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))

MTR Corporation Limited

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

Position: Independent Environmental Checker

Date: 1 Aug 2019

MTR Corporation Limited

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

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 5A – Kai Tak Station (KAT))

July 2019

	Name	Signature
Prepared & Checked:	Isaac Chu	
Reviewed & Approved:	Josh Lam	

Version:	A	Date: 30 July 2019

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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.

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

Location	Fixed Plant ID.	Fixed Plant Source	Maximum Allowable SWL, dB(A)(1)	
			Daytime & Evening(2)	Night-time(2)
KAT	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 - 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

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
Sound Level Meter	SVANTEK SVAN 958	20890
	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**.

Table 3.2 Measurement Schedule

Location	Date
KAT	20 September 2018
	4 October 2018
	16 January 2019
	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_{Aeq} (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_{Aeq} (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**.

Table 3.3 Noise Measurement Equipment

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

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	Representative NSR (NSR ID)	Type	Measurement Height

Measurement Location ID	Representative NSR (NSR ID)	Type	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 3.5 Measurement 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**.

Table 4.1 Summary of Measured SWLs for Fixed Plants

Plant Item	Measured SWL[(1)], dB(A)		Maximum allowable SWL, dB(A)		Compliance (Y/N)	
	Day / Evening-time[(2)]	Night-time[(2)(3)]	Day / Evening - time[(2)]	Night-time[(2)]	Day / Evening - time[(2)]	Night-time[(2)]
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	-

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 Location ID	Representing NSRs	Time Period[1]&[2]	Measurement Results			Site Observation	Characteristics of Tonality, Impulsiveness and Intermittency at NSRs (Y/N)
			Measured Noise Level $L_{Aeq(30mins)}$, dB(A)	Background Noise Level $L_{Aeq(5mins)}$, dB(A)	Difference between Measured Noise Level and Background Level, dB(A)[3]		
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 observed. Noise from SCL fixed plant was not noticeable at the measurement location	N[4]
		Night-time	52.8	52.5	0.3		N[4]
KAT-FN2 [8]	Kai Tak One II	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 building at Oasis Kai Tak. Noise from SCL fixed plant was not noticeable at the measurement location.	N[5]
		Night-time	56.9	56.6	0.3		N[5]
KAT-FN3 [9]	Planned NSR	Daytime & Evening	50.4	50.9	-0.5	Background noise was relatively low and was dominated by buzzing sound	N[6]
		Night-time	50.2	51.1	-0.9		N[6]

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

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

821200 N
821300 N
821400 N
821500 N
838400 E
838500 E

KAT-P1-4
KAT-P1-3
KAT-P1-2
KAT-P1-1

KAT-3
KAT-2
KAT-1A
KAT-1B
KAT-4D
KAT-5
KAT-35
KAT-34
KAT-38A
KAT-38

KAT

KAT-13
KAT-14
KAT-15
KAT-16
KAT-44
KAT-39
KAT-40
KAT-41
KAT-42
KAT-17

KAT-28

Nullah
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LEGEND:

- REPRESENTATIVE NOISE SENSITIVE RECEIVERS (NSRs)
- ASSESSMENT POINT FOR FIXED PLANT NOISE CALCULATION
- APPROXIMATE NOISE SOURCE LOCATION (FACADE)
- APPROXIMATE NOISE SOURCE LOCATION (TOP)

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DATE	01/JUN/2015

MTR

SHATIN TO CENTRAL LINK

ORIGINATOR

AECOM

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TITLE

C11033
SCL (TAW - HUH)
LOCATIONS OF NSRs AND FIXED PLANT NOISE SOURCES (KAI TAK STATION)

SCALE	FIGURE NO.	REV.
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821200 N
821300 N
821400 N
821500 N
838400 E
838500 E

KAT-FN4
KAT-FN3
KAT-FN2
KAT-FN1

KAT

KAT-1A
KAT-1B
KAT-2
KAT-3
KAT-4D
KAT-5
KAT-13
KAT-14
KAT-15
KAT-16
KAT-17
KAT-28
KAT-34
KAT-35
KAT-38
KAT-38A
KAT-39
KAT-40
KAT-41
KAT-42
KAT-44

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WIP Nov 2013

LEGEND:

- REPRESENTATIVE NOISE SENSITIVE RECEIVERS (NSRs)
- APPROXIMATE NOISE SOURCE LOCATION (FACADE)
- APPROXIMATE NOISE SOURCE LOCATION (TOP)
- NOISE MEASUREMENT POINT

REV	DESCRIPTION	BY	DATE	APPROVED	REV	DESCRIPTION	BY	DATE	APPROVED

DRAWN	KTH
DESIGNED	LCLL
CHECKED	LCLL
APPROVED	IMW
DATE	01/JUN/2015

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SHATIN TO CENTRAL LINK

ORIGINATOR

AECOM

CADD REF. C11033_C_SCL_ACM_M52_052A.dgn

TITLE

C11033
SCL (TAW - HUH)
LOCATIONS OF NOISE MEASUREMENT POINTS
(KAI TAK STATION)

SCALE 1 : 1250 (A3)

FIGURE NO. C11033/C/SCL/ACM/M52/052

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Appendix A

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

MTR Corporation Limited

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

Date: 20 June 2019

MTR Corporation Limited

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 

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	
Reviewed & Approved:	Josh Lam	

Version:	A	Date: 23 May 2019

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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 Assessment of Noise from Fixed Sources

Time Period	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 2.2 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 (1)	Prevailing Background Noise Levels, dB(A) (2)	ASR	ANL-5, dB(A) (3)	Criteria, dB(A) (4)
Kai Tak Station					
Planned NSR (KAT-P1-1, KAT-P1-2, KAT-P1-3, KAT-P1-4)	Day & evening	70	B	60	60
	Night	56	B	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**.

