HHS) EIA Report (Register No. AEIAR-164/2012) and all relevant documents in the Register, or otherwise approved by the Director in compliance with the requirements in Technical Memorandum on Environmental Impact Assessment Process having due regard to the characteristics of tonality, impulsiveness and intermittency.
- 1.1.4 Since the installation of fixed plant along the SCL (TAW-HUH) and SCL (HHS) would be completed in stages, the fixed plant noise audit will be conducted in stages according to the testing and commissioning programmes in each area.
- 1.1.5 AECOM Asia Co. Ltd was commissioned by the MTR to prepare the fixed plant noise audit report to check the compliance of the maximum sound power levels (SWLs) and to undertake noise measurement at the representative Noise Sensitive Receivers (NSRs) for investigation of any characteristics of tonality, impulsiveness and intermittency from the fixed plant noise sources associated with the Project.
- 1.1.6 Based on the latest design information, the maximum allowable SWLs of fixed plant items has been updated to reflect the latest design of the Project, and therefore Proposals were prepared to present the updated maximum allowable sound power levels (SWLs) of the fixed plant items at different stations of the Project. The Proposal for Updating Maximum Allowable Sound Power Levels of Fixed Plant Sources (Batch 5B Ma Chai Hang Ventilation Building (MCV)) (hereinafter referred to as "the Proposal (Batch 5B MCV)") (Appendix A refers) was approved by DEP on 17 July 2019.
- 1.1.7 This Fixed Plant Noise Audit Report (Batch 5B Ma Chai Hang Ventilation Building (MCV)) (hereinafter referred to as "the FPNAR (Batch 5B MCV)" presents the noise measurement methodology and measurement results at the fixed plant noise sources of MCV and at the representative NSRs near MCV, for checking compliance with the maximum allowable sound power levels (SWLs) determined in the Proposal (Batch 5B MCV).

#### 1.2 Purpose of This Report

- 1.2.1 This Report presents the noise measurement methodology and measurement results at the fixed plant noise sources of MCV and at the representative NSRs near MCV.
- 1.2.2 This Report comprises the following sections:
  - Section 1 presents the background information.
  - Section 2 presents the Updated SWL of fixed plant noise sources.
  - Section 3 presents the noise measurement methodology.
  - Section 4 presents the noise measurement results.
  - Section 5 presents the conclusions.

#### 2 UPDATED SOUND POWER LEVELS OF FIXED PLANT NOISE SOURCES

2.1.1 The updated maximum allowable SWL of fixed plant noise sources at MCV are extracted from the Proposal (Batch 5B – MCV) and are summarised in **Table 2.1**. The updated fixed plant noise sources locations at MCV are shown in **Figure No. C1103/C/SCL/ACM/M52/053**. The measured noise level of fixed plant noise sources during the commissioning test shall comply with the maximum allowable SWLs as summarised in **Table 2.1**. Appropriate corrections in tonal, impulsive or intermittent characteristics should be applied, where applicable, in accordance with the IND-TM during the commissioning test conducted at the representative NSRs.

Location	Fixed Plant ID.	Fixed Plant Source	Maximum Allowable S dB(A) <sup>(1)</sup>	
			Daytime & Evening <sup>(2)</sup>	Night-time <sup>(2)</sup>
	VS-MCV-02	Station Ventilation Louver	77	77
	VS-MCV-03	Station Ventilation Louver	76	76
	VS-MCV-06	Station Ventilation Louver	86	86
	VS-MCV-10	Station Ventilation Louver	67	67
	VS-MCV-11	Station Ventilation Louver	86	83
	VS-MCV-12	Station Ventilation Louver	76	73
	VS-MCV-15	Station Ventilation Louver	78	75
VS-MCV-19 VS-MCV-23A	Station Ventilation Louver	87	84	
	VS-MCV-23A	Tunnel Ventilation Louver	95	81
	VS-MCV-23B	Tunnel Ventilation Louver	86	71
MCV	VS-MCV-24A	Tunnel Ventilation Louver	95	81
	VS-MCV-24B	Tunnel Ventilation Louver	87	72
VS-MCV-25		Station Ventilation Louver	81	81
	VS-MCV-27A	Station Ventilation Louver	67	67
	VS-MCV-27B	Station Ventilation Louver	77	77
	VS-MCV-28	Station Ventilation Louver	70	70
	VS-MCV-29	Station Ventilation Louvre	68	68
	VCU-001	Outdoor Unit	84	84
	VCU-002	Outdoor Unit	84	84
	VCU-003	Outdoor Unit	83	83

#### Table 2.1 Summary of Updated Maximum Allowable SWLs for Fixed Plant Noise Sources at MCV

Notes:

 The maximum allowable sound power levels have due regard to the characteristics of tonality, intermittency and impulsiveness.

(2) Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours.

#### 3 MEASUREMENT METHODOLOGY

#### 3.1 Noise Measurement to obtain the SWLs of Fixed Plant Noise Sources

#### Measurement Methodology

3.1.1 Details of measurement methodology for SCL are presented in **Appendix B1**. Noise measurements to obtain the SWLs of the fixed plant noise sources followed **Appendix B1** and were conducted by Wilson Acoustics Limited and Gammon Construction Limited under supervision by Beexergy Consulting Limited.

#### Measurement Equipment

3.1.2 The sound level meters and calibrators used for noise measurements are listed in the **Table 3.1**. The instruments used for the noise measurements complied with International Electrotechnical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1). The calibration certificates of equipment are provided in **Appendix B2**.

#### Table 3.1Noise Measurement Equipment

Equipment	Model	Serial Number	
	SVANTEK SVAN 958	20890	
Sound Level Meter	SVANTEK SVAN 958	69082	
	NTi M2211	7684	
	Rion NL-52	00564841	
Calibrator	SVANTEK SV30A	10814	
	CASELLA CEL-120	4478630	

3.1.3 Before and after each series of measurements, a calibration check was carried out on the sound level meter by the calibrator. The difference between the readings made before and after each series of measurements shall be less than or equal to 1.0 dB.

#### Measurement Date and Time

3.1.4 There will be daytime/evening and night-time operation modes for fixed plant sources at MCV. Nevertheless, the noise measurements at MCV were all conducted during night-time period at the fixed plant noise sources in order to minimise influence from background noise on measurement data. Details of the noise measurement schedule are shown in **Table 3.2**.

#### Table 3.2Measurement Schedule

Location	Date			
	10 September 2018			
MCV	25 October 2018			
	2 May 2019			

## 3.2 Noise Measurement to Confirm any Tonal, Impulsive and Intermittent Characteristics from the Fixed Plant Nose Sources at Representative NSRs

Measurement Parameters

- 3.2.1 L<sub>Aeq</sub> (30min) was measured at each designated measurement location. 1/3 octave band spectrum and time history over the measurement period was also be logged for determination of tonal, impulsiveness and intermittency characteristic.
- 3.2.2 Background noise level was measured at the same measurement location in term of L<sub>Aeq</sub> (5 min) immediate before or after the noise measurement when all Project's fixed plant equipment shut down. To minimise the measurement data being influenced by background noise, noise data obtained at an instance of minimal or no traffic on the road was used to evaluate the tonal characteristic. The corrections for tonality, impulsiveness or intermittency at the representative NSRs was determined in accordance with IND-TM. In addition, any noticeable characteristics of tonality, impulsiveness and intermittency from the fixed plant noise sources was recorded during the measurement. For the measurement was under unmanned condition, the investigator conducted visit in the vicinity of the measurement location to record any noticeable characteristics of tonality, impulsiveness and intermittency from the fixed plant noise sources during the measurement.

#### Measurement Equipment

3.2.3 The sound level meters and calibrators used for noise measurements at representative NSRs are listed in **Table 3.3**. The instruments used for the noise measurements complied with International Electrotechnical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1). The calibration certificates of equipment are shown in **Appendix C1**.

Equipment	Model	Serial Number
	B&K 2250	3001291
Sound Level Meter	B&K 2250L	2681366
	B&K 2270	2644597
	B&K 2270	3007965
Acoustic Calibrator	B&K 4231	3014024

#### Table 3.3 Noise Measurement Equipment

3.2.4 Before and after each series of measurements, a calibration check was carried out on the sound level meter by the calibrator. The difference between the readings made before and after each series of measurements shall be less than or equal to 1.0 dB.

#### Measurement Locations

3.2.5 The proposed noise measurement locations were selected at the representative NSRs where have direct line of sight to the noise sources and were accessible for noise measurement. These measurement locations were agreed with EPD prior to noise measurement. The measurement locations are summarised in **Table 3.4** and shown in **Figure No. C1103/C/SCL/ACM/M52/054**. Photographs of measurement locations are shown in **Appendix C2**.

Table 3.4 Noise Measurement Locations	Table 3.4	Noise Meas	surement Loc	ations
---------------------------------------	-----------	------------	--------------	--------

Measurement Location ID	Representative NSR (NSR ID)	Туре	Measurement Height
DIH-4-2	Tsui Chuk Peace Evangelical Centre	Place of Worship	Ground level of building (1m from building façade)
DIH-20-1	Baptist Rainbow Primary School	Educational Institution	Pedestrian road adjacent to DIH-20-1 (approx. 6m above ground level in free-field condition)

Measurement Location ID	Representative NSR (NSR ID)	Туре	Measurement Height
DIH-21-1	Tin Wang Court – Wang King House	Residential	1 <sup>st</sup> floor of the Lung Wan House (approx. 4m above ground level & 1m from building facade)
DIH-23-1	Tin Ma Court – Chun On House	Residential	Footbridge adjacent to DIH-23-1 (approx. 5m above ground in free-field condition)

#### Measurement Date and Time

3.2.6 For daytime/evening and night-time operation modes, noise measurement at representative NSRs was conducted during evening and night-time periods. The measurement schedule is presented in **Table 3.5**.

#### Table 3.5Measurement Schedule

Measurement Location ID	Date
DIH-2-4, DIH-20-1, DIH-21-1 & DIH-23-1	24 & 25 May 2019

#### 4 MEASUREMENT RESULTS

#### 4.1 Noise Measurement to obtain the SWLs of Fixed Plant Noise Sources

4.1.1 The measured SWLs for daytime and evening, and night-time periods are presented in Table
4.1. Photographs showing the examples of noise measurement for fixed plant noise are shown in Appendix B3. Details of the measurement results are shown in Appendix B4.

	Measured SWL <sup>(1)</sup> , dB(A)Maximum allowableSWL <sup>(1)</sup> , dB(A)		allowable dB(A)	Complia	nce (Y/N)	
Plant Item	Day / Evening- time <sup>(2)</sup>	Night- time <sup>(2)</sup>	Day / Evening - time <sup>(2)</sup>	Night- time <sup>(2)</sup>	Day / Evening - time <sup>(2)</sup>	Night- time <sup>(2)</sup>
VS-MCV-02	74	74	77	77	Y	Y
VS-MCV-03	73	73	76	76	Y	Y
VS-MCV-06	83	83	86	86	Y	Y
VS-MCV-10	64	64	67	67	Y	Y
VS-MCV-11	83	83	86	83	Y	Y
VS-MCV-12	73	73	76	73	Y	Y
VS-MCV-15	75	75	78	75	Y	Y
VS-MCV-19	84	84	87	84	Y	Y
VS-MCV-23A (3)	92	81	95	81	Y	Y
VS-MCV-23B (3)	83	71	86	71	Y	Y
VS-MCV-24A (3)	92	81	95	81	Y	Y
VS-MCV-24B (3)	84	72	87	72	Y	Y
VS-MCV-25	78	78	81	81	Y	Y
VS-MCV-27A	64	64	67	67	Y	Y
VS-MCV-27B	74	74	77	77	Y	Y
VS-MCV-28	67	67	70	70	Y	Y
VS-MCV-29	68	68	68	68	Y	Y
VCU-001	84	84	84	84	Y	Y
VCU-002	84	84	84	84	Y	Y
VCU-003	83	83	83	83	Y	Y

 Table 4.1
 Summary of Measured SWLs for Fixed Plants

Notes:

(1) As discussed in S3.1.4, some plants would be operated in different modes, namely daytime/evening and night-time operation modes. For those plants operating in the same mode during daytime/evening and night-time periods, the measured SWL is same for both daytime/evening and night-time periods.

(2) Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours.

(3) Fixed plant will be operated in different modes under daytime/evening and night-time periods.

# 4.2 Noise Measurement to Confirm any Tonal, Impulsive and Intermittent Characteristics from the Fixed Plant Nose Sources at NSRs

4.2.1 Noise measurement to confirm any characteristics of tonality, impulsiveness and intermittency at the representative NSRs were conducted during both evening and night-time periods. Measurement results are summarised in **Table 4.2** below. No characteristics of tonality, impulsiveness and intermittency was observed at the selected NSRs. Data analysis has been carried out to determine the characteristics of tonality, impulsiveness and intermittency by assessing the logged 1/3 octave band spectra and time history profile. Result of data analysis also indicated no characteristics of tonality, impulsiveness and intermittency is found at the representative NSRs. Detailed noise measurements results are presented in **Appendix C3**.

#### Table 4.2 Noise Measurement Results at Measurement Locations

			Measurement Results				Characteristics of
Measurement Location ID	Representing NSRs	Time Period <sup>(1)&amp;(2)</sup>	Measured Noise Level L <sub>Aeq(30mins)</sub> , dB(A)	Background Noise Level L <sub>Aeq(5mins)</sub> , dB(A)	Difference between Measured Noise Level and Background Level, dB(A)	Site Observation	Inpulsiveness and Intermittency at NSRs (Y/N)
DIH-4-2	Tsui Chuk Peace Evangelical Centre	Daytime & Evening	63.1	63.1	0	Noise environment was dominated by traffic noise. Noise from SCL fixed plant was not noticeable at measurement location.	Ν
DIH-20-1	Baptist Rainbow Primary School	Daytime & Evening	55.8	58.1	-2.3	Noise environment was dominated by human activities at tennis court. Noise from SCL fixed plant was not noticeable at measurement location.	N
DIH-21-1	Tin Wang Court –	Daytime & Evening	67.3	66.0	1.3	Noise environment was dominated by traffic	Ν
	Wang King House	Wang King House Night-time	Night-time	67.2	68.9	-1.7	noise. Noise from SCL fixed plant was not
DIH-23-1	Tin Ma Court –	Daytime & Evening	63.8	63.6	0.2	measurement locations.	N
	Chun On House	Night-time	63.4	64.6	-1.2		Ν

Note:

Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours
 Fixed plant noise operation during daytime/evening and night-time periods have been included according to corresponding fixed plant noise measurement.

#### 5 CONCLUSION

5.1.1 The fixed plant noise verification was undertaken and the measurement results indicated all the fixed plant noise levels in MCV comply with the updated maximum allowable SWLs. No characteristics of tonality, impulsiveness and intermittency was observed at the measurement locations. Result of data analysis also indicated no characteristics of tonality, impulsiveness and intermittency were found at the measurement locations.

Figures





Appendix A

Proposal for Updating Maximum Allowable Sound Power Levels of Fixed Plant Sources (Batch 5B – Ma Chai Hang Ventilation Building (MCV))

# Shatin to Central Link – Tai Wai to Hung Hom Section and Stabling Sidings at Hung Hom Freight Yard

Proposal for Updating Maximum Allowable

Sound Power Levels of Fixed Plant Sources

(Batch 5A – Kai Tak Station (KAT))

(Batch 5B – Ma Chai Hang Ventilation Building (MCV))

(Batch 5C – Sung Wong Toi Station (SUW))

(June 2019)

Certified by: Fredrick Leong

Position: Independent Environmental Checker

20 June 2019 Date:

# Shatin to Central Link – Tai Wai to Hung Hom Section and Stabling Sidings at Hung Hom Freight Yard

Proposal for Updating Maximum Allowable

Sound Power Levels of Fixed Plant Sources

(Batch 5 - Kai Tak (KAT), Ma Chai Hang (MCV) and Sung

Wong Toi (SUW))

(June 2019)

Certified by:	Lisa Poon	
		1

Position: Environmental Team Leader

Date: 20 June 2019

## AECOM

### **MTR Corporation Limited**

Consultancy Agreement No. C11033

### Shatin to Central Link - Tai Wai to Hung Hom Section [SCL(TAW – HUH)] and Stabling Sidings at Hung Hom Freight Yard [SCL(HHS)]

#### Proposal for Updating Maximum Allowable Sound Power Levels of Fixed Plant Sources (Batch 5B – Ma Chai Hang Ventilation Building (MCV))

#### June 2019

	Name	Signature				
Prepared & Checked:	Isaac Chu	Usan				
Reviewed & Approved:	Josh Lam	Angeli				
Version:	A Date:	4 June 2019				
This Report is prepared for MTR Corporation Limited and is given for its sole benefit in relation to and pursuant to Consultancy Agreement No. C11033 and may not be disclosed to, quoted to or relied upon by any person other than MTR Corporation Limited without our prior written consent. No person (other than MTR Corporation Limited) into whose possession a copy of this Report comes may rely on this Report without our express written consent and MTR Corporation Limited may not rely on it for any purpose other than as described above.						

AECOM Asia Co. Ltd. 8/F, Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, NT, Hong Kong Tel: (852) 3922 9000 Fax: (852) 3922 9797 www.aecom.com

#### Table of Content

1	INTR	ODUCTION	1
	1.1 1 2	Background Purpose of This Proposal	1 1
2	NOIS	E CRITERIA AND NOISE SENSITIVE RECEIVERS	2
	2.1 2.2 2.3	Environmental Legislation, Standard and Guidelines Assessment Criteria and Representative Noise Sensitive Receivers Review of Area Sensitivity Rating	2 2 3
3	UPD/ LEVE	ATE OF FIXED PLANT SOURCES AND PREDICTION OF FIXED PLANT NOISE	4
	3.1 3.2	Update of Fixed Plant Sources Prediction of Fixed Plant Noise	4 4
4	CON	CLUSION	6

#### List of Tables

MTR Corporation Limited

Table 2.1	ANLs for Assessment of Noise from Fixed Sources
Table 2.2	Summary of noise criteria at representative NSRs for fixed noise sources (Reference
	from Table 8.8 of the approved EIA Report)
Table 3.1	Summary of Updated Maximum Allowable SWLs for Fixed Plant Sources
Table 3.2	Predicted Fixed Plant Noise Levels at Representative NSRs

#### List of Figure

C1103/C/SCL/ACM/M52/053 Locations of NSRs and Fixed Plant Noise Sources (Ma Chai Hang Ventilation Building)

#### **List of Appendices**

Annex A Detail Calculation of Fixed Plant Noise Assessment

#### 1 INTRODUCTION

#### 1.1 Background

- 1.1.1 The Shatin to Central Link (SCL) is a 17km extension of the existing Ma On Shan Line (MOL) and East Rail Line (EAL) comprising (i) The East-West Corridor which extends the MOL from Tai Wai to Hung Hom via East Kowloon to connect with the West Rail Line (WRL) at Hung Hom Station (HUH) and Stabling Sidings at Hung Hom Freight Yard (HHS); and (ii) The North-South Corridor which is an extension of the EAL at Hung Hom across the harbour to Admiralty Station (ADM).
- 1.1.2 Environmental Impact Assessment (EIA) Reports for SCL Tai Wai to Hung Hom Section [SCL (TAW-HUH)] (Register No. AEIAR-167/2012) and SCL Stabling Sidings at Hung Hom Freight Yard [SCL (HHS)] (Register No. AEIAR-164/2012) (hereinafter referred to as "the EIA Reports") were approved on 17 February 2012 under the Environmental Impact Assessment Ordinance (EIAO). Following the approval of the EIA Reports, the Environmental Permit (EP) (EP No: EP-438/2012), covering the construction of both SCL (TAW-HUH) and SCL (HHS) (hereinafter referred to as "the Project"), was granted on 22 March 2012. Variations of Environmental Permit (VEP) were subsequently applied for EP-438/2012 and the latest Environmental Permit (EP No: EP-438/2012/K) was issued by Director of Environmental Protection (DEP) on 4 October 2016.
- 1.1.3 Pursuant to EP Condition 2.32, at least one month before commencement of operation of the Project, the Permit Holder, MTR Corporation Ltd (MTR), shall carry out fixed plant noise audit and deposit with the Director four hardcopies and one electronic copy of an audit report showing the design of the fixed plant noise sources associated with the Project complies with the maximum sound power levels determined in the approved SCL(TAW-HUH) EIA Report (Register No. AEIAR-167/2012) and SCL(HHS) EIA Report (Register No. AEIAR-164/2012) and all relevant documents in the Register, or otherwise approved by the Director in compliance with the requirements in Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO) having due regard to the characteristics of tonality, impulsiveness and intermittency.
- 1.1.4 AECOM Asia Co. Ltd was commissioned by the MTR to prepare the fixed plant noise audit report to check the compliance of the maximum sound power levels (SWLs) and to undertake noise measurement at the identified Noise Sensitive Receivers (NSRs) for investigation of any characteristics of tonality, impulsiveness and intermittency from the fixed plant noise sources associated with the Project.
- 1.1.5 Based on the latest design information, the maximum allowable SWLs of fixed plant items has been updated to reflect the latest design of the Project, and therefore Proposal(s) will be prepared to present the updated maximum allowable sound power levels (SWLs) of the fixed plant items at different stations of the Project.

#### 1.2 Purpose of This Proposal

1.2.1 As discussed in **Section 1.1.5**, the maximum allowable SWLs of fixed plant items has been updated to reflect the latest design of the Project. This Proposal (Batch 5B – Ma Chai Hang Ventilation Building (MCV)) presents the updated maximum allowable SWLs of the fixed plant noise sources at MCV.

#### 2 NOISE CRITERIA AND NOISE SENSITIVE RECEIVERS

#### 2.1 **Environmental Legislation, Standard and Guidelines**

- 2.1.1 The Noise Control Ordinance, Cap. 400 (NCO) and Environmental Impact Assessment Ordinance, Cap. 499 (EIAO) provide the statutory framework for noise control. Operational noise from fixed noise sources is controlled by Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites (IND-TM) under NCO. To plan for a better environment, the Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO) under EIAO has specified the following requirements:
  - 5 dB below the appropriate ANLs in the IND-TM; or
  - the prevailing background noise levels (For quiet areas with level 5dB or more below the ANL).
- The Acceptable Noise Levels (ANLs) for different Area Sensitivity Ratings (ASRs) during 2.1.2 different periods are summarized in the Table 2.1.

Table 2.1	ANLs for	Assessment o	f Noise f	rom Fixed	Sources
-----------	----------	--------------	-----------	-----------	---------

Time Beried	ANL, dB(A)				
	ASR "A"	ASR "B"	ASR "C"		
Day (0700 to 1900 hours)	60	65	70		
Evening (1900 to 2300 hours)	60	65	70		
Night (2300 to 0700 hours)	50	55	60		

#### 2.2 Assessment Criteria and Representative Noise Sensitive Receivers

2.2.1 Table 8.8 of the approved SCL (TAW-HUH) EIA Report presents the identified Noise Sensitive Receivers (NSRs) and the adopted noise assessment criteria for fixed plant noise assessment. The assessment criteria at the NSRs selected for assessing the fixed plant noise impact from MCV are summarised in Table 2.2.

#### Table 2.2 Summary of noise criteria at representative NSRs for fixed noise sources (Reference from Table 8.8 of the approved EIA Report)

Area (NSR No.)	Time Period <sup>(1)</sup>	Prevailing Background Noise Levels, dB(A) <sup>(2)</sup>	ASR	ANL-5, dB(A) <sup>(3)</sup>	Criteria, dB(A) <sup>(4)</sup>
Ma Chai Hang Ventilatior	n Building				
Carbo Anglo-Chinese	Day & evening	66	В	60	60
Kindergarten (DIH-4-2)	Night	58	В	50	50
Baptist Rainbow Primary	Day & evening	66	В	60	60
School (DIH-20-1)	Night	58	В	50	50
Wang King House	Day & evening	69	В	60	60
(DIH-21-1)	Night	56	В	50	50
Chun On House	Day & evening	69	В	60	60
(DIH-23-1)	Night	56	В	50	50

Notes:

(1) Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours.

(2)

Prevailing background noise levels are extracted from Table 8.8 of approved EIA Report. A 5 dB(A) has been deducted from ANL as specified in requirement of TM-EIAO. (3)

- (4) The minimum of prevailing background noise level & ANL-5 is adopted.
- (5) Carbo Anglo-Chinese Kindergarten (DIH-4-2) was no longer in operation and the building is currently occupied by Tsui Chuk Peace Evangelical Centre for use as place of worship.

#### 2.3 Review of Area Sensitivity Rating

- 2.3.1 Area Sensitive Ratings (ASR) as defined in the approved EIA Reports were determined by the existence of any influencing factors (IFs) (e.g. major road, industrial area) according to IND-TM at the time of preparation of the EIA Reports. During the preparation of this Proposal, it is revealed that there was no major change on the land use in the vicinity of representative NSRs, and thus only the existence of any major road (i.e. annual average daily traffic flow in excess of 30,000) has been reviewed.
- 2.3.2 Based on best available information (i.e. The Annual Traffic Census 2017) during the preparation of this Proposal, there is no major road located in the vicinity of the identified NSRs and thus the ASR defined in **Table 2.2** remains unchanged.

# 3 UPDATE OF FIXED PLANT SOURCES AND PREDICTION OF FIXED PLANT NOISE LEVELS

#### 3.1 Update of Fixed Plant Sources

3.1.1 The locations of updated fixed plant noise sources at MCV are shown in **Figure No. C1103/C/SCL/ACM/M52/053**. Based on latest design information, the maximum allowable SWLs for ventilation louvers and outdoor units are updated and summarized in **Table 3.1**.

Location	Fixed Plant ID.	Fixed Plant Source	Maximum A dB	llowable SWL, (A) <sup>(1)</sup>
			Daytime & Evening <sup>(2)</sup>	Night-time <sup>(2)</sup>
	VS-MCV-02	Station Ventilation Louver	77	77
	VS-MCV-03	Station Ventilation Louver	76	76
	VS-MCV-06	Station Ventilation Louver	86	86
	VS-MCV-10	Station Ventilation Louver	67	67
	VS-MCV-11	Station Ventilation Louver	86	83
	VS-MCV-12	Station Ventilation Louver	76	73
	VS-MCV-15	Station Ventilation Louver	78	75
	VS-MCV-19	Station Ventilation Louver	87	84
	VS-MCV-23A	Tunnel Ventilation Louver	95	81
MOV	VS-MCV-23B	Tunnel Ventilation Louver	86	71
	VS-MCV-24A	Tunnel Ventilation Louver	95	81
	VS-MCV-24B	Tunnel Ventilation Louver	87	72
	VS-MCV-25	Station Ventilation Louver	81	81
	VS-MCV-27A	Station Ventilation Louver	67	67
	VS-MCV-27B	Station Ventilation Louver	77	77
	VS-MCV-28	Station Ventilation Louver	70	70
	VS-MCV-29	Station Ventilation Louver	68	68
	VCU-001	Outdoor Unit	84	84
	VCU-002	Outdoor Unit	84	84
	VCU-003	Outdoor Unit	83	83

Table 3.1	Summary of L	Jodated Maximum	Allowable SWLs for	<b>Fixed Plant Sources</b>
1 abie 5.1	Summary or C		Allowable SwLS IOI	I INCU FIAIIL SOULC

Notes:

- (1) The maximum allowable sound power levels have due regard to the characteristics of tonality, intermittency and impulsiveness.
- (2) Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours.

#### 3.2 Prediction of Fixed Plant Noise

3.2.1 With the updated maximum allowable SWLs presented in **Table 3.1**, the predicted noise levels at the representative NSRs comply with both daytime/evening and night-time criteria as presented in **Table 2.2**. The predicted noise levels are summarised in **Table 3.2** with details of calculation shown in **Annex A**.

	Decorintion	Criteria, dB(A)		Predicted Sound Pressure Level, L <sub>eq,30mins</sub> , dB(A) <sup>(1)</sup>	
NSK ID	Description	Daytime & Evening <sup>(2)</sup>	Night-time <sup>(2)</sup>	Daytime & Evening <sup>(2)</sup>	Night-time <sup>(2)</sup>
DIH-4-2	Tsui Chuk Peace Evangelical Centre <sup>(3)</sup>	60	N/A <sup>(4)</sup>	51	N/A <sup>(4)</sup>
DIH-20-1	Baptist Rainbow Primary School	60	N/A <sup>(4)</sup>	47	N/A <sup>(4)</sup>
DIH-21-1	Wang King House	60	50	52	46
DIH-23-1	Chun On House	60	50	60	50

#### Predicted Fixed Plant Noise Levels at Representative NSRs Table 3.2

Notes:

(1) The predicted fixed plant noise levels have due regard to the characteristics of tonality, intermittency and impulsiveness.

(2)

Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours. Carbo Anglo-Chinese Kindergarten (DIH-4-2) as a NSR in the approved SCL (TAW-HUH) EIA Report was no (3) longer in operation and the building is currently occupied by Tsui Chuk Peace Evangelical Centre for use as place of worship.

There is no sensitive use during night-time period at the place of worship (i.e. DIH-4-2) and educational institution (4) (i.e. DIH-20-1).
## MTR Corporation Limited

## 4 CONCLUSION

- 4.1.1 The maximum allowable SWLs of fixed plant noise sources at MCV has been updated based on the latest design information. The predicted noise levels at representative NSRs comply with the noise criteria based on the updated maximum allowable SWLs of fixed plant noise sources.
- 4.1.2 The measured SWLs at each fixed plant noise source during the fixed plant noise audit shall comply with the maximum allowable SWLs as stated in the **Table 3.1**. Appropriate corrections in tonal, impulsive or intermittent characteristics should be applied, where applicable, in accordance with the IND-TM during the commissioning test.

Figure



Annex A

**Detail Calculation of Fixed Plant Noise Assessment** 

## Annex A Detail Calculation of Fixed Plant Noise Assessment

#### Fixed Plant Noise Calculation - MCV NSRs (Daytime Period)

Noise Assessment Points	Description	Plant item	Direction Facing	Horizontial Distance , m	SWL, dB(A)	Correction for line of sight <sup>[1]</sup> , dB(A)	Distance Correction of Point Source, dB(A)	Façade Correction, dB(A)	Predicted SPL, dB(A)	Total SPL, dB(A)	Daytime Noise Criteria, dB(A)
Ma Chai Hang Ven DIH-4-2	tilation Building										
DIH-4-2	Tsui Chuk Peace	VS-MCV-02	North	113	77	0	-49	3	31		
	Evangelical Centre	VS-MCV-03	North	113	76	0	-49	3	30		
		VS-MCV-06	East	119	86	0	-49	3	40		
		VS-MCV-10	East	127	67	0	-50	3	20		
		VS-MCV-11	East	133	86	-5	-50	3	34		
		VS-MCV-12	South	146	76	-10	-51	3	18		
		VS-MCV-19	East	140	70 87	-10	-51	3	20		
		VS-MCV-23A	North	123	95	0	-50	3	48		
		VS-MCV-23B	Roof	120	86	0	-50	3	39		
		VS-MCV-24A	West	140	95	-10	-51	3	37		
		VS-MCV-24B	Roof	142	87	0	-51	3	39		
		VS-MCV-25	East	117	81	0	-49	3	35		
		VS-MCV-27A	East	126	67	0	-50	3	20		
		VS-MCV-27B	Edsi	123	70	0	-50	3	30		
		VS-MCV-29	South	143	68	-10	-51	3	10		
		VCU-001	Roof	121	84	0	-50	3	37		
		VCU-002	Roof	122	84	0	-50	3	37		
		VCU-003	Roof	123	83	0	-50	3	36	51	60
DIH-20-1	Destist Daist D :		Nerth	4/5	77		51		<u></u>	1	
DIH-20-1	Baptist Rainbow Primary	VS-MCV-02	North	145	77	0	-51	3	29		
	301001	VS-MCV-06	East	143	86	0	-51	3	20		
		VS-MCV-10	East	143	67	0	-51	3	19	1	
		VS-MCV-11	East	145	86	Ő	-51	3	38		
		VS-MCV-12	South	161	76	-5	-52	3	22		
		VS-MCV-15	South	169	78	-10	-53	3	18		
		VS-MCV-19	East	148	87	0	-51	3	39		
		VS-MCV-23A	North	161	95	-10	-52	3	36		
		VS-MCV-23B	Root	157	86	0	-52	3	37		
		VS-MCV-24A	Roof	172	95	-10	-53	3	35		
		VS-MCV-25	East	151	81	0	-52	3	32		
		VS-MCV-27A	East	157	67	Ő	-52	3	18		
		VS-MCV-27B	East	155	77	0	-52	3	28		
		VS-MCV-28	East	168	70	0	-53	3	20		
		VS-MCV-29	South	157	68	-5	-52	3	14		
		VCU-001	Roof	148	84	0	-51	3	36		
		VCU-002	Roof	148	84	0	-51	3	35	47	60
DIH-23-1	-			110	00						
DIH-23-1	Chun On House	VS-MCV-02	North	130	77	-10	-50	3	20		
		VS-MCV-03	North	130	76	-10	-50	3	19		
		VS-MCV-06	East	122	86	-5	-50	3	34		
		VS-IVICV-10	East	114	6/	-5	-49	3	16		
		VS-MCV-12	South	107	80 76	0	-49	3	40		
		VS-MCV-15	South	97	78	0	-48	3	33		
		VS-MCV-19	East	104	87	0	-48	3	42		
		VS-MCV-23A	North	125	95	-10	-50	3	38		
		VS-MCV-23B	Roof	127	86	0	-50	3	39		
		VS-MCV-24A	West	109	95	0	-49	3	49		
		VS-MCV-24B	Root	106	87	0	-49	3	41		
		VS-MCV-274	Edol	119	67	0	-30	3	21		
		VS-MCV-27B	East	121	77	0	-50	3	30		
		VS-MCV-28	East	103	70	Ŏ	-48	3	25	]	
		VS-MCV-29	South	97	68	0	-48	3	23		
		VCU-001	Roof	121	84	0	-50	3	37		
		VCU-002	Roof	120	84	0	-50	3	37		
DIH-21-1		VCU-003	ROOI	119	83	0	-50	3	36	52	60
DIH-21-1	Wang King House	VS-MCV-02	North	71	77	-10	-45	3	25		
200200	trang rang riodoo	VS-MCV-03	North	72	76	-10	-45	3	24		
		VS-MCV-06	East	71	86	-10	-45	3	34		
		VS-MCV-10	East	70	67	-10	-45	3	15		
		VS-MCV-11	East	69	86	-10	-45	3	34		
		VS-MCV-12	South	54	76	0	-43	3	36		
		VS-MCV-15	Fast	44	/8 97	_10	-41	3	40	1	
		VS-MCV-23A	North	56	07	-10	-44	3	55		
I	1	VS-MCV-23B	Roof	60	86	0	-44	3	45	1	
I	1	VS-MCV-24A	West	41	95	ő	-40	3	58	1	
		VS-MCV-24B	Roof	42	87	0	-40	3	50	]	
		VS-MCV-25	East	65	81	-10	-44	3	30		
		VS-MCV-27A	East	57	67	-10	-43	3	17		
I	1	VS-MCV-27B	East	60	77	-10	-44	3	26		
I	1	VS-MCV-28	East	45	70	-10	-41	3	22		
I	1	VCI1-001	Boof	58	80	0	-43	3	28	1	
		VCU-002	Roof	65	84	0	-44 -44	3	43		
		VCU-003	Roof	64	83	ő	-44	3	42	60	60

Remark: [1] A negative correction of 10 dB(A) has been adopted to the direction facing of the ventilation shaft totally screened by buildings and negative correction of 5 dB(A) for NSR do not have direct line of sight to the ventilation shaft.

## Annex A Detail Calculation of Fixed Plant Noise Assessment

#### Fixed Plant Noise Calculation - MCV NSRs (Night-time Period)

Noise Assessment Points	Description	Plant item	Direction Facing	Horizontial Distance , m	SWL, dB(A)	Correction for line of sight <sup>[1]</sup> , dB(A)	Distance Correction of Point Source, dB(A)	Façade Correction, dB(A)	Predicted SPL, dB(A)	Total SPL, dB(A)	Night-time Noise Criteria, dB(A)
Ma Chai Hang Ven	tilation Building										
DIH-23-1	Chun On House	VS-MCV-02	North	130	77	-10	-50	3	20	[	1
0111201	onun on nouse	VS-MCV-02	North	130	76	-10	-50	3	19		
		VS-MCV-06	East	122	86	-5	-50	3	34		
		VS-MCV-10	East	114	67	-5	-49	3	16		
		VS-MCV-11	East	107	83	0	-49	3	37		
		VS-MCV-12	South	96	73	0	-48	3	28		
		VS-MCV-15	South	97	75	0	-48	3	30		
		VS-MCV-19	East	104	84	0	-48	3	39		
		VS-MCV-23A	North	125	81	-10	-50	3	24		
		VS-MCV-23B	Roof	127	71	0	-50	3	24		
		VS-MCV-24A	West	109	81	0	-49	3	35		
		VS-MCV-24B	Roof	106	72	0	-49	3	26		
		VS-MCV-25	East	127	81	0	-50	3	34		
		VS-MCV-27A	East	118	67	0	-49	3	21		
		VS-MCV-27B	East	121	77	0	-50	3	30		
		VS-MCV-28	East	103	70	0	-48	3	25		
		VS-MCV-29	South	97	68	0	-48	3	23		
		VCU-001	Roof	121	84	0	-50	3	37		
		VCU-002	Roof	120	84	0	-50	3	37		
		VCU-003	Roof	119	83	0	-50	3	36	46	50
DIH-21-1								-			
DIH-21-1	Wang King House	VS-MCV-02	North	71	77	-10	-45	3	25		
		VS-MCV-03	North	72	76	-10	-45	3	24		
		VS-MCV-06	East	71	86	-10	-45	3	34		
		VS-MCV-10	East	70	67	-10	-45	3	15		
		VS-MCV-11	East	69	83	-10	-45	3	31		
		VS-MCV-12	South	54	73	0	-43	3	33		
		VS-MCV-15	South	44	75	0	-41	3	37		
		VS-MCV-19	East	66	84	-10	-44	3	33		
		VS-MCV-23A	North	56	81	0	-43	3	41		
		VS-MCV-23B	Root	60	71	0	-44	3	30		
		VS-MCV-24A	West	41	81	0	-40	3	44		
		VS-MCV-24B	Root	42	72	0	-40	3	35		
		VS-MCV-25	East	65	81	-10	-44	3	30		
		VS-MCV-27A	East	57	67	-10	-43	3	17		
		VS-MCV-27B	East	60	- 17	-10	-44	3	26		
		VS-MCV-28	East	45	70	-10	-41	3	22		
		VS-MCV-29	South	58	68	0	-43	3	28		
		VCU-001	Roof	66	84	0	-44	3	43		
		VCU-002	Root	65	84	0	-44	3	43		
		VCU-003	Roof	64	83	0	-44	3	42	50	50

Remark: [1] A negative correction of 10 dB(A) has been adopted to the direction facing of the ventilation shaft totally screened by buildings and negative correction of 5 dB(A) for NSR do not have direct line of sight to the ventilation shaft.

Appendix B

Noise Measurement to obtain the SWLs of Fixed Plant Noise Sources

Appendix B1

Measurement Methodology

# Method 1: Far-Field Testing Method for Louver



a: Short side of the louver

b: Long side of the louver

D: Measurement distance (separation between louver and microphone), where D must be greater than (2b) and rounded up to interger.

# Louver opening

Proposed measurement point (microphone pointing perpendicular to the center of the louvre)

For method 1,

- "D" must be greater than 2b and round up to integer.
- The microphone must point to the center of the louver.
- At least 3 sets of LAeq, 1 min should be obtained.
- Background noise measurement should be obtained for determination of background correction factor.
- Any reason causing this method cannot be performed, noise measurement should then be conducted at near field in accordance with Method 2.
- If results of measurement reveal that difference in noise levels measured at far field with and without operation of fixed plant item is less than 3.0dB(A), noise measurement should then be conducted at near field in accordance with Method 2.
- Noise measurement to confirm any tonal, impulsive and intermittent characheristics at representative NSRs.

 $SWL = Mean \ measured \ L_{Aeq, \ 1 \ min} + 20log(D) + 8 + background \ noise \ correction \ factor$ 

# Method 2: Near-Field Testing Method for Louver



# D: Measurement distance

- Louver opening
- Measurement box
- Proposed measurement point (microphone pointing perpendicular to the louvre)

For method 2 (developed based on the principle of ISO3746:2010),

- First step is to determine a hypothetical measurement surfaces with at least 1m separation (D, measured from the centre of the louvre or its nearest edges as appropriate) from the louver.
- For louvre with largest dimension ≤3D, at least one measurement at the centre of the measurement surface parallel to the louvre should be conducted.
- Minimum 10 seconds of measurement interval should be obtained at each measurement point.
- Extra localized microphone positions on the measurement surfaces in the region of high radiation should be considered. In this case follow the procedures of ISO3744.
- For louver with largest dimension > 3D, measurement surface and measurement position should follow ISO3746.
- Background noise level should be taken at each measurement point for determining the background correction (K1A).
- If the difference between the background noise and the measured noise level is less than 3.0dB, K1A should be capped to 3.0dB.
- If necessary to obtain less conservative results, D should be reduced according to ISO3746 to obtain higher measured noise levels.
- Noise measurement to confirm any tonal, impulsive and intermittent characheristics at representative NSRs.

 $SWL = Mean \ LAeq \ over \ all \ measurement \ points + 10 \ log \ (total surface \ area \ over \ the \ measurement \ box) + K1A + K2A$ 

K1A refers to background noise correction factor K2A refers to environmental correction for sound absorption and reflection

# Method 3 – Far Field Testing Method for Plant Item



"L" is the longest side of the plant item

"D, Center" is the separation between center of the plant item and microphone

"D, Surface" is the separation between surface of the plant item and microphone

- "D, Surface" must be greater than twice of L (2L) and roundup to integer (e.g 6m, 7m, 8m...).
- The microphone must be pointing to the center of the plant.
- Measurement should be carried out at the direction toward all NSRs.
- At least 3 sets of  $L_{Aeq, 1}$  min should be obtained at each the measurement point.
- Background noise measurement should be obtained for determination of background correction factor.
- Any reason causing this method cannot be performed, noise measurement should then be conducted at near field in accordance with latest edition of ISO3746 (Method 4).
- If results of measurement reveal that difference in noise levels measured at far field with and without operation of fixed plant item is less than 3.0 dB(A), noise measurement should then be conducted at near field in accordance with latest edition of ISO3746 (Method 4).
- Noise measurement to confirm any tonal, impulsive and intermittent characheristics at representative NSRs.

 $SWL = Mean measured L_{Aeq, 1 min} + 20 log (D,Center) + 8 + background noise correction factor$ 

# Method 4 – Near Field Testing Method for Plant Item

P2 P2 P1 20 2 11+220 A

Kev

For Method 4 (based on ISO3746:2010),

- Please refer to latest edition of ISO3746 for measurement requirement.
- The locations of measurement points are depended on the size of the plant, which cannot be easily generalized (see figure for example)
- Background noise measurement should be obtained for determination of background correction factor (K1A). According to ISO3746, if the source under test radiates noise predominantly in one direction or if the noise from a large source is emitted only from a small portion of the source, the usage of extra localized microphone positions on the measurement surface in the region of high radiation should be considered. In this case, follow the procedures specified in ISO3744.
- Minimum 10 seconds of measurement interval should be obtained at each measurement point.
- Detail calculation of the SWL should refer to the latest edition of ISO3746.
- Noise measurement to confirm any tonal, impulsive and intermittent characheristics at representative NSRs.

 $SWL = Mean \ L_{Aeq} \ over \ all \ measurement \ points + 10 \ log \ (total surface \ area \ over \ the \ measurement \ box) + K1A + K2A$ 

K1A refers to background noise correction factor K2A refers to environmental correction for sound absorption and reflection Shatin to Central Link Proposal of Measurement methodology for Fixed Plant Noise Measurement

# Method 5 – Near Field Testing Method for Plant Room or other source



For Method 5 (developed based on the principle of ISO3746 -2010),

- First step is to determine a measurement box with at least 1m separation (measured from the centre of the louvre or its nearest edges as appropriate) from the louver.
- Secondly, is to determine the location of measurement points on the measurement surface of the hypothetical box.
- Extra localized microphone positions on the measurement surface in the region of high radiation should be considered. In this case follow the procedures of ISO 3744.
- Background noise level should be taken for determination of background correction (K1A.
- Minimum 10 seconds of measurement interval should be obtained at each measurement point.
- If the difference between the BGL and the measured noise level (MNL) is less than 3.0dB, K1A should be capped to 3.0dB.
- If necessary to obtain less conservative results. D should be reduced according to ISO3746 to obtain higher MNLs.
- Noise measurement to confirm any tonal, impulsive and intermittent characheristics at representative NSRs.

 $SWL = Mean \ L_{Aeq} \ over \ all \ measurement \ points \ + \ 10 \ log \ (total \ surface area \ over \ the \ measurement \ box) \ + \ K1A \ + \ K2A$ 

K1A refers to background noise correction factor K2A refers to environmental correction for sound absorption and reflection Appendix B2

Calibration Certificates – Noise Measurement for Fixed Plant Noise

## Appendix B2 Calibration Certificates – Noise Measurement for Fixed Plant Noise

Cert B1: Calibration Certificate of Sound Level Meter SVANTEK 958 (SN: 20890)



# CALIBRATION CERTIFICATE

Certificate Informati	on	A CONTRACTOR OF A CONTRACT OF	STATISTICS IN THE REAL PROPERTY.	and the second designed in
Date of Issue	23-Jun-2017		Certificate Number	MLCN1711378
Customer Informatio	201	and the second second		Children's Long
Company Name Address	Wilson Account Unit 601, Bloc Yuen Shun Ch Shatin, N. T., Hong Kong	stics Limited k A, Shatin Industrial ( cuil,	Centre,	
Equipment-under-To	est (EUT)		All State of Case of State	Statute 15
Description Manufacturer Model Number Serial Number Equipment Number	Sound & Vibn Svantek SVAN 958 20890	ation Analyser		
Calibration Particul	ar	Contraction of the later.	THE REPORT OF LEVEL	STREET, STREET
Date of Calibration Calibration Equipment	23-Jun-2017 4231(MLTE0	)/PA160059/20-M	ny-2018	
Calibration Procedure	MLCG00, ML	CG15		
Calibration Conditions	Laboratory EUT	Temperature Relative Humidity Stabilizing Time Warm-up Time Power Supply	23 °C ± 5 °C 55% ± 25% Over 3 hours 10 minutes Internal battery	
Calibration Results	Calibration da	ta were detailed in the	continuation pages.	
Approved By & Date		10-010-000 //		22 1- 201
Constanting of the local division of the loc		transfer of the local division of the	N.O. L0	23-301-201
Calibration equipment use:     Calibration equipment use:     The results on this Calibrating     mot include allowance for to     evertoading, misiandling,     Masclab Calibration Centin     The copy of this Certificat     price written approval of M	d for this calibratio ion Certificate only the EUT long term missus, and the car e Limited shall not e is could by Masi faxLab Calibration	n are traceable to national / relate to the values measu frift, variation with environ natity of any other laborator he liable for any loss or dat als Calibration Centre Lim Centre Limited.	international standards, red at the time of the calibration and th mental changes, vibration and shock di y to repeat the measurement, nage resulting from the use of the EUT ned. No part of this Certificate may be	e uncertainties quoted wil aring transportation, reproduced without the

Page 1 of 2



貫保校正中心有限公司 MakLah Carbration Centro Limited 香港新発芸薄単品向16.18 愛保賀工業大度9億B2室 Unit B2, 94F, Boldwin Industrial Bidg., 16-18 Wah Sing Street, Kwai Chung, N.T., Hong Kong, Tet: (852) 2116 1389 Fax: (852) 2264 8488 Ennet inke@maxtab.com.hv



Certificate NoMLCN171137S

Calibration	Data								
Channel / Mode	Filter / Detector	Range		EUT Reading		Standard Reading		EUT Error	Calibration Uncertainty
CH4 / Sound	A / FAST	105	dB	94.0	dB	94.0	dB	0.0 dB	0.2 dB
	(1 kHz Input)	130	dB	94.1	dB	94.0	dB	0.1 dB	0.2 dB
				114.1	dB	114.0	dB	0.1 dB	0.2 dB
	C / FAST	105	dB	94.0	dB	94.0	dB	0.0 dB	0.2 dB
	(1 kHz Input)	130	dB	94.1	dB	94.0	dB	0.1 dB	0.2 dB
				114.1	dB	114.0	dB	0.1 dB	0.2 dB
	LIN / FAST	105	dB	94.0	dB	94.0	dB	0.0 dB	0.2 dB
	(1 kHz Input)	130	dB	94.1	dB	94.0	dB	0.1 dB	0.2 dB
				114.1	dB	114.0	dB	0.1 dB	0.2 dB
	A / SLOW	105	dB	94.0	dB	94.0	dB	0.0 dB	0.2 dB
	(1 kHz Input)	130	dB	114.1	dB	114.0	dB	0.1 dB	0.2 dB
	C / SLOW	105	dB	94.0	dB	94.0	dB	0.0 dB	0.2 dB
	(1 kHz Input)	130	dB	114.1	dB	114.0	dB	0.1 dB	0.2 dB
	LIN / SLOW	105	dB	94.0	dB	94.0	dB	0.0 dB	0.2 dB
	(1 kHz Input)	130	dB	114.1	dB	114.0	dB	0.1 dB	0.2 dB
	A / IMPULSE	105	dB	94.0	dB	94.0	dB	0.0 dB	0.2 dB
	(1 kHz Input)	130	dB	114.1	dB	114.0	dB	0.1 dB	0.2 dB
	C / IMPULSE	105	dB	94.0	dB	94.0	dB	0.0 dB	0.2 dB
	(1 kHz Input)	130	dB	114.1	dB	114.0	dB	0.1 dB	0.2 dB
	LIN / IMPULSE	105	dB	94.0	dB	94.0	dB	0.0 dB	0.2 dB
	(1 kHz Input)	130	dB	114.1	dB	114.0	dB	0.1 dB	0.2 dB

- END -

Calibrated By : Date :

Patrick 23-Jun-2017 Checked By : K.O. Lo 23-Jun-2017 Date : Page 2 of 2

萬儀校正中心有限公司 MaxLab Calibration Centre Limited 香港新界葵滴華星街 16-18 號保盈工業大廈 9 樓 B2 室 Unit B2, 9/F., Boldwin Industrial Bldg., 16-18 Wah Sing Street, Kwai Chung, N.T., Hong Kong Tel: (852) 2116 1380 Fax: (852) 2264 6480 Email: info@maxlab.com.hk

## Cert B2: Calibration Certificate of Sound Level Meter SVANTEK 958A (SN: 69082)



ISO9001 certified

## FACTORY CALIBRATION DATA OF THE SVAN 958 No. 69082

#### SOUND LEVEL METER

1. CALIBRATION (electrical)

LEVEL METER; Filter: LIN; Input signal =114.0dB, fsm=1kHz

	Range 1	05dB	Range	BodB Error [dB]		
	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]		
Channel 1	113.98	-0.02	114.03	0.03		
Channel 2	113.98	-0.02	114.02	0.02		
Channel 3	113.98	-0.02	114.02	0.02		
Channel 4	113.98	-0.02	114.02	0.02		

#### 2. CALIBRATION\* (acoustical)

LEVEL METER; Range: 130 dB; Reference frequency: 1000Hz;

Filter	LIN		A		C		
	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	
Channel 1	113.8	-0.2	113.8	-0.2	113.8	-0.2	
Channel 2	113.8	-0.2	113.8	-0.2	113.8	-0.2	
Channel 3	113.8	-0.2	113.8	-0.2	113.8	-0.2	
Channel 4	113.8	-0.2	113.8	-0.2	113.8	-0.2	

Calibration measured with the microphone SVANTEK type SV 22 No. 4010479. Calibration factor: 0.6dB

#### 3. LINEARITY TEST' (electrical)

LEVEL METER; Range: 105 dB; Filter: A; f sin= 1000 Hz

	Input [dB]	24.0	30.0	40.0	60.0	80.0	100.0	114.0
Channel 1	Error.[dB]	0.19	0.10	0.05	0.00	0.00	0.00	0.00
Channel 2	Error [dB]	0.21	0.11	0.04	-0.01	0.00	0.00	0.00
Channel 3	Error [dB]	0.14	0.08	0.03	0.00	0.00	0.01	0.01
Channel 4	Error [dB]	0.11	0.07	0.03	0.00	0.00	0.00	0.01

LEVEL METER; Range: 130 dB; Filter: A; f sin= 1000 Hz

	Input [dB]	45.0	50.0	60.0	80.0	100.0	120.0	135.0
Channel 1	Error [dB]	0.11	0.15	0.06	0.00	0.00	0.00	0.01
Channel 2	Error [dB]	0.13	0.14	0.05	0.00	0.00	-0.01	0.01
Channel 3	Error [dB]	0.07	0.07	0.04	-0.00	0.01	-0.00	0.02
Channel 4	Error [dB]	0.08	0.07	0.03	-0.00	-0.00	-0.01	0.01

1/3 OCTAVE (1kHz); Range: 130 dB; Filter: A; f sin= 1000 Hz

	Input [dB]	35.0	40.0	60.0	80.0	100.0	120.0	135.0
Channel 1	Error [dB]	0.44	0.11	0.07	0.00	0.00	-0.01	0.01
Channel 2	Error [dB]	0.42	0.12	0.07	-0.00	-0.00	-0.00	0.01
Channel 3	Error [dB]	0.34	0.11	0.04	-0.00	-0.00	-0.01	0.01
Channel 4	Error [dB]	0.35	0.12	0.04	0.00	0.01	0.00	0.01

\*\*\* SVAN958 No. 69082 page 1 \*\*\*

## 4. TONEBURST RESPONSE' (electrical)

LEVEL METER; Characteristic: A; f sin= 4000 Hz; Burst duration: 2s;

Range: 105dB; Equivalent input steady level = 112dB

Result	Detector	Ch.	Duration [ms]	1000	500	200	100	50	20	10	5	2	1	0.5	0.25
			Indication [dB]	112.0	111.9	111.0	109.4	107.2	103.7	100.8	97.9	94.0	91.0	87.9	84.9
		4	Error [dB]	-0.0	0.0	0.0	0.0	-0.0	-0.0	-0.1	0.0	-0.0	-0.0	-0.1	-0.1
		2	Indication [dB]	112.0	111.9	111.0	109.4	107.2	103.7	100.8	97.9	94.0	91.0	87.9	84.9
	Feet	2	Error [dB]	-0.0	0.0	0.0	0.0	-0.0	-0.0	-0.1	0.0	-0.0	-0.0	-0.1	-0.1
	rasi	2	Indication [dB]	112.0	111.9	111.0	109.4	107.2	103.7	100.9	97.9	94.0	91.0	87.9	84.9
		3	Error [dB]	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	0.0	-0.0	-0.0	-0.1	-0.1
			Indication [dB]	112.0	111.9	111.0	109.4	107.2	103.7	100.8	97.9	94.0	90.9	87.9	84.9
MAY			Error [dB]	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	0.0	-0.0	-0.0	-0.1	-0.1
MAA			Indication [dB]	109.9	107.9	104.6	101.8	98.9	95.0	92.0	89.0	85.0		•	
		1	Error [dB]	-0.1	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0		-	•
		2	Indication [dB]	109.9	107.9	104.6	101.8	98.9	95.0	92.0	89.0	85.0	-	-	
	Clause	2	Error [dB]	-0.1	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	1.1	-	
	SIOW	2	Indication [dB]	109.9	108.0	104.6	101.8	98.9	95.0	92.0	89.0	85.0	141	-	
		3	Error [dB]	-0.1	0.1	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-		
		4	Indication [dB]	109.9	107.9	104.6	101.8	98.9	95.0	92.0	89.0	85.0		-	
		*	Error [dB]	-0.1	0.1	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	(m.)		
		4	Indication [dB]	111.8	109.0	105.0	102.0	99.0	95.0	92.0	89.0	85.0	82.0	78.9	75.9
		1	Error [dB]	-0.2	-0.0	0.0	0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.1	-0.1
		2	Indication [dB]	111.8	109.0	105.0	102.0	99.0	95.0	92.0	89.0	85.0	82.0	78.9	75.9
CEI		2	Error [dB]	-0.2	-0.0	0.0	0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.1	-0.1
SEL	- P	2	Indication [dB]	111.8	109.0	105.0	102.0	99.0	95.0	92.0	89.0	85.0	82.0	78.9	75.9
		3	Error [dB]	-0.2	-0.0	0.0	0.0	-0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.1	-0.1
		4	Indication [dB]	111.8	109.0	105.0	102.0	99.0	95.0	92.0	89.0	85.0	81.9	78.9	75.9
		+	Error [dB]	-0.2	-0.0	0.0	0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.1	-0.1

Range: 105dB; Equivalent input steady level = 52dB

Result	Detector	Ch.	Duration [ms]	1000	500	200	100	50	20	10	5		
		-	Indication [dB]	52.0	51.9	51.0	49.4	47.2	43.7	40.9	37.9		
		1	Error [dB]	0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0	0.0		
		2	Indication [dB]	52.0	51.9	51.0	49.4	47.2	43.7	40.8	37.9		
	E.c.a	2	Error [dB]	0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0	0.0		
	Fast	2	Indication [dB]	52.0	51.9	51.0	49.4	47.2	43.7	40.9	38.0		
		3	Error [dB]	0.0	0.0	0.0	-0.0	-0.0	0.0	-0.0	0.0		
		4	Indication [dB]	52.0	51.9	51.0	49.4	47.1	43.7	40.8	37.9		
MAN		4	Error [dB]	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	0.0		
MAX			Indication [dB]	49.8	47.9	44.6	41.8	38.9	35.0	32.0	29.0		
		1	Error [dB]	-0.2	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0		
		2	Indication [dB]	49.8	47.9	44.6	41.8	38.9	35.0	32.0	29.0		
	01	2	Error (dB)	-0.2	0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0		
	Slow	ow 3	Indication [dB]	49.9	48.0	44.6	41.8	38.9	35.0	32.0	29.0		
			Error [dB]	-0.1	0.1	-0.0	-0.0	-0.0	-0.0	0.0	0.0		
			Indication [dB]	49.8	47.9	44.6	41.8	38.9	34.9	32.0	29.0		
		4	Error [dB]	-0.2	0.1	-0.0	-0.0	-0.0	-0.0	0.0	0.0		
			Indication [dB]	51.7	49.0	45.0	42.0	39.0	35.0	32.1	29.1		
		1	Error [dB]	-0.3	-0.0	0.0	0.0	0.0	0.0	0.1	0.1		
		-	-	-	Indication [dB]	51.7	49.0	45.0	42.0	39.0	35.0	32.0	29.1
CCI		2	Error [dB]	-0.3	-0.0	0.0	-0.0	0.0	0.0	0.1	0.1		
SEL		2	Indication [dB]	51.7	49.0	45.0	42.0	39.0	35.1	32.1	29.1		
	1	2	Error [dB]	-0.3	0.0	0.0	0.0	0.0	0.1	0.1	0.1		
			Indication [dB]	51.7	49.0	45.0	42.0	39.0	35.0	32.0	29.1		
		4	Error [dB]	-0.3	-0.0	0.0	0.0	0.0	0.0	0.1	0.1		

\*\*\* SVAN958 No. 69082 page 2 \*\*\*

#### Range: 105dB; Equivalent input steady level = 34dB

Result	Detector	Ch.	Duration [ms]	1000	500
			Indication [dB]	34.1	34.0
		1	Error [dB]	0.0	0.1
		2	Indication [dB]	34.0	34.0
	E.c.	2	Error [dB]	0.0	0.0
	rast	2	Indication [dB]	34.0	34.0
		3	Error [dB]	-0.0	0.0
			Indication [dB]	34.0	33.9
		4	Error [dB]	0.0	0.1
MAX			Indication [dB]	31.9	30.1
		1	Error [dB]	-0.1	0.1
			Indication [dB]	31.9	30.0
		2	Error [dB]	-0.1	0.1
	Slow	3	Indication [dB]	31.9	30.1
			Error [dB]	-0.1	0.1
			Indication [dB]	31.8	30.0
		4	Error [dB]	-0.1	0.1
			Indication [dB]	33.8	31.1
		1	Error [dB]	-0.2	0.1
			Indication [dB]	33.8	31.1
SEL		2	Error [dB]	-0.2	0.1
		-	Indication [dB]	33.8	31.1
		3	Error [dB]	-0.2	0.0
			Indication [dB]	33.8	31.1
		4	Error [dB]	-0.2	0.1

Range: 130dB; Equivalent input steady level = 134dB

Result	Detector	Ch.	Duration [ms]	1000	500	200	100	50	20	10	5	2	1	0.5	0.25	
			Indication [dB]	134.0	133.9	133.0	131.4	129.2	125.7	122.8	119.9	116.0	113.0	109.9	106.9	
			Error [dB]	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.1	0.0	-0.0	-0.0	-0.1	-0.1	
			Indication [dB]	134.0	133.9	133.0	131.4	129.2	125.7	122.8	119.9	116.0	112.9	109.9	106.9	
		2	Error [dB]	-0.0	0.0	0.0	0.0	-0.0	-0.0	-0.1	0.0	-0.0	-0.1	-0.1	-0.1	
	Fast		Indication [dB]	134.0	133.9	133.1	131.4	129.2	125.7	122.9	119.9	116.0	113.0	109.9	106.9	
		3	Error [dB]	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.1	0.0	-0.0	-0.1	-0.1	-0.1	
			Indication [dB]	134.0	133.9	133.0	131.4	129.2	125.7	122.8	119.9	116.0	112.9	109.9	106.9	
		4	Error [dB]	0.0	0.0	0.0	0.0	129.2	-0.0	-0.1	0.0	-0.0	-0.1	-0.1	-0.1	
MAX			Indication [dB]	131.8	129.9	126.6	123.8	120.9	117.0	114.0	111.0	107.0	-	-	-	
		1	Error [dB]	-0.2	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-	-	· · ·	
			Indication [dB]	131.8	129.9	126.6	123.8	120.9	117.0	114.0	111.0	107.0	-	-	-	
		2	Error [dB]	-0.2	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0		-		
	Slow	low 2	Indication [dB]	131.9	130.0	126.6	123.8	120.9	117.0	114.0	111.0	107.0		-		
			3	Error [dB]	-0.2	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0		-	
			Indication [dB]	131.8	129.9	126.6	123.8	120.9	117.0	114.0	111.0	107.0			1.5	
		4	Error [dB]	-0.2	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-			
			Indication [dB]	133.7	131.0	127.0	124.0	121.0	117.0	114.0	111.0	107.0	104.0	100.9	97.9	
		1	Error [dB]	-0.3	-0.0	0.0	0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.1	-0.1	
			Indication [dB]	133.7	131.0	127.0	124.0	121.0	117.0	114.0	111.0	107.0	103.9	100.9	97.9	
		2	Error [dB]	-0.3	-0.0	0.0	-0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.1	-0.1	-0.1	
SEL	•		Indication [dB]	133.8	131.0	127.0	124.0	121.0	117.0	114.0	111.0	107.0	104.0	100.9	97.9	
		3	Error [dB]	-0.3	-0.0	0.0	0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.1	-0.1	
			Indication [dB]	133.7	131.0	127.0	124.0	121.0	117.0	114.0	111.0	107.0	103.9	100.9	97.9	
		4	Error [dB]	-0.3	-0.0	0.0	-0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.1	-0.1	-0.1	

\*\*\* SVAN958 No. 69082 page 3 \*\*\*

## Range: 130dB; Equivalent input steady level = 74dB

Result	Detector	Ch.	Duration [ms]	1000	500	200	100	50	20	10	5	
			Indication [dB]	74.0	73.9	73.0	71.4	69.2	65.7	62.9	59.9	
		1	Error [dB]	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	0.0	
			Indication [dB]	74.0	73.9	73.0	71.4	69.2	65.7	62.9	59.9	
		2	Error [dB]	0.0	0.0	73.0	0.0	-0.0	-0.0	-0.0	-0.0	
	Fast		Indication [dB]	74.0	73.9	73.0	71.4	69.2	65.7	62.9	60.0	
		3	Error [dB]	-0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0	0.0	
			Indication [dB]	74.0	73.9	73.0	71.4	69.2	65.7	62.8	59.9	
		4	Error [dB]	-0.0	0.0	0.0	0.0	-0.0	-0.0	-0.1	0.0	
MAX			Indication [dB]	71.9	70.0	66.6	63.8	60.9	57.0	54.0	51.0	
		1	Error [dB]	-0.1	0.1	-0.0	-0.0	-0.0	-0.0	0.0	-0.0	
	Slow		Indication [dB]	71.8	69.9	66.6	63.8	60.9	57.0	54.0	51.0	
		2	Error [dB]	-0.2	0.0	-0.0	-0.0	-0.0	-0.0	0.0	-0.0	
		Slow 3	Slow	Indication [dB]	71.9	70.0	66.6	63.8	60.9	57.0	54.0	51.0
			Error [dB]	-0.2	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	
			Indication [dB]	71.8	69.9	66.6	63.8	60.9	56.9	54.0	51.0	
		4	Error [dB]	-0.1	0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	
			Indication [dB]	73.8	71.0	67.0	64.0	61.0	57.0	54.0	51.1	
		1	Error [dB]	-0.2	-0.0	0.0	0.0	0.0	0.0	0.0	0.1	
			Indication [dB]	73.7	71.0	67.0	64.0	61.0	57.0	54.1	51.0	
		2	Errer [dB]	-0.3	-0.0	0.0	0.0	-0.0	0.0	0.1	0.0	
SEL			Indication [dB]	73.8	71.0	67.0	64.0	61.0	57.0	54.1	51.1	
		3	Error [dB]	-0.3	-0.0	0.0	0.0	-0.0	0.0	0.0	0.1	
			Indication [dB]	73.7	71.0	67.0	64.0	61.0	57.0	54.0	51.1	
		4	Error [dB]	-0.3	-0.0	0.0	0.0	0.0	0.0	0.0	0.1	

Range: 130dB; Equivalent input steady level = 54dB

Result	Detector	Ch.	Duration [ms]	1000	500
			Indication [dB]	54.1	54.0
		<u>.</u>	Error [dB]	0.0	0.0
			Indication [dB]	54.1	54.0
	E.d.	2	Error [dB]	0.0	0.0
	Fast	2	Indication [dB]	54.1	54.0
		3	Error [dB]	0.0	0.1
		4	Indication [dB]	54.0	53.9
MAX		4	Error [dB]	0.0	0.0
		Indication [dB]	52.0	50.1	
	1	Error [dB]	-0.1	0.1	
	2	Indication [dB]	51.9	50.0	
	2 Slow	Error [dB]	-0.1	0.1	
	Slow	3	Indication [dB]	51.9	50.0
		3	Error [dB]	-0.1	0.1
		4	Indication [dB]	51.9	50.0
			Error [dB]	-0.1	0.1
			Indication [dB]	53.9	51.1
SEL	1	Error [dB]	-0.2	0.1	
		2	Indication [dB]	53.8	51.1
	2	Error [dB]	-0.2	0.1	
SEL	SEL -	Indication [dB]	53.8	51.1	
		3	Error [dB]	-0.2	0.1
		4	Indication [dB]	53.8	51.0
		4	Error [dB]	-0.2	0.0

\*\*\* SVAN958 No. 69082 page 4 \*\*\*

#### 6. FREQUENCY RESPONSE (electrical)

LEVEL METER; Filter: Z; Range: 130 dB; Input signal =135 dB;



f [Hz]	AI[dB]	A2[dB]	A3[dB]	A4[dB]	f [Hz]	A1[dB]	A2[dB]	A3[dB]	A4[dB]
10	3.2	3.2	3.2	3.2	250	-0.0	0.0	0.0	-0.0
12.5	1.4	1.4	1.4	1.4	500	-0.0	0.0	0.0	0.0
16	0.5	0.5	0.5	0.5	1000	0.0	0.0	0.0	0.0
20	0.1	0.1	0.1	0.1	2000	0.0	0.0	0.0	0.0
25	-0.0	0.0	0.0	-0.0	4000	0.0	0.0	0.0	0.0
31.5	-0.0	-0.0	-0.0	-0.0	8000	0.0	0.0	0.0	0.0
63	-0.0	-0.0	-0.0	-0.0	16000	0.0	0.0	0.0	-0.0
125	-0.0	0.0	0.0	-0.0	20000	0.0	0.0	0.0	-0.0

All frequencies are nominal center values for the 1/3 octave bands

7. INTERNAL NOISE LEVEL' (electrical)

LEVEL METER; Range: 105 dB; Back-light - off; Calibration factor: 0dB

	Filter	Z	A	С
Channel I	Level [dB]	14.4	11.2	12.0
Channel 2	Level [dB]	15.0	10.9	11.1
Channel 3	Level [dB]	13.9	10.6	11.2
Channel 4	Level [dB]	13.3	10.2	11.3

\* measured with preamplifier SVANTEK type SV 12L No. 17701.