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

Location	Fixed Plant ID.	Fixed Plant Source	Maximum Allowable SWL, dB(A)[1]	
			Daytime & Evening[2]	Night-time[2]
KAT	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 - 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

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

NSR ID	Description	Criteria, dB(A)		Predicted Sound Pressure Level, $L_{eq,30mins}$, dB(A)[1]	
		Daytime & Evening[2]	Night-time[2]	Daytime & Evening[2]	Night-time[2]
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.
(2) Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours.

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

821200 N
821300 N
821400 N
821500 N
838400 E
838500 E

KAT-P1-4
KAT-P1-3
KAT-P1-2
KAT-P1-1

KAT-3
KAT-2
KAT-1A
KAT-1B
KAT-4D
KAT-5
KAT-35
KAT-34
KAT-38A
KAT-38

KAT

KAT-13
KAT-14
KAT-15
KAT-16
KAT-44
KAT-39
KAT-40
KAT-41
KAT-42
KAT-17

KAT-28

Nullah
Pipeline
TS
WIP Nov 2013

LEGEND:

- REPRESENTATIVE NOISE SENSITIVE RECEIVERS (NSRs)
- ASSESSMENT POINT FOR FIXED PLANT NOISE CALCULATION
- APPROXIMATE NOISE SOURCE LOCATION (FACADE)
- APPROXIMATE NOISE SOURCE LOCATION (TOP)

PLOT DRV: V:\ustnset\MTR\PLOTDRIVER\WINDOWS\A3 COLOUR.plt
MODEL: PRINTED BY: Wenk 2019/5/8 12:07:09
MODELNAME: p:\Projects\60273491\DRAWING\REPORT\C11033\C11033_C_SCL_ACM_M52_051A.dgn
FILENAME:

REV	DESCRIPTION	BY	DATE	APPROVED	REV	DESCRIPTION	BY	DATE	APPROVED

DRAWN	KTH
DESIGNED	LCLL
CHECKED	LCLL
APPROVED	IMW
DATE	01/JUN/2015

MTR

SHATIN TO CENTRAL LINK

ORIGINATOR

AECOM

CADD REF. C11033_C_SCL_ACM_M52_051A.dgn

TITLE

C11033
SCL (TAW - HUH)
LOCATIONS OF NSRs AND FIXED PLANT NOISE SOURCES (KAI TAK STATION)

SCALE	FIGURE NO.	REV.
1 : 1250 (A3)	C11033/C/SCL/ACM/M52/051	A

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 [1], 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 Ventilation Shaft											
KAT-P1-1											
KAT-P1-1	Kai Long Court	KAT - 1A	South	236	95	-10	-55	3	33		
		KAT - 1B	South	234	92	-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 - 5	West	217	83	-10	-55	3	21		
		KAT - 13	West	112	87	-10	-49	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	North	97	84	0	-48	3	39		
		KAT - 28	West	58	83	-10	-43	3	33		
		KAT - 34	South	220	97	-10	-55	3	35		
		KAT - 35	Top	225	96	0	-55	3	44		
		KAT - 38	Top	214	86	0	-55	3	34		
		KAT - 38A	North	212	80	0	-55	3	28		
		KAT - 39	Top	113	100	0	-49	3	54		
		KAT - 40	Top	106	98	0	-49	3	52		
		KAT - 41	Top	102	96	0	-48	3	51		
		KAT - 42	Top	100	101	0	-48	3	56		
		KAT - 44	West	116	100	-10	-49	3	44	**60**	**60**
KAT-P1-2											
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	-10	-50	3	32		
		KAT - 4D	West	126	78	-10	-50	3	21		
		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	West	132	89	-10	-50	3	32		
		KAT - 16	North	132	88	-10	-50	3	31		
		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	126	96	0	-50	3	49		
		KAT - 38	Top	118	86	0	-49	3	40		
		KAT - 38A	North	116	80	0	-49	3	34		
		KAT - 39	Top	108	100	0	-49	3	54		
		KAT - 40	Top	112	98	0	-49	3	52		
		KAT - 41	Top	115	96	0	-49	3	50		
		KAT - 42	Top	123	101	0	-50	3	54		
		KAT - 44	West	114	100	-10	-49	3	44	**60**	**60**
KAT-P1-3											
KAT-P1-3	Residential premises near KAT	KAT - 1A	South	104	95	0	-48	3	50		
		KAT - 1B	South	100	92	0	-48	3	47		
		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		
		KAT - 5	West	124	83	-10	-50	3	26		
		KAT - 13	West	250	87	-10	-56	3	24		
		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	North	267	84	-10	-57	3	20		
		KAT - 28	West	312	83	-10	-58	3	18		
		KAT - 34	South	109	97	0	-49	3	51		
		KAT - 35	Top	108	96	0	-49	3	50		
		KAT - 38	Top	117	86	0	-49	3	40		
		KAT - 38A	North	119	80	-10	-50	3	23		
		KAT - 39	Top	236	100	0	-55	3	48		
		KAT - 40	Top	245	98	0	-56	3	45		
		KAT - 41	Top	251	96	0	-56	3	43		
		KAT - 42	Top	261	101	0	-56	3	48		
		KAT - 44	West	239	100	-10	-56	3	37	**58**	**60**
KAT-P1-4											
KAT-P1-4	Residential premises near KAT	KAT - 1A	South	71	95	-5	-45	3	48		
		KAT - 1B	South	76	92	-5	-46	3	44		
		KAT - 2	West	65	83	0	-44	3	42		
		KAT - 3	West	63	89	0	-44	3	48		
		KAT - 4D	West	61	78	0	-44	3	37		
		KAT - 5	West	62	83	0	-44	3	42		
		KAT - 13	West	151	87	0	-52	3	38		
		KAT - 14	West	157	88	0	-52	3	39		
		KAT - 15	West	168	89	0	-53	3	39		
		KAT - 16	North	170	88	-10	-53	3	28		
		KAT - 17	North	173	84	-10	-53	3	24		
		KAT - 28	West	237	83	0	-56	3	30		
		KAT - 34	South	74	97	-10	-45	3	45		
		KAT - 35	Top	72	96	0	-45	3	54		
		KAT - 38	Top	71	86	0	-45	3	44		
		KAT - 38A	North	71	80	0	-45	3	38		
		KAT - 39	Top	142	100	0	-51	3	52		
		KAT - 40	Top	152	98	0	-52	3	49		
		KAT - 41	Top	158	96	0	-52	3	47		
		KAT - 42	Top	166	101	0	-52	3	52		
		KAT - 44	West	142	100	0	-51	3	52	**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.

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 [1], 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 Ventilation Shaft											
KAT-P1-1											
KAT-P1-1	Kai Long Court	KAT - 1A	South	236	85	-10	-55	3	23		
		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	West	219	68	-10	-55	3	6		
		KAT - 5	West	217	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	North	103	78	0	-48	3	33		
		KAT - 17	North	97	74	0	-48	3	29		
		KAT - 28	West	58	73	-10	-43	3	23		
		KAT - 34	South	220	94	-10	-55	3	32		
		KAT - 35	Top	225	86	0	-55	3	34		
		KAT - 38	Top	214	76	0	-55	3	24		
		KAT - 38A	North	212	70	0	-55	3	18		
		KAT - 39	Top	113	93	0	-49	3	47		
		KAT - 40	Top	106	88	0	-49	3	42		
		KAT - 41	Top	102	86	0	-48	3	41		
		KAT - 42	Top	100	84	0	-48	3	39		
		KAT - 44	West	116	84	-10	-49	3	28	**50**	**50**
KAT-P1-2											
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 - 2	West	133	75	-10	-51	3	17		
		KAT - 3	West	130	75	-10	-50	3	18		
		KAT - 4D	West	126	68	-10	-50	3	11		
		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	West	132	79	-10	-50	3	22		
		KAT - 16	North	132	78	-10	-50	3	21		
		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	Top	126	86	0	-50	3	39		
		KAT - 38	Top	118	76	0	-49	3	30		
		KAT - 38A	North	116	70	0	-49	3	24		
		KAT - 39	Top	108	93	0	-49	3	47		
		KAT - 40	Top	112	88	0	-49	3	42		
		KAT - 41	Top	115	86	0	-49	3	40		
		KAT - 42	Top	123	84	0	-50	3	37		
		KAT - 44	West	114	84	-10	-49	3	28	**50**	**50**
KAT-P1-3											
KAT-P1-3	Residential premises near KAT	KAT - 1A	South	104	85	0	-48	3	40		
		KAT - 1B	South	100	82	0	-48	3	37		
		KAT - 2	West	112	75	-10	-49	3	19		
		KAT - 3	West	116	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 - 14	West	257	78	-10	-56	3	15		
		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	South	109	94	0	-49	3	48		
		KAT - 35	Top	108	86	0	-49	3	40		
		KAT - 38	Top	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	Top	245	88	0	-56	3	35		
		KAT - 41	Top	251	86	0	-56	3	33		
		KAT - 42	Top	261	84	0	-56	3	31		
		KAT - 44	West	239	84	-10	-56	3	21	**50**	**50**
KAT-P1-4											
KAT-P1-4	Residential premises near KAT	KAT - 1A	South	71	85	-5	-45	3	38		
		KAT - 1B	South	76	82	-5	-46	3	34		
		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 - 5	West	62	73	0	-44	3	32		
		KAT - 13	West	151	77	0	-52	3	28		
		KAT - 14	West	157	78	0	-52	3	29		
		KAT - 15	West	168	79	0	-53	3	29		
		KAT - 16	North	170	78	-10	-53	3	18		
		KAT - 17	North	173	74	-10	-53	3	14		
		KAT - 28	West	237	73	0	-56	3	20		
		KAT - 34	South	74	94	-10	-45	3	42		
		KAT - 35	Top	72	86	0	-45	3	44		
		KAT - 38	Top	71	76	0	-45	3	34		
		KAT - 38A	North	71	70	0	-45	3	28		
		KAT - 39	Top	142	93	0	-51	3	45		
		KAT - 40	Top	152	88	0	-52	3	39		
		KAT - 41	Top	158	86	0	-52	3	37		
		KAT - 42	Top	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.