#### VIBRATION LEVEL METER

1. CALIBRATION (electrical)

## LEVEL METER; Filter: HP10; Input signal =140.0dB (10.0 m/s<sup>2</sup>), f<sub>sin</sub>=79,6Hz

	Range 1	45dB	Range 170dB		
	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	
Channel 1	139.98	-0.02	140.04	0.04	
Channel 2	139,98	-0.02	140.03	0.03	
Channel 3	139.98	-0.02	140.03	0.03	
Channel 4	139.98	-0.02	140.03	0.03	

#### 2. CALIBRATION (vibrational)

#### LEVEL METER; Range: 145dB; Input signal: 120dB;

Filter	HP1	1	HPI	0	Wd	1	Wm	1	Wh	
	Indication [dB]	Error [dB]								
Channel I	120.0	0.0	120.0	0.0	106.1	0.0	102.0	-0.0	110.5	-0.0
Channel 2	120.0	0.0	120.0	0.0	106.1	0.0	102.0	-0.0	110.5	-0.0
Channel 3	120.0	0.0	120.0	0.0	106.1	0.0	102.0	-0.0	110.5	-0.0
Channel 4	120.0	0.0	120.0	0.0	106.2	0.0	102.0	-0.0	110.5	-0.0

Calibration measured with the accelerometer SVANTEK type SV80 No. H0413. Calibration factor: -0.56dB

\*\*\* SVAN958 No. 69082 page 5 \*\*\*

#### 3. FREQUENCY RESPONSE (electrical) 1/3 OCTAVE; Filter: HP; Range: 170 dB; input=175 dB;



0.8	0.19	0.19	0.19	0.19	5	0.02	0.01	0.01	0.01	500	-0.01	-0.01	-0.01	-0.01
1	0.10	0.10	0.10	0.10	6.3	0.00	-0.00	-0.00	-0.00	1000	0.00	-0.00	-0.00	-0.01
1.25	0.08	0.08	0.08	0.08	8	-0.01	-0.01	-0.01	-0.01	2000	0.00	-0.00	-0.00	-0.00
1.6	0.06	0.06	0.06	0.06	16	-0.02	-0.02	-0.02	-0.02	4000	0.01	0.01	-0.00	-0.00
2	0.02	0.02	0.02	0.02	31.5	0.00	-0.00	-0.00	-0.00	8000	0.03	0.04	0.02	0.02
2.5	0.01	0.01	0.01	0.01	63	-0.01	-0.01	-0.01	-0.01	16000	0.02	0.02	-0.01	-0.02
3.15	-0.01	-0.01	-0.01	-0.01	125	-0.01	-0.01	-0.01	-0.01	20000	0.02	0.01	0.01	-0.01
4	0.02	0.02	0.02	0.02	250	-0.01	-0.01	-0.01	-0.01		-			
				All freq	uencies a	re nomina	center va	lues for th	e 1/3 octa	ve bands	-			

#### 4. INTERNAL NOISE LEVEL (electrical)

LEVEL METER func.;	Range: 145 dB; Back-light -	off				
	Filter	HP1	HP10	Wd	Wm	
Channel 1	Indication [dB]	54.8	52.0	42.6	38.8	
Channel 2	Indication [dB]	55.0	52.4	42.6	39.0	1
Channel 3	Indication [dB]	55.5	53.3	42.8	39.1	1
Channel 4	Indication [dB]	54.8	52.4	42.4	39.0	-

ENV	<b>IRONMENTAL CONDIT</b>	TIONS
Temperature	Relative humidity	Ambient pressure
26 °C	47 %	1000 hPa

			TEST EQUIPME	NT
Item	Manufacturer	Model	Serial no.	Description
1.	SVANTEK	SVAN 401	127	Signal generator
2	SVANTEK	SVAN 912A	4369	Sound & Vibration Analyser
3.	KEITHLEY	2000	0910165	Digital multimeter
4.	SVANTEK	SV33	48878	Acoustic calibrator
5.	SVANTEK	ST02		Microphone equivalent electrical impedance (18pF)
6.	DYTRAN	3233A	1376	Reference accelerometer

#### CONFORMITY & TEST DECLARATION

1. Herewith Svantek company declares that this instrument has been calibrated and tested in compliance with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass them.

2. Traceability of the calibration is guaranteed by the above mentioned ISO9001 procedures.

The information appearing on this sheet has been compiled specifically for this instrument. This form is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
 This calibration sheet shall not be reproduced except in full, without written permission of the SVANTEK Ltd.

Test date: 2018-08-13

\*\*\* SIAN958 No. 69082 page 6 \*\*\*

Appendix B2 - Page 12

# Cert B3: Calibration Certificate of Sound Level Meter Rion NL-52 (SN: 00564841)

Hong Kong Calibration Ltd. 香港校正有限公司

.

# **Calibration Certificate**

.

Certificate N	o. 806605		Page 1 of 3 Pages
Customer	: Gammon Construction Limite	ed	
Address	: 28/F, Devon House, Taikoo F	Place, 979 King's Roa	ad, Quarry Bay, Hong Kong.
Order No.	Q82354		Date of receipt : 29-Jun-18
Item Teste	d		
Description	: Sound Level Meter		
Manufacture	r:Rion		I.D. :
Model	: NL-52		Serial No. : 00564841
Test Cond	itions		
Date of Test	: 11-Jul-18		Supply Voltage :
Ambient Ten	nperature : (23 ± 3)°C		Relative Humidity : (50 ± 25) %
Test Speci	ifications		
Calibration ch	neck.		
Ref. Docume	nt/Procedure: Z01, IEC 61672.		
Test Resul All results we The results ar	Its re within the IEC 61672 Type 1 s re shown in the attached page(s)	specification. (where a	applicable)
Main Test equ	uipment used:		
Equipment No	o. Description	Cert. No.	Traceable to
S017	Multi-Function Generator	C170120	SCL-HKSAR
S240	Sound Level Calibrator	803357	NIM-PRC & SCL-HKSAR
	1.00		
The values given will not include al overloading, mis- for any loss or da The test equipme The test results a	in this Calibration Certificate only relate lowance for the equipment long term dr -handling, or the capability of any other I amage resulting from the use of the equi ent used for calibration are traceable to apply to the above Unit-Under-Test only	e to the values measured a ift, variations with environr laboratory to repeat the m ipment. International System of Ur	at the time of the test and any uncertainties quoted mental changes, vibration and shock during transportation, easurement. Hong Kong Calibration Ltd. shall not be liable nits (SI), or by reference to a natural constant.
	Ra		6
Calibrated by	X	Ar	proved by :
Calibrated by	y:	Ap	proved by :Kin Wong
Calibrated by	y : Elva Chong	<b>Ар</b> Da	pproved by :Kin Wong te: 11-Jul-18

The copyright of this certificate is owned by Hong Kong Calibration Ltd.. It may not be reproduced except in full.

Е



# **Calibration Certificate**

Certificate No. 806605

Page 2 of 3 Pages

Results :

## 1. Self-generated noise: 17.3 dBA

2.	Acoustical	signal	test

	UUT S	etting			
Range (dB)	Frequency Weighting	Time Weighting	Octave Filter	Applied Value (dB)	UUT Reading (dB)
20~130	A	F	OFF	94.0	94.0
		S	OFF	_	94.0
	C	F	OFF	7	94.1
	Z	F	OFF		94.1
	A	F	OFF	114.0	114.1
		S	OFF		114.1
	C	F	OFF		114.1
	Z	F	OFF		114.1

IEC 61672 Type 1 Spec. :  $\pm$  1.1 dB Uncertainty :  $\pm$  0.1 dB

# 3 Electrical signal tests of frequency weightings (A weighting)

Frequency	Attenuation (dB)	IEC 61672 Type 1 Spec.
31.5 Hz	-39.8	-39.4  dB + 2  dB
63 Hz	-26.4	-26.2  dB + 1.5  dB
125 Hz	-16.2	-16.1  dB + 1.5  dB
250 Hz	-8.7	- 8.6  dB + 1  dB
500 Hz	-3.3	-32 dB + 14 dB
1 kHz	0.0 (Ref)	0  dB + 11  dB
2 kHz	+1.2	+ 12 dB + 16 dB
4 kHz	+0.9	+ 10  dB + 16  dB
8 kHz	-1.1	$+ 11 dB + 21 dB \sim -31 dE$
16 kHz	-8.1	$- 66 dB + 35 dB \sim - 170 d$

Uncertainty :  $\pm 0.1 \text{ dB}$ 

The copyright of this certificate is owned by Hong Kong Callbration Ltd., It may not be reproduced except in full.



Hong Kong Calibration Ltd. 香港校正<sub>有限公司</sub>

# **Calibration Certificate**

Certificate No.	806605
-----------------	--------

Page 3 of 3 Pages

# 4. Frequency & Time weightings at 1 kHz

4.1 Frequency Weighting (Fast)

UUT Setting	Applied Value (dB)	UUT Reading (dB)	Difference (dB)	IEC 61672 Type 1 Spec
Α	94.0	94.0 (Ref.)	(42)	$\pm 0.4 dB$
С	94.0	94.0	0.0	± 0.4 uD
Z	94.0	94.0	0.0	

4.2 Time Weighting (A-weighted)

UUT	Applied	UUT	Difference	IEC 61672
Setting	Value (dB)	Reading (dB)	(dB)	Type 1 Spec
Fast	94.0	94.0 (Ref.)		+0.3 dB
Slow	94.0	94.0	0.0	± 0.5 dD
Time-averaging	94.0	94.0	0.0	

Uncertainty : ± 0.1 dB

Remarks : 1. UUT : Unit-Under-Test

2. The uncertainty claimed is for a confidence probability of not less than 95%.

3. Atmospheric Pressure : 1 000 hPa.

4. Preamplifier model : NH-25, S/N : 64967

5. Firmware Version: 1.8

6. Power Supply Check: OK

7. The UUT was adjusted with the laboratory's sound calibrator at the reference sound pressure level before the calibration.

----- END ------

The copyright of this certificate is owned by Hong Kong Calibration Ltd., it may not be reproduced except in full.

AUDI	0		*	
Man	ufacturer Ca	libration	Certifica	ate
	nt has been tested and calibrat	ed to the manufacture	er specifications	
The calibration is tracea	able in accordance with ISO/IEC	C 17025 covering all in	strument functions.	
Device Type:	M2211 Measurement Micr	ophone		
	MA220 Capsule	Serial Number: Serial Number:	7684 72076	
Certificate Issued:	05 October 2018			
Certificate Number:	43378-7684-M2211			
Results:	PASSED (for detailed report see next p	Dage)		
Tested by:	M. Frick			
Signature:	66			
Stamp:	NTI Audio AG Im alten Riet 102 LI 9494 Schaan			
`	www.nti-audio.com			<b>`</b>
4				



www.nti-audio.com • HR-Nr: 2.012.557 • MwStNr: 54306 • Bank: VP Bank, Vaduz, Acc No: 322.235.015

2/2

# Cert B5: Calibration Certificate of Acoustic Calibrator SV30A (SN: 10814)



## **CALIBRATION CERTIFICATE**

Date of issue	21-Jul-2018		Certificate Numb	er MLCN1815265		
Customer Informatio	n	State States		A State of the second second		
Company Name	Wilson Accoustic	s Limited				
Address	Unit 601, Block A, Shatin Industrial Centre,					
Autress	Vuen Shun Circu	it	inte,			
	Shatin N T					
	Hong Kong					
Fauinment-under-Ta	st (EUT)	and the second				
Description	Acoustic Calibrat	OF				
Monufacturer	Acoustic Canorat	01				
Madal Number	SV 20 A					
viodel Number	SV 50A					
Serial Number	10814					
Equipment Number						
Calibration Particula	r					
Date of Calibration	21-Jul-2018					
Calibration Equipment	4231(MLTE008)	/ AV180068 / 13-Mag	y-20			
	1351(MLTE049)	/ MLEC18/06/02 / 6-	Jun-19			
Calibration Procedure	MLCG00, MLCO	315				
Calibration Conditions	Laboratory	Temperature	23 °C + 5 °C			
Calibration Conditions	Laboratory	Relative Humidity	55% + 25%			
	FUT	Stabilizing Time	0 vor 3 hours			
	LUI	Warm un Tima	Not appliable			
		Power Supply	Internal battery			
Calibration Desults	Calibration data	vere detailed in the co	ntinuation pages			
Cambration Results	All colibration ro	were detailed in the co	enacification			
	An canoration re	suits were within LOT	specification.			
Approved By & Date						
Approved By & Date						
Approved By & Date		h	K.O. Lo	21-Jul-20		
Approved By & Date		A	K.O. Lo	21-Jul-20		
Approved By & Date Statements Calibration equipment used	for this calibration are	/Ja-	K.O. Lo mational standards.	21-Jul-20		
Approved By & Date Statements Calibration equipment used The results on this Calibrati	for this calibration are on Certificate only relat	Interest of the second	K.O. Lo national standards. t the time of the calibration and the unc	21-Jul-20 ertainties quoted will not		
Approved By & Date Statements Calibration equipment used The results on this Calibrati include allowance for the E	for this calibration are on Certificate only relat JT long term drift, varie	Interest of the second	K.O. Lo rational standards. It the time of the calibration and the unc hanges, vibration and shock during tran	21-Jul-20 ertainties quoted will not sportation, overloading,		
Approved By & Date Statements Calibration equipment used The results on this Calibrati include allowance for the El mishandling, misuse, and the	for this calibration are on Certificate only relat JT long term drift, varia e capacity of any other Limited chell are the lin	traceable to national / inter e to the values measured a tation with environmental c laboratory to repeat the mu blue for our loce or demones	K.O. Lo national standards. It the time of the calibration and the unc hanges, vibration and shock during tran assurement.	21-Jul-20 ertainties quoted will not sportation, overloading,		
Approved By & Date Statements * Calibration equipment used * The results on this Calibrati include allowance for the El mishandling, misuse, and th * MaxLab Calibration Centre The conv of this Certificate	for this calibration are on Certificate only relat JT long term drift, varia e capacity of any other Limited shall not be lia is owned by MaxLab C	traceable to national / inter e to the values measured a tion with environmental c laboratory to repeat the mo ble for any loss or damage alibration Centre Limited.	K.O. Lo national standards. t the time of the calibration and the unc hanges, vibration and shock during tran essurement. resulting from the use of the EUT. No part of this Certificate may be reon	21-Jul-20 ertainties quoted will not sportation, overloading, oduced without the prior		
Approved By & Date Statements * Calibration equipment used * The results on this Calibrati include allowance for the El mishandling, misuse, and th * MaxLab Calibration Centre * The copy of this Certificate written approval of MaxLab	for this calibration are on Certificate only relat JT long term drift, varia e capacity of any other Limited shall not be lia is owned by MaxLab C Calibration Centre Lin	traceable to national / inter e to the values measured a tion with environmental of laboratory to repeat the me ble for any loss or damage alibration Centre Limited. nited.	K.O. Lo national standards. It the time of the calibration and the une hanges, vibration and shock during tran assurement. resulting from the use of the EUT. No part of this Certificate may be repre	21-Jul-20 ertainties quoted will not sportation, overloading, oduced without the prior		
Approved By & Date Statements Calibration equipment used The results on this Calibrati include allowance for the El mishandling, misuse, and th MaxLab Calibration Centre MaxLab Calibration Centre The copy of this Certificate written approval of MaxLab	for this calibration are on Certificate only relat JT long term drift, varia e capacity of any other Limited shall not be lia is owned by MaxLab C Calibration Centre Lin	traceable to national / inter e to the values measured a ation with environmental c laboratory to repeat the ms ble for any loss or damage alibration Centre Limited, nited.	K.O. Lo mational standards. It the time of the calibration and the unc hanges, vibration and shock during tran assurement. resulting from the use of the EUT. No part of this Certificate may be repro	21-Jul-20 ertainties quoted will not sportation, overloading, sduced without the prior		
Approved By & Date Statements Calibration equipment used The results on this Calibrati include allowance for the El mishandling, misuse, and th MaxLab Calibration Centre The copy of this Certificate written approval of MaxLab	for this calibration are on Certificate only relat JT long term drift, vari e capacity of any other is expacity of any other Limited shall not be lia is owned by MaxLab C Calibration Centre Lin	Intersection of the second sec	K.O. Lo rational standards. It the time of the calibration and the unc hanges, vibration and shock during tran assurement. resulting from the use of the EUT. No part of this Certificate may be repro	21-Jul-20 ertainties quoted will not sportation, overloading, oduced without the prior		
Approved By & Date Statements Calibration equipment used The results on this Calibrati include allowance for the El mishandling, misuse, and th MaxLab Calibration Centre The copy of this Certificate written approval of MaxLab	for this calibration are on Certificate only relative e capacity of any other Limited shall not be lia is owned by MaxLab C Calibration Centre Lim	Interceable to national / inter e to the values measured a taiton with environmental of laboratory to repeat the me ble for any loss or damage alibration Centre Limited. nited.	K.O. Lo mational standards. It the time of the calibration and the unc hanges, vibration and shock during tran easurement. resulting from the use of the EUT. No part of this Certificate may be repro	21-Jul-20 ertainties quoted will not sportation, overloading, oduced without the prior		
Approved By & Date Statements Calibration equipment used The results on this Calibrati include allowance for the E mishandling, misuse, and th MaxLab Calibration Centre The copy of this Certificate written approval of MaxLab	for this calibration are on Certificate only relat JT long term drift, varia e capacity of any other Limited shall not be lia is owned by MaxLab C Calibration Centre Lin	Irraceable to national / inter e to the values measured a tion with environmental c laboratory to repeat the mo ble for any loss or damage alibration Centre Limited. nited.	K.O. Lo national standards. t the time of the calibration and the unc hanges, vibration and shock during tran easurement. resulting from the use of the EUT. No part of this Certificate may be repri	21-Jul-20 ertainties quoted will not sportation, overloading, oduced without the prior Page 1 o		
Approved By & Date Statements Calibration equipment used The results on this Calibrati include allowance for the El mishandling, misuse, and th MaxLab Calibration Centre The copy of this Certificate written approval of MaxLab	for this calibration are on Certificate only relat JT long term drift, vari e capacity of any other Limited shall not be lia is owned by MaxLab C Calibration Centre Lin	Irraceable to national / inter e to the values measured a tion with environmental c laboratory to repeat the mo ble for any loss or damage alibration Centre Limited. nited.	K.O. Lo national standards. t the time of the calibration and the unc hanges, vibration and shock during tran easurement. resulting from the use of the EUT. No part of this Certificate may be repri	21-Jul-20 ertainties quoted will not sportation, overloading, oduced without the prior Page 1 o		
Approved By & Date Statements Calibration equipment used The results on this Calibrati include allowance for the El mishandling, misuse, and th MaxLab Calibration Centre The copy of this Certificate written approval of MaxLab	for this calibration are on Crtificate only relat T long term drift, vari e capacity of any other Limited shall not be lia is owned by MaxLab C Calibration Centre Lin	Interceable to national / inter e to the values measured a tion with environmental or laboratory to repeat the mm ble for any loss or damage alibration Centre Limited. nited.	K.O. Lo national standards. t the time of the calibration and the unc hanges, vibration and shock during tran essurement. resulting from the use of the EUT. No part of this Certificate may be repro	21-Jul-20 ertainties quoted will not sportation, overloading, oduced without the prior Page 1 o		

萬儀校正中心有限公司 MaxLab Calibration Centre Limited 香港新界琴涌華星街 16-18 號保登工業大廈 9 樓 82 室 Unit 82, 9/F., Boldwin Industrial Bldg., 16-18 Wah Sing Street, Kwai Chung, N.T., Hong Kong Tel: (852) 216 1380 Fax: (852) 2264 6480 Email: info@maxlab.com.hk



Certificate No.

MLCN181526S

Calibration Data								
EUT Setting	Standard Reading	EUT Error	Calibration Uncertainty	EUT Specification				
94 dB	94.0 dB	0.0 dB	0.15 dB	± 0.3 dB				
114 dB	114.0 dB	0.0 dB	0.15 dB	± 0.3 dB				

- END -

 Calibrated By:
 Dan
 Checked By:
 K.O. Lo

 Date:
 21-Jul-18
 Date:
 21-Jul-18

 萬 儀 校 正 中 心 有 限 公 司 MaxLab Calibration Centre Limited 香港新界葵涌華星街 16-18 號保盈工業大廈 9 樓 B2 室 Unit B2, 9/F., Boldwin Industrial Bldg., 16-18 Wah Sing Street, Kwai Chung, N.T., Hong Kong Tel: (852) 2116 1380 Fax: (852) 2264 6480 Email: info@maxlab.com.hk

.

Appendix B2 - Page 15

## Cert B6: Calibration Certificate of Acoustic Calibrator CEL-120 (SN: 4478630)

CASELLA Certificate of Conformance and Calibration for **CEL-120** Acoustic Calibrator Applicable Standards :-IEC 60942: 2003 & ANSI S1.40: 2006 CEL-120/1 Class 1 CEL-120/2 Class 2 Serial No: 4478630 Firmware: 04. Temperature: 23.0 «C Pressure: 01/1.0 mb %RH 52.4 Frequency = 1.00kHz ± 2Hz T.H.D. = < 1% SPL @ 114.0dB Setting Calibration Level 114.02 dB 93.96 dB/N.A SPL @ 94.0dB Setting (CEL-120/1 only) Engineer: W. 67al Date: 29 AUG 2018 Company test equipment and acoustic working standards, used for conformance testing, are subject to periodic calibration, traceable to UK national standards, in accordance with the company's ISO9001 Quality System. DECLARATION OF CONFORMITY firms that the instrument specified above has been produced and rested to comply with ter's published specifications and the relevant European Community CE directives. ers published spectraleaness and the Casella CEL (U.K.). Casella CEL (U.K.). Regent House, Woheley Road, Kampiston, Bedford, MK42 7JY Phone: +44 (0) 1234 841400 Fax: +44 (0) 1234 841490 E-mail: Info@casellaned.com Web: www.casellameasurement.com 198032A-01

Appendix B3

Photographs showing the Examples of Noise Measurement for Fixed Plant Noise



Appendix B3 Photographs showing the Examples of Noise Measurement for Fixed Plant Noise



Appendix B3 - Page 2





Appendix B4

**Noise Measurement Results**
## **Appendix B4 Noise Measurement Results**

			Size of Lou	vre/Outdoor AC	unit (mm)						
Fixed Plant Source ID	Plant Type	Method	Length	Width	Height	Measurement Distance (m) D <sup>(a)</sup>	Averaged Measured L <sub>Aeq</sub> ,dB(A) <sup>(b)</sup>	Background L <sub>Aeq</sub> ,dB(A)	Difference L <sub>Aeq</sub> ,dB(A)	Background Corrected L <sub>Aeq</sub> ,dB(A) <sup>(c)</sup>	Calculated SWL <sub>,</sub> dB(A)
VS-MCV-02	Louvre	2	1000	750	N/A	1.0	60.9	49.3	11.6	60.9	74
VS-MCV-03	Louvre	2	1000	750	N/A	1.0	60.1	49.5	10.6	60.1	73
VS-MCV-06	Louvre	2	4000	2700	N/A	1.0	67.1	50.2	16.9	67.1	83
VS-MCV-10	Louvre	2	1400	1200	N/A	1.0	53.2	50.9	2.3	50.2	64
VS-MCV-11	Louvre	2	4000	1500	N/A	1.0	68.3	51.9	16.4	68.3	83
VS-MCV-12	Louvre	2	850	850	N/A	1.0	59.7	49.6	10.1	59.7	73
VS-MCV-15	Louvre	2	850	850	N/A	1.0	61.9	50.6	11.3	61.9	75
VS-MCV-19	Louvre	2	1000	5300	N/A	1.0	67.5	52.4	15.1	67.5	84
VS-MCV-23A	Louvre	2	6350	13500	N/A	1.0	60.2	55.0	5.2	58.6	81
VS-MCV-23A <sup>(d)</sup>	Louvre	2	6350	13500	N/A	1.0	70.5	62.7	7.8	69.7	92
VS-MCV-23B	Louvre	2	7180	3941	N/A	1.0	55.1	53.5	1.6	52.1	71
VS-MCV-23B <sup>(d)</sup>	Louvre	2	7180	3940	N/A	1.0	64.1	56.0	8.1	63.4	83
VS-MCV-24A	Louvre	2	6350	13500	N/A	1.0	59.8	53.9	5.9	58.5	81
VS-MCV-24A <sup>(d)</sup>	Louvre	2	6350	13500	N/A	1.0	69.7	58.4	11.3	69.7	92
VS-MCV-24B	Louvre	2	7180	3940	N/A	1.0	55.4	53.7	1.7	52.4	72
VS-MCV-24B <sup>(d)</sup>	Louvre	2	7180	3940	N/A	1.0	65.9	58.0	7.9	65.1	84
VS-MCV-25	Louvre	2	3250	5550	N/A	1.0	61.9	53.2	8.7	61.3	78
VS-MCV-27A	Louvre	2	1200	1950	N/A	1.0	53.0	52.4	0.6	50.0	64
VS-MCV-27B	Louvre	2	2500	1700	N/A	1.0	59.5	52.4	7.1	58.6	74
VS-MCV-28	Louvre	2	1000	5800	N/A	1.0	56.0	53.6	2.4	53.0	67
VS-MCV-29	Louvre	2	1000	3100	N/A	1.0	56.2	55.3	0.9	53.2	68
VCU-001	Outdoor AC Unit	4	760	1220	1650	0.5	70.6	55.2	15.4	70.6	84
VCU-002	Outdoor AC Unit	4	760	1220	1650	0.5	70.6	54.5	16.1	70.6	84
VCU-003	Outdoor AC Unit	4	760	920	1650	0.5	70.6	55.3	15.3	70.6	83

Remarks:

a) Measurement Distance between louvre and microphone.

b) Results are averaged from number of points in accordance with ISO3746.

c) If the difference between the background and the measured noise level is less than 3.0 dB, background noise correction factor should be capped to 3.0dB.

d) Operation scenario during daytime/evening period only and the measured SWL will be checked against the respective noise criterion.

Appendix C

Noise Measurement to Confirm any Tonal, Impulsive and Intermittent Characteristics from the Fixed Plant Nose Sources at Representative NSRs Appendix C1

Calibration Certificates – Noise Measurement at Representative NSRs



### 综合試驗 有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



# **CERTIFICATE OF CALIBRATION**

Certificate No.:	18CA1019 01-01		Page	1	of	2	
Item tested							
Description:	Sound Level Mete	r (Type 1)	Microphone		Preamp		
Manufacturer:	B & K		B & K		B & K		
Type/Model No.:	2250		4950		ZC0032		
Serial/Equipment No.:	3001291		2665582		17190		
Adaptors used:	-		-		-		
Item submitted by			t.				
Customer Name:	AECOM ASIA CO	LIMITED					
Address of Customer:	-						
Request No.:	-						
Date of receipt:	19-Oct-2018						
Date of test:	19-Oct-2018						
Reference equipment	used in the calib	ration					
Description:	Model:	Serial No.	Expiry Date:		Traceat	le to:	
Multi function sound calibrator	B&K 4226	2288444	23-Aug-2019		CIGISME	С	
Signal generator	DS 360	33873	24-Apr-2019		CEPREI		
Signal generator	DS 360	61227	23-Apr-2019		CEPREI		
Ambient conditions							
Temperature:	20 ± 1 °C						
Relative humidity:	50 ± 10 %						
Air pressure:	1005 ± 5 hPa						
				_			

### **Test specifications**

- 1, The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- 2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

### **Test results**

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets.

Approved Signatory:

Fend Junai





**Comments:** The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

Date:

© Soils & Materials Engineering Co., Ltd.

Form No.CARP152-1/Issue 1/Rev.C/01/02/2007



### 综合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD.

香港黃竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



## **CERTIFICATE OF CALIBRATION**

(Continuation Page)

Certificate No.:

18CA1019 01-01

Page 2

of

2

### 1, Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

			Expanded	Coverage
Test:	Subtest:	Status:	Uncertanity (dB)	Factor
Call and the last	2	Deres	0.0	
Self-generated noise	A	Pass	0.3	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	С	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
A	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
200529 genella – odre Meno 🗢 Handa suor 🗢 otre	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

### 2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Expanded Uncertanity (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 8000 Hz	Pass	0.5	

### 3, Response to associated sound calibrator

### N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

End Calibrated by: Checked by: Fung Chi Yip shek Kwong Tat Date: 19-Oct-2018 Date: 20-Oct-2018

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

© Soils & Materials Engineering Co., Ltd

Form No CARP152-2/Issue 1/Rev C/01/02/2007





# **CERTIFICATE OF CALIBRATION**

Certificate No.:	18CA0321 01-02		Page	1 of 2 🚛	
Item tested					
Description: Manufacturer: Type/Model No.: Serial/Equipment No.: Adaptors used:	Sound Level Mete B & K 2250-L 2681366	(N. 011 01)	Microphone B & K 4950 2665582	Preamp B & K ZC0032 17190	
Item submitted by		ne fallet tek alle ka you			
Customer Name: Address of Customer: Request No.: Date of receipt:	AECOM ASIA CO = = 21-Mar-2018	LTD			
Date of test:	23-Mar-2018				
Reference equipment	used in the calib	ration			
Description: Multi function sound calibrator Signal generator Signal generator Ambient conditions	Model: B&K 4226 DS 360 DS 360	<b>Serial No.</b> 2288444 33873 61227	Expiry Date: 08-Sep-2018 25-Apr-2018 01-Apr-2018	Traceable to: CIGISMEC CEPREI CEPREI	
Temperature: Relative humidity: Air pressure:	21 ± 1 °C 50 ± 10 % 1000 ± 5 hPa				
Test specifications					
<ol> <li>The Sound Level Me and the lab calibratio</li> <li>The electrical tests w replaced by an equiv</li> </ol>	ter has been calibrate n procedure SMTP00 ere performed using alent capacitance wit	ed in accordance with 04-CA-152. an electrical signal su thin a tolerance of +20	the requirements as spec obstituted for the micropho %.	cified in BS 7580: Part	1: 199; d and

### **Test results**

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets.

**Approved Signatory:** Date: 24-Mar-2018 **Company Chop:** Feng Jun Qi

**Comments:** The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

© Soils & Materials Engineering Co., Ltd

Form No.CARP152-1/Issue 1/Rev.C/01/02/2007

<sup>3.</sup> The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.



### 綜合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道 37號利達中心12樓

12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



# CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA0321 01-02

Page

2

of

2

### 1, Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

Test:	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor
o.r	•	<b>D</b>	0.0	
Self-generated noise	A	Pass	0.3	,
	C	Pass	0.8	ŗ
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	- 0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	Α	Pass	0.3	
	С,	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

### 2, 1/2 Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Expanded Uncertanity (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz Weighting A at 8000 Hz	Pass Pass	0.3 0.5	

### 3, Response to associated sound calibrator

### N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

/		🗧 End -	1	
Calibrated by:		Checked by:	K	
Date:	Fung Chi Yip V 23-Mar-2018	Date:	Lam Tze Wai 24-Mar-2018	

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

© Soils & Materials Engineering Co., Ltd.

Form No.CARP152-2/Issue 1/Rev.C/01/02/2007



### 综合試驗 有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 . Fax: (852) 2555 7533



# **CERTIFICATE OF CALIBRATION**

Certificate No.:	19CA0228 02		ş	Page 1	of	2
Item tested						
Description:	Sound Level Meter	r (Type 1)	Microphe	one	Pream	
Manufacturer:	B & K		B&K		B & K	
Type/Model No.:	2270		4950		ZC0032	
Serial/Equipment No.:	2644597		2879980		19428	
Adaptors used:	- (N.	012.01)	-		-	
Item submitted by	5					
Customer Name:	AECOM ASIA CO	LTD				
Address of Customer:	-					
Request No	12					
Date of receipt:	28-Feb-2019					
Date of test:	01-Mar-2019					
Reference equipment	used in the calib	ration				
Description:	Model:	Serial No.	Expiry D	ate:	Traceal	ole to:
Multi function sound calibrator	B&K 4226	2288444	23-Aug-2	019	CIGISME	EC
Signal generator	DS 360	33873	24-Apr-20	19	CEPREI	
Signal generator	DS 360	61227	26-Dec-2	019	CEPREI	
Ambient conditions						
Temperature:	21 ± 1 °C					
Relative humidity:	55 ± 10 %					
Air pressure:	1005 ± 5 hPa					

### **Test specifications**

- 1, The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- 2, The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- 3, The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

### **Test results**

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets

Approved Signatory:

Feng Junqi

02-Mar-2019

**Company Chop:** 



**Comments:** The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

Date:

© Soils & Materials Engineering Co., Ltd.

Form No.CARP152-1/Issue 1/Rev.C/01/02/2007



## 綜合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD.

香港黃竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.

E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



# CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 19CA

19CA0228 02

Page 2 of 2

### 1, Electrical Tests

Test

The electrical tests were perfomed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

Test.	Subtest:	Status:	Uncertanity (dB)	/ Coverage Factor
Self-generated noise Linearity range for Leq	A C Lin At reference range , Step 5 dB at 4 kHz Reference SPL on all other ranges 2 dB below upper limit of each range 2 dB about the first of each range	Pass Pass Pass Pass Pass Pass	0.3 1.0 2.0 0.3 0.3 0.3 0.3	2.1 2.2
Linearity range for SPL Frequency weightings	At reference range , Step 5 dB at 4 kHz A C Lin	Pass Pass Pass Pass Pass	0.3 0.3 0.3 0.3	
Time weightings Peak response R.M.S. accuracy Time weighting I Time averaging	Single Burst Fast Single Burst Slow Single 100µs rectangular pulse Crest factor of 3 Single burst 5 ms at 2000 Hz Repeated at frequency of 100 Hz 1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass Pass Pass Pass Pass Pass Pass Pass	0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	
Pulse range Sound exposure level Overload indication	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz Single burst 10 ms at 4 kHz Single burst 10 ms at 4 kHz SPL Leq	Pass Pass Pass Pass Pass	0.3 0.4 0.4 0.3 0.4	

### 2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

		Coverage Factor
ng A at 125 Hz ng A at 8000 Hz	Pass Pass	0.3 0.5
	ng A at 125 Hz ng A at 8000 Hz	ng A at 125 Hz Pass ng A at 8000 Hz Pass

## 3, Response to associated sound calibrator

### N/A

The uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95 %. A coverage factor of 2 is

	c l	- End -	Λ
Calibrated by:	-U	Checked by:	$1 \sim 6$
Date:	Fong Chun Wai 01-Mar-2019	Detai	Fung Chi Yip
		Date:	02-Mar-2019

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

© Soils & Materials Engineering Co., Ltd

Form No.CARP152-2/Issue 1/Rev.C/01/02/2007



### 综合試驗 有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



# **CERTIFICATE OF CALIBRATION**

Certificate No.:	18CA0920 02		Page 1 of 2			
Item tested						
Description: Manufacturer: Type/Model No.: Serial/Equipment No.: Adaptors used:	Sound Level Mete B & K 2270 3007965 C N	er (Type 1)	3 3 3 3	Microphone B & K 4189 284646 -	Pream B & K ZC0032 17965	
Item submitted by						
Customer Name: Address of Customer: Request No.: Date of receipt:	AECOM ASIA CO - - 20-Sep-2018	. LTD.				
Date of test:	22-Sep-2018					
Reference equipment	used in the calib	ration				
Description: Multi function sound calibrator Signal generator Signal generator	Model: B&K 4226 DS 360 DS 360	Serial No. 2288444 33873 61227		Expiry Date: 23-Aug-2019 24-Apr-2019 23-Apr-2019	Traceable to: CIGISMEC CEPREI CEPREI	
Ambient conditions						
Temperature: Relative humidity: Air pressure:	21 ± 1 °C 55 ± 10 % 1005 ± 5 hPa					
Test specifications						

- 1, The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- 2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

## **Test results**

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets

Approved Signatory:

Feng Jung

22-Sep-2018 Company Chop:



**Comments:** The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long term stability of the instrument.

Date:

© Soils & Materials Engineering Co., Ltd.