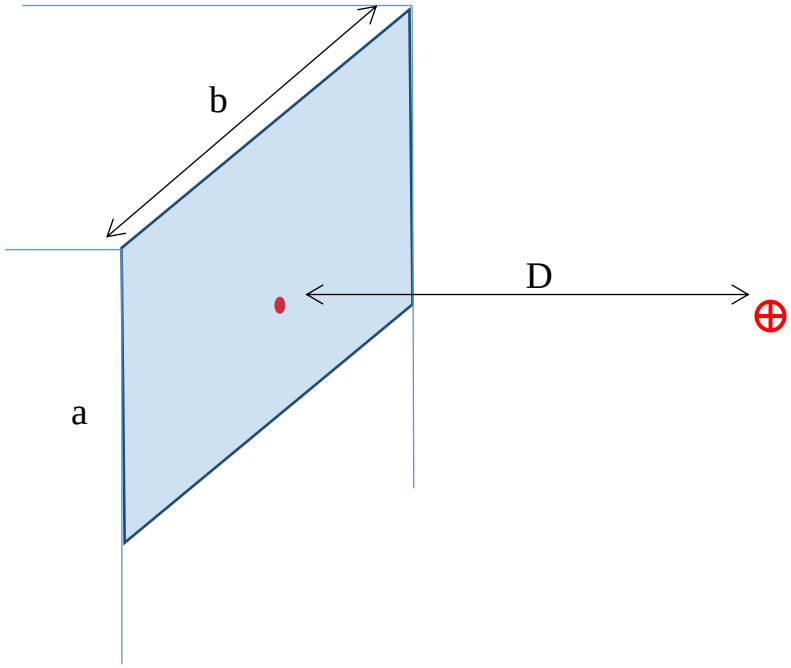
Appendix B

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.

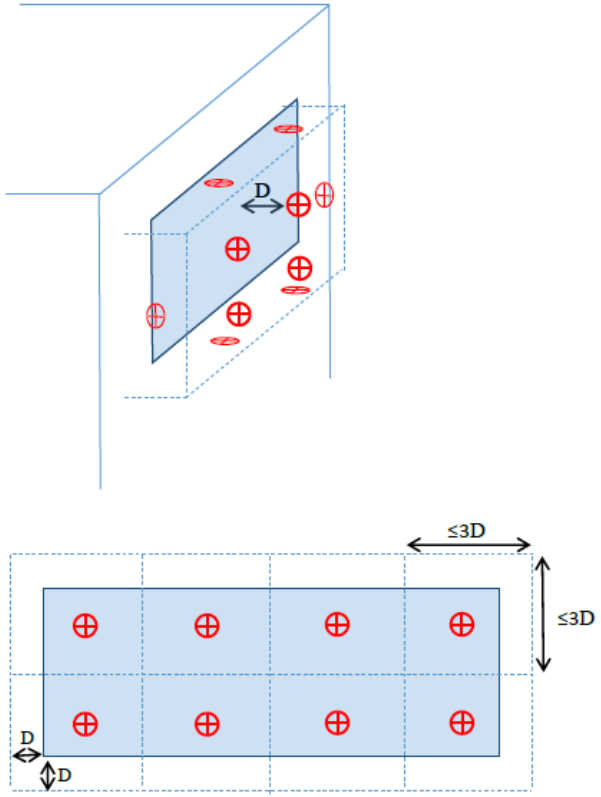
Louver opening
Proposed measurement point (microphone pointing perpendicular to the center of the louvre)

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 $L_{Aeq,\ 1\ min}$ 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)

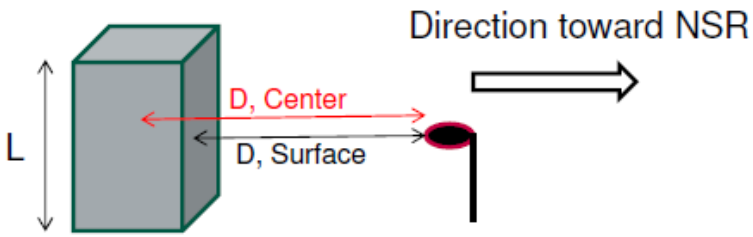
For method 2 (developed based on the principle of ISO3746:2010),

- 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



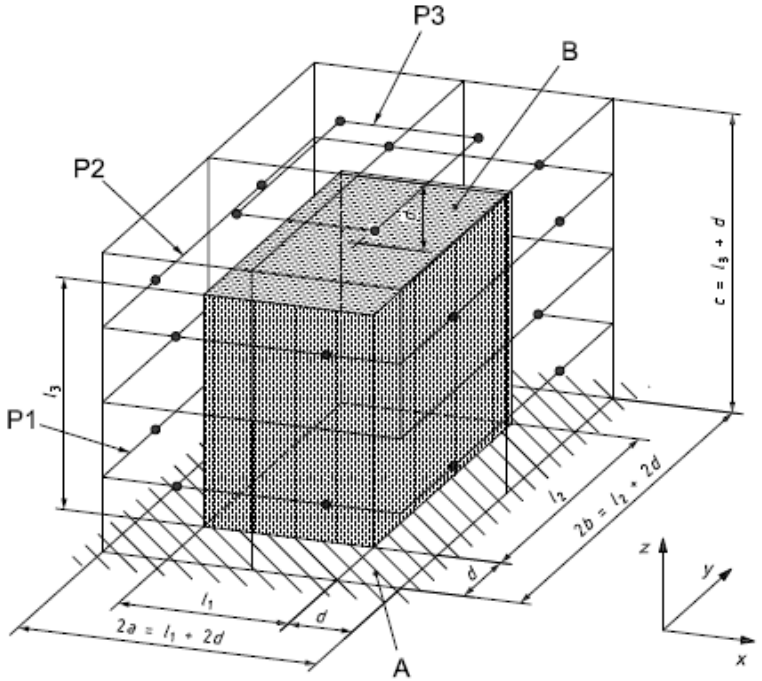
"L" is the longest side of the plant item
"D, Center" is the separation between center of the plant item and microphone
"D, Surface" is the separation between surface of the plant item and microphone

- "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



Key

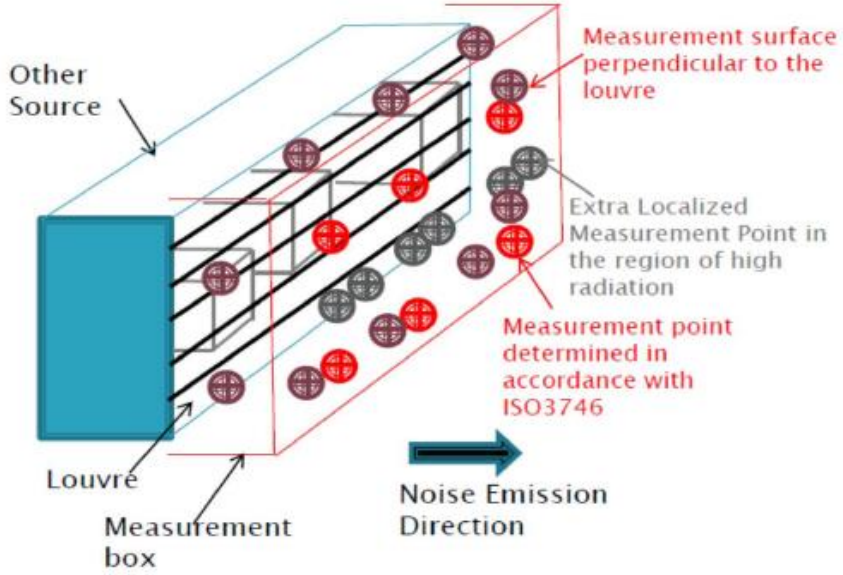
For Method 4 (based on ISO3746:2010),

- 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

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)

MAXLAB

CALIBRATION CERTIFICATE

Certificate Information

Date of Issue	23-Jun-2017	**Certificate Number**	MLCN171137S

Customer Information

Company Name	Wilson Accoustics Limited
Address	Unit 601, Block A, Shatin Industrial Centre, Yuen Shun Circuit, Shatin, N. T., Hong Kong

Equipment-under-Test (EUT)

Description	Sound & Vibration Analyser
Manufacturer	Svantek
Model Number	SVAN 958
Serial Number	20890
Equipment Number	--

Calibration Particular

Date of Calibration	23-Jun-2017		
Calibration Equipment	4231(MLTE008) / PA160059 / 20-May-2018		
Calibration Procedure	MLCG00, MLCG15		
Calibration Conditions	Laboratory	Temperature	23 °C ± 5 °C
		Relative Humidity	55% ± 25%
	EUT	Stabilizing Time	Over 3 hours
		Warm-up Time	10 minutes
		Power Supply	Internal battery
Calibration Results	Calibration data were detailed in the continuation pages.		

Approved By & Date

K.O. Lo 23-Jun-2017

Statements

* Calibration equipment used for this calibration are traceable to national / international standards.
* The results on this Calibration Certificate only relate to the values measured at the time of the calibration and the uncertainties quoted will not include allowance for the EUT long term drift, variation with environmental changes, vibration and shock during transportation, overloading, mishandling, misuse, and the capacity of any other laboratory to repeat the measurement.
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MAXLAB

Certificate No.MLCN171137S

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 : Patrick
Date : 23-Jun-2017

Checked By : K.O. Lo
Date : 23-Jun-2017

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香港新界葵涌華星街 16-18 號保盈工業大廈 9 樓 B2 室
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Cert B2: Calibration Certificate of Sound Level Meter SVANTEK 955 (SN: 15234)

MAXLAB

CALIBRATION CERTIFICATE

Certificate Information

Date of Issue	6-Feb-2018	**Certificate Number**	MLCN180200S

Customer Information

Company Name	Wilson Acoustics Limited
Address	Unit 601, Block A, Shatin Industrial Centre, Yuen Shun Circuit, Shatin, N. T.

Equipment-under-Test (EUT)

Description	Sound Level Meter
Manufacturer	Svantek
Model Number	SVAN 955
Serial Number	15234
Equipment Number	--

Calibration Particular

Date of Calibration	6-Feb-2018		
Calibration Equipment	4231(MLTE008) / PA160059 / 20-May-2018		
Calibration Procedure	MLCG00, MLCG15		
Calibration Conditions	Laboratory	Temperature	23 °C ± 5 °C
		Relative Humidity	55% ± 25%
	EUT	Stabilizing Time	Over 3 hours
		Warm-up Time	10 minutes
		Power Supply	Internal battery
Calibration Results	Calibration data were detailed in the continuation pages.		