Form No.CARP152-1/Issue 1/Rev.C/01/02/2007



## 综合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓

12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



2

# CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA0920 02	Page	2	of	

#### 1, **Electrical Tests**

The electrical tests were perfomed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

lest:	Subtest:	Status:	Uncertanity (dB) / Coverage Factor
Self-generated noise Linearity range for Leq	A C Lin At reference range , Step 5 dB at 4 kHz	Pass Pass Pass Pass	0.3 1.0 2.1 2.0 2.2 0.3
Linearity range for SPL Frequency weightings	A reference SPL on all other ranges 2 dB below upper limit of each range 2 dB above lower limit of each range At reference range, Step 5 dB at 4 kHz A C	Pass Pass Pass Pass Pass	0.3 0.3 0.3 0.3 0.3
Time weightings Peak response R.M.S. accuracy Time weighting I Time averaging Pulse range Sound exposure level Dverload indication	Lin Single Burst Fast Single Burst Slow Single 100µs rectangular pulse Crest factor of 3 Single burst 5 ms at 2000 Hz Repeated at frequency of 100 Hz 1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz 1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz Single burst 10 ms at 4 kHz Single burst 10 ms at 4 kHz SPI	Pass Pass Pass Pass Pass Pass Pass Pass	0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3

#### 2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Uncertanity (dB) / Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3
	Weighting A at 8000 Hz	Pass	0.5

### 3, Response to associated sound calibrator

### N/A

The uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95 %. A coverage factor of 2 is assumed unless explicitly stated



The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

C Soils & Materials Engineering Co., Ltd

Form No.CARP152-2/Issue 1/Rev C/01/02/2007



### 综合試驗 有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



# **CERTIFICATE OF CALIBRATION**

Certificate No.:	18CA1019 01-02		Page:	1	of	2
Item tested						
Description: Manufacturer: Type/Model No.: Serial/Equipment No.: Adaptors used:	Acoustical Calibrato B & K 4231 3014024 / N004.04	or (Class 1)				
Item submitted by						
Curstomer: Address of Customer: Request No.: Date of receipt:	AECOM ASIA CO L - - 19-Oct-2018	IMITED				
Date of test:	19-Oct-2018					
Reference equipment	used in the calibr	ation				
Description: Lab standard microphone Preamplifier Measuring amplifier Signal generator Digital multi-meter Audio analyzer Universal counter	Model: B&K 4180 B&K 2673 B&K 2610 DS 360 34401A 8903B 53132A	Serial No. 2341427 2743150 2346941 61227 US36087050 GB41300350 MY40003662	Expiry Date: 20-Apr-2019 27-Apr-2019 08-May-2019 24-Apr-2019 23-Apr-2019 23-Apr-2019 24-Apr-2019		Traceabl SCL CEPREI CEPREI CEPREI CEPREI CEPREI CEPREI	le to:
Ambient conditions						
Temperature: Relative humidity: Air pressure:	20 ± 1 °C 50 ± 10 % 1005 ± 5 hPa					
Test specifications						

1, The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B and the lab calibration procedure SMTP004-CA-156.

2, The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.

3. The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

### **Test results**

This is to certify that the sound calibrator conforms to the requirements of annex B of IEC 60942: 1997 for the conditions under which the test was performed. This does not imply that the sound calibrator meets IEC 60942 under any other conditions.

Details of the performed measurements are presented on page 2 of this certificate.



Approved Signatory:

ZU Feng Junqi

20-Oct-2018 Company Chop:

**Comments:** The results reported in this certificate refer to the conditon of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

Date:

© Soils & Materials Engineering Co. Ltd

Form No CARP156-1/Issue 1/Rev D/01/03/2007



## 綜合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD.

香港黃竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



# **CERTIFICATE OF CALIBRATION**

(Continuation Page)

Certificate No.:

18CA1019 01-02

Page: 2 of 2

2 Of 2

### 1, Measured Sound Pressure Level

The output Sound Pressure Level in the calibrator head was measured at the setting and frequency shown using a calibrated laboratory standard microphone and insert voltage technique. The results are given in below with the estimated uncertainties.

Frequency	Output Sound Pressure	Measured Output	Estimated Expanded
Shown	Level Setting	Sound Pressure Level	Uncertainty
Hz	dB	dB	dB
1000	94.00	94.22	0.10

### 2, Sound Pressure Level Stability - Short Term Fluctuations

The Short Term Fluctuations was determined by measuring the maximum and minimum of the fast weighted DC output of the B&K 2610 measuring amplifier over a 20 second time interval as required in the standard. The Short Term Fluctuation was found to be:

At 1000 Hz	STF = 0.007 dB
Estimated expanded uncertainty	0.005 dB

### 3, Actual Output Frequency

The determination of actual output frequency was made using a B&K 4180 microphone together with a B&K 2673 preamplifier connected to a B&K 2610 measuring amplifier. The AC output of the B&K 2610 was taken to an universal counter which was used to determine the frequency averaged over 20 second of operation as required by the standard. The actual output frequency at 1 KHz was:

At 1000 Hz	Actual Frequency = 1000.0 Hz	
Estimated expanded uncertainty	0.1 Hz	Coverage factor k = 2.2

### 4, Total Noise and Distortion

For the Total Noise and Distortion measurement, the unfiltered AC output of the B&K 2610 measuring amplifier was connected to an Agilent Type 8903 B distortion analyser. The TND result at 1 KHz was:

At 1000 Hz	TND = 0.2 %
Estimated expanded uncertainty	0.7 %

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

	A	- End -	l
Calibrated by:	1~	Checked by:	Auth
Date:	Fung Chi Yip) 19-Oct-2018	Date:	Shek Kwong Tat 20-Oct-2018

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

© Soils & Materials Engineering Co. Ltd

Form No CARP156-2/Issue 1/Rev.C/01/05/2005

Appendix C2

Photographs – Noise Measurement at Representative NSRs





Appendix C2 - Page 1



Appendix C2 - Page 2

Appendix C3

Measurement Results at Representative NSRs

			Fixed Plant Noise		Background Noise		Difference between
Measurement Location ID	Measurement Date	Operation Scenario <sup>(1)(2)</sup>	Measurement Time	Measured Noise Level,L <sub>Aeq 30mins</sub> , dB(A)	Measurement Time	Background Noise Level, L <sub>Aeq 5mins</sub> , dB(A)	Measured Noise Level and Background Level, dB(A)
DIH-4-2 <sup>(3)</sup>	24/5/2019 - 25/5/2019	Daytime and Evening	22:19:00 - 22:48:59	63.1	21:00:09 - 21:05:08	63.1	0.0
DIH-20-1 <sup>(3)</sup>	24/5/2019 - 25/5/2019	Daytime and Evening	22:19:00 - 22:48:59	55.8	21:00:09 - 21:05:08	58.1	-2.3
		Daytime and Evening	22:19:00 - 22:48:59	67.3	21:00:09 - 21:05:08	66	1.3
DIH-21-1	24/5/2019 - 25/5/2019	Night-time	23:08:00 - 23:37:59	67.2	00:03:31 - 00:08:30	68.9	-1.7
		Daytime and Evening	22:19:00 - 22:48:59	63.8	21:00:09 - 21:05:08	63.6	0.2
DIH-23-1	24/5/2019 - 25/5/2019	Night-time	23:08:00 - 23:37:59	63.4	00:03:31 - 00:08:30	64.6	-1.2

Notes:

(1) Daytime and evening period (i.e 0700 to 2300 hours) and night-time period (i.e. Night: 2300 to 0700 hours).

(2) Fixed plant noise operation during daytime/evening and nigth-time periods have been included according to corresponding fixed plant noise measurement.

(3) There is no sensitive use during night-time period at the place of worship (i.e. DIH-4-2) and educational institution (i.e. DIH-20-1).

Fixed Plant Noise Audit Report (Batch 5C – Sung Wong Toi Station (SUW))

# Shatin to Central Link – Tai Wai to Hung Hom Section and Stabling Sidings at Hung Hom Freight Yard

Fixed Plant Noise Audit Report

(Batch 5c – Sung Wong Toi Station (SUW))

(July 2019)

		Ant
Certified by:	Fredrick Leong	$\sim$

Position: Independent Environmental Checker

Date:\_\_\_\_ I Ang 2.19

# Shatin to Central Link – Tai Wai to Hung Hom Section and Stabling Sidings at Hung Hom Freight Yard

Fixed Plant Noise Audit Report

(Batch 5c – Sung Wong Toi Station (SUW))

(July 2019)

		$\cap$	
Certified by:	Lisa Poon	K	

Position: Environmental Team Leader

Date: 1 Aug 2019

# AECOM

## **MTR Corporation Limited**

## Consultancy Agreement No. C11033

# Shatin to Central Link - Tai Wai to Hung Hom Section [SCL(TAW – HUH)] and Stabling Sidings at Hung Hom Freight Yard [SCL(HHS)]

## Fixed Plant Noise Audit Report (Batch 5C – Sung Wong Toi Station (SUW))

## July 2019

		Name		Signature
Prepared & Checked:	pp	Isaac Chu		
Reviewed & Approved:	np 1	Josh Lam		Apeli
Version:	A		Date:	25 July 2019
This Report is prepared for MTR Corporation Limited and is given for its sole benefit in relation to and pursuant to Consultancy Agreement No. C11033 and may not be disclosed to, quoted to or relied upon by any person other than MTR Corporation Limited without our prior written consent. No person (other than MTR Corporation Limited) into whose possession a copy of this Report comes may rely on this Report without our express written consent and MTR Corporation Limited may not rely on it for any purpose other than as described above.				

AECOM Asia Co. Ltd. 8/F, Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, NT, Hong Kong Tel: (852) 3922 9000 Fax: (852) 3922 9797 www.aecom.com

## **Table of Content**

## Page

1	INTRO	DUCTION	1
	1.1 1.2	Background Purpose of This Report	1 2
2	UPDA	TED SOUND POWER LEVELS OF FIXED PLANT NOISE SOURCES	3
3	MEAS	UREMENT METHODOLOGY	5
	3.1 3.2	Noise Measurement to obtain the SWLs of Fixed Plant Noise Sources	5
4	MEAS	UREMENT RESULTS	3
	4.1 4.2	Noise Measurement to obtain the SWLs of Fixed Plant Noise Sources	3 Э
5	CONC	LUSION	1

## List of Tables

- Table 2.1
   Summary of Updated Maximum Allowable SWLs for Fixed Plant Noise Sources at SUW
- Table 3.1 Noise Measurement Equipment
- Table 3.2Measurement Schedule
- Table 3.3
   Noise Measurement Equipment
- Table 3.4
   Noise Measurement Locations
- Table 3.5Measurement Schedule
- Table 4.1
   Summary of Measured SWLs for Fixed Plants
- Table 4.2
   Noise Measurement Results at Measurement Locations

## **List of Figures**

C1103/C/SCL/ACM/M52/055	Locations of NSRs and Fixed Noise Sources (Sung Wong Toi Station)
C1103/C/SCL/ACM/M52/056	Locations of Noise Measurement Points (Sung Wong Toi Station)

## **List of Appendices**

Appendix A	Proposal for L Sources (Batch	Jpdating Maximum Allowable Sound Power Levels of Fixed Plant 5C – Sung Wong Toi Station)
Appendix B	Noise Measure	ment to obtain the SWLs of Fixed Plant Noise Sources
	Appendix B1 Appendix B2 Appendix B3	Measurement Methodology Calibration Certificates – Noise Measurement for Fixed Plant Noise Photographs showing the Examples of Noise Measurement for Fixed Plant Noise
	Appendix B4	Noise Measurement Results

Appendix CNoise Measurement to Confirm any Tonal, Impulsive and Intermittent Characteristics<br/>from the Fixed Plant Nose Sources at Representative NSRsAppendix C1Calibration Certificates – Noise Measurement at Representative<br/>NSRsAppendix C2Photographs – Noise Measurement at Representative NSRs<br/>Noise Measurement Results at Representative NSRs

## 1 INTRODUCTION

## 1.1 Background

- 1.1.1 The Shatin to Central Link (SCL) is a 17km extension of the existing Ma On Shan Line (MOL) and East Rail Line (EAL) comprising (i) The East-West Corridor which extends the MOL from Tai Wai to Hung Hom via East Kowloon to connect with the West Rail Line (WRL) at Hung Hom Station (HUH) and Stabling Sidings at Hung Hom Freight Yard (HHS); and (ii) The North-South Corridor which is an extension of the EAL at Hung Hom across the harbour to Admiralty Station (ADM).
- 1.1.2 Environmental Impact Assessment (EIA) Reports for SCL Tai Wai to Hung Hom Section [SCL (TAW-HUH)] (Register No. AEIAR-167/2012) and SCL Stabling Sidings at Hung Hom Freight Yard [SCL (HHS)] (Register No. AEIAR-164/2012) (hereinafter referred to as "the EIA Reports") were approved on 17 February 2012 under the Environmental Impact Assessment Ordinance (EIAO). Following the approval of the EIA Reports, the Environmental Permit (EP) (EP No: EP-438/2012), covering the construction of both SCL (TAW-HUH) and SCL (HHS) (hereinafter referred to as "the Project"), was granted on 22 March 2012. Variations of Environmental Permit (VEP) were subsequently applied for EP-438/2012 and the latest Environmental Permit (EP No: EP-438/2012/K) was issued by Director of Environmental Protection (DEP) on 4 October 2016.
- 1.1.3 Pursuant to EP Condition 2.32, at least one month before commencement of operation of the Project, the Permit Holder, MTR Corporation Ltd (MTR), shall carry out fixed plant noise audit and deposit with the Director four hardcopies and one electronic copy of an audit report showing the design of the fixed plant noise sources associated with the Project complies with the maximum sound power levels determined in the approved SCL(TAW-HUH) EIA Report (Register No. AEIAR-167/2012) and SCL(HHS) EIA Report (Register No. AEIAR-164/2012) and all relevant documents in the Register, or otherwise approved by the Director in compliance with the requirements in Technical Memorandum on Environmental Impact Assessment Process having due regard to the characteristics of tonality, impulsiveness and intermittency.
- 1.1.4 Since the installation of fixed plant along the SCL (TAW-HUH) and SCL (HHS) would be completed in stages, the fixed plant noise audit will be conducted in stages according to the testing and commissioning programmes in each area.
- 1.1.5 AECOM Asia Co. Ltd was commissioned by the MTR to prepare the fixed plant noise audit report to check the compliance of the maximum sound power levels (SWLs) and to undertake noise measurement at the representative Noise Sensitive Receivers (NSRs) for investigation of any characteristics of tonality, impulsiveness and intermittency from the fixed plant noise sources associated with the Project.
- 1.1.6 Based on the latest design information, the maximum allowable SWLs of fixed plant items has been updated to reflect the latest design of the Project, and therefore Proposals were prepared to present the updated maximum allowable sound power levels (SWLs) of the fixed plant items at different stations of the Project. The Proposal for Updating Maximum Allowable Sound Power Levels of Fixed Plant Sources (Batch 5C Sung Wong Toi Station (SUW)) (hereinafter referred to as "the Proposal (Batch 5C SUW") (Appendix A refers) was approved by DEP on 17 July 2019.
- 1.1.7 This Fixed Plant Noise Audit Report (Batch 5C Sung Wong Toi (SUW)) (hereinafter referred to as "the FPNAR (Batch 5C SUW)" presents the noise measurement methodology and measurement results at the fixed plant noise sources of SUW and at the representative NSRs near SUW, for checking compliance with the maximum allowable sound power levels (SWLs) determined in the Proposal (Batch 5C SUW).

## 1.2 Purpose of This Report

- 1.2.1 This Report presents the noise measurement methodology and measurement results at the fixed plant noise sources of SUW and at the representative NSRs near SUW.
- 1.2.2 This Report comprises the following sections:
  - Section 1 presents the background information.
  - Section 2 presents the Updated SWL of fixed plant noise sources.
  - Section 3 presents the noise measurement methodology.
  - Section 4 presents the noise measurement results.
  - Section 5 presents the conclusions.

## 2 UPDATED SOUND POWER LEVELS OF FIXED PLANT NOISE SOURCES

2.1.1 The updated maximum allowable SWL of fixed plant noise sources at SUW are extracted from the Proposal (Batch 5C – SUW) and are summarised in **Table 2.1**. The updated fixed plant noise sources locations at SUW are shown in **Figure No. C1103/C/SCL/ACM/M52/055**. The measured noise level of fixed plant noise sources during the commissioning test shall comply with the maximum allowable SWLs as summarised in **Table 2.1**. Appropriate corrections in tonal, impulsive or intermittent characteristics should be applied, where applicable, in accordance with the IND-TM during the commissioning test conducted at the representative NSRs.

	Fixed Plant		Maximum Allowable SWL, dB(A) <sup>(1)</sup>	
Location	ID.	Fixed Plant Source	Daytime & Evening <sup>(2)</sup>	Night-time <sup>(2)</sup>
	SUW-01A	Tunnel Ventilation Louver	102	94
	SUW-01B	Tunnel Ventilation Louver	100	92
	SUW-02	Tunnel Ventilation Louver	97	89
	SUW-03	Tunnel Ventilation Louver	106	98
	SUW-04	Tunnel Ventilation Louver	92	84
	SUW-05	Tunnel Ventilation Louver	87	79
	SUW-06	Tunnel Ventilation Louver	97	89
	SUW-07	Station Ventilation Louver	83	77
	SUW-08	Station Ventilation Louver	85	77
	SUW-09	Station Ventilation Louver	88	80
	SUW-10	Station Ventilation Louver	81	73
	SUW-11	Station Ventilation Louver	84	76
	SUW-12	Station Ventilation Louver	85	77
	SUW-13	Station Ventilation Louver	89	81
	SUW-14	Tunnel Ventilation Louver	94	86
	SUW-15	Tunnel Ventilation Louver	100	87
SUW	SUW-16	Tunnel Ventilation Louver	99	87
	SUW-17, 18	Tunnel Ventilation Louver	82	74
	SUW-19	Tunnel Ventilation Louver	94	86
	SUW-22	Station Ventilation Louver	82	72
	SUW-23	Station Ventilation Louver	87	73
	SUW-24	Station Ventilation Louver	85	77
	SUW-25	Station Ventilation Louver	83	75
	SUW-26	Station Ventilation Louver	81	73
	SUW-28	Station Ventilation Louver	103	95
	SUW-29	Station Ventilation Louver	82	74
	SUW-31	Station Ventilation Louver	96	88
	SUW-32	Station Ventilation Louver	96	88
	SUW-35	Station Ventilation Louver	89	81
	SUW-37	Station Ventilation Louver	88	80
	SUW-40	Station Ventilation Louver	102	94
	SUW-45	Station Ventilation Louver	88	80
	SUW-50	Station Ventilation Louver	87	79

 Table 2.1
 Summary of Updated Maximum Allowable SWLs for Fixed Plant Noise

 Sources at SUW

Lesstian	Fixed Plant	Fined Blant One	Maximum Allowa	ble SWL, dB(A) <sup>(1)</sup>
Location	ID.	Fixed Plant Source	Daytime & Evening <sup>(2)</sup>	Night-time <sup>(2)</sup>
	SUW-51	Station Ventilation Louver	104	93
	SUW-53	Station Ventilation Louver	90	82
	SUW-58	Station Ventilation Louver	86	78
	SUW-66	Station Ventilation Louver	80	72
	VCU-101	Outdoor Unit	82	74
	VCU-102-01	Outdoor Unit	84	76
	VCU-102-02	Outdoor Unit	81	73
	VCU-103	Outdoor Unit	84	76
	VCU-104	Outdoor Unit	85	77
	VCU-031	Outdoor Unit	81	73
	VCU-032	Outdoor Unit	88	80
	VCU-033	Outdoor Unit	82	74
	VCU-035	Outdoor Unit	82	74
	VCU-171-1	Outdoor Unit	85	77
	VCU-171-2	Outdoor Unit	85	77

Notes:
(1) The maximum allowable sound power levels have due regard to the characteristics of tonality, intermittency and impulsiveness.
(2) Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours.

## 3 MEASUREMENT METHODOLOGY

## 3.1 Noise Measurement to obtain the SWLs of Fixed Plant Noise Sources

### Measurement Methodology

3.1.1 Details of measurement methodology for SCL are presented in **Appendix B1**. Noise measurements to obtain the SWLs of the fixed plant noise sources followed **Appendix B1** and were conducted by Wilson Acoustics Limited and Supreme Acoustics Research Ltd.

### Measurement Equipment

3.1.2 The sound level meters and calibrators used for noise measurements are listed in the **Table 3.1**. The instruments used for the noise measurements complied with International Electrotechnical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1). The calibration certificates of equipment are provided in **Appendix B2**.

### Table 3.1 Noise Measurement Equipment

Equipment	Model	Serial Number
Sound Level Meter	SVANTEK SVAN 955	15234
	Rion NA-28	30431893
Calibratar	SVANTEK SV30A	29088
Calibrator	CIRRUS CR:515	78572

3.1.3 Before and after each series of measurements, a calibration check was carried out on the sound level meter by the calibrator. The difference between the readings made before and after each series of measurements shall be less than or equal to 1.0 dB.

### Measurement Date and Time

3.1.4 There will be daytime/evening and night-time operation modes for fixed plant sources at SUW. Nevertheless, the noise measurements at SUW were all conducted during night-time period at the fixed plant noise sources in order to minimise influence from background noise on measurement data. Details of the noise measurement schedule are shown in **Table 3.2**.

### Table 3.2 Measurement Schedule

Location	Date	
SUW -	26 & 28 November 2018	
	12, 18, 19, 21 & 26 March 2019	

# 3.2 Noise Measurement to Confirm any Tonal, Impulsive and Intermittent Characteristics from the Fixed Plant Nose Sources at Representative NSRs

### Measurement Parameters

- 3.2.1 L<sub>Aeq</sub> (30min) was measured at each designated measurement location. 1/3 octave band spectrum and time history over the measurement period was also be logged for determination of tonal, impulsiveness and intermittency characteristic.
- 3.2.2 Background noise level was measured at the same measurement location in term of L<sub>Aeq</sub> (5 min) immediate before or after the noise measurement when all Project's fixed plant equipment shut down. To minimise the measurement data being influenced by background noise, noise data obtained at an instance of minimal or no traffic on the road was used to

evaluate the tonal characteristic. The corrections for tonality, impulsiveness or intermittency at the representative NSRs was determined in accordance with IND-TM. In addition, any noticeable characteristics of tonality, impulsiveness and intermittency from the fixed plant noise sources was recorded during the measurement.

## Measurement Equipment

3.2.3 The sound level meters and calibrators used for noise measurements at representative NSRs are listed in **Table 3.3**. The instruments used for the noise measurements complied with International Electrotechnical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1). The calibration certificates of equipment are shown in **Appendix C1**.

## Table 3.3 Noise Measurement Equipment

Equipment	Model	Serial Number
Sound Level Meter	B&K 2250	3001291
	B&K 2250L	2681366
	B&K 2270	2644597
	B&K 2270	3007965
Acoustic Calibrator	B&K 4231	3006428
	Rion NC-74	34246490

3.2.4 Before and after each series of measurements, a calibration check was carried out on the sound level meter by the calibrator. The difference between the readings made before and after each series of measurements shall be less than or equal to 1.0 dB.

### Measurement Locations

3.2.5 The proposed noise measurement locations were selected at the representative NSRs where have direct line of sight to the noise sources and were accessible for noise measurement. These measurement locations were agreed with EPD prior to noise measurement. The measurement locations are summarised in **Table 3.4** and shown in **Figure No. C1103/C/SCL/ACM/M52/056**. Photographs of measurement locations are shown in **Appendix C2**.

NSR ID <sup>(1)</sup>	Description	Туре	Measurement Height
SUW-1-1	Parc 22	Residential	Rooftop of Parc 22 (1m from building façade)
SUW-3-2	Prosperity House	Residential	Rooftop of Prosperity House (1m from building façade)
SUW-P1-1	Planned NSR	Residential	1.2m above ground (free-field measurement)
TKW-19-1	Holy Trinity Church	Place of Worship	Pedestrian road adjacent to Holy Trinity Church (1.2m above ground & 1m from building façade)

Table 3.4	Noise Measurement Locations
-----------	-----------------------------

Note:

(1) To Kwa Wan Station and Ma Tau Wai Station as named in the EIA Reports have been recently renamed as Sung Wong Toi Station (SUW) and To Kwa Wan Station (TKW) respectively. The NSR Nos. are therefore updated from TKW-XX-X to SUW-XX-X and from MTW-XX-X to TKW-XX-X respectively to match with existing naming of both stations.

## Measurement Date and Time

3.2.6 For daytime/evening and night-time operation modes, noise measurement at representative NSRs was conducted during evening and night-time periods. The measurement schedule is presented in **Table 3.5**.

## Table 3.5Measurement Schedule

NSR ID	Date				
SUW-1-1, SUW-3-2, SUW-P1-1 & TKW-19-1	14 & 15 June 2019				

## 4 MEASUREMENT RESULTS

## 4.1 Noise Measurement to obtain the SWLs of Fixed Plant Noise Sources

4.1.1 The measured SWLs for daytime and evening, and night-time periods are presented in Table4.1. Photographs showing the examples of noise measurement for fixed plant noise are shown in Appendix B3. Details of the measurement results are shown in Appendix B4.

Plant Item	Measured SWL <sup>(1)</sup> , dB(A)		Maximum allowable SWL, dB(A)		Compliance (Y/N)	
	Day / Evening- time <sup>(2)</sup>	Night- time <sup>(2)</sup>	Day / Evening - time <sup>(2)</sup>	Night- time <sup>(2)</sup>	Day / Evening - time <sup>(2)</sup>	Night- time <sup>(2)</sup>
SUW-01A	88	88	102	94	Y	Y
SUW-01B	86	86	100	92	Y	Y
SUW-02	83	83	97	89	Y	Y
SUW-03	92	92	106	98	Y	Y
SUW-04	78	78	92	84	Y	Y
SUW-05	73	73	87	79	Y	Y
SUW-06	83	83	97	89	Y	Y
SUW-07	71	71	83	77	Y	Y
SUW-08	71	71	85	77	Y	Y
SUW-09	74	74	88	80	Y	Y
SUW-10	67	67	81	73	Y	Y
SUW-11	70	70	84	76	Y	Y
SUW-12	71	71	85	77	Y	Y
SUW-13	75	75	89	81	Y	Y
SUW-14	80	80	94	86	Y	Y
SUW-15	92	81	100	87	Y	Y
SUW-16	91	82	99	87	Y	Y
SUW-17, 18	68	68	82	74	Y	Y
SUW-19	80	80	94	86	Y	Y
SUW-22	68	68	82	72	Y	Y
SUW-23	73	73	87	73	Y	Y
SUW-24	71	71	85	77	Y	Y
SUW-25	69	69	83	75	Y	Y
SUW-26	67	67	81	73	Y	Y
SUW-28	89	89	103	95	Y	Y
SUW-29	68	68	82	74	Y	Y
SUW-31	82	82	96	88	Y	Y
SUW-32	82	82	96	88	Y	Y
SUW-35	75	75	89	81	Y	Y
SUW-37	74	74	88	80	Y	Y
SUW-40	88	88	102	94	Y	Y
SUW-45	74	74	88	80	Y	Y
SUW-50	73	73	87	79	Y	Y
SUW-51	90	90	104	93	Y	Y
SUW-53	76	76	90	82	Y	Y
SUW-58	72	72	86	78	Y	Y

 Table 4.1
 Summary of Measured SWLs for Fixed Plants

	Measured SWL <sup>(1)</sup> , dB(A)		Maximum allowable SWL, dB(A)		Compliance (Y/N)	
Plant Item	Day / Evening- time <sup>(2)</sup>	Night- time <sup>(2)</sup>	Day / Evening - time <sup>(2)</sup>	Night- time <sup>(2)</sup>	Day / Evening - time <sup>(2)</sup>	Night- time <sup>(2)</sup>
SUW-66	66	66	80	72	Y	Y
VCU-101	67	67	82	74	Y	Y
VCU-102-01	70	70	84	76	Y	Y
VCU-102-02	67	67	81	73	Y	Y
VCU-103	70	70	84	76	Y	Y
VCU-104	71	71	85	77	Y	Y
VCU-031	66	66	81	73	Y	Y
VCU-032	74	74	88	80	Y	Y
VCU-033	68	68	82	74	Y	Y
VCU-035	68	68	82	74	Y	Y
VCU-171-1	71	71	85	77	Y	Y
VCU-171-2	70	70	85	77	Y	Y

Notes:

(1) As discussed in S3.1.4, some plants would be operated in different modes, namely daytime/evening and night-time operation modes. For those plants operating in the same mode during daytime/evening and night-time periods, the measured SWL is same for both daytime/evening and night-time periods.

(2) Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours

# 4.2 Noise Measurement to Confirm any Tonal, Impulsive and Intermittent Characteristics from the Fixed Plant Nose Sources at NSRs

4.2.1 Noise measurement to confirm any characteristics of tonality, impulsiveness and intermittency at the representative NSRs were conducted during both evening and night-time periods. Measurement results are summarised in **Table 4.2** below. No characteristics of tonality, impulsiveness and intermittency was observed at the selected NSRs. Data analysis has been carried out to determine the characteristics of tonality, impulsiveness and intermittency by assessing the logged 1/3 octave band spectra and time history profile. Result of data analysis also indicated no characteristics of tonality, impulsiveness and intermittency is found at the representative NSRs. Detailed noise measurements results are presented in **Appendix C3**.

### Table 4.2 Noise Measurement Results at Measurement Locations

NSR ID Des		Time Period <sup>(1)&amp;(2)</sup>	Measurement Results				Characteristics of
	Description		Measured Noise Level L <sub>Aeq(30mins)</sub> , dB(A)	Background Noise Level L <sub>Aeq(5mins)</sub> , dB(A)	Difference between Measured Noise Level and Background Level, dB(A) <sup>(3)</sup>	Site Observation	Tonality, Impulsiveness and Intermittency at NSRs (Y/N)
SUW-1-1 Parc 22	Dere 22	Daytime & Evening	67.4	68.0	-0.6	Noise environment was dominated by traffic noise. Noise from SCL fixed plant was not noticeable at measurement location.	Ν
	Parc 22	Night-time	67.4	66.6	0.8		Ν
SUW-3-2 Prosperity House	Prospority House	Daytime & Evening	75.0	75.1	-0.1		Ν
	Flospenty House	Night-time	74.4	73.1	1.3		Ν
SUW-P1-1 Planned NSR	Daytime & Evening	50.8	49.9	0.9	Background noise was relative low and noise	Ν	
	Planned NSR	Night-time	51.3	51.0	0.3	trom SCL fixed plant was not noticeable at the measurement location.	Ν
TKW-19-1	Holy Trinity Church	Daytime & Evening	77.7	77.5	0.2	Noise environment was dominated by traffic noise. Noise from SCL fixed plant was not noticeable at the measurement location.	Ν

Notes:

(1) Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours

(2) Fixed plant noise operation during daytime/evening and night-time periods have been included according to corresponding fixed plant noise measurement.

(3) The measured noise levels were dominated by background noise (i.e. road traffic noise from major roads nearby). Since traffic noise fluctuated during the daytime & evening measurement periods, leading to higher background noise levels than the measured noise levels of the fixed sources at few measurement locations.

## 5 CONCLUSION

5.1.1 The fixed plant noise verification was undertaken and the measurement results indicated all the fixed plant noise levels in SUW comply with the updated maximum allowable SWLs. No characteristics of tonality, impulsiveness and intermittency was observed at the measurement locations. Result of data analysis also indicated no characteristics of tonality, impulsiveness and intermittency were found at the measurement locations.

Figures




Appendix A

Proposal for Updating Maximum Allowable Sound Power Levels of Fixed Plant Sources (Batch 5C – Sung Wong Toi Station (SUW))

# Shatin to Central Link – Tai Wai to Hung Hom Section and Stabling Sidings at Hung Hom Freight Yard

Proposal for Updating Maximum Allowable

Sound Power Levels of Fixed Plant Sources

(Batch 5A – Kai Tak Station (KAT))

(Batch 5B – Ma Chai Hang Ventilation Building (MCV))

(Batch 5C – Sung Wong Toi Station (SUW))

(June 2019)

Certified by: Fredrick Leong

Position: Independent Environmental Checker

20 June 2019 Date:

# Shatin to Central Link – Tai Wai to Hung Hom Section and Stabling Sidings at Hung Hom Freight Yard

Proposal for Updating Maximum Allowable

Sound Power Levels of Fixed Plant Sources

(Batch 5 - Kai Tak (KAT), Ma Chai Hang (MCV) and Sung

Wong Toi (SUW))

(June 2019)

Certified by:	Lisa Poon	
		1

Position: Environmental Team Leader

Date: 20 June 2019

# AECOM

# **MTR Corporation Limited**

Consultancy Agreement No. C11033

# Shatin to Central Link - Tai Wai to Hung Hom Section [SCL(TAW – HUH)] and Stabling Sidings at Hung Hom Freight Yard [SCL(HHS)]

Proposal for Updating Maximum Allowable Sound Power Levels of Fixed Plant Sources (Batch 5C – Sung Wong Toi Station (SUW))

# June 2019

	Name	Signature			
Prepared & Checked:	Isaac Chu	Thomas			
Reviewed & Approved:	Josh Lam	Ayola			
Version:	A Date	: 13 June 2019			
This Report is prepared for MTR Corporation Limited and is given for its sole benefit in relation to and pursuant to Consultancy Agreement No. C11033 and may not be disclosed to, quoted to or relied upon by any person other than MTR Corporation Limited without our prior written consent. No person (other than MTR Corporation Limited) into whose possession a copy of this Report comes may rely on this Report without our express written consent and MTR Corporation Limited may not rely on it for any purpose other than as described above.					

AECOM Asia Co. Ltd. 8/F, Grand Central Plaza, Tower 2, 138 Shatin Rural Committee Road, Shatin, NT, Hong Kong Tel: (852) 3922 9000 Fax: (852) 3922 9797 www.aecom.com

# Table of Content

1	INTR	ODUCTION	1
	1.1 1.2	Background Purpose of This Proposal	1 1
2	NOIS	E CRITERIA AND NOISE SENSITIVE RECEIVERS	2
	2.1 2.2 2.3	Environmental Legislation, Standard and Guidelines Representative Noise Sensitive Receivers Review of Area Sensitivity Rating and Assessment Criteria	2 2 3
3	UPD/ LEVE	ATE OF FIXED PLANT SOURCES AND PREDICTION OF FIXED PLANT NOISE	5
	3.1 3.2	Update of Fixed Plant Sources Prediction of Fixed Plant Noise	5 6
4	CON	CLUSION	8

# List of Tables

MTR Corporation Limited

Table 2.1	ANLs for Assessment of Noise from Fixed Sources
Table 2.2	Summary of noise criteria at representative NSRs for fixed noise sources (Reference
	from Table 8.8 of the approved EIA Report)
Table 2.3	Major Roads in the Vicinity of SUW
Table 2.4	Review of ASRs and Assessment Criteria
Table 3.1	Summary of Updated Maximum Allowable SWLs for Fixed Plant Sources
Table 3.2	Predicted Fixed Plant Noise Levels at Representative NSRs

# List of Figure

C1103/C/SCL/ACM/M52/055	Locations of NSRs and Fixed Plant Noise Sources (Sung Wong Toi
	Station)

# **List of Appendices**

Annex A Detail Calculation of Fixed Plant Noise Assessment

# 1 INTRODUCTION

# 1.1 Background

- 1.1.1 The Shatin to Central Link (SCL) is a 17km extension of the existing Ma On Shan Line (MOL) and East Rail Line (EAL) comprising (i) The East-West Corridor which extends the MOL from Tai Wai to Hung Hom via East Kowloon to connect with the West Rail Line (WRL) at Hung Hom Station (HUH) and Stabling Sidings at Hung Hom Freight Yard (HHS); and (ii) The North-South Corridor which is an extension of the EAL at Hung Hom across the harbour to Admiralty Station (ADM).
- 1.1.2 Environmental Impact Assessment (EIA) Reports for SCL Tai Wai to Hung Hom Section [SCL (TAW-HUH)] (Register No. AEIAR-167/2012) and SCL Stabling Sidings at Hung Hom Freight Yard [SCL (HHS)] (Register No. AEIAR-164/2012) (hereinafter referred to as "the EIA Reports") were approved on 17 February 2012 under the Environmental Impact Assessment Ordinance (EIAO). Following the approval of the EIA Reports, the Environmental Permit (EP) (EP No: EP-438/2012), covering the construction of both SCL (TAW-HUH) and SCL (HHS) (hereinafter referred to as "the Project"), was granted on 22 March 2012. Variations of Environmental Permit (VEP) were subsequently applied for EP-438/2012 and the latest Environmental Permit (EP No: EP-438/2012/K) was issued by Director of Environmental Protection (DEP) on 4 October 2016.
- 1.1.3 Pursuant to EP Condition 2.32, at least one month before commencement of operation of the Project, the Permit Holder, MTR Corporation Ltd (MTR), shall carry out fixed plant noise audit and deposit with the Director four hardcopies and one electronic copy of an audit report showing the design of the fixed plant noise sources associated with the Project complies with the maximum sound power levels determined in the approved SCL(TAW-HUH) EIA Report (Register No. AEIAR-167/2012) and SCL(HHS) EIA Report (Register No. AEIAR-164/2012) and all relevant documents in the Register, or otherwise approved by the Director in compliance with the requirements in Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO) having due regard to the characteristics of tonality, impulsiveness and intermittency.
- 1.1.4 AECOM Asia Co. Ltd was commissioned by the MTR to prepare the fixed plant noise audit report to check the compliance of the maximum sound power levels (SWLs) and to undertake noise measurement at the identified Noise Sensitive Receivers (NSRs) for investigation of any characteristics of tonality, impulsiveness and intermittency from the fixed plant noise sources associated with the Project.
- 1.1.5 Based on the latest design information, the maximum allowable SWLs of fixed plant items has been updated to reflect the latest design of the Project, and therefore Proposal(s) will be prepared to present the updated maximum allowable sound power levels (SWLs) of the fixed plant items at different stations of the Project.

## 1.2 Purpose of This Proposal

1.2.1 As discussed in **Section 1.1.5**, the maximum allowable SWLs of fixed plant items has been updated to reflect the latest design of the Project. This Proposal (Batch 5C – Sung Wong Toi Station (SUW)) presents the updated maximum allowable SWLs of the fixed plant noise sources at SUW.

# 2 NOISE CRITERIA AND NOISE SENSITIVE RECEIVERS

# 2.1 Environmental Legislation, Standard and Guidelines

- 2.1.1 The Noise Control Ordinance, Cap. 400 (NCO) and Environmental Impact Assessment Ordinance, Cap. 499 (EIAO) provide the statutory framework for noise control. Operational noise from fixed noise sources is controlled by Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites (IND-TM) under NCO. To plan for a better environment, the Technical Memorandum on Environmental Impact Assessment Process (TM-EIAO) under EIAO has specified the following requirements:
  - 5 dB below the appropriate ANLs in the IND-TM; or
  - the prevailing background noise levels (For quiet areas with level 5dB or more below the ANL).
- 2.1.2 The Acceptable Noise Levels (ANLs) for different Area Sensitivity Ratings (ASRs) during different periods are summarized in the **Table 2.1**.

Time Deried	ANL, dB(A)				
	ASR "A"	ASR "B"	ASR "C"		
Day (0700 to 1900 hours)	60	65	70		
Evening (1900 to 2300 hours)	60	65	70		
Night (2300 to 0700 hours)	50	55	60		

Table 2.1 ANLs for Assessment of Noise from Fixed Sources

## 2.2 Representative Noise Sensitive Receivers

2.2.1 Table 8.8 of the approved SCL (TAW-HUH) EIA Report presents the identified Noise Sensitive Receivers (NSRs) and the adopted noise assessment criteria for fixed plant noise assessment. The assessment criteria at the NSRs selected for assessing the fixed plant noise impact from SUW are summarised in **Table 2.2**.

# Table 2.2Summary of noise criteria at representative NSRs for fixed noise sources<br/>(Reference from Table 8.8 of the approved EIA Report)

Area (NSR No.)	Time Period <sup>(1)</sup>	Prevailing Background Noise Levels, dB(A) <sup>(2)</sup>	ASR	ANL-5, dB(A) <sup>(3)</sup>	Criteria, dB(A) <sup>(4)</sup>
Sung Wong Toi Station					
Dara 22 (SUW(1,1))	Day & evening	66	С	65	65
Parc 22 (50W-1-1)	Night	61	С	55	55
	Day & evening	67	В	60	60
Phince Ritz (SUW-3-1)	Night	61	В	50	50
Prosperity House (SUW-3-	Day & evening	67	В	60	60
2)	Night	61	В	50	50
Diapped NCD (CLIW/ D1 1)	Day & evening	66	В	60	60
Planned NSR (SUW-PI-I)	Night	61	В	50	50
Falt On Building (TKM/ 6.1)	Day & evening	66	С	65	65
Fok On Building (TKW-6-1)	Night	61	С	55	55
	Day & evening	66	С	65	65

Area (NSR No.)	Time Period <sup>(1)</sup>	Prevailing Background Noise Levels, dB(A) <sup>(2)</sup>	ASR	ANL-5, dB(A) <sup>(3)</sup>	Criteria, dB(A) <sup>(4)</sup>
Holy Trinity Church (TKW- 19-1)	Night	61	С	55	55

Notes:

(1) Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours.

(2) Prevailing background noise levels are extracted from Table 8.8 of approved EIA Report.

(3) A 5 dB(A) has been deducted from ANL as specified in requirement of TM-EIAO.

(4) The minimum of prevailing background noise level & ANL-5 is adopted.

#### 2.3 Review of Area Sensitivity Rating and Assessment Criteria

- 2.3.1 Area Sensitive Ratings (ASR) as defined in the approved EIA Reports were determined by the existence of any influencing factors (IFs) (e.g. major road, industrial area) according to IND-TM at the time of preparation of the EIA Reports. During the preparation of this Proposal, it is revealed that there was no major change on the land use in the vicinity of representative NSRs, and thus only the existence of any major road (i.e. annual average daily traffic flow in excess of 30,000) has been reviewed.
- 2.3.2 Based on best available information (i.e. The Annual Traffic Census 2017) during the preparation of this Proposal, three major roads have been identified in the vicinity of the NSRs near SUW and are listed in **Table 2.3** below.

Table 2.3	Maior Roads	in the Vicinit	v of SUW
	major noudo	In the trent	,

Area	Road Name	From	То	A.A.D.T. <sup>(1)</sup> (2017)
SUW	Prince Edward Road East & Flyover <k10a></k10a>	Kai Tak River	Prince Edward Road West #456	155,360
	Prince Edward Road West & Flyover <k11a></k11a>	Nga Tsin Long Road	Junction Road	74,680
	Ma Tau Chung Road	Sung Wong Toi Road	Slip Road to Olympic Avenue	67,690

Note:

(1) Annual average daily traffic (A.A.D.T.) as extracted from The Annual Traffic Census 2017 (https://www.td.gov.hk/filemanager/en/content\_4915/annual%20traffic%20census%202017.pdf).

2.3.3 Site inspections have also been conducted to determine the degree to which NSR is affected by IF. Based on site observation, it was revealed that that all representative NSRs identified in **Table 2.2** are either "directly affected" or "indirectly affected" by the major roads as listed in **Table 2.3**. As all of the representative NSRs are located in "Urban Area", some representative NSRs previously assigned with ASR"B" should be revised to ASR"C" in accordance with the IND-TM. Details of ASR and the assessment criteria for each NSR are presented in **Table 2.4** below.

 Table 2.4
 Review of ASRs and Assessment Criteria

Area (NSR No.) <sup>(1)</sup>	Type of Area <sup>(2)</sup>	Influencing Factor (IF)	Degree to which NSR is affected by IF	ASR	Time Period <sup>(3)</sup>	Prevailing Background Noise Levels, dB(A) <sup>(4)</sup>	ANL-5, dB(A) <sup>(5)</sup>	Criteria, dB(A) <sup>(6)</sup>
Sung Wong Toi								
Pare 22 (SLIW 1.1)		Ma Tau Chung Road		C	Day & evening	66	65	65
Faic 22 (30W-1-1)	(SOW-1-1) Orban Area Ma Tau Chung Road Directly Allected	C	Night	61	55	55		
$\mathbf{Prince}$ $\mathbf{Pitz}$ (SLIM/ 2.1)	Lirbon Aroo	Irban Area Prince Edward Road West & Flyover <k11a> Directly Affected C</k11a>	Day & evening	67	65	65		
Prince Ritz (SUVV-3-1)	Ulball Alea		0	Night	61	55	55	
Brospority House (SLIM 2.2)	Lirbon Aroo	Prince Edward Road		С	Day & evening	67	65	65
Flospelity House (SOW-3-2)	Ulban Alea	West & Flyover <k11a></k11a>	Directly Arrected		Night	61	55	55
Diamod NCD (CLIM/ D1 1)	Lirbon Aroo	Prince Edward Road	Indirectly	0	Day & evening	66	65	65
Planned NSR (SOW-P1-1)	Urban Area	East & Flyover <k10a></k10a>	Affected	C	Night	61	55	55
Falt On Building (TKM 6.1)	Lirbon Aroo	Ma Tau Chung Dood	Directly Affected	0	Day & evening	66	65	65
Fok On Building (TKVV-6-1)	Urban Area	Ma Tau Chung Road	Directly Affected		Night	61	55	55
Holy Trinity Church (TKW-		Ma Tau Chung Dood	Directly Affected	<u> </u>	Day & evening	66	65	65
19-1)	orban Area	IVIA TAU CHUNG KOAD	Directly Allected	C	Night	61	55	N/A (7)

Notes:

(1) To Kwa Wan Station and Ma Tau Wai Station as named in the EIA Reports have been recently renamed as Sung Wong Toi Station (SUW) and To Kwa Wan Station (TKW) respectively. The NSR Nos. are therefore updated from TKW-XX-X to SUW-XX-X and from MTW-XX-X to TKW-XX-X respectively to match with existing naming of both stations.

(2) Reference is made from Appendix 8.2 of the approved SCL(TAW-HUH) EIA report.

(3) Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours.

(4) Prevailing background noise levels are extracted from Table 8.8 of approved EIA Reports.

(5) A 5 dB(A) has been deducted from ANL as specified in requirement of TM-EIAO.

(6) The minimum of prevailing background noise level & ANL-5 is adopted.

(7) No sensitive use during night-time period is assumed.

# 3 UPDATE OF FIXED PLANT SOURCES AND PREDICTION OF FIXED PLANT NOISE LEVELS

# 3.1 Update of Fixed Plant Sources

3.1.1 The locations of updated fixed plant noise sources at SUW are shown in **Figure No. C1103/C/SCL/ACM/M52/055**. Based on latest design information, the maximum allowable SWLs for ventilation louvers and outdoor units are updated and summarized in **Table 3.1**.

Leastion	Fixed Plant	Fixed Plant Course	Maximum Allowa	ble SWL, dB(A) <sup>(1)</sup>
Location	ID.	Fixed Plant Source	Daytime & Evening <sup>(2)</sup>	Night-time <sup>(2)</sup>
	SUW-01A	Tunnel Ventilation Louver	102	94
	SUW-01B	Tunnel Ventilation Louver	100	92
	SUW-02	Tunnel Ventilation Louver	97	89
	SUW-03	Tunnel Ventilation Louver	106	98
	SUW-04	Tunnel Ventilation Louver	92	84
	SUW-05	Tunnel Ventilation Louver	87	79
	SUW-06	Tunnel Ventilation Louver	97	89
	SUW-07	Station Ventilation Louver	83	77
	SUW-08	Station Ventilation Louver	85	77
	SUW-09	Station Ventilation Louver	88	80
	SUW-10	Station Ventilation Louver	81	73
	SUW-11	Station Ventilation Louver	84	76
	SUW-12	Station Ventilation Louver	85	77
	SUW-13	Station Ventilation Louver	89	81
	SUW-14	Tunnel Ventilation Louver	94	86
	SUW-15	Tunnel Ventilation Louver	100	87
	SUW-16	Tunnel Ventilation Louver	99	87
5000	SUW-17, 18	Tunnel Ventilation Louver	82	74
	SUW-19	Tunnel Ventilation Louver	94	86
	SUW-22	Station Ventilation Louver	82	72
	SUW-23	Station Ventilation Louver	87	73
	SUW-24	Station Ventilation Louver	85	77
	SUW-25	Station Ventilation Louver	83	75
	SUW-26	Station Ventilation Louver	81	73
	SUW-28	Station Ventilation Louver	103	95
	SUW-29	Station Ventilation Louver	82	74
	SUW-31	Station Ventilation Louver	96	88
	SUW-32	Station Ventilation Louver	96	88
	SUW-35	Station Ventilation Louver	89	81
	SUW-37	Station Ventilation Louver	88	80
	SUW-40	Station Ventilation Louver	102	94
	SUW-45	Station Ventilation Louver	88	80
	SUW-50	Station Ventilation Louver	87	79
	SUW-51	Station Ventilation Louver	104	93

 Table 3.1
 Summary of Updated Maximum Allowable SWLs for Fixed Plant Sources

	Fixed Plant		Maximum Allowa	ble SWL, dB(A) <sup>(1)</sup>
Location	ID.	Fixed Plant Source	Daytime & Evening <sup>(2)</sup>	Night-time <sup>(2)</sup>
	SUW-53	Station Ventilation Louver	90	82
	SUW-58	Station Ventilation Louver	86	78
	SUW-66	Station Ventilation Louver	80	72
	VCU-101	Outdoor Unit	82	74
	VCU-102-01	Outdoor Unit	84	76
	VCU-102-02	Outdoor Unit	81	73
	VCU-103	Outdoor Unit	84	76
	VCU-104	Outdoor Unit	85	77
	VCU-031	Outdoor Unit	81	73
	VCU-032	Outdoor Unit	88	80
	VCU-033	Outdoor Unit	82	74
	VCU-035	Outdoor Unit	82	74
	VCU-171-1	Outdoor Unit	85	77
	VCU-171-2	Outdoor Unit	85	77

## Notes:

(1) The maximum allowable sound power levels have due regard to the characteristics of tonality, intermittency and impulsiveness.

(2) Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours.

# 3.2 Prediction of Fixed Plant Noise

3.2.1 With the updated maximum allowable SWLs presented in **Table 3.1**, the predicted noise levels at the representative NSRs comply with both daytime/evening and night-time criteria as presented in **Table 2.2**. The predicted noise levels are summarised in **Table 3.2** with details of calculation shown in **Annex A**.

Table 3.2	Predicted Fixed Plant Noise Levels at Representative NSRs
-----------	---

	Description	Criteri	a, dB(A)	Predicted Se Level, L <sub>eq,3</sub>	ound Pressure <sub>0mins</sub> , dB(A) <sup>(1)</sup>
חיצע אינא	Description	Daytime & Evening <sup>(2)</sup>	Night-time <sup>(2)</sup>	Daytime & Evening <sup>(2)</sup>	Night-time <sup>(2)</sup>
SUW-1-1	Parc 22	65	55	60	52
SUW-3-1	Prince Ritz	65	55	59	50
SUW-3-2	Prosperity House	65	55	58	49
SUW-P1-1	Planned NSR	65	55	65	55
TKW-6-1	Fok On Building	65	55	59	51
TKW-19-1	Holy Trinity Church	65	N/A <sup>(3)</sup>	64	N/A <sup>(3)</sup>

Notes:

(1) The predicted fixed plant noise levels have due regard to the characteristics of tonality, intermittency and impulsiveness.

(2) Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours.
(3) No sensitive use during night-time period is assumed.

# 4 CONCLUSION

- 4.1.1 The maximum allowable SWLs of fixed plant noise sources at SUW has been updated based on the latest design information. The predicted noise levels at representative NSRs comply with the noise criteria based on the updated maximum allowable SWLs of fixed plant noise sources.
- 4.1.2 The measured SWLs at each fixed plant noise source during the fixed plant noise audit shall comply with the maximum allowable SWLs as stated in the **Table 3.1**. Appropriate corrections in tonal, impulsive or intermittent characteristics should be applied, where applicable, in accordance with the IND-TM during the commissioning test.

Figure



Annex A

**Detail Calculation of Fixed Plant Noise Assessment** 

# Fixed Plant Noise Calculation - SUW NSRs (Day-time Period)

							21			<u> </u>	
Noise Assessment	Description	Plant item	Direction Facing	Horizontial	SWL,	Correction for line of	Distance Correction of Point	Façade	Predicted SPL,	Total SPL, dB(A)	Daytime Noise
Points				Distance , m	dB(A)	sight <sup>11</sup> , dB(A)	Source, dB(A)	Correction, dB(A)	dB(A) <sup>(2)</sup>		Criteria, dB(A)
Sung Wong Toi Sta	ation	-		• •			•	•	•		
SUW-1-1	Parc 22	SUW-01A	West	170	102	0	-53	3	52		
		SUW-01B	West	170	100	0	-53	3	50	1	
		SUW-02 SUW-03	Southwest	1/1	97	0	-53	3	47 57		
		SUW-04	East	167	92	0	-52	3	43	1	
		SUW-05	East	178	87	0	-53	3	37	-	
		SUW-06 SUW-07	East	172	97 83	0	-53	3	33		
		SUW-08	East	189	85	0	-54	3	34	1	
		SUW-09	South	158	88	0	-52	3	39	-	
		SUW-11	Top	196	84	0	-52	3	33	4	
		SUW-12	Тор	193	85	0	-54	3	34	1	
		SUW-13	Top	193	89	0	-54	3	38	-	
		SUW-15	Southwest	330	100	0	-52	3	N/A		
		SUW-16	Southeast	335	99	-5	-59	3	N/A	]	
		SUW-17, 18 SUW-19	Northeast	343	82 94	-10	-59	3	N/A N/A	4	
		SUW-22	Northeast	343	82	-10	-59	3	N/A	1	
		SUW-23	Northeast	343	87	-10	-59	3	N/A	4	
		SUW-25	Northwest	338	83	0	-59	3	N/A N/A	1	
		SUW-26	Southwest	334	81	0	-58	3	N/A	1	
		SUW-28	Northwest	329	103	0	-58	3	N/A N/A	4	
		SUW-31	East	205	96	-10	-54	3	35		
		SUW-32	North	201	96	0	-54	3	45	]	
		SUW-35 SUW-37	East	343	89	-10	-59	3	N/A N/A	4	
		SUW-40	North	180	102	-10	-53	3	42		
		SUW-45	West	183	88	0	-53	3	38	]	
		SUW-50 SUW-51	East	322	87 104	-10	-58	3	N/A N/A	4	
		SUW-53	West	325	90	-10	-58	3	N/A	1	
		SUW-58	West	176	86	0	-53	3	36	4	
		VCU-101	- South	221	80 82	0	-55 -54	3	28		
		VCU-102-01	-	202	84	0	-54	3	33	1	
		VCU-102-02	-	200	81	0	-54	3	30	-	
		VCU-103	-	198	84	0	-54	3	33	1	
		VCU-031	-	335	81	0	-59	3	N/A	1	
		VCU-032	-	335	88 82	0	-59	3	N/A N/A	-	
		VCU-035	-	335	82	0	-58	3	N/A	1	
		VCU-171-1	-	324	85	0	-58	3	N/A		65
SUW-3-1		VCU-171-2	-	324	85	0	86-	3	N/A	60	60
SUW-3-1	Prince Ritz	SUW-01A	West	288	102	0	-57	3	48		
		SUW-01B	West Top	288	100 97	0	-57	3	46	4	
		SUW-03	Southwest	299	106	-10	-58	3	41		
		SUW-04	East	296	92	-10	-57	3	28	1	
		SUW-05	Top	286	87 97	-10	-57	3	43	-	
		SUW-07	East	281	83	-10	-57	3	19	1	
		SUW-08	East	275	85	-10	-57	3	21	]	
		SUW-09 SUW-10	Fast	303	88	-10	-58	3	N/A 17	4	
		SUW-11	Тор	268	84	0	-57	3	30	1	
		SUW-12	Top	268	85	0	-57	3	31	4	
		SUW-13 SUW-14	Тор	266	89 94	0	-57	3	35 N/A		
		SUW-15	Southwest	249	100	-10	-56	3	37	1	
		SUW-16	Southeast	258	99 82	-10	-56	3	36	4	
		SUW-19	Northeast	235	94	0	-55	3	42		
		SUW-22	Northeast	252	82	0	-56	3	29	1	
		SUW-23 SUW-24	Northeast	252	87	0	-56	3	34	4	
		SUW-25	Northwest	228	83	0	-55	3	31	1	
		SUW-26	Southwest	230	81	-10	-55	3	19	4	
		SUW-28	Top	237	82	0	-56	3	29		
		SUW-31	East	257	96	0	-56	3	43	1	
		SUW-32	North	258	96	0	-56	3	43	-	
		SUW-37	East	233	88	0	-55	3	36	4	
		SUW-40	North	281	102	0	-57	3	48	]	
		SUW-45 SUW-50	West	276	88 87	0	-57 -51	3	34	1	1
		SUW-51	East	148	104	Ő	-51	3	56	1	
		SUW-53	West	149	90	0	-51	3	42	4	1
		SUW-66	South	283	86 80	-10	-57 -57	3	32	1	
		VCU-101	-	261	82	0	-56	3	29	1	1
		VCU-102-01	-	260	84 91	0	-56	3	31	4	
		VCU-103	<u> </u>	263	84	0	-56	3	31	j <sup> </sup>	1
		VCU-104	-	264	85	0	-56	3	32	1	
		VCU-031 VCU-032	-	253 247	81 88	0	-56	3	28	1	1
		VCU-033		249	82	0	-56	3	29	1	
		VCU-035	-	255	82	0	-56	3	29	4	
	1	VCU-1/1-1		149	85 05	U	-51	3	3/		

# Fixed Plant Noise Calculation - SUW NSRs (Day-time Period)

Noise Assessment Points	Description	Plant item	Direction Facing	Horizontial Distance , m	SWL, dB(A)	Correction for line of sight <sup>[1]</sup> , dB(A)	Distance Correction of Point Source, dB(A)	Façade Correction, dB(A)	Predicted SPL, dB(A) <sup>[2]</sup>	Total SPL, dB(A)	Daytime Noise Criteria, dB(A)
SUW-3-2			10/	070	400				40		
5010-3-2	Prosperity House	SUW-01R	West	272	102	0	-57	3	48		
		SUW-02	Top	272	97	0	-57	3	40		
		SUW-03	Southwest	283	106	-10	-57	3	42		
		SUW-04	East	283	92	-10	-57	3	28		
		SUW-05	East	274	87	-10	-57	3	23		
		SUW-06	Тор	275	97	0	-57	3	43		
		SUW-07	East	270	83	-10	-57	3	19		
		SUW-08	East	265	85	-10	-56	3	22		
		SUW-09	Fast	209	00 91	-10	-57	3	17		
		SUW-11	Top	258	84	-10	-56	3	31		
		SUW-12	Тор	256	85	0	-56	3	32		
		SUW-13	Тор	253	89	0	-56	3	36		
		SUW-14	Тор	288	94	0	-57	3	40		
		SUW-15	Southwest	292	100	0	-57	3	46		
		SUW-16	Southeast	302	99	-10	-58	3	N/A		
		SUW-17, 18	Northeast	291	82	-10	-57	3	18		
		SUW-19	Northeast	281	94	-10	-57	3	30		
		SUW-22	Northeast	298	82	-10	-57	3	18		
		SUW-23	Northwest	290	85	-10	-57	3	31		
		SUW-25	Northwest	272	83	0	-57	3	29		
		SUW-26	Southwest	273	81	0	-57	3	27		
		SUW-28	Northwest	279	103	0	-57	3	49		
		SUW-29	Тор	282	82	0	-57	3	28		
		SUW-31	East	248	96	0	-56	3	43		
1	1	SUW-32	North	245	96	0	-56	3	43		
		SUW-35	East	285	89	-5	-57	3	30		
		SUW-3/	East	2/8	88	-5	-57	3	29		
		SUW-40	W/pet	<u>∠08</u> 261	102	0	-5/ -56	3	48 25		
		SUW-50	West	104	87	0	-30	3	42		
		SUW-51	East	105	104	-10	-48	3	49		
		SUW-53	West	101	90	0	-48	3	45		
		SUW-58	West	267	86	0	-57	3	32		
		SUW-66	South	305	80	-10	-58	3	N/A		
		VCU-101	-	303	82	0	-58	3	N/A		
		VCU-102-01	-	282	84	0	-57	3	30		
		VCU-102-02	-	300	81	0	-58	3	N/A		
		VCU-103	-	104	84 95	0	-48	3	39		
		VCU-031		104	81	0	-40	3	36		
		VCU-032	-	105	88	0	-48	3	43		
		VCU-033	-	101	82	Ő	-48	3	37		
		VCU-035	-	260	82	0	-56	3	29		
		VCU-171-1	-	305	85	0	-58	3	N/A		
		VCU-171-2	•	303	85	0	-58	3	N/A	58	65
SUW-P1-1	Diamond NICD	SUW-01A	Wost	220	102	10	<b>FF</b>	2	40	1	
50W-P1-1	Planned NSR	SUW-01R	West	220	102	-10	-55	3	40		
		SUW-02	Тор	218	97	0	-55	3	45		
		SUW-03	Southwest	221	106	-10	-55	3	44		
		SUW-04	East	210	92	0	-54	3	41		
		SUW-05	East	204	87	0	-54	3	36		
		SUW-06	Тор	212	97	0	-55	3	45		
		SUW-07	East	201	83	0	-54	3	32		
		SUW-08	East	198	85	0	-54	3	34		
		SUW-10	East	210	81	0	-54	3	30		
		SUW-11	Тор	195	84	0	-54	3	33		
		SUW-12	Тор	202	85	0	-54	3	34		
		SUW-13	Тор	206	89	0	-54	3	38		
		SUW-14	Тор	218	94	0	-55	3	42		
		SUW-15	Southwest	47	100	-10	-41	3	52		
1		SUW-10 SUW-17 19	Northeast	36	99	0	-39	3	63	1	
1		SUW-19	Northeast	57	02	0	-41	3	-44 54		
1		SUW-22	Northeast	39	82	0	-40	3	45	1	
		SUW-23	Northeast	39	87	ŏ	-40	3	50		
1	1	SUW-24	Northwest	62	85	-10	-44	3	34	]	
I		SUW-25	Northwest	66	83	-10	-44	3	32		
		SUW-26	Southwest	65	81	-10	-44	3	30		
1	1	SUW-28	Northwest	59	103	-10	-43	3	53		
1		SUW-29	1 op	56	82	0	-43	3	42		
		SUW-31 SUW-32	East North	194	96	-10	-54	3	45	1	
1		SUW-35	East	52	90	-10	-34	3	50		
1		SUW-37	East	60	88	0	-43	3	48	1	
		SUW-40	North	208	102	0	-54	3	51	1	
1		SUW-45	West	213	88	-10	-55	3	26		
1		SUW-50	West	283	87	-10	-57	3	23		
1	1	SUW-51	East	279	104	0	-57	3	50		
1		SUW-53	West	288	90	-10	-57	3	26		
		SUW-58	West	217	86	-10	-55	3	24		
1		5UW-66	South	132	08	0	-50	3	33		
1		VCU-101		199	82 84	0	-54	3	31	1	
1	1	VCU-102-01	-	195	04 81	0	-04 -54	3	30		
1		VCU-103		200	84	0	-54	3	33	1	
		VCU-104		197	85	0	-54	3	34	1	
1		VCU-031	-	41	81	ŏ	-40	3	44	1	
		VCU-032	<u> </u>	47	88	0	-41	3	50		
1		VCU-033	-	45	82	0	-41	3	44		
1		VCU-035	-	39	82	0	-40	3	45		
1	1	VCU-171-1	· · ·	287	85	0	-57	3	31		
1	1	VCU-171-2		287	85	0	-57	3	31	65	65

Noise Assessment Points	Description	Plant item	Direction Facing	Horizontial Distance , m	SWL, dB(A)	Correction for line of sight <sup>[1]</sup> , dB(A)	Distance Correction of Point Source, dB(A)	Façade Correction, dB(A)	Predicted SPL, dB(A) <sup>[2]</sup>	Total SPL, dB(A)	Daytime Noise Criteria, dB(A)
TKW-6-1	Eok On Building	SUW-01A	West	197	102	0	.52	2	52		
1100-0-1	T OK OT Building	SUW-01R	West	187	102	0	-53	3	50		
		SUW-02	Тор	188	97	0	-53	3	47		
		SUW-03	Southwest	181	106	0	-53	3	56		
		SUW-04	East	190	92	-10	-54	3	31		
		SUW-05	East	199	87	-10	-54	3	26		
		SUW-06	Top	192	97	-10	-54	3	46		
		SUW-08	East	204	85	-10	-54	3	24		
		SUW-09	South	181	88	0	-53	3	38		
		SUW-10	East	190	81	-10	-54	3	20		
		SUW-11	Тор	216	84	0	-55	3	32		
		SUW-12	Тор	210	85	0	-54	3	34		
		SUW-13	Top	209	89	0	-54	3	38		
		SUW-15	Southwest	365	100	0	-59	3	N/A		
		SUW-16	Southeast	373	99	-5	-59	3	N/A		
		SUW-17, 18	Northeast	378	82	-10	-60	3	N/A		
		SUW-19	Northeast	377	94	-10	-60	3	N/A		
		SUW-22	Northeast	379	82	-10	-60	3	N/A		
		SUW-23	Northwest	379	87	-10	-60	3	N/A N/A		
		SUW-25	Northwest	368	83	0	-59	3	N/A		
		SUW-26	Southwest	367	81	0	-59	3	N/A		
		SUW-28	Northwest	362	103	0	-59	3	N/A		
		SUW-29	Тор	368	82	0	-59	3	N/A		
		SUW-31	East	223	96	-10	-55	3	34		
		SUW-35	Fast	216	96	-10	-05 -60	3	44 N/A		
		SUW-37	East	376	88	-10	-60	3	N/A	1	
		SUW-40	North	199	102	-10	-54	3	41	1	
		SUW-45	West	199	88	0	-54	3	37		
1		SUW-50	West	311	87	-10	-58	3	N/A		
		SUW-51	East	311	104	0	-58	3	N/A		
		SUW-53 SUW-58	West	313	90	-10	-58	3	N/A 25		
		SUW-66	South	259	80	0	-54	3	27		
		VCU-101	-	217	82	0	-55	3	30		
		VCU-102-01	-	220	84	0	-55	3	32		
		VCU-102-02	-	218	81	0	-55	3	29		
		VCU-103	-	215	84	0	-55	3	32		
		VCU-104	-	217	85	0	-55	3	33		
		VCU-031	-	371	88	0	-59	3	N/A		
		VCU-033	-	371	82	0	-59	3	N/A		
		VCU-035	-	372	82	0	-59	3	N/A		
		VCU-171-1	-	312	85	0	-58	3	N/A		
TK/W/ 40.4		VCU-171-2	-	312	85	0	-58	3	N/A	59	65
TKW-19-1	Holy Tripity Church	SUW-01A	West	117	102	0	-49	3	56	· · · · · · · · · · · · · · · · · · ·	
1100 15 1	Thony Thinky Ondron	SUW-01B	West	117	102	0	-49	3	54		
		SUW-02	Тор	119	97	0	-50	3	50		
		SUW-03	Southwest	122	106	0	-50	3	59		
		SUW-04	East	132	92	-10	-50	3	35		
		SUW-05	East	134	87	-10	-51	3	29		
		SUW-07	East	135	83	-10	-50	3	25		
		SUW-08	East	137	85	-10	-51	3	27		
		SUW-09	South	128	88	0	-50	3	41		
		SUW-10	East	132	81	-10	-50	3	24		
		SUW-11	l op Top	139	84	0	-51	3	36		
		SUW-13	Top	127	00 80	0	-50	3	42		
		SUW-14	Тор	127	94	0	-50	3	47	1	
		SUW-15	Southwest	293	100	0	-57	3	46	]	
		SUW-16	Southeast	303	99	-10	-58	3	N/A		
		SUW-17, 18	Northeast	303	82	-10	-58	3	N/A		
		SUW-19	Northeast	298	94 92	-10	-57	3	30 N/A	1	
		SUW-23	Northeast	307	87	-10	-58	3	N/A		
		SUW-24	Northwest	290	85	0	-57	3	31	1	
		SUW-25	Northwest	286	83	0	-57	3	29		
		SUW-26	Southwest	286	81	0	-57	3	27		
		SUW-28	Northwest	285	103	0	-57	3	49		
		SUW-29	Top	291	82	0	-57	3	28		
		SUW-32	North	128	96	-10	-50	3	49		
		SUW-35	East	300	89	-10	-58	3	24		
		SUW-37	East	296	88	-10	-57	3	24		
		SUW-40	North	128	102	0	-50	3	55		
		SUW-45	vvest Woot	121	88	0	-50	3	41		
		SUW-50	Fact	163	87 104	-10 0	-52	3	28	1	
		SUW-53	West	163	90	-10	-52	3	31	1	
		SUW-58	West	119	86	0	-49	3	40	1	
		SUW-66	South	211	80	-10	-54	3	19		
		VCU-101	-	133	82	0	-50	3	35		
		VCU-102-01	-	137	84	0	-51	3	36		
		VCU-102-02	-	130	61 94	0	-50	3	33	1	
		VCU-104		136	85	0	-50	3	37		
		VCU-031	-	300	81	Ö	-58	3	N/A	1	
		VCU-032	-	297	88	0	-57	3	34		
		VCU-033	-	298	82	0	-57	3	28		
		VCU-035	-	301	82	0	-58	3	N/A		
		VCU-1/1-1	-	163	85 85	0	-52	3	36	64	65
			-	100	55	0	JZ	5	50	04	00

Remark: [1] A negative correction of 10 dB(A) has been adopted to the direction facing of the ventilation shaft totally screened by buildings and negative correction of 5 dB(A) for NSR do not have direct line of sight to the ventilation shaft. [2] Only noise sources within 300m from the NSRs are included in the assessment.