Approved By & Date

K.O. Lo 6-Feb-2018

Statements

* Calibration equipment used for this calibration are traceable to national / international standards.
* The results on this Calibration Certificate only relate to the values measured at the time of the calibration and the uncertainties quoted will not include allowance for the EUT long term drift, variation with environmental changes, vibration and shock during transportation, overloading, mishandling, misuse, and the capacity of any other laboratory to repeat the measurement.
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MAXLAB

Certificate No. MLCN180200S

Calibration Data

Parameter	Frequency Weighting	Range (dB)	Time Weighting	EUT Reading	Standard Reading	EUT Error	Calibration Uncertainty
SPL	A (1 kHz Input)	25 - 130	F	94 dB	94.0 dB	0.0 dB	0.2 dB
			S	94 dB	94.0 dB	0.0 dB	0.2 dB
			I	94 dB	94.0 dB	0.0 dB	0.2 dB
	C (1 kHz Input)	25 - 130	F	94 dB	94.0 dB	0.0 dB	0.2 dB
			S	94 dB	94.0 dB	0.0 dB	0.2 dB
			I	94 dB	94.0 dB	0.0 dB	0.2 dB
	Z (1 kHz Input)	25 - 130	F	94 dB	94.0 dB	0.0 dB	0.2 dB
			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 (1 kHz Input)	25 - 130	F	114 dB	114.0 dB	0.0 dB	0.2 dB
			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 (1 kHz Input)	25 - 130	F	114 dB	114.0 dB	0.0 dB	0.2 dB
			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 (1 kHz Input)	25 - 130	F	114 dB	114.0 dB	0.0 dB	0.2 dB
			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 By : Patrick
Date : 6-Feb-2018

Checked By : K.O. Lo
Date : 6-Feb-2018

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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
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Cert B3: 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 (Type 1)	Microphone	Preamp
Manufacturer:	Rion Co., Ltd.	Rion Co., Ltd.	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 Venture
Address of Customer:	5C, Hong Kong Spinners Industrial Building, Phase 1, 601-603 Tai Nan West Street, Cheung Sha Wan, Kowloon, Hong Kong
Request No.:	2000072119
Date of receipt:	24-Jun-2017

Date of test: 28-Jun-2017

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	17-Jun-2018	CIGISMEC
Signal generator	DS 360	33873	25-Apr-2018	CEPREI
Signal generator	DS 360	61227	01-Apr-2018	CEPREI

Ambient conditions

Temperature:	24 ± 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.

Approved Signatory: Huang Jian Min/Feng Jun Qi **Date:** 29-Jun-2017 **Company Chop:** SOILS AND MATERIALS ENGINEERING COMPANY LTD. 綜合試驗有限公司

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.

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)

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.

Test:	Subtest:	Status:	Expanded Uncertainty (dB)	Coverage Factor
Self-generated noise	A	Pass	0.3	
	C	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	
	C	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 $1/10^3$ at 4kHz	Pass	0.3	
	1 ms burst duty factor $1/10^4$ 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 Uncertainty (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: Lai Sheng Jie Date: 28-Jun-2017

Checked by: Fung Chi Yip Date: 29-Jun-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.

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

MAXLAB

CALIBRATION CERTIFICATE

Certificate Information

Date of Issue	5-Mar-2018	**Certificate Number**	MLCN180297S

Customer Information

Company Name	Wilson Accoustics Limited
Address	Unit 601, Block A, Shatin Industrial Centre, Yuen Shun Circuit, Shatin, N. T., Hong Kong

Equipment-under-Test (EUT)

Description	Acoustic Calibrator
Manufacturer	Svantek
Model Number	SV 30A
Serial Number	29088
Equipment Number	--

Calibration Particular

Date of Calibration	5-Mar-2018		
Calibration Equipment	4231(MLTE008) / PA160059 / 20-May-18 1351(MLTE049) / MLEC17/06/02 / 6-Jun-18		
Calibration Procedure	MLCG00, MLCG15		
Calibration Conditions	Laboratory	Temperature	23 °C ± 5 °C
		Relative Humidity	55% ± 25%
	EUT	Stabilizing Time	Over 3 hours
		Warm-up Time	Not applicable
		Power Supply	Internal battery
Calibration Results	Calibration data were detailed in the continuation pages. All calibration results were within EUT specification.		

Approved By & Date

K.O. Lo 5-Mar-2018

Statements

* Calibration equipment used for this calibration are traceable to national / international standards.
* The results on this Calibration Certificate only relate to the values measured at the time of the calibration and the uncertainties quoted will not include allowance for the EUT long term drift, variation with environmental changes, vibration and shock during transportation, overloading, mishandling, misuse, and the capacity of any other laboratory to repeat the measurement.
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MAXLAB

Certificate No. MLCN180297S

Calibration Data

EUT Setting	Standard Reading	EUT Error	Calibration Uncertainty	EUT 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
Date : 5-Mar-18

Checked By : K.O. Lo
Date : 5-Mar-18

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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
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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

COPY

Certificate No. 811336 Page 1 of 2 Pages

Customer : Leighton M&E Limited

Address : 3 Dakota Drive, Kowloon City, Kowloon, Hong Kong

Order No. : Q84453 **Date of receipt :** 14-Nov-18

Item Tested

Description : Sound Level Calibrator

Manufacturer : CIRRUS **I.D.** : --

Model : CR:515 **Serial No.** : 78572

Test Conditions

Date of Test : 16-Nov-18 **Supply Voltage** : --

Ambient Temperature : (23 ± 3)°C **Relative Humidity :** (50 ± 25) %

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:

Equipment No.	Description	Cert. No.	Traceable to
S014	Spectrum Analyzer	805025	NIM-PRC & SCL-HKSAR
S041	Universal Counter	802061	SCL-HKSAR
S240	Sound Level Calibrator	803357	NIM-PRC & SCL-HKSAR
S206	Sound Level Meter	805027	SCL-HKSAR

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 : Elva Chong

Approved by : Kin Wong

Date: 16-Nov-18

This Certificate is issued by:
Hong Kong Calibration Ltd.
Unit 8B, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street,Kwai Chung, NT,Hong Kong.
Tel: 2425 8801 Fax: 2425 8646

E

Hong Kong Calibration Ltd.
香港校正有限公司

Calibration Certificate

COPY

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 : ± 0.2 dB

2. **Short-term Level Fluctuation** : 0.0 dB
IEC 60942 Class 1 Spec. : ± 0.1 dB
Uncertainty : ± 0.01 dB

3. **Frequency**

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

Uncertainty : $\pm 3.6 \times 10^{-6}$

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 ----------

Appendix B3

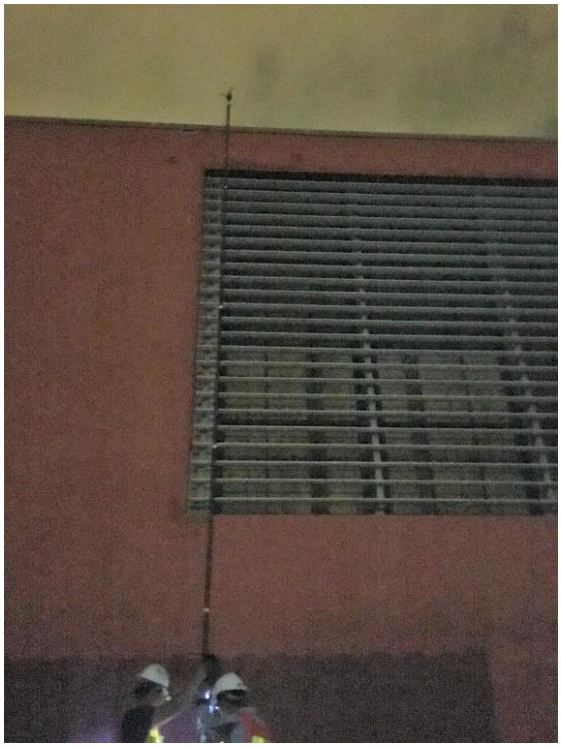
Photographs showing the Examples of Noise Measurement for Fixed Plant Noise