# Fixed Plant Noise Calculation - SUW NSRs (Night-time Period)

Noise							Distance			1	
Assessment	Description	Plant item	Direction Facing	Horizontial Distance , m	SWL, dB(A)	Correction for line of sight <sup>[1]</sup> , dB(A)	Correction of Point	Façade Correction, dB(A)	Predicted SPL, dB(A) <sup>[2]</sup>	Total SPL, dB(A)	Night-time Noise Criteria, dB(A)
Points Suna Wong Toi Sta	tion		1				Source, dB(A)		(-)	L	
SUW-1-1			1		T	1	1	•	•		1
SUW-1-1	Parc 22	SUW-01A SUW-01B	West	170	94	0	-53 -53	3	44	4	
		SUW-02	Тор	171	89	0	-53	3	39	1	
		SUW-03 SUW-04	Southwest	161	98 84	0	-52	3	49	-	
		SUW-05	East	178	79	0	-53	3	29		
		SUW-06	Top	172	89	0	-53	3	39	-	
		SUW-08	East	189	77	0	-53	3	26	•	
		SUW-09	South	158	80	0	-52	3	31	1	
		SUW-10 SUW-11	Top	167	73	0	-52	3	24		
		SUW-12	Тор	193	77	Ő	-54	3	26	1	
		SUW-13 SUW-14	Top	193	81	0	-54	3	30	-	
		SUW-15	Southwest	330	87	0	-58	3	N/A		
		SUW-16	Southeast	335	87	-5	-59	3	N/A	-	
		SUW-19	Northeast	343	86	-10	-59	3	N/A N/A	1	
		SUW-22	Northeast	343	72	-10	-59	3	N/A	1	
		SUW-23 SUW-24	Northeast	343	73	-10	-59	3	N/A N/A		
		SUW-25	Northwest	335	75	0	-59	3	N/A	1	
		SUW-26 SUW-28	Southwest	334	73 95	0	-58	3	N/A N/A	4	
		SUW-29	Тор	334	74	0	-58	3	N/A	1	
		SUW-31	East	205	88	-10	-54	3	27	-	
		SUW-35	East	343	81	-10	-59	3	N/A	j	
		SUW-37	East	343	80	-10	-59	3	N/A	1	
		SUW-40 SUW-45	West	180	94 80	-10	-53 -53	3	34 30		
		SUW-50	West	322	79	-10	-58	3	N/A	1	
		SUW-51 SUW-53	East West	321	93 82	-10	-58	3	N/A N/A	4	
		SUW-58	West	176	78	0	-53	3	28	1	
		SUW-66	South	221	72	0	-55	3	20	-	
		VCU-102-01	-	200	76	0	-54	3	25	·	
		VCU-102-02	-	200	73	0	-54	3	22	1	
		VCU-103	-	198	76	0	-54 -54	3	25	•	
		VCU-031	-	335	73	0	-59	3	N/A	1	
		VCU-032 VCU-033	-	335	80 74	0	-59	3	N/A N/A	-	
		VCU-035	-	335	74	0	-58	3	N/A	1	
		VCU-171-1	-	324	77	0	-58	3	N/A N/A	52	55
SUW-3-1		100 1112		524					IN/A	52	
SUW-3-1	Prince Ritz	SUW-01A	West	288	94	0	-57	3	40	-	
		SUW-02	Тор	288	89	0	-57	3	35		
		SUW-03	Southwest	299	98	-10	-58	3	33	4	
		SUW-04	East	296	84 79	-10	-57	3	15	•	
		SUW-06	Тор	289	89	0	-57	3	35	1	
		SUW-07 SUW-08	East	281	77	-10	-57	3	13	-	
		SUW-09	South	303	80	-10	-58	3	N/A		
		SUW-10	East	296	73	-10	-57	3	9	-	
		SUW-12	Тор	268	76	0	-57	3	22	1	
		SUW-13	Тор	266	81	0	-57	3	27	1	
		SUW-14 SUW-15	l op Southwest	303 249	86 87	-10	-58	3	N/A 24	1	
		SUW-16	Southeast	258	87	-10	-56	3	24	1	
		SUW-17, 18 SUW-19	Northeast Northeast	245	74 86	0	-56	3	21	1	
		SUW-22	Northeast	252	72	0	-56	3	19	1	
		SUW-23	Northeast	252	73	0	-56	3	20	1	
		SUW-25	Northwest	231	75	0	-55	3	25	•	
		SUW-26	Southwest	230	73	-10	-55	3	11	1	
		SUW-28 SUW-29	Top	237	95 74	0	-56	3	42	1	
		SUW-31	East	257	88	0	-56	3	35	1	
		SUW-32 SUW-35	North	258	88	0	-56	3	35	-	
		SUW-37	East	239	80	0	-55	3	28		
		SUW-40	North	281	94	0	-57	3	40	4	
		SUW-50	West	149	79	0	-ə/ -51	3	20 31	j	
		SUW-51	East	148	93	0	-51	3	45	1	
		SUW-53 SUW-58	West	149 283	82 78	0	-51 -57	3	34	1	
		SUW-66	South	294	72	-10	-57	3	8	1	
		VCU-101	-	261	74	0	-56	3	21	4	
		VCU-102-02	-	262	73	0	-op -56	3	23	j	
		VCU-103	-	263	76	0	-56	3	23	1	
		VCU-104 VCU-031	-	264 253	77	0	-56 -56	3	24 20	1	
		VCU-032	-	247	80	0	-56	3	27	1	
		VCU-033 VCU-035	-	249	74	0	-56	3	21	1	
		VCU-171-1		149	77	0	-51	3	29	1	
	1	VCU-171-2	-	149	77	0	-51	3	29	50	55

# Fixed Plant Noise Calculation - SUW NSRs (Night-time Period)

Noise Assessment Points	Description	Plant item	Direction Facing	Horizontial Distance , m	SWL, dB(A)	Correction for line of sight <sup>[1]</sup> , dB(A)	Distance Correction of Point Source, dB(A)	Façade Correction, dB(A)	Predicted SPL, dB(A) <sup>[2]</sup>	Total SPL, dB(A)	Night-time Noise Criteria, dB(A)
SUW-3-2	Drooperity House	SUW-01A	Wost	070	04	0	57	2	40		[
3010-3-2	Prospenty House	SUW-01B	West	272	94	0	-57	3	38		
		SUW-02	Тор	272	89	0	-57	3	35		
		SUW-03	Southwest	283	98	-10	-57	3	34	_	
		SUW-04 SUW-05	East	283	84	-10	-57	3	20	-	
		SUW-05	Top	274	89	-10	-57	3	35		
		SUW-07	East	270	77	-10	-57	3	13		
		SUW-08	East	265	77	-10	-56	3	14		
		SUW-09	South	289	80	-10	-57	3	16	-	
		SUW-10	East	283	73	-10	-57	3	9	-	
		SUW-12	Top	256	70	0	-56	3	23		
		SUW-13	Тор	253	81	Ő	-56	3	28		
		SUW-14	Тор	288	86	0	-57	3	32		
		SUW-15	Southwest	292	87	0	-57	3	33	-	
		SUW-16	Southeast	302	87	-10	-58	3	N/A	-	
		SUW-19	Northeast	291	86	-10	-57	3	22		
		SUW-22	Northeast	298	72	-10	-57	3	8		
		SUW-23	Northeast	298	73	-10	-57	3	9		
		SUW-24	Northwest	275	77	0	-57	3	23	-	
		SUW-25	Northwest	272	75	0	-57	3	21	-	
		SUW-26 SUW-28	Northwest	273	73 95	0	-57	3	19	-	
		SUW-29	Top	282	74	0	-57	3	20		
		SUW-31	East	248	88	0	-56	3	35		
		SUW-32	North	245	88	0	-56	3	35	-	
		SUW-35	East	285	81	-5	-57	3	22	4	
		SUW-37 SUW-40	East	278	94	-5	-57	3	40	1	
		SUW-45	West	261	80	Ő	-56	3	27		
		SUW-50	West	104	79	0	-48	3	34		
		SUW-51	East	105	93	-10	-48	3	38	-	
		SUW-53	West	101	82	0	-48	3	37	-	
		SUW-58 SUW-66	VVest	267	78	-10	-57	3	24 N/A	1	
		VCU-101	-	250	74	0	-56	3	21		
		VCU-102-01	-	251	76	0	-56	3	23		
		VCU-102-02	-	253	73	0	-56	3	20	-	
		VCU-103	-	252	76	0	-56	3	23	-	
		VCU-104	-	297	73	0	-50	3	24		
		VCU-032	-	291	80	0	-57	3	26		
		VCU-033	-	293	74	0	-57	3	20		
		VCU-035	-	299	74	0	-58	3	19	_	
		VCU-171-1	-	102	77	0	-48	3	32	40	55
SUW-P1-1		100 1112		102		0	-40	5	32	43	
SUW-P1-1	Planned NSR	SUW-01A	West	220	94	-10	-55	3	32		
		SUW-01B	West	220	92	-10	-55	3	30	-	
		SUW-02	l op Southwoot	218	89	0	-55	3	37	-	
		SUW-03	East	221	90 84	-10	-53	3	33		
		SUW-05	East	204	79	0	-54	3	28		
		SUW-06	Тор	212	89	0	-55	3	37		
		SUW-07	East	201	77	0	-54	3	26	-	
		SUW-08	East	198	77	0	-54	3	26	-	
		SUW-10	East	210	73	0	-54	3	20		
		SUW-11	Тор	195	76	0	-54	3	25		
		SUW-12	Тор	202	77	0	-54	3	26		
		SUW-13	Тор	206	81	0	-54	3	30	-	
		SUW-14	1 op Southwost	218	86	-10	-55	3	34	-	
		SUW-16	Southeast	36	87	0	-39	3	51		
		SUW-17, 18	Northeast	46	74	0	-41	3	36		
		SUW-19	Northeast	57	86	0	-43	3	46		
		SUW-22	Northeast	39	72	0	-40	3	35		
		SUW-23 SUW-24	Northeast	39	73	-10	-40	3	36	-	
		SUW-25	Northwest	66	75	-10	-44	3	20		
		SUW-26	Southwest	65	73	-10	-44	3	22		
		SUW-28	Northwest	59	95	-10	-43	3	45	-	
		SUW-29	Top	56	/4	0	-43	3	34	-	
		SUW-32	North	204	88	-10	-54	3	27		
		SUW-35	East	52	81	0	-42	3	42		
		SUW-37	East	60	80	0	-43	3	40		
		SUW-40	North	208	94	0	-54	3	43	_	
		SUW-45 SUW-50	West	213	80	-10	-55	3	18	4	
		SUW-51	Fast	203	93	-10	-07	3	39	1	
		SUW-53	West	288	82	-10	-57	_3	18	1	
		SUW-58	West	217	78	-10	-55	3	16	]	
		SUW-66	South	132	72	0	-50	3	25	4	
		VCU-101	-	199	74	0	-54	3	23	4	
		VCU-102-01		195	70	0	-04	3	20	1	
		VCU-103	-	200	76	0	-54	3	25	1	
1	1	VCU-104	-	197	77	0	-54	3	26	]	
		VCU-031	-	41	73	0	-40	3	36	4	
		VCU-032		47	80	0	-41	3	42	4	
		VCU-033	1	45	74	0	-41	3	36	1	
		VCU-171-1	1	287	77	0	-40	3	23	1	
1	1			201				5	20		

#### Fixed Plant Noise Calculation - SUW NSRs (Night-time Period)

Noise Assessment Points	Description	Plant item	Direction Facing	Horizontial Distance , m	SWL, dB(A)	Correction for line of sight <sup>[1]</sup> , dB(A)	Distance Correction of Point Source, dB(A)	Façade Correction, dB(A)	Predicted SPL, dB(A) <sup>[2]</sup>	Total SPL, dB(A)	Night-time Noise Criteria, dB(A)
TKW-6-1											
TKW-6-1	Fok On Building	SUW-01A	West	187	94	0	-53	3	44		
		SUW-01B	West	187	92	0	-53	3	42		
		SUW-02	Тор	188	89	0	-53	3	39		
		SUW-03	Southwest	181	98	0	-53	3	48		
		SUW-04	East	190	84	-10	-54	3	23		
		SUW-05	East	199	79	-10	-54	3	18		
		SUW-06	Тор	192	89	0	-54	3	38		
		SUW-07	East	204	77	-10	-54	3	16		
		SUW-08	East	209	77	-10	-54	3	16		
		SUW-09	South	181	80	0	-53	3	30		
		SUW-10	East	190	73	-10	-54	3	12		
		SUW-11	Тор	216	76	0	-55	3	24		
		SUW-12	Тор	210	77	0	-54	3	26		
		SUW-13	Тор	209	81	0	-54	3	30		
		SUW-14	Тор	181	86	0	-53	3	36		
		SUW-15	Southwest	365	87	0	-59	3	N/A		
		SUW-16	Southeast	373	87	-5	-59	3	N/A		
		SUW-17, 18	Northeast	378	74	-10	-60	3	N/A		
		SUW-19	Northeast	377	86	-10	-60	3	N/A		
		SUW-22	Northeast	379	72	-10	-60	3	N/A		
		SUW-23	Northeast	379	73	-10	-60	3	N/A		
		SUW-24	Northwest	370	77	0	-59	3	N/A		
		SUW-25	Northwest	368	75	0	-59	3	N/A		
		SUW-26	Southwest	367	73	0	-59	3	N/A		
		SUW-28	Northwest	362	95	0	-59	3	N/A		
		SUW-29	Тор	368	74	0	-59	3	N/A		
		SUW-31	East	223	88	-10	-55	3	26		
		SUW-32	North	216	88	0	-55	3	36		
		SUW-35	East	377	81	-10	-60	3	N/A		
		SUW-37	East	376	80	-10	-60	3	N/A		
		SUW-40	North	199	94	-10	-54	3	33		
		SUW-45	West	199	80	0	-54	3	29		
		SUW-50	West	311	79	-10	-58	3	N/A		
		SUW-51	East	311	93	0	-58	3	N/A		
		SUW-53	West	313	82	-10	-58	3	N/A		
		SUW-58	West	192	78	0	-54	3	27		
		SUW-66	South	259	72	0	-56	3	19		
		VCU-101	-	217	74	0	-55	3	22		
		VCU-102-01	-	220	76	0	-55	3	24		
		VCU-102-02	-	218	73	0	-55	3	21		
		VCU-103	-	215	76	0	-55	3	24		
		VCU-104	-	217	77	0	-55	3	25	]	
		VCU-031	-	372	73	0	-59	3	N/A		
		VCU-032	-	371	80	0	-59	3	N/A		
		VCU-033	-	371	74	0	-59	3	N/A	]	
		VCU-035	-	372	74	0	-59	3	N/A	]	
		VCU-171-1	-	312	77	0	-58	3	N/A	]	
		VCU-171-2	-	312	77	0	-58	3	N/A	51	55

Remark: [1] A negative correction of 10 dB(A) has been adopted to the direction facing of the ventilation shaft totally screened by buildings and negative correction of 5 dB(A) for NSR do not have direct line of sight to the ventilation shaft. [2] Only noise sources within 300m from the NSRs are included in the assessment.

Appendix B

Noise Measurement to obtain the SWLs of Fixed Plant Noise Sources

Appendix B1

Measurement Methodology

# Method 1: Far-Field Testing Method for Louver



a: Short side of the louver

b: Long side of the louver

D: Measurement distance (separation between louver and microphone), where D must be greater than (2b) and rounded up to interger.

# Louver opening

Proposed measurement point (microphone pointing perpendicular to the center of the louvre)

For method 1,

- "D" must be greater than 2b and round up to integer.
- The microphone must point to the center of the louver.
- At least 3 sets of LAeq, 1 min should be obtained.
- Background noise measurement should be obtained for determination of background correction factor.
- Any reason causing this method cannot be performed, noise measurement should then be conducted at near field in accordance with Method 2.
- If results of measurement reveal that difference in noise levels measured at far field with and without operation of fixed plant item is less than 3.0dB(A), noise measurement should then be conducted at near field in accordance with Method 2.
- Noise measurement to confirm any tonal, impulsive and intermittent characheristics at representative NSRs.

 $SWL = Mean \ measured \ L_{Aeq, \ 1 \ min} + 20log(D) + 8 + background \ noise \ correction \ factor$ 

# Method 2: Near-Field Testing Method for Louver



# D: Measurement distance

- Louver opening
- Measurement box
- Proposed measurement point (microphone pointing perpendicular to the louvre)

For method 2 (developed based on the principle of ISO3746:2010),

- First step is to determine a hypothetical measurement surfaces with at least 1m separation (D, measured from the centre of the louvre or its nearest edges as appropriate) from the louver.
- For louvre with largest dimension ≤3D, at least one measurement at the centre of the measurement surface parallel to the louvre should be conducted.
- Minimum 10 seconds of measurement interval should be obtained at each measurement point.
- Extra localized microphone positions on the measurement surfaces in the region of high radiation should be considered. In this case follow the procedures of ISO3744.
- For louver with largest dimension > 3D, measurement surface and measurement position should follow ISO3746.
- Background noise level should be taken at each measurement point for determining the background correction (K1A).
- If the difference between the background noise and the measured noise level is less than 3.0dB, K1A should be capped to 3.0dB.
- If necessary to obtain less conservative results, D should be reduced according to ISO3746 to obtain higher measured noise levels.
- Noise measurement to confirm any tonal, impulsive and intermittent characheristics at representative NSRs.

 $SWL = Mean \ LAeq \ over \ all \ measurement \ points + 10 \ log \ (total surface \ area \ over \ the \ measurement \ box) + K1A + K2A$ 

K1A refers to background noise correction factor K2A refers to environmental correction for sound absorption and reflection

# Method 3 – Far Field Testing Method for Plant Item



"L" is the longest side of the plant item

"D, Center" is the separation between center of the plant item and microphone

"D, Surface" is the separation between surface of the plant item and microphone

- "D, Surface" must be greater than twice of L (2L) and roundup to integer (e.g 6m, 7m, 8m...).
- The microphone must be pointing to the center of the plant.
- Measurement should be carried out at the direction toward all NSRs.
- At least 3 sets of  $L_{Aeq, 1}$  min should be obtained at each the measurement point.
- Background noise measurement should be obtained for determination of background correction factor.
- Any reason causing this method cannot be performed, noise measurement should then be conducted at near field in accordance with latest edition of ISO3746 (Method 4).
- If results of measurement reveal that difference in noise levels measured at far field with and without operation of fixed plant item is less than 3.0 dB(A), noise measurement should then be conducted at near field in accordance with latest edition of ISO3746 (Method 4).
- Noise measurement to confirm any tonal, impulsive and intermittent characheristics at representative NSRs.

 $SWL = Mean measured L_{Aeq, 1 min} + 20 log (D,Center) + 8 + background noise correction factor$ 

# Method 4 – Near Field Testing Method for Plant Item

P2 P2 P1 20 2 11+220 A

Kev

For Method 4 (based on ISO3746:2010),

- Please refer to latest edition of ISO3746 for measurement requirement.
- The locations of measurement points are depended on the size of the plant, which cannot be easily generalized (see figure for example)
- Background noise measurement should be obtained for determination of background correction factor (K1A). According to ISO3746, if the source under test radiates noise predominantly in one direction or if the noise from a large source is emitted only from a small portion of the source, the usage of extra localized microphone positions on the measurement surface in the region of high radiation should be considered. In this case, follow the procedures specified in ISO3744.
- Minimum 10 seconds of measurement interval should be obtained at each measurement point.
- Detail calculation of the SWL should refer to the latest edition of ISO3746.
- Noise measurement to confirm any tonal, impulsive and intermittent characheristics at representative NSRs.

 $SWL = Mean \ L_{Aeq} \ over \ all \ measurement \ points + 10 \ log \ (total surface \ area \ over \ the \ measurement \ box) + K1A + K2A$ 

K1A refers to background noise correction factor K2A refers to environmental correction for sound absorption and reflection Shatin to Central Link Proposal of Measurement methodology for Fixed Plant Noise Measurement

# Method 5 – Near Field Testing Method for Plant Room or other source



For Method 5 (developed based on the principle of ISO3746 -2010),

- First step is to determine a measurement box with at least 1m separation (measured from the centre of the louvre or its nearest edges as appropriate) from the louver.
- Secondly, is to determine the location of measurement points on the measurement surface of the hypothetical box.
- Extra localized microphone positions on the measurement surface in the region of high radiation should be considered. In this case follow the procedures of ISO 3744.
- Background noise level should be taken for determination of background correction (K1A.
- Minimum 10 seconds of measurement interval should be obtained at each measurement point.
- If the difference between the BGL and the measured noise level (MNL) is less than 3.0dB, K1A should be capped to 3.0dB.
- If necessary to obtain less conservative results. D should be reduced according to ISO3746 to obtain higher MNLs.
- Noise measurement to confirm any tonal, impulsive and intermittent characheristics at representative NSRs.

 $SWL = Mean \ L_{Aeq} \ over \ all \ measurement \ points \ + \ 10 \ log \ (total \ surface area \ over \ the \ measurement \ box) \ + \ K1A \ + \ K2A$ 

K1A refers to background noise correction factor K2A refers to environmental correction for sound absorption and reflection Appendix B2

Calibration Certificates – Noise Measurement for Fixed Plant Noise

# Appendix B2 Calibration Certificates – Noise Measurement for Fixed Plant Noise

Cert B1: Calibration Certificate of Sound Level Meter SVANTEK 955 (SN: 15234)

Date of Issue	6-Feb-2018		Certificate Number	MLCN180200S
Customer Informatio	on and a second s			
Company Name Address	Wilson Acoustic Unit 601, Block Yuen Shun Circo Shatin, N. T.	s Limited A, Shatin Industrial Ce uit,	ntre,	
Equipment-under-To	est (EUT)			
Description Manufacturer Model Number Serial Number Equipment Number	Sound Level Me Svantek SVAN 955 15234 	ter		
Calibration Particula	ar			
Date of Calibration Calibration Equipment	6-Feb-2018 4231(MLTE008	) / PA160059 / 20-May	-2018	
Calibration Procedure	MLCG00, MLC	G15		
Calibration Conditions	Laboratory EUT	Temperature Relative Humidity Stabilizing Time Warm-up Time	23 °C ± 5 °C 55% ± 25% Over 3 hours 10 minutes	
Calibration Results	Calibration data	were detailed in the co	ntinuation pages.	
				4
Approved By & Date				
		16	K.O. Lo	6-Feb-20
Statements Calibration equipment used The results on this Calibrat include allowance for the E mishandling, misuse, and t MaxLab Calibration Centre The copy of this Certificat written approval of MaxLa	d for this calibration are ion Certificate only rel- UT long term drift, var he capacity of any othe E Limited shall not be l is is owned by MaxLab b Calibration Centre Li	e traceable to national / inte tate to the values measured a iation with environmental or r laboratory to repeat the m able for any loss or damage Calibration Centre Limited. mited.	national standards. It the time of the calibration and the uncer hanges, vibration and shoek during transp assurement. resulting from the use of the EUT. No part of this Certificate may be reprod	tainties quoted will not ortation, overloading, uced without the prior



Certificate No. MLCN180200S

SPL	righting	(dB)	Weighting	Read	i ing	Readi	ng	EUT F	rror	Calibrat Uncertai	nty	
	А	25 - 130	F	94	dB	94.0	dB	0.0	dB	0.2	dB	
	(1 kHz Input)		S	94	dB	94.0	dB	0.0	dB	0.2	dB	
			Ι	94	dB	94.0	dB	0.0	dB	0.2	dB	
	С	25 - 130	F	94	dB	94.0	dB	0.0	dB	0.2	dB	
	(1 kHz Input)		S	94	dB	94.0	dB	0.0	dB	0.2	dB	
			Ι	94	dB	94.0	dB	0.0	dB	0.2	dB	
	Z	25 - 130	F	94	dB	94.0	dB	0.0	dB	0.2	dB	
	(1 kHz Input)		S	94	dB	94.0	dB	0.0	dB	0.2	dB	
			I	94	dB	94.0	dB	0.0	dB	0.2	dB	
	Α	25 - 130	F	114	dB	114.0	dB	0.0	dB	0.2	dB	
	(1 kHz Input)	4	S	114	dB	114.0	dB	0.0	dB	0.2	dB	
			I	114	dB	114.0	dB	0.0	dB	0.2	dB	
1000	С	25 - 130	F	114	dB	114.0	dB	0.0	dB	0.2	dB	
	(1 kHz Input)		S	114	dB	114.0	dB	0.0	dB	0.2	dB	
	-	25 120	I	114	dB	114.0	dB	0.0	dB	0.2	dB	
	Z	25 - 130	F	114	dB	114.0	dB	0.0	dB	0.2	dB	
	(1 kHz Input)		S	114	dB	114.0	dB	0.0	dB	0.2	dB	
			1	-]	END -		ub	0.0	ub	0.2	ub	
Calibrated B Date :	y :		Patri 6-	ck Feb-201	8				0	Checked B Date :	y :	K.O. Lo 6-Feb-2
												Page 2

# Cert B2: Calibration Certificate of Sound Level Meter Rion NA-28 (SN: 30431893)



綜合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黃竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



# CERTIFICATE OF CALIBRATION

Certificate No.:	17CA0624 01-02		Page	1	of	2
Item tested						
Description:	Sound Level Meter (T	vpe 1) .	Microphone		Preamp	
Manufacturer:	Rion Co., Ltd.		Rion Co., Ltd.	- 20	Rion Co.	, Ltd.
Type/Model No.:	NA-28		UC-59		NH-23	
Serial/Equipment No.:	30431893		04956	,	21956	
Adaptors used:						
Item submitted by						
Customer Name:	CW - SELI Joint Vent	ure				
Address of Customer:	5C, Hong Kong Spinners Indu	strial Building, Phase 1, 6	01-603 Tai Nan West Street, C	heung	Sha Wan, Ko	wloon, Hong Kong
Request No .:	2000072119					
	A					
Date of receipt:	24-Jun-2017					
Date of receipt: Date of test:	24-Jun-2017 28-Jun-2017					
Date of receipt: Date of test: Reference equipment i	24-Jun-2017 28-Jun-2017 used in the calibrat	ion				
Date of receipt: Date of test: Reference equipment i Description:	24-Jun-2017 28-Jun-2017 used in the calibrat Model:	ion Serial No.	Expiry Date:		Tracea	ble to:
Date of receipt: Date of test: Reference equipment i Description: Multi function sound calibrator	24-Jun-2017 28-Jun-2017 used in the calibrat Model: B&K 4226	ion Serial No. 2288444	Expiry Date: 17-Jun-2018		Traceal	ble to: EC
Date of receipt: Date of test: Reference equipment i Description: Multi function sound calibrator Signal generator	24-Jun-2017 28-Jun-2017 used in the calibrat Model: B&K 4226 DS 360	ion Serial No. 2288444 33873	Expiry Date: 17-Jun-2018 25-Apr-2018		Traceal CIGISMI CEPREI	ble to: EC
Date of receipt: Date of test: Reference equipment i Description: Multi function sound calibrator Signal generator Signal generator	24-Jun-2017 28-Jun-2017 used in the calibrat B&K 4226 DS 360 DS 360	ion Serial No. 2288444 33873 61227	Expiry Date: 17-Jun-2018 25-Apr-2018 01-Apr-2018		Traceal CIGISME CEPREI CEPREI	ble to: EC
Date of receipt: Date of test: Reference equipment i Description: Multi function sound calibrator Signal generator Signal generator Ambient conditions	24-Jun-2017 28-Jun-2017 used in the calibrat Model: B&K 4226 DS 360 DS 360	ion Serial No. 2288444 33873 61227	Expiry Date: 17-Jun-2018 25-Apr-2018 01-Apr-2018		Traceal CIGISMI CEPREI CEPREI	ble to: EC
Date of receipt: Date of test: Reference equipment i Description: Multi function sound calibrator Signal generator Signal generator Ambient conditions Temperature:	24-Jun-2017 28-Jun-2017 used in the calibrat Model: B&K 4226 DS 360 DS 360 DS 360	ion Serial No. 2288444 33873 61227	Expiry Date: 17-Jun-2018 25-Apr-2018 01-Apr-2018		Traceal CIGISME CEPREI CEPREI	ble to: EC
Date of receipt: Date of test: Reference equipment i Description: Multi function sound calibrator Signal generator Signal generator Ambient conditions Temperature: Relative humidity:	24-Jun-2017 28-Jun-2017 used in the calibrat B&K 4226 DS 360 DS 360 24 ± 1 °C 50 ± 10 %	ion Serial No. 2288444 33873 61227	Expiry Date: 17-Jun-2018 25-Apr-2018 01-Apr-2018		Traceal CIGISMI CEPREI CEPREI	ble to: EC

Test specifications

- The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 1. and the lab calibration procedure SMTP004-CA-152. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and
- 2. replaced by an equivalent capacitance within a tolerance of ±20%.
- 3, The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

#### Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate

Actual Measurement data are documented on worksheets.

Approved Signatory:

1 ng Jun Qi Li. tin/F

Company Chop: 29-Jun-2017



Comments: The results reported whis certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

Date:

© Soils & Materials Engineering Co., Ltd

Form No CARP152-1/Issue 1/Rev C/01/02/2007

Hong Kong Accreditation Service (HKAS) has accredited this laboratory (Reg. No. HOKLAS 028 - CAL) under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific calibration activities as listed in the HOKLAS Directory of Accredited Laboratories. The results shown in this certificate were determined by this laboratory in accordance with its terms of accreditation. Such terms of accreditation stipulate that the results shall be traceable to the International System of Units (S.I.) or recognised measurement standards. This certificate shall not be reproduced except in full.



综合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



# CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:	17CA0624 01-02	Page	2	of	2

1, Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

Test:	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor
Self-generated noise	А	Pass	0.3	
	С	Pass	0.8	2.1
	Lin	Pass	1.6	2.2
Linearity range for Leq	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	С	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

#### 2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Expanded Uncertanity (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 8000 Hz	Pass	0.5	

3, Response to associated sound calibrator

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.



Hong Kong Accreditation Service (HKAS) has accredited this laboratory (Reg. No. HOKLAS 028 - CAL) under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific calibration activities as listed in the HOKLAS Directory of Accredited Laboratories. The results shown in this certificate were determined by this laboratory in accordance with its terms of accreditation. Such terms of accreditation stipulate that the results shall be traceable to the International System of Units (S.I.) or recognised measurement standards. This certificate shall not be reproduced except in full.

N/A
## Cert B3: Calibration Certificate of Acoustic Calibrator SV30A (SN: 29088)



# **CALIBRATION CERTIFICATE**

Date of Issue	5-Mar-2018			Certificate Numbe	r  MLCN180297S
Customer Informatio	n				
Company Name	Wilson Accoust	tics Limited			
Address	Unit 601, Block	A, Shatin Industrial Co	entre,		
	Yuen Shun Circ	cuit,			
	Shatin, N. T.,				
	Hong Kong				
Equipment-under-Te	st (EUT)				
Description	Acoustic Calibr	ator			
<b>Anufacturer</b>	Svantek				
Iodel Number	SV 30A				
erial Number	29088				
Quipment Number					
Calibration Particula	ur en		a share and		
ate of Calibration	5-Mar-2018				
Calibration Equipment	4231(MLTE00	8) / PA160059 / 20-Ma	y-18		
	1351(MLTE049	9) / MLEC17/06/02 / 6-	Jun-18		
Calibration Procedure	MLCG00, MLC	CG15			
alibration Conditions	Laboratory	Temperature	23 °C ± 5 °	С	
		Relative Humidity	55% ± 25%	5	
	EUT	Stabilizing Time	Over 3 hou	rs	
		Warm-up Time	Not applica	ible	
		Power Supply	Internal bat	tery	
Calibration Results	Calibration data	a were detailed in the co	ntinuation pag	ges.	
	All calibration	results were within EU1	specification		
Approved By & Date					
			10	K.O. Lo	5-Mar-20
•		Contraction of the local division of the loc		R.O. 20	5 Mai 20
tatements	for this calibration at	e traceable to national / inte	rnational standar	de	
The results on this Calibrati	on Certificate only re	late to the values measured a	at the time of the	calibration and the uncer	tainties quoted will not
include allowance for the El	UT long term drift, va	riation with environmental of	changes, vibratio	n and shock during transp	portation, overloading,
mishandling, misuse, and th	e capacity of any othe	er laboratory to repeat the m	easurement.	he use of the FUT	
The copy of this Certificate	is owned by MaxLab	Calibration Centre Limited.	No part of this	Certificate may be reprod	luced without the prior
written approval of MaxLab	Calibration Centre L	imited.			
					Page 1 c
			•		
		萬儀校正中心不	与限公司		
	A State of a	axLab Calibration C			

Unit B2, 9/F., Boldwin Industrial Bldg., 16-18 Wah Sing Street, Kwai Chung, N.T., Hong Kong, Tel: (852) 2116 1380 Fax: (852) 2264 6480 Email: info@maxlab.com.hk



Certificate No. MLCN180297S

EUT Setti	ing	Standard Re	eading	EUT E	ror	Calibrati Uncertain	ion nty	Spe	EUT cificat	ion
94	dB	93.7	dB	0.3	dB	0.15	dB	±	0.3	dB
114	dB	113.7	dB	0.3	dB	0.15	dB	±	0.3	dE
			- END	-						
alibrated By :		Patrick			С	hecked By :		K	.0. L	Э
ate :		5-Mar-18			D	ate :		5-	Mar-1	8

Page 2 of 2

萬儀校正中心有限公司 MaxLab Calibration Centre Limited 香港新界藝涌華星街 16-18 號保盈工業大廈 9 樓 B2 室 Unit B2, 9/F., Boldwin Industrial Bldg., 16-18 Wah Sing Street, Kwai Chung, N.T., Hong Kong Tel: (852) 2116 1380 Fax: (852) 2264 6480 Email: info@maxlab.com.hk

•

## Cert B4: Calibration Certificate of Acoustic Calibrator CIRRUS CR-515 (SN: 78572)

Hong Kong Calibration Ltd. 香港校正有限公司 COBY **Calibration Certificate** Page 1 of 2 Pages Certificate No. 811336 Customer: Leighton M&E Limited Address : 3 Dakota Drive, Kowloon City, Kowloon, Hong Kong 14-Nov-18 Order No.: Q84453 Date of receipt . . **Item Tested** Description : Sound Level Calibrator : --Manufacturer : CIRRUS I.D. : CR:515 : 78572 Serial No. Model **Test Conditions** Date of Test: 16-Nov-18 Supply Voltage : --Relative Humidity : (50 ± 25) % Ambient Temperature : (23 ± 3)°C **Test Specifications** Calibration check. Ref. Document/Procedure : Z02. **Test Results** All results were within the IEC 60942 Type1 specifications. The results are shown in the attached page(s). Main Test equipment used: Traceable to Equipment No. Description Cert. No. Spectrum Analyzer 805025 NIM-PRC & SCL-HKSAR S014 SCL-HKSAR S041 Universal Counter 802061 Sound Level Calibrator 803357 NIM-PRC & SCL-HKSAR S240 SCL-HKSAR 805027 S206 Sound Level Meter The values given in this Calibration Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Hong Kong Calibration Ltd. shall not be liable for any loss or damage resulting from the use of the equipment. The test equipment used for calibration are traceable to International System of Units (SI), or by reference to a natural constant. The test results apply to the above Unit-Under-Test only

Calibrated by :	Appro	oved by :	Chr	
Elva Chong			Kin Wong	
This Certificate is issued by: Hong Kong Calibration Ltd. Unit 88, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street, Kwai Chung, NT, H	Date:	16-Nov-18		
Tel: 2425 8801 Fax: 2425 8646				
The copyright of this certificate is owned by Hong Kong Calibration Ltd., It may not be reproduced	d except in full.			E



.Hong Kong Calibration Ltd. 香港校正有限公司

**Calibration Certificate** 



Certificate No. 811336

Page 2 of 2 Pages

Results :

1. Generated Sound Pressure Level

UUT Nominal Value (dB)	Measured Value (dB)	IEC 60942 Class 1 Spec.
94.0	93.9	± 0.4 dB

Uncertainty :  $\pm 0.2 \text{ dB}$ 

- 2. Short-term Level Fluctuation : 0.0 dB IEC 60942 Class 1 Spec. :  $\pm$  0.1 dB Uncertainty :  $\pm 0.01 \text{ dB}$
- 3. Frequency

UUT Nominal Value (kHz)	Measured Value (kHz)	IEC 60942 Class 1 Spec.
1	1.000	±1%

Uncertainty :  $\pm$  3.6 x 10 <sup>-6</sup>

- 4. Total Distortion : < 0.3 % IEC 60942 Class 1 Spec. : < 4 % Uncertainty : ± 2.3 % of reading
- Remark : 1. UUT : Unit-Under-Test
  - 2. The uncertainty claimed is for a confidence probability of not less than 95%.
  - 3. Atmospheric Pressure : 1 001 hPa.

----- END ------

The copyright of this certificate is owned by Hong Kong Calibration Ltd., It may not be reproduced except in full.

Appendix B3

Photographs showing the Examples of Noise Measurement for Fixed Plant Noise



# Appendix B3 Photographs showing the Examples of Noise Measurement for Fixed Plant Noise



Appendix B4

**Noise Measurement Results** 

## Appendix B4 Noise Measurement Results

Find Flort Source D         Paint Type         Method         Longh         With         Height         Different Unit         Bekground Ling         Different Ling (M)         Bekground Ling (M)         B		Size of Louvre/Outdoor AC unit (mm)										
Stav 0:A         Laure         2         77.0         399         NA         10         094         02.3         6.9.1         88.4         88           StW 0:0         Laure         2         200         0.155         N/A         1.0         06.1         02.5         6.9         68.4         88           StW 0:0         Laure         2         100         13.55         N/A         1.0         06.1         13.0         0.1         13.0         61.4         63.1           StW 0:0         Laure         2         173.0         47.0         N/A         1.0         07.2         94.3         1.2         1.4         7.7           StW 0:0         Laure         2         100         47.0         N/A         1.0         07.5         54.8         2.7         45.5         71.           StW 0:1         Laure         2         4500         800         N/A         1.0         53.2         53.9         4.3         54.5         71.           StW 10         Laure         2         4500         800         N/A         1.0         53.9         52.0         1.3         50.7         71.7         55.9         1.0         1.1         7	Fixed Plant Source ID	Plant Type	Method	Length	Width	Height	Measurement Distance (m) D <sup>(a)</sup>	Averaged Measured L <sub>Aeq</sub> ,dB(A) <sup>(b)</sup>	veraged Measured Background L <sub>Aeq</sub> L <sub>Aeq</sub> ,dB(A) <sup>(b)</sup> ,dB(A)	Difference L <sub>Aeq</sub> ,dB(A)	Background Corrected L <sub>Aeq</sub> ,dB(A) <sup>(c)</sup>	Calculated SWL, dB(A)
Sum Oral         Leave         2         3300         6155         N/A         1.0         69.4         62.5         6.9         68.4         66.           SUM-03         Leaver         2         712.0         72.6         44.0         10.0         66.1         93.0         73.0         65.4         83.0           SUM-04         Leaver         2         712.0         72.6         44.0         10.0         66.2         63.1         33.3         66.3         73.0         65.4         73.0         75.4         45.0         73.0         75.1         75.0         75.	SUW-01A	Louvre	2	7120	3980	N/A	1.0	69.4	62.5	6.9	68.4	88
SUM-02         Loure         2         830         1385         N/A         1.0         68.3         93.0         7.3         66.4         83           SUM-03         Loure         2         1320         6300         N/A         1.0         7.23         61.2         11.3         7.25         92.2           SUM-05         Loure         2         1320         6300         N/A         1.0         6.1.3         60.1         3.7         61.4         7.8           SUM-05         Loure         2         4400         1700         N/A         1.0         9.7.5         54.8         2.7         9.5.5         9.7           SUM-08         Loure         2         4400         2700         N/A         1.0         9.5.2         51.9         4.3         9.41         1.1           SUM-03         Loure         2         20.0         1.00         N/A         1.0         51.3         52.0         1.0         9.9         6.7           SUM-13         Loure         2         20.0         1.00         N/A         1.0         63.8         58.2         3.1         59.7         7.7         5.3         5.9         3.1         59.7         7	SUW-01B	Louvre	2	3200	6165	N/A	1.0	69.4	62.5	6.9	68.4	86
SUW-01         Learner         2         7.10         528         N/A         1.0         7.23         6.12         11.3         7.25         9.2           SUW-05         Learner         2         7120         4760         4//A         1.0         6.33         60.1         3.7         61.4         773           SUW-05         Learner         2         7100         4760         4//A         1.0         63.4         63.1         83         63.1         773         61.4         773         61.4         773         61.2         773         61.2         774         <	SUW-02	Louvre	2	8030	1365	N/A	1.0	66.3	59.0	7.3	65.4	83
SUV-94         Lower         2         330         800         N/A         1.0         63.8         60.1         3.7         61.4         78           SUV-65         Louver         2         7120         Af50         N/A         1.0         57.2         53.8         63.5         64.9         83           SUV-65         Louver         2         2100         3810         N/A         1.0         55.2         53.8         65.5         64.9         83           SUV-63         Louver         2         4400         720         N/A         1.0         55.2         53.9         64.5         54.1         71.1           SUV-61         Louver         2         4400         720         N/A         1.0         53.9         52.0         1.0         55.9         64.6         3.2         56.9         71.7         71.9           SUV-11         Louver         2         1200         N/A         1.0         57.3         55.9         6.8         54.7         70.7           SUV-15         Louver         2         3065         905.5         N/A         1.0         73.3         57.0         6.3         62.1         73.3         92.0	SUW-03	Louvre	2	7120	5280	N/A	1.0	72.5	61.2	11.3	72.5	92
SIW 05         Laure         2         7120         4750         N/A         1.0         57.2         54.3         2.9         54.2         73           SIW 00         Loure         2         460         1570         N/A         1.0         65.4         55.8         95.6         64.9         83           SIW 00         Loure         2         2000         N/A         1.0         57.5         54.8         2.7         54.5         71           SIW 01         Loure         2         6900         7700         N/A         1.0         57.7         55.6         8.2         57.7         70         50.8         54.7         70           SIW 11         Loure         2         1600         1100         N/A         1.0         67.7         55.9         8.8         54.7         70           SIW 11         Loure         2         1600         1505         N/A         1.0         63.3         55.0         1.1         50.7         71         71           SIW 12         Loure         2         305.5         1005.5         N/A         1.0         63.3         55.0         1.0         51.4         51.6         51.1         61.6 <td>SUW-04</td> <td>Louvre</td> <td>2</td> <td>3320</td> <td>6300</td> <td>N/A</td> <td>1.0</td> <td>63.8</td> <td>60.1</td> <td>3.7</td> <td>61.4</td> <td>78</td>	SUW-04	Louvre	2	3320	6300	N/A	1.0	63.8	60.1	3.7	61.4	78
SUW-06         Louvre         2         5100         3810         N/A         1.0         65.4         53.8         9.6         64.9         83           SUW-08         Louvre         2         5270         1970         N/A         1.0         55.2         51.8         4.3         54.1         71           SUW-08         Louvre         2         5270         1970         N/A         1.0         53.9         52.0         1.9         53.9	SUW-05	Louvre	2	7120	4750	N/A	1.0	57.2	54.3	2.9	54.2	73
SUW 67         Lowre         2         4460         1970         N/A         10         57.5         54.8         2.7         54.5         71.           SUW 69         Lowret         2         4400         2700         N/A         1.0         552         51.3         4.3         54.1         71.           SUW 60         Lowret         2         600         800         N/A         1.0         53.8         56.6         32.2         55.9         74           SUW 10         Lowret         2         1000         1100         N/A         1.0         65.2         51.0         71.5         52.6         67.1         71.7           SUW 13         Lowret         2         1000         259.5         N/A         1.0         60.1         73.3         57.0         16.3         73.1         87.0         16.3         73.1         87.0         16.3         73.1         87.0         16.3         73.3         92.0         90.0         N/A         1.0         73.3         57.0         16.3         73.1         87.0         16.3         73.1         87.0         16.3         73.3         92.0         90.0         N/A         1.0         73.3         57.0 <td>SUW-06</td> <td>Louvre</td> <td>2</td> <td>5100</td> <td>3810</td> <td>N/A</td> <td>1.0</td> <td>65.4</td> <td>55.8</td> <td>9.6</td> <td>64.9</td> <td>83</td>	SUW-06	Louvre	2	5100	3810	N/A	1.0	65.4	55.8	9.6	64.9	83
SUW 08         Lowre         2         5270         1970         N/A         10         562         51.9         4.3         54.1         71           SUW 09         Lowre         2         600         800         N/A         1.0         539         566         3.2         559         74           SUW-10         Lowre         2         2200         1800         N/A         1.0         539         566         3.2         559         74           SUW-11         Lowre         2         2200         1800         N/A         1.0         539         56.6         3.2         559         77         7.7         70           SUW-14         Lowre         2         3005         N/A         1.0         63         57.7         5.6         62.4         50           SUW-15         Lowre         2         3005         10055         N/A         1.0         73.3         57.0         6.3         62.4         82           SUW-15         Lowre         2         3005         10055         N/A         1.0         73.6         51.1         1.15         53.6         68           SUW-21         Lowre         2         300	SUW-07	Louvre	2	4640	1970	N/A	1.0	57.5	54.8	2.7	54.5	71
SUM-09         Lowre         2         4400         2790         N/A         1.0         58.8         56.6         3.2         56.9         74           SUM-10         Lowre         2         220         100         N/A         1.0         53.9         52.0         1.9         9.9         67           SUM-11         Lowre         2         2200         1000         N/A         1.0         53.9         52.0         1.8         9.7         75           SUM-13         Lowre         2         2000         2559         N/A         1.0         62.6         53.5         3.6         62.4         80.7           SUM-14         Lowre         2         3065         9005         N/A         1.0         63.8         55.2         5.6         62.4         80.7           SUM-15"         Lowre         2         3065         10055         N/A         1.0         63.8         57.0         63.3         62.1         81.8         66.6         51.1         11.5         61.6         82.1         53.0         63.7         63.1         63.6         63.1         63.7         63.1         63.6         63.1         63.6         63.1         63.6	SUW-08	Louvre	2	5270	1970	N/A	1.0	56.2	51.9	4.3	54.1	71
SUW-10         Louvre         2         6300         N/A         1.0         53.9         52.0         1.9         50.9         67           SUW-11         Louvre         2         1200         1100         N/A         1.0         57.7         55.9         0.4         54.7         70           SUW-12         Louvre         2         1600         1305         N/A         1.0         65.7         55.9         0.4         57.7         7.5         2.6         57.1         71           SUW-13         Louvre         2         1806         2.85         N/A         1.0         63.1         57.7         7.6         6.3         63.1         83.	SUW-09	Louvre	2	4400	2790	N/A	1.0	59.8	56.6	3.2	56.9	74
SIW-11         Louver         2         2220         1900         N/A         1.0         57.7         56.9         0.8         54.7         70           SUW-12         Louver         2         1600         1200         N/A         1.0         60.1         57.7         56.9         0.8         54.7         70           SUM-14         Louver         2         1600         2355         N/A         1.0         62.6         935.3         3.1         39.7         73           SUM-14         Louver         2         806         2905         N/A         1.0         63.8         35.2         5.6         62.4         60           SUM-15         Louver         2         8065         2905         N/A         1.0         63.6         52.1         11.5         63.6         62.1           SUM-13         Louver         2         8005         10055         N/A         1.0         63.6         52.1         11.5         63.6         62.1         63.6         63.1         63.6         63.1         63.6         63.1         63.6         63.1         63.6         63.1         63.6         63.1         63.6         63.1         63.6         63.1	SUW-10	Louvre	2	6300	800	N/A	1.0	53.9	52.0	1.9	50.9	67
SUM-12         Loure         2         1600         1100         N/A         1.0         60.1         57.5         2.6         57.1         71           SUM-13         Loure         2         3600         2565         N/A         1.0         62.6         59.5         3.1         59.7         75           SUM-15"         Loure         2         3065         590.5         N/A         1.0         63.8         58.2         5.6         62.4         80           SUM-15"         Loure         2         3065         590.5         N/A         1.0         63.3         57.0         16.3         73.3         92           SUM-16"         Loure         2         3065         10055         N/A         1.0         63.8         52.1         1.0         63.8         62.1         81.0         63.8         62.1         83.6         63.8         63.1         1.1         63.6         63.1         2.5         33.6         63.6         63.1         2.5         33.6         63.6         63.1         2.5         63.6         63.1         2.5         63.6         63.1         2.5         63.6         63.1         2.5         63.6         63.6         63.1	SUW-11	Louvre	2	2220	1900	N/A	1.0	57.7	56.9	0.8	54.7	70
SUM-13         Loure         2         1600         2595         N/A         1.0         62.6         55.5         3.1         59.7         75           SUM-14         Loure         2         3063         9905         N/A         1.0         62.8         38.2         5.6         62.4         80           SUM-15         Loure         2         3065         9905         N/A         1.0         73.3         57.0         1.6.3         73.3         92           SUM-15         Loure         2         3065         9005         N/A         1.0         63.3         57.0         6.3         62.1         81.7         1.2         1.0         73.6         59.1         1.0         73.6         93.1         1.2         75         53.6         63.1         1.0         73.6         54.1         2.5         73.6         64.9         93.1         93.1         93.1         93.2         53.6         68         93.1         93.6         93.1         93.6         93.1         93.6         93.1         93.6         93.6         93.1         93.6         93.1         93.7         73.5         93.6         93.1         93.7         93.6         93.1         93.6	SUW-12	Louvre	2	1600	1100	N/A	1.0	60.1	57.5	2.6	57.1	71
SUM-14         Loure         2         5000         2550         N/A         1.0         63.8         58.2         3.6         6.2.4         80           SUM-15         Loure         2         3065         9905         N/A         1.0         73.3         57.0         16.3         73.3         92           SUM-16         Loure         2         3065         1905         N/A         1.0         63.3         57.0         6.3         62.1         81           SUM-16         Loure         2         3065         10055         N/A         1.0         63.6         52.1         11.5         63.6         68.1           SUM-17         Loure         2         3060         1400         N/A         1.0         63.6         52.1         11.5         63.6         68.1           SUM-13         Loure         2         2600         4065         N/A         1.0         62.3         56.7         6.2         61.3         80.6           SUM-24         Loure         2         1350         2200         N/A         1.0         57.5         54.5         1.0         54.8         69           SUM-24         Loure         2	SUW-13	Louvre	2	1600	2595	N/A	1.0	62.6	59.5	3.1	59.7	75
SUM:15"         Lowre         2         3065         9905         N/A         1.0         73.3         57.0         16.3         73.3         92           SUM:16"         Lowre         2         3065         10555         N/A         1.0         63.3         57.0         6.3         62.1         81           SUM:16         Lowre         2         3065         10555         N/A         1.0         63.6         62.1         11.5         63.6         62.1           SUM:17         Lowre         2         8300         2400         N/A         1.0         63.6         54.1         2.5         53.6         68           SUM:19         Lowre         2         2800         7000         N/A         1.0         53.3         51.1         2.2         503.6         68           SUM-21         Lowre         2         3126         3665         N/A         1.0         57.2         51.0         6.2         56.0         73           SUM-24         Lowre         2         115.0         2000         N/A         1.0         57.5         58.5         4.0         52.2         65.7         17.3         74.2         89           S	SUW-14	Louvre	2	5000	2650	N/A	1.0	63.8	58.2	5.6	62.4	80
S0W-15         L0W7E         2         3065         10055         N/A         1.0         63.3         57.0         6.3         62.1         81           SUW-16         Lowre         2         3065         10055         N/A         1.0         72.9         52.9         20.0         72.9         91           SUW-17         Lowre         2         3065         10055         N/A         1.0         63.6         52.1         11.5         63.6         82           SUW-17         Lowre         2         2800         7000         N/A         1.0         63.6         52.1         11.5         63.6         82           SUW-22         Lowre         2         2800         4800         N/A         1.0         63.3         51.1         2.2         50.3         68           SUW-23         Lowre         2         3700         3065         N/A         1.0         57.8         54.9         2.9         54.8         71           SUW-24         Lowre         2         1150         2200         N/A         1.0         57.2         55.2         0.0         52.2         67           SUW-32         Lowre         2         1700<	SUW-15 <sup>(0)</sup>	Louvre	2	3065	9905	N/A	1.0	/3.3	57.0	16.3	/3.3	92
SUW-16         Lowre         2         3065         10055         N/A         1.0         72.9         52.9         2.00         72.9         91           SUW-16         Lowre         2         8305         10055         N/A         1.0         63.6         52.1         1115         63.6         682           SUW-17         Bowre         2         2800         7000         N/A         1.0         65.6         54.1         2.5         53.6         68           SUW-12         Lowre         2         2800         7000         N/A         1.0         65.6         54.1         2.5         53.6         68           SUW-32         Lowre         2         3100         3065         N/A         1.0         57.2         51.0         62.2         56.0         73           SUW-34         Lowre         2         1150         2200         N/A         1.0         57.5         84.3         -1.0         54.5         69           SUW-35         Lowre         2         1150         2200         N/A         1.0         74.2         56.7         11.5         74.2         69           SUW-35         Lowre         2         115	SUW-15	Louvre	2	3065	9905	N/A	1.0	63.3	57.0	6.3	62.1	81
S0W-16         Louvie         2         300         N/A         1.0         55.6         52.1         1.1.5         65.6         84           SUW-17, 18         Louvie         2         2600         N/A         1.0         55.6         54.1         2.5         55.6         6.1         61.6         80           SUW-22         Louvie         2         2820         4800         N/A         1.0         55.3         51.1         2.2         50.3         68           SUW-23         Louvie         2         3700         3065         N/A         1.0         57.2         51.0         6.2         56.0         73           SUW-24         Louvie         2         3125         3065         N/A         1.0         57.8         54.9         2.9         54.8         71           SUW-25         Louvie         2         1150         2200         N/A         1.0         55.2         0.0         52.2         67           SUW-26         Louvie         2         1000         1000         N/A         1.0         63.2         55.7         17.5         74.2         89           SUW-31         Louvie         2         1000 <t< td=""><td>SUW-16 (**)</td><td>Louvre</td><td>2</td><td>3065</td><td>10055</td><td>N/A</td><td>1.0</td><td>72.9</td><td>52.9</td><td>20.0</td><td>72.9</td><td>91</td></t<>	SUW-16 (**)	Louvre	2	3065	10055	N/A	1.0	72.9	52.9	20.0	72.9	91
SUW-17,18         Löuvre         2         8500         2400         N/A         1.0         58.6         54.1         2.5         53.8         68           SUW-12         Louvre         2         2600         7000         N/A         1.0         62.8         56.7         6.1         6.1         6.6         80           SUW-23         Louvre         2         3700         3065         N/A         1.0         57.2         51.0         6.2         56.0         73           SUW-24         Louvre         2         3125         3665         N/A         1.0         57.8         54.9         2.9         54.8         71           SUW-26         Louvre         2         1150         2200         N/A         1.0         57.5         58.5         1.0         54.5         69           SUW-26         Louvre         2         1700         1800         N/A         1.0         55.2         55.2         0.0         52.2         67           SUW-31         Louvre         2         1000         1000         N/A         1.0         69.4         61.4         8.0         68.7         82           SUW-32         Louvre <td< td=""><td>SUW-16</td><td>Louvre</td><td>2</td><td>3065</td><td>10055</td><td>N/A</td><td>1.0</td><td>63.6</td><td>52.1</td><td>25</td><td>63.6</td><td>82</td></td<>	SUW-16	Louvre	2	3065	10055	N/A	1.0	63.6	52.1	25	63.6	82
S0W-19         L0Wre         2         2000         // 000         N/A         1.0         62.6         36.7         6.1         6.1.6         7.6         6.2.2         7.5.7	SUW-17, 18	Louvre	2	8300	2400	N/A	1.0	50.0	54.1	2.5	53.0	80
30W-22         Louvre         2         2220         3000         N/A         1.0         33.5         21.1         2.2         2.0         30         35.5           SUW-23         Louvre         2         3125         3065         N/A         1.0         57.8         54.9         2.9         54.8         71           SUW-25         Louvre         2         1150         2200         N/A         1.0         57.5         58.5         1.0         54.8         71           SUW-26         Louvre         2         1950         2200         N/A         1.0         57.5         58.5         1.0         54.2         67           SUW-26         Louvre         2         1950         2200         N/A         1.0         74.2         56.7         17.5         74.2         89           SUW-31         Louvre         2         1000         1000         N/A         1.0         69.6         61.4         8.0         68.7         82           SUW-32         Louvre         2         800         800         N/A         1.0         63.1         55.6         7.0         61.6         74           SUW-32         Louvre         2<	SUW-19	Louvre	2	2000	7000	N/A	1.0	52.8 52.2	50.7	0.1	61.0	60
SUW-24         Loure         2         310         300         NA         1.0         512         21.0         0.2         300         1.7           SUW-24         Loure         2         3115         3065         N/A         1.0         57.8         54.9         2.9         54.8         71           SUW-25         Loure         2         1150         2200         N/A         1.0         57.8         58.5         -1.0         54.5         69           SUW-26         Loure         2         1700         1800         N/A         1.0         57.8         58.7         17.5         74.2         69           SUW-28         Loure         2         1700         1800         N/A         1.0         53.2         54.4         -1.2         50.2         68           SUW-31         Loure         2         1000         1000         N/A         1.0         69.6         61.4         8.0         68.7         82           SUW-35         Loure         2         800         800         N/A         1.0         63.1         55.6         7.5         62.2         75           SUW-35         Loure         2         800	SUW-22	Louvre	2	3700	3065	N/A	1.0	57.2	51.0	6.2	56.0	72
JUN-26         Lowre         2         J110         J000         N/A         1.0         S7.5         J8.5         L.0         J8.4.5         J11           SUW-26         Lowre         2         1150         2200         N/A         1.0         57.5         58.5         -1.0         58.4.5         69           SUW-28         Lowre         2         1700         1800         N/A         1.0         57.5         58.5         -0.0         52.2         67           SUW-28         Lowre         2         2130         6575         N/A         1.0         53.2         54.4         -1.2         50.2         68           SUW-31         Lowre         2         1000         1000         N/A         1.0         69.6         61.4         8.0         68.7         82           SUW-32         Lowre         2         800         800         N/A         1.0         63.1         55.6         7.0         61.6         75         55.6           SUW-37         Lowre         2         800         800         N/A         1.0         63.6         59.3         4.3         61.6         75           SUW-37         Lowre         2 <td>SUW-23</td> <td>Louvre</td> <td>2</td> <td>3125</td> <td>3065</td> <td>N/A</td> <td>1.0</td> <td>57.8</td> <td>54.9</td> <td>2.0</td> <td>54.8</td> <td>73</td>	SUW-23	Louvre	2	3125	3065	N/A	1.0	57.8	54.9	2.0	54.8	73
JUN-26         Louvre         2         1100         1200         N/A         1.0         55.2         55.2         0.0         52.2         67           SUW-26         Louvre         2         1700         1800         N/A         1.0         74.2         55.2         0.0         52.2         67           SUW-28         Louvre         2         1230         6575         N/A         1.0         74.2         55.7         17.5         74.2         89           SUW-31         Louvre         2         1000         1000         N/A         1.0         65.6         61.4         8.2         68.9         82           SUW-32         Louvre         2         1000         1000         N/A         1.0         69.4         61.4         8.0         68.7         82           SUW-35         Louvre         2         800         800         N/A         1.0         70.6         61.1         8.0         66.7         62.2         75           SUW-37         Louvre         2         480         700         N/A         1.0         70.6         61.1         9.3         70.0         88           SUW-31         Louvre         2 </td <td>SUW-24</td> <td>Louvre</td> <td>2</td> <td>1150</td> <td>2200</td> <td>N/A</td> <td>1.0</td> <td>57.5</td> <td>58.5</td> <td>-1.0</td> <td>54.5</td> <td>69</td>	SUW-24	Louvre	2	1150	2200	N/A	1.0	57.5	58.5	-1.0	54.5	69
SUW-28         Louvre         2         1200         1200         N/A         1.0         74.2         50.7         12.5         0.0         74.2         89           SUW-29         Louvre         2         2130         6575         N/A         1.0         74.2         56.7         117.5         74.2         89           SUW-31         Louvre         2         1000         1000         N/A         1.0         69.6         61.4         8.2         68.9         82           SUW-32         Louvre         2         1000         1000         N/A         1.0         69.4         61.4         8.0         68.7         82           SUW-32         Louvre         2         800         800         N/A         1.0         63.1         55.6         7.0         61.6         74           SUW-37         Louvre         2         382.0         423.0         N/A         1.0         62.6         55.6         7.0         61.6         74           SUW-45         Louvre         2         450         700         N/A         1.0         63.3         64.1         0.8         60.3         73           SUW-50         Louvre	SUW-26	Louvre	2	1950	2200	N/A	1.0	55.2	55.2	0.0	52.2	67
SUW-29         Louve         2         2130         6575         N/A         1.0         53.2         54.4         4.12         50.2         68           SUW-31         Louve         2         1000         1000         N/A         1.0         69.6         61.4         8.2         68.9         82           SUW-32         Louve         2         1000         1000         N/A         1.0         69.4         61.4         8.2         68.9         82           SUW-32         Louve         2         800         800         N/A         1.0         63.1         55.6         7.5         62.2         75           SUW-37         Louve         2         820         4230         N/A         1.0         63.6         55.6         7.0         61.6         74           SUW-45         Louve         2         450         700         N/A         1.0         63.6         59.3         4.3         61.6         74           SUW-50         Louve         2         450         700         N/A         1.0         63.6         59.3         4.3         61.6         74           SUW-51         Louve         2         1000	SUW-20	Louvre	2	1350	1800	N/A	1.0	74.2	56.7	17.5	74.2	89
SUW-31         Louvre         2         1000         1000         N/A         1.0         69.6         61.4         8.2         68.9         82           SUW-32         Louvre         2         1000         1000         N/A         1.0         69.6         61.4         8.2         68.9         82           SUW-32         Louvre         2         800         800         N/A         1.0         69.6         61.4         8.2         68.9         82           SUW-35         Louvre         2         800         800         N/A         1.0         63.1         55.6         7.5         62.2         75           SUW-37         Louvre         2         800         800         N/A         1.0         63.6         55.6         7.0         61.6         74           SUW-40         Louvre         2         450         700         N/A         1.0         63.6         59.3         4.3         61.6         74           SUW-50         Louvre         2         450         700         N/A         1.0         63.3         64.1         -0.8         60.3         73           SUW-53         Louvre         2         1500	SUW-29	Louvre	2	2130	6575	N/A	1.0	53.2	54.4	-1.2	50.2	68
SUW-32         Louve         2         1000         1000         N/A         1.0         69.4         61.4         8.0         68.7         82           SUW-35         Louvre         2         800         800         N/A         1.0         63.1         55.6         7.5         62.2         75           SUW-37         Louvre         2         800         800         N/A         1.0         62.6         55.6         7.5         61.6         74           SUW-40         Louvre         2         3820         4230         N/A         1.0         70.6         61.3         9.3         70.0         88           SUW-45         Louvre         2         450         700         N/A         1.0         63.6         59.3         4.3         61.6         74           SUW-50         Louvre         2         450         700         N/A         1.0         63.3         64.1         -0.8         60.3         73           SUW-51         Louvre         2         1500         3200         N/A         1.0         62.7         58.1         4.6         60.9         76           SUW-53         Louvre         2         358.0	SUW-31	Louvre	2	1000	1000	N/A	1.0	69.6	61.4	8.2	68.9	82
SUW-35         Louvre         2         800         800         N/A         1.0         63.1         55.6         7.5         62.2         75           SUW-37         Louvre         2         800         800         N/A         1.0         62.6         55.6         7.0         61.6         74           SUW-40         Louvre         2         3820         4230         N/A         1.0         70.6         61.3         9.3         70.0         88           SUW-45         Louvre         2         450         700         N/A         1.0         63.6         59.3         4.3         61.6         74           SUW-50         Louvre         2         400         1300         N/A         1.0         63.6         59.3         4.3         61.6         74           SUW-51         Louvre         2         2350         1500         N/A         1.0         62.7         58.1         4.6         60.9         76           SUW-53         Louvre         2         1500         3200         N/A         1.0         61.4         57.8         3.6         58.9         72           SUW-54         Louvre         2         3580	SUW-32	Louvre	2	1000	1000	N/A	1.0	69.4	61.4	8.0	68.7	82
SUW-37         Louvre         2         800         800         N/A         1.0         62.6         55.6         7.0         61.6         74           SUW-40         Louvre         2         3820         4230         N/A         1.0         70.6         61.3         9.3         70.0         88           SUW-45         Louvre         2         450         700         N/A         1.0         63.6         59.3         4.3         61.6         74           SUW-50         Louvre         2         400         1300         N/A         1.0         63.3         64.1         -0.8         60.3         73           SUW-51         Louvre         2         2350         1500         N/A         1.0         62.7         58.1         4.6         60.9         76           SUW-58         Louvre         2         3580         4350         N/A         1.0         61.4         57.8         3.6         58.9         72           SUW-66         Louvre         2         3580         4350         N/A         1.0         50.9         49.0         1.9         47.9         66           VCU-101         Outdor AC Unit         4 <t< td=""><td>SUW-35</td><td>Louvre</td><td>2</td><td>800</td><td>800</td><td>N/A</td><td>1.0</td><td>63.1</td><td>55.6</td><td>7.5</td><td>62.2</td><td>75</td></t<>	SUW-35	Louvre	2	800	800	N/A	1.0	63.1	55.6	7.5	62.2	75
SUW-40         Louvre         2         3820         4230         N/A         1.0         70.6         61.3         9.3         70.0         88           SUW-45         Louvre         2         450         700         N/A         1.0         63.6         59.3         4.3         61.6         74           SUW-50         Louvre         2         400         1300         N/A         1.0         63.3         64.1         -0.8         60.3         73           SUW-51         Louvre         2         2350         1500         N/A         1.0         75.4         63.1         12.3         75.4         90           SUW-53         Louvre         2         1500         3200         N/A         1.0         62.7         58.1         4.6         60.9         76           SUW-58         Louvre         2         3580         4350         N/A         1.0         50.9         49.0         1.9         47.9         66           VCU-101         Outdoor AC Unit         4         1220         760         1650         0.5         57.5         57.5         0.0         54.5         67           VCU-102-02         Outdoor AC Unit	SUW-37	Louvre	2	800	800	N/A	1.0	62.6	55.6	7.0	61.6	74
SUW-45         Louvre         2         450         700         N/A         1.0         63.6         59.3         4.3         61.6         74           SUW-50         Louvre         2         400         1300         N/A         1.0         63.3         64.1         -0.8         60.3         73           SUW-51         Louvre         2         2350         1500         N/A         1.0         67.4         63.1         12.3         75.4         90           SUW-53         Louvre         2         1500         3200         N/A         1.0         62.7         58.1         4.6         60.9         76           SUW-58         Louvre         2         1500         3200         N/A         1.0         61.4         57.8         3.6         58.9         72           SUW-66         Louvre         2         3580         4350         N/A         1.0         50.9         49.0         1.9         47.9         66           VCU-101         Outdor AC Unit         4         1220         760         1650         0.5         57.5         57.0         1.0         53.8         67           VCU-102-02         Outdor AC Unit         4<	SUW-40	Louvre	2	3820	4230	N/A	1.0	70.6	61.3	9.3	70.0	88
SUW-50         Louvre         2         400         1300         N/A         1.0         63.3         64.1         -0.8         60.3         73           SUW-51         Louvre         2         2350         1500         N/A         1.0         75.4         63.1         12.3         75.4         90           SUW-53         Louvre         2         1500         3200         N/A         1.0         62.7         58.1         4.6         60.9         76           SUW-58         Louvre         2         1000         900         N/A         1.0         61.4         57.8         3.6         58.9         72           SUW-66         Louvre         2         3580         4350         N/A         1.0         50.9         49.0         1.9         47.9         66           VCU-101         Outdor AC Unit         4         1220         760         1650         0.5         60.0         58.1         1.9         57.0         70           VCU-102-01         Outdor AC Unit         4         1220         760         1650         0.5         59.6         57.5         2.1         56.6         70           VCU-102-02         Outdor AC Unit	SUW-45	Louvre	2	450	700	N/A	1.0	63.6	59.3	4.3	61.6	74
SUW-51         Louvre         2         2350         1500         N/A         1.0         75.4         63.1         12.3         75.4         90           SUW-53         Louvre         2         1500         3200         N/A         1.0         62.7         58.1         4.6         60.9         76           SUW-58         Louvre         2         1000         900         N/A         1.0         61.4         57.8         3.6         58.9         72           SUW-66         Louvre         2         3580         4350         N/A         1.0         50.9         49.0         1.9         47.9         66           VCU-101         Outdoor AC Unit         4         1220         760         1650         0.5         57.5         57.5         0.0         54.5         67           VCU-102-01         Outdoor AC Unit         4         1220         760         1650         0.5         56.8         58.1         1.3         53.8         67           VCU-102-01         Outdoor AC Unit         4         1220         760         1650         0.5         59.6         57.5         2.1         56.6         70           VCU-103         Outdoor A	SUW-50	Louvre	2	400	1300	N/A	1.0	63.3	64.1	-0.8	60.3	73
SUW-53         Louvre         2         1500         3200         N/A         1.0         62.7         58.1         4.6         60.9         76           SUW-58         Louvre         2         1000         900         N/A         1.0         61.4         57.8         3.6         58.9         72           SUW-66         Louvre         2         3580         4350         N/A         1.0         50.9         49.0         1.9         47.9         66           VCU-101         Outdoor AC Unit         4         1220         760         1650         0.5         57.5         57.5         0.0         54.5         67           VCU-102-01         Outdoor AC Unit         4         1220         760         1650         0.5         56.8         58.1         1.9         57.0         70           VCU-102-02         Outdoor AC Unit         4         1220         760         1650         0.5         56.8         58.1         -1.3         53.8         67           VCU-103         Outdoor AC Unit         4         1220         760         1650         0.5         59.6         57.7         1.1         56.6         70           VCU-103 <td< td=""><td>SUW-51</td><td>Louvre</td><td>2</td><td>2350</td><td>1500</td><td>N/A</td><td>1.0</td><td>75.4</td><td>63.1</td><td>12.3</td><td>75.4</td><td>90</td></td<>	SUW-51	Louvre	2	2350	1500	N/A	1.0	75.4	63.1	12.3	75.4	90
SUW-58         Louvre         2         1000         900         N/A         1.0         61.4         57.8         3.6         58.9         72           SUW-66         Louvre         2         3580         4350         N/A         1.0         50.9         49.0         1.9         47.9         66           VCU-101         Outdoor AC Unit         4         1220         760         1650         0.5         57.5         57.0         0.0         45.5         67           VCU-102-01         Outdoor AC Unit         4         1220         760         1650         0.5         56.8         58.1         1.9         57.0         70           VCU-102-02         Outdoor AC Unit         4         1220         760         1650         0.5         56.8         58.1         1.3         53.8         67           VCU-103         Outdoor AC Unit         4         1220         760         1650         0.5         59.6         57.7         1.3         56.6         70           VCU-103         Outdoor AC Unit         4         920         760         1650         0.5         59.0         57.7         1.3         56.6         70           VCU-031	SUW-53	Louvre	2	1500	3200	N/A	1.0	62.7	58.1	4.6	60.9	76
SUW-66         Louvre         2         3580         4350         N/A         1.0         50.9         49.0         1.9         47.9         66           VCU-101         Outdoor AC Unit         4         1220         760         1650         0.5         57.5         57.5         0.0         54.5         67           VCU-102-01         Outdoor AC Unit         4         1220         760         1650         0.5         60.0         58.1         1.9         57.0         70           VCU-102-02         Outdoor AC Unit         4         1220         760         1650         0.5         56.8         58.1         -1.3         53.8         67           VCU-103         Outdoor AC Unit         4         1220         760         1650         0.5         59.6         57.7         1.3         56.0         71           VCU-031         Outdoor AC Unit         4         920         760         1650         0.5         59.4         57.7         1.3         56.0         71           VCU-031         Outdoor AC Unit         4         920         760         1650         0.5         59.4         52.4         7.0         58.5         74           VCU-0	SUW-58	Louvre	2	1000	900	N/A	1.0	61.4	57.8	3.6	58.9	72
VCU-101         Outdoor AC Unit         4         1220         760         1650         0.5         57.5         57.5         0.0         54.5         67           VCU-102-01         Outdoor AC Unit         4         1220         760         1650         0.5         60.0         58.1         1.9         57.0         70           VCU-102-02         Outdoor AC Unit         4         1220         760         1650         0.5         56.8         58.1         -1.3         53.8         67           VCU-103         Outdoor AC Unit         4         1220         760         1650         0.5         59.6         57.5         2.1         56.6         70           VCU-103         Outdoor AC Unit         4         920         3800         1650         0.5         59.0         57.7         1.3         56.0         71           VCU-031         Outdoor AC Unit         4         920         760         1650         0.5         59.0         57.7         1.3         56.0         71           VCU-031         Outdoor AC Unit         4         920         760         1650         0.5         59.0         57.7         1.3         56.0         74	SUW-66	Louvre	2	3580	4350	N/A	1.0	50.9	49.0	1.9	47.9	66
VCU-102-01         Outdoor AC Unit         4         1220         760         1650         0.5         60.0         58.1         1.9         57.0         70           VCU-102-02         Outdoor AC Unit         4         1220         760         1650         0.5         56.8         58.1         -1.3         53.8         67           VCU-103         Outdoor AC Unit         4         1220         760         1650         0.5         59.6         57.5         2.1         56.6         70           VCU-104         Outdoor AC Unit         4         920         3800         1650         0.5         59.0         57.7         1.3         56.0         71           VCU-031         Outdoor AC Unit         4         920         760         1650         0.5         59.0         57.7         1.3         56.0         71           VCU-031         Outdoor AC Unit         4         920         760         1650         0.5         59.4         52.0         4.2         54.1         66           VCU-033         Outdoor AC Unit         4         920         760         1650         0.5         57.0         52.0         5.0         55.4         68	VCU-101	Outdoor AC Unit	4	1220	760	1650	0.5	57.5	57.5	0.0	54.5	67
VCU-102-02         Outdoor AC Unit         4         1220         760         1650         0.5         56.8         58.1         -1.3         53.8         67           VCU-103         Outdoor AC Unit         4         1220         760         1650         0.5         59.6         57.7         1.3         53.8         67           VCU-104         Outdoor AC Unit         4         920         3800         1650         0.5         59.6         57.7         1.3         56.0         71           VCU-031         Outdoor AC Unit         4         920         760         1650         0.5         56.2         52.0         4.2         54.1         66           VCU-032         Outdoor AC Unit         4         920         760         1650         0.5         59.4         52.4         7.0         58.5         74           VCU-033         Outdoor AC Unit         4         920         760         1650         0.5         57.0         52.0         5.0         58.5         74           VCU-035         Outdoor AC Unit         4         920         760         1650         0.5         57.2         52.0         5.2         55.7         68	VCU-102-01	Outdoor AC Unit	4	1220	760	1650	0.5	60.0	58.1	1.9	57.0	70
VCU-103         Outdoor AC Unit         4         1220         760         1650         0.5         59.6         57.5         2.1         56.6         70           VCU-104         Outdoor AC Unit         4         920         3800         1650         0.5         59.6         57.5         2.1         56.6         70           VCU-104         Outdoor AC Unit         4         920         3800         1650         0.5         59.0         57.7         1.3         56.0         71           VCU-031         Outdoor AC Unit         4         920         760         1650         0.5         56.2         52.0         4.2         54.1         66           VCU-032         Outdoor AC Unit         4         920         760         1650         0.5         59.4         52.4         7.0         58.5         74           VCU-033         Outdoor AC Unit         4         920         760         1650         0.5         57.0         52.0         5.0         55.4         68           VCU-035         Outdoor AC Unit         4         920         760         1650         0.5         57.2         52.0         5.2         55.7         68           VCU-	VCU-102-02	Outdoor AC Unit	4	1220	760	1650	0.5	56.8	58.1	-1.3	53.8	67
VCU-104         Outdoor AC Unit         4         920         3800         1650         0.5         59.0         57.7         1.3         56.0         71           VCU-031         Outdoor AC Unit         4         920         760         1650         0.5         59.0         57.7         1.3         56.0         71           VCU-031         Outdoor AC Unit         4         920         760         1650         0.5         56.2         52.0         4.2         58.5         74           VCU-032         Outdoor AC Unit         4         920         760         1650         0.5         57.0         52.0         5.0         55.4         68           VCU-033         Outdoor AC Unit         4         920         760         1650         0.5         57.0         52.0         5.0         55.4         68           VCU-035         Outdoor AC Unit         4         920         760         1650         0.5         57.2         52.0         5.2         55.7         68           VCU-171-1         Outdoor AC Unit         4         1050         1560         N/A         0.5         63.9         63.2         0.7         60.9         71           VCU	VCU-103	Outdoor AC Unit	4	1220	760	1650	0.5	59.6	57.5	2.1	56.6	70
VCU-031         Outdoor AC Unit         4         920         760         1650         0.5         56.2         52.0         4.2         54.1         66           VCU-032         Outdoor AC Unit         4         920         760         1650         0.5         59.4         52.0         4.2         54.1         66           VCU-032         Outdoor AC Unit         4         920         760         1650         0.5         59.4         52.0         5.0         55.4         68           VCU-033         Outdoor AC Unit         4         920         760         1650         0.5         57.0         52.0         5.0         55.4         68           VCU-035         Outdoor AC Unit         4         920         760         1650         0.5         57.2         52.0         5.2         55.7         68           VCU-171-1         Outdoor AC Unit         4         1050         1560         N/A         0.5         63.9         63.2         0.7         60.9         71           VCU-171-2         Outdoor AC Unit         4         1050         1560         N/A         0.5         63.5         63.2         0.3         60.5         70	VCU-104	Outdoor AC Unit	4	920	3800	1650	0.5	59.0	57.7	1.3	56.0	71
VCU-032         Outdoor AC Unit         4         920         3800         150         0.5         59.4         52.4         7.0         58.5         74           VCU-033         Outdoor AC Unit         4         920         760         1650         0.5         57.0         52.0         5.0         55.4         68           VCU-035         Outdoor AC Unit         4         920         760         1650         0.5         57.2         52.0         5.2         55.7         68           VCU-171-1         Outdoor AC Unit         4         1050         1560         N/A         0.5         63.9         63.2         0.7         60.9         71           VCU-171-1         Outdoor AC Unit         4         1050         1560         N/A         0.5         63.9         63.2         0.7         60.9         71	VCU-031	Outdoor AC Unit	4	920	760	1650	0.5	56.2	52.0	4.2	54.1	66
VCU-035         Outdoor AC Unit         4         920         760         1650         0.5         57.0         52.0         5.0         55.4         68           VCU-035         Outdoor AC Unit         4         920         760         1650         0.5         57.2         52.0         5.2         55.7         68           VCU-035         Outdoor AC Unit         4         1050         1560         N/A         0.5         63.9         63.2         0.7         60.9         71           VCU-171-1         Outdoor AC Unit         4         1050         1560         N/A         0.5         63.9         63.2         0.3         60.9         71           VCU-171-2         Outdoor AC Unit         4         1050         1560         N/A         0.5         63.5         63.2         0.3         60.9         70	VCU-032	Outdoor AC Unit	4	920	3800	1650	0.5	59.4	52.4	7.0	58.5	/4
VCU-USS         Outdoor AC Unit         4         920         /b0         160         0.5         57.2         52.0         5.2         55.7         68           VCU-171-1         Outdoor AC Unit         4         1050         1560         N/A         0.5         63.9         63.2         0.7         60.9         71           VCU-171-2         Outdoor AC Unit         4         1050         1560         N/A         0.5         63.5         63.2         0.3         60.9         71	VCU-033	Outdoor AC Unit	4	920	760	1650	0.5	57.0	52.0	5.0	55.4	68
VCI-1/1-1 ULIQUOTACUTIN 4 1050 1500 N/A 0.5 05.9 05.2 0.7 00.9 /1 VCI-1/1-2 Outdoor ACUTIN 4 1050 1560 N/A 0.5 63.5 63.2 0.2 60.5 70	VCU-035	Outdoor AC Unit	4	920	/60	1650	0.5	57.2	52.0	5.2	55./	58
	VCU-1/1-1 VCU-171-2	Outdoor AC Unit	4	1050	1560	N/A	0.5	63.5	63.2	0.7	60.5	71

Remarks:

a) Measurement Distance between louvre and microphone.

b) Results are averaged from number of points in accordance with ISO3746.

c) If the difference between the background and the measured noise level is less than 3.0 dB, background noise correction factor should be capped to 3.0 dB.

d) Operation scenario during daytime/evening period only and the measured SWL will be checked against the respective noise criterion.

Appendix C

Noise Measurement to Confirm any Tonal, Impulsive and Intermittent Characteristics from the Fixed Plant Nose Sources at Representative NSRs Appendix C1

Calibration Certificates – Noise Measurement at Representative NSRs



## 综合試驗 有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



# CERTIFICATE OF CALIBRATION

Certificate No.:	18CA1019 01-01		Page	1	of	2	
Item tested							
Description:	Sound Level Mete	r (Type 1)	Microphone		Preamp		
Manufacturer:	B & K		B & K		B & K		
Type/Model No.:	2250		4950		ZC0032		
Serial/Equipment No.:	3001291		2665582		17190		
Adaptors used:	-		-		-		
Item submitted by			t.				
Customer Name:	AECOM ASIA CO	LIMITED					
Address of Customer:	-						
Request No.:	-						
Date of receipt:	19-Oct-2018						
Date of test:	19-Oct-2018						
Reference equipment	used in the calib	ration					
Description:	Model:	Serial No.	Expiry Date:		Traceat	le to:	
Multi function sound calibrator	B&K 4226	2288444	23-Aug-2019		CIGISME	С	
Signal generator	DS 360	33873	24-Apr-2019		CEPREI		
Signal generator	DS 360	61227	23-Apr-2019		CEPREI		
Ambient conditions							
Temperature:	20 ± 1 °C						
Relative humidity:	50 ± 10 %						
Air pressure:	1005 ± 5 hPa						
				_			

### **Test specifications**

- 1, The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- 2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

## **Test results**

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets.

Approved Signatory:

Fend Junai





**Comments:** The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

Date:

© Soils & Materials Engineering Co., Ltd.

Form No.CARP152-1/Issue 1/Rev.C/01/02/2007



## 综合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD.

香港黃竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



# **CERTIFICATE OF CALIBRATION**

(Continuation Page)

Certificate No.:

18CA1019 01-01

Page 2

of

2

### 1, Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

			Expanded	Coverage
Test:	Subtest:	Status:	Uncertanity (dB)	Factor
Call and the last	2	Deres	0.0	
Self-generated noise	A	Pass	0.3	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	С	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
A	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
200529 genella – odre Meno 🗢 Handa suor 🗢 otre	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

### 2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Expanded Uncertanity (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 8000 Hz	Pass	0.5	

## 3, Response to associated sound calibrator

## N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

End Calibrated by: Checked by: Fung Chi Yip shek Kwong Tat Date: 19-Oct-2018 Date: 20-Oct-2018

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

© Soils & Materials Engineering Co., Ltd

Form No CARP152-2/Issue 1/Rev C/01/02/2007



## 综合試驗 有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



# **CERTIFICATE OF CALIBRATION**

Certificate No.:	19CA0311 02		Page	1 of 2	
Item tested					
Description:	Sound Level Mete	er (Type 1)	Microphone	Preamp	
Manufacturer:	B & K		B & K	B&K	
Type/Model No.:	2250-L		4189	ZC0032	
Serial/Equipment No.:	2681366		3005374	23853	
Adaptors used:	- (	N.01.01)	-	-	
Item submitted by					
Customer Name:	AECOM ASIA CO	LTD			
Address of Customer:	-				
Request No.:	-				
Date of receipt:	11-Mar-2019				
Date of test:	18-Mar-2019				
Reference equipment	used in the calib	ration			
Description:	Model:	Serial No.	Expiry Date:	Traceable to:	
Multi function sound calibrator	B&K 4226	2288444	23-Aug-2019	CIGISMEC	
Signal generator	DS 360	33873	24-Apr-2019	CEPREI	
Signal generator	DS 360	61227	26-Dec-2019	CEPREI	
Ambient conditions					
Temperature:	21 ± 1 °C				
Relative humidity:	55 ± 10 %				
Air pressure:	1005 + 5 hPa				
	1000 1 0 11 0				

## Test specifications

- 1, The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- 2, The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

## **Test results**

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets.

**Approved Signatory:** Feng. ungi

19-Mar-2019 Company Chop:



**Comments:** The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

Date:

© Soils & Materials Engineering Co., Ltd.

Form No.CARP152-1/Issue 1/Rev.C/01/02/2007



## 綜合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD.

香港黄竹坑道37號利達中心12樓

12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



# **CERTIFICATE OF CALIBRATION**

(Continuation Page)

Certificate No.:

19CA0311 02

Page 2

of

2

### 1, Electrical Tests

The electrical tests were perfomed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

-			Expanded	Coverage
Test:	Subtest:	Status:	Uncertanity (dB)	Factor
Self generated poice	٥	5		
Sell-generated hoise	A	Pass	0.3	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	С	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

## 2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Expanded Uncertanity (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz Weighting A at 8000 Hz	Pass Pass	0.3 0.5	

## Response to associated sound calibrator

### N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.



calibrated on a schedule to maintain the required accuracy level.

© Soils & Materials Engineering Co., Ltd.

Form No.CARP152-2/Issue 1/Rev.C/01/02/2007



## 综合試驗 有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 . Fax: (852) 2555 7533



# **CERTIFICATE OF CALIBRATION**

Certificate No.:	19CA0228 02		ş	Page 1	of	2
Item tested						
Description:	Sound Level Meter	r (Type 1)	Microphe	one	Pream	
Manufacturer:	B & K		B&K		B & K	
Type/Model No.:	2270		4950		ZC0032	
Serial/Equipment No.:	2644597		2879980		19428	
Adaptors used:	- (N.	012.01)	-		-	
Item submitted by	5					
Customer Name:	AECOM ASIA CO	LTD				
Address of Customer:	-					
Request No	12					
Date of receipt:	28-Feb-2019					
Date of test:	01-Mar-2019					
Reference equipment	used in the calib	ration				
Description:	Model:	Serial No.	Expiry D	ate:	Traceal	ole to:
Multi function sound calibrator	B&K 4226	2288444	23-Aug-2	019	CIGISME	EC
Signal generator	DS 360	33873	24-Apr-20	19	CEPREI	
Signal generator	DS 360	61227	26-Dec-2	019	CEPREI	
Ambient conditions						
Temperature:	21 ± 1 °C					
Relative humidity:	55 ± 10 %					
Air pressure:	1005 ± 5 hPa					

## **Test specifications**

- 1, The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- 2, The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- 3, The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

## **Test results**

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets

Approved Signatory:

Feng Junqi

02-Mar-2019

**Company Chop:** 



**Comments:** The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

Date:

© Soils & Materials Engineering Co., Ltd.

Form No.CARP152-1/Issue 1/Rev.C/01/02/2007



# 綜合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD.

香港黃竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.

E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



# CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 19CA

19CA0228 02

Page 2 of 2

## 1, Electrical Tests

Test

The electrical tests were perfomed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

Test.	Subtest:	Status:	Uncertanity (dB)	/ Coverage Factor
Self-generated noise Linearity range for Leq	A C Lin At reference range , Step 5 dB at 4 kHz Reference SPL on all other ranges 2 dB below upper limit of each range 2 dB about here there is a construction of the state of	Pass Pass Pass Pass Pass Pass	0.3 1.0 2.0 0.3 0.3 0.3 0.3	2.1 2.2
Linearity range for SPL Frequency weightings	At reference range , Step 5 dB at 4 kHz A C Lin	Pass Pass Pass Pass Pass	0.3 0.3 0.3 0.3	
Time weightings Peak response R.M.S. accuracy Time weighting I Time averaging	Single Burst Fast Single Burst Slow Single 100µs rectangular pulse Crest factor of 3 Single burst 5 ms at 2000 Hz Repeated at frequency of 100 Hz 1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass Pass Pass Pass Pass Pass Pass Pass	0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3	
Pulse range Sound exposure level Overload indication	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz Single burst 10 ms at 4 kHz Single burst 10 ms at 4 kHz SPL Leq	Pass Pass Pass Pass Pass	0.3 0.4 0.4 0.3 0.4	

## 2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

		Coverage Factor	
ng A at 125 Hz ng A at 8000 Hz	Pass Pass	0.3	
	ng A at 125 Hz ng A at 8000 Hz	ng A at 125 Hz Pass ng A at 8000 Hz Pass	

## 3, Response to associated sound calibrator

### N/A

The uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95 %. A coverage factor of 2 is

	c l	- End -	Λ
Calibrated by:	-U	Checked by:	$1 \sim 6$
Date:	Fong Chun Wai 01-Mar-2019	Detai	Fung Chi Yip
		Date:	02-Mar-2019

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

© Soils & Materials Engineering Co., Ltd

Form No.CARP152-2/Issue 1/Rev.C/01/02/2007



## 综合試驗 有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



# **CERTIFICATE OF CALIBRATION**

Certificate No.:	18CA0920 02		Page	1 of 2	
Item tested					
Description: Manufacturer: Type/Model No.: Serial/Equipment No.: Adaptors used:	Sound Level Mete B & K 2270 3007965 C N	er (Type 1)	3 3 3 3	Microphone B & K 4189 284646 -	Pream B & K ZC0032 17965
Item submitted by					
Customer Name: Address of Customer: Request No.: Date of receipt:	AECOM ASIA CO - - 20-Sep-2018	. LTD.			
Date of test:	22-Sep-2018				
Reference equipment	used in the calib	ration			
Description: Multi function sound calibrator Signal generator Signal generator	Model: B&K 4226 DS 360 DS 360	Serial No. 2288444 33873 61227		Expiry Date: 23-Aug-2019 24-Apr-2019 23-Apr-2019	Traceable to: CIGISMEC CEPREI CEPREI
Ambient conditions					
Temperature: Relative humidity: Air pressure:	21 ± 1 °C 55 ± 10 % 1005 ± 5 hPa				
Test specifications					

- 1, The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- 2. The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

## **Test results**

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets

Approved Signatory:

Feng Jung

22-Sep-2018 Company Chop:



**Comments:** The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long term stability of the instrument.

Date:

© Soils & Materials Engineering Co., Ltd.

Form No.CARP152-1/Issue 1/Rev.C/01/02/2007



## 综合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓

12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



2

# CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA0920 02	Page	2	of	

#### 1, **Electrical Tests**

The electrical tests were perfomed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

lest:	Subtest:	Status:	Uncertanity (dB) / Coverage Factor
Self-generated noise Linearity range for Leq	A C Lin At reference range , Step 5 dB at 4 kHz	Pass Pass Pass Pass	0.3 1.0 2.1 2.0 2.2 0.3
Linearity range for SPL Frequency weightings	A reference SPL on all other ranges 2 dB below upper limit of each range 2 dB above lower limit of each range At reference range, Step 5 dB at 4 kHz A C	Pass Pass Pass Pass Pass	0.3 0.3 0.3 0.3 0.3
Time weightings Peak response R.M.S. accuracy Time weighting I Time averaging Pulse range Sound exposure level Dverload indication	Lin Single Burst Fast Single Burst Slow Single 100µs rectangular pulse Crest factor of 3 Single burst 5 ms at 2000 Hz Repeated at frequency of 100 Hz 1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz 1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz Single burst 10 ms at 4 kHz Single burst 10 ms at 4 kHz SPI	Pass Pass Pass Pass Pass Pass Pass Pass	0.3 0.3 0.3 0.3 0.3 0.3 0.3 0.3

#### 2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Uncertanity (dB) / Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3
	Weighting A at 8000 Hz	Pass	0.5

#### 3, Response to associated sound calibrator

### N/A

The uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95 %. A coverage factor of 2 is assumed unless explicitly stated



The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

C Soils & Materials Engineering Co., Ltd

Form No.CARP152-2/Issue 1/Rev C/01/02/2007



## 综合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓

12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



# CERTIFICATE OF CALIBRATION

Certificate No.:	19CA0327 01-02		Page:	1	of	2
Item tested						
Description: Manufacturer: Type/Model No.: Serial/Equipment No.: Adaptors used:	Acoustical Calibrat B & K 4231 3006428 / N004.03 -	tor (Class 1) 3				
Item submitted by						
Curstomer: Address of Customer: Request No.: Date of receipt:	AECOM ASIA CO - - 27-Mar-2019	(N.004.03	)			
Date of test:	27-Mar-2019					
Reference equipment	used in the calib	ration				
Description: Lab standard microphone Preamplifier Measuring amplifier Signal generator Digital multi-meter Audio analyzer Universal counter	Model: B&K 4180 B&K 2673 B&K 2610 DS 360 34401A 8903B 53132A	Serial No. 2341427 2743150 2346941 33873 US36087050 GB41300350 MY40003662	Expiry Date: 20-Apr-2019 27-Apr-2019 08-May-2019 24-Apr-2019 23-Apr-2019 23-Apr-2019 24-Apr-2019		Traceable SCL CEPREI CEPREI CEPREI CEPREI CEPREI CEPREI	e to:
Ambient conditions						
Temperature: Relative humidity: Air pressure:	22 ± 1 °C 55 ± 10 % 1005 ± 5 hPa					
Test specifications						
<ol> <li>The Sound Calibrato and the lab calibratio</li> <li>The calibrator was te</li> </ol>	or has been calibrated on procedure SMTP00 ested with its axis vert	in accordance with the 04-CA-156. ical facing downwards	requirements as speci at the specific frequenc	fied in y usin	IEC 6094	2 1997 Anr oltage techr

3, The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

## **Test results**

This is to certify that the sound calibrator conforms to the requirements of annex B of IEC 60942: 1997 for the conditions under which the test was performed. This does not imply that the sound calibrator meets IEC 60942 under any other conditions.

Details of the performed measurements are presented on page 2 of this certificate.



20 Feng Jungi

29-Mar-2019 Company Chop:



**Comments:** The results reported in this certificate refer to the conditon of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

Date:

© Soils & Materials Engineering Co., Ltd.

Form No.CARP156-1/Issue 1/Rev.D/01/03/2007



ふ 驗 有 限 公 司 MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心19棟

12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



# **CERTIFICATE OF CALIBRATION**

(Continuation Page)

Certificate No.:

19CA0327 01-02

Page: 2 of

of 2

## 1, Measured Sound Pressure Level

The output Sound Pressure Level in the calibrator head was measured at the setting and frequency shown using a calibrated laboratory standard microphone and insert voltage technique. The results are given in below with the estimated uncertainties.

Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	Estimated Expanded Uncertainty dB
1000	94.00	94.23	0.10

## 2, Sound Pressure Level Stability - Short Term Fluctuations

The Short Term Fluctuations was determined by measuring the maximum and minimum of the fast weighted DC output of the B&K 2610 measuring amplifier over a 20 second time interval as required in the standard. The Short Term Fluctuation was found to be:

At 1000 Hz	STF = 0.014 dB
Estimated expanded uncertainty	0.005 dB

## 3, Actual Output Frequency

The determination of actual output frequency was made using a B&K 4180 microphone together with a B&K 2673 preamplifier connected to a B&K 2610 measuring amplifier. The AC output of the B&K 2610 was taken to an universal counter which was used to determine the frequency averaged over 20 second of operation as required by the standard. The actual output frequency at 1 KHz was:

At 1000 Hz	Actual Frequency = 1000.0 Hz	
Estimated expanded uncertainty	0.1 Hz	Coverage factor k = 2.2

### 4, Total Noise and Distortion

For the Total Noise and Distortion measurement, the unfiltered AC output of the B&K 2610 measuring amplifier was connected to an Agilent Type 8903 B distortion analyser. The TND result at 1 KHz was:

At 1000 Hz	TND = 0.3 %
Estimated expanded uncertainty	0.7 %

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

/	- End -	
$\sim \chi$	Checked by:	El
Fung Chi Yip∬ 7-Mar-2019	Date:	Fong Chun Wai 29-Mar-2019
	Fung Chi Yip 7-Mar-2019	Fung Chi Yip 7-Mar-2019 Date:

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

© Soils & Materials Engineering Co., Ltd.

Form No.CARP156-2/Issue 1/Rev.C/01/05/2005



## 综合試驗 有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



# CERTIFICATE OF CALIBRATION

Certificate No.:	18CA1008 02		Page:	1	of	2
Item tested						
Description: Manufacturer: Type/Model No.: Serial/Equipment No.:	Acoustical Calibra Rion Co., Ltd. NC-74 34246490 / N.004	tor (Class 1) .10				
Adaptors used:						
Item submitted by						
Curstomer: Address of Customer:	AECOM ASIA CO	LIMITED				
Request No .:	-			9	(	
Date of receipt:	08-Oct-2018					
Date of test:	10-Oct-2018					
Reference equipment	used in the calib	ration				
Description: Lab standard microphone Preamplifier Measuring amplifier Signal generator Digital multi-meter Audio analyzer Universal counter	Model: B&K 4180 B&K 2673 B&K 2610 DS 360 34401A 8903B 53132A	Serial No. 2341427 2743150 2346941 61227 US36087050 GB41300350 MY40003662	Expiry Date: 20-Apr-2019 27-Apr-2019 08-May-2019 24-Apr-2019 23-Apr-2019 23-Apr-2019 24-Apr-2019		Traceabl SCL CEPREI CEPREI CEPREI CEPREI CEPREI CEPREI	e to:
Ambient conditions						
Temperature: Relative humidity: Air pressure:	21 ± 1 °C 50 ± 10 % 1005 ± 5 hPa					

## **Test specifications**

1, The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B and the lab calibration procedure SMTP004-CA-156.

2. The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.

 The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

### **Test results**

This is to certify that the sound calibrator conforms to the requirements of annex B of IEC 60942: 1997 for the conditions under which the test was performed. This does not imply that the sound calibrator meets IEC 60942 under any other conditions.

Details of the performed measurements are presented on page 2 of this certificate.



Approved Signatory:

Feng Jungi

10-Oct-2018 Company Chop:

Comments: The results reported in this certificate refer to the conditon of the instrument on the date of calibration and carry no implication regarding the long term stability of the instrument.

Date:

© Soils & Materials Engineering Co., Ltd.

Form No CARP156-1/Issue 1/Rev D/01/03/2007



## 綜合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD.

香港黄竹坑道37號利達中心12樓

12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



# **CERTIFICATE OF CALIBRATION**

(Continuation Page)

Certificate No.:

18CA1008 02

Page: 2 of 2

2 01 2

## 1, Measured Sound Pressure Level

The output Sound Pressure Level in the calibrator head was measured at the setting and frequency shown using a calibrated laboratory standard microphone and insert voltage technique. The results are given in below with the estimated uncertainties.

Frequency	Output Sound Pressure	Measured Output	Estimated Expanded
Shown	Level Setting	Sound Pressure Level	Uncertainty
Hz	dB	dB	dB
1000	94.00	93.89	0.10

### 2, Sound Pressure Level Stability - Short Term Fluctuations

The Short Term Fluctuations was determined by measuring the maximum and minimum of the fast weighted DC output of the B&K 2610 measuring amplifier over a 20 second time interval as required in the standard. The Short Term Fluctuation was found to be:

At 1000 Hz	STF = 0.030 dB
Estimated expanded uncertainty	0.005 dB

### 3, Actual Output Frequency

The determination of actual output frequency was made using a B&K 4180 microphone together with a B&K 2673 preamplifier connected to a B&K 2610 measuring amplifier. The AC output of the B&K 2610 was taken to an universal counter which was used to determine the frequency averaged over 20 second of operation as required by the standard. The actual output frequency at 1 KHz was:

At 1000 Hz	Actual Frequency = 1002.0 Hz	
Estimated expanded uncertainty	0.1 Hz	Coverage factor k = 2.2

### 4, Total Noise and Distortion

For the Total Noise and Distortion measurement, the unfiltered AC output of the B&K 2610 measuring amplifier was connected to an Agilent Type 8903 B distortion analyser. The TND result at 1 KHz was:

At 1000 Hz	TND = 2.3 %
Estimated expanded uncertainty	0.7 %

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.



The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

© Soils & Materials Engineering Co., Ltd

Form No.CARP156-2/Issue 1/Rev C/01/05/2005

Appendix C2

Photographs – Noise Measurement at Representative NSRs







NSR Measurement Location at TKW-19-1

Appendix C3

Measurement Results at Representative NSRs

			Fixed Plant N	loise	Background Noise		Difference between
				Measured Noise	Background Noise		Measured Noise Level
Measurement	Manager and Data	<b>O</b>	NA	Level, L <sub>Aeq 30mins</sub> ,	• • • • • • • • •	Level, L <sub>Aeq 5mins</sub> ,	and Background Level,
Location ID	Measurement Date	Operation Scenario	Measurement Time	dB(A)	Measurement Time	dB(A)	dB(A)
	14/6/2019 - 15/6/2019	Daytime and Evening	22:35:00 - 23:04:59	67.4	21:25:30 - 21:30:29	68.0	-0.6
SUW-1-1	14/6/2019 - 15/6/2019	Night-time	23:24:00 - 23:53:59	67.4	00:23:30 - 00:28:29	66.6	0.8
	14/6/2019 - 15/6/2019	Daytime and Evening	22:35:00 - 23:04:59	75.0	21:25:30 - 21:30:29	75.1	-0.1
SUW-3-2	14/6/2019 - 15/6/2019	Night-time	23:24:00 - 23:53:59	74.4	00:23:30 - 00:28:29	73.1	1.3
	14/6/2019 - 15/6/2019	Daytime and Evening	22:35:00 - 23:04:59	50.8	21:25:30 - 21:30:29	49.9	0.9
SUW-P1-1	14/6/2019 - 15/6/2019	Night-time	23:24:00 - 23:53:59	51.3	00:23:30 - 00:28:29	51.0	0.3
TKW-19-1 <sup>(3)</sup>	14/6/2019 - 15/6/2019	Daytime and Evening	22:35:00 - 23:04:59	77.7	21:25:30 - 21:30:29	77.5	0.2

## Notes:

(1) Daytime and evening period (i.e 0700 to 2300 hours) and night-time period (i.e. Night: 2300 to 0700 hours).

(2) Fixed plant noise operation during daytime/evening and nigth-time periods have been included according to corresponding fixed plant noise measurement.

(3) There is no sensitive use during night-time period at the place of worship (i.e. TKW-19-1).