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

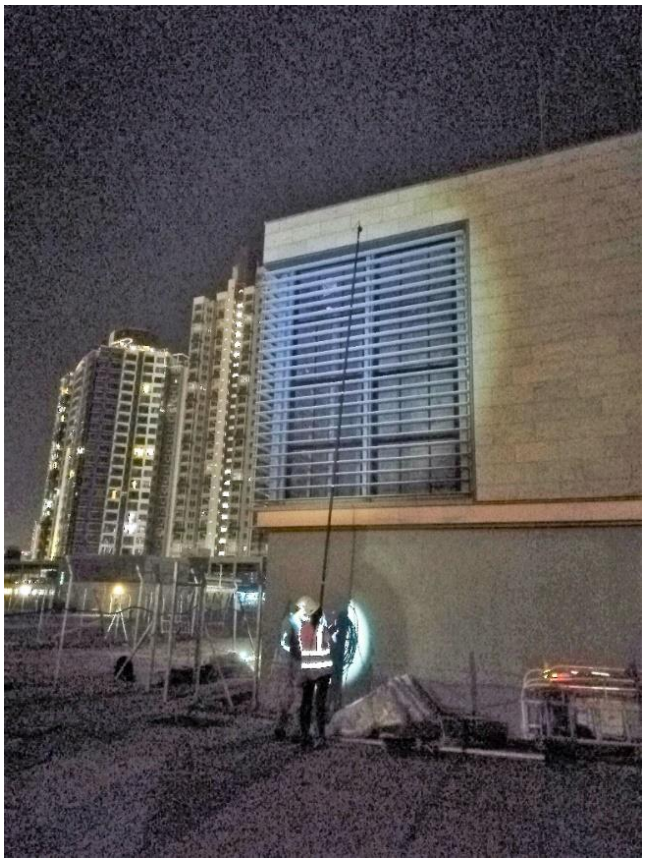
SWL Measurement for KAT-1A

SWL Measurement for KAT-13

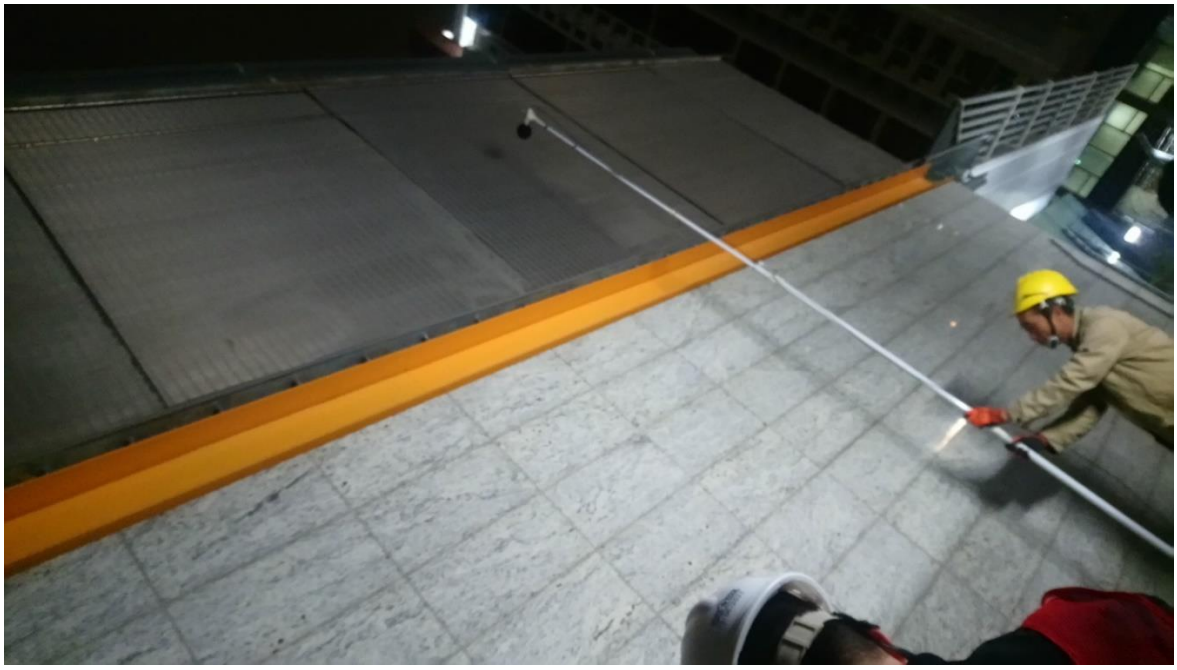
SWL Measurement for KAT-14



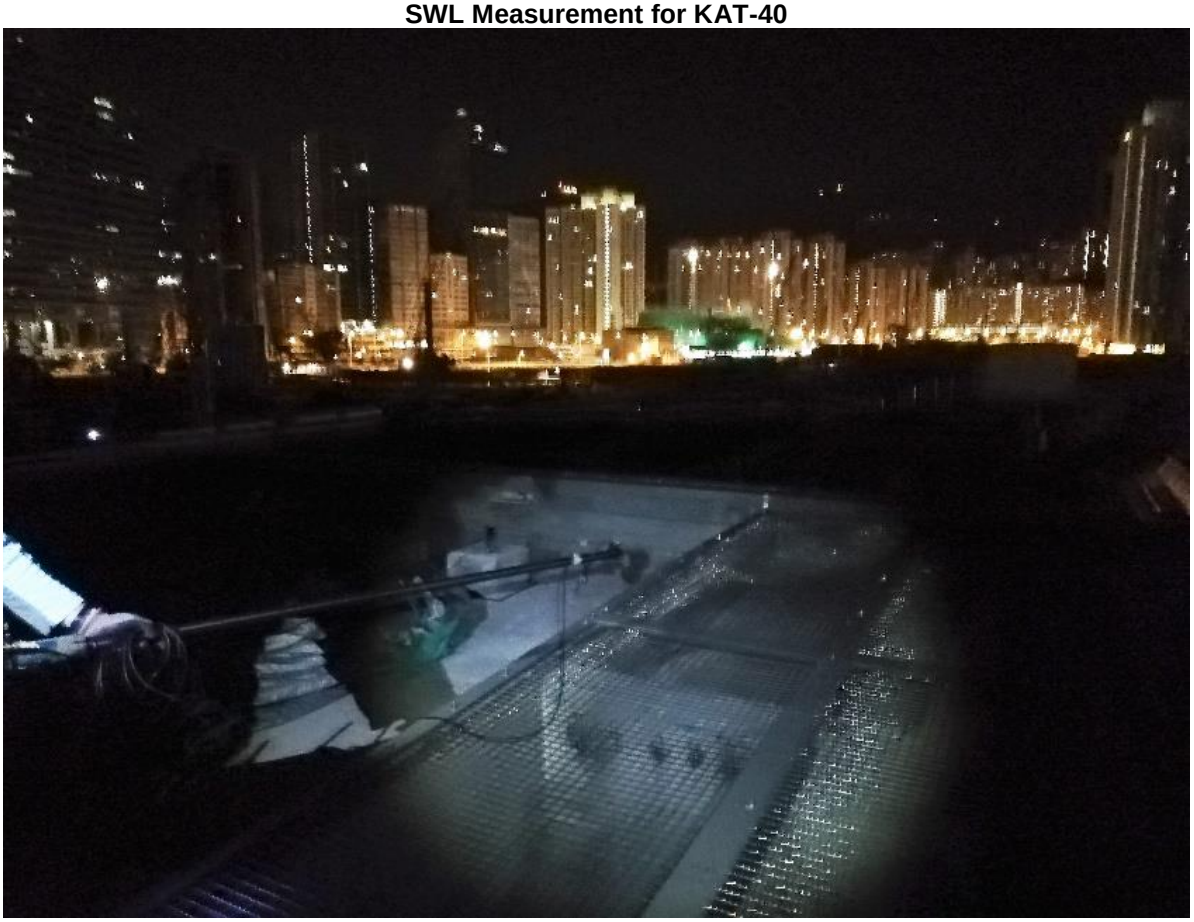
SWL Measurement for KAT-15



SWL Measurement for KAT-23



SWL Measurement for KAT-40



Appendix B4

Noise Measurement Results

Appendix B4 Noise Measurement Results

Fixed Plant Source ID	Plant Type	Method	Size of Louvre (mm)			Measurement Distance (m) D [(a)]	Averaged Measured L_{Aeq} ,dB(A) [(b)]	Background L_{Aeq} ,dB(A)	Difference L_{Aeq} ,dB(A)	Background Corrected L_{Aeq} ,dB(A)[(c)]	Calculated SWL, dB(A)
			Length	Width	Height						
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[(d)]	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

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

HOKLAS 028
CAL

CERTIFICATE OF CALIBRATION

Certificate No.: 18CA1019 01-01 **Page** 1 **of** 2

Item tested

Description:	Sound Level Meter (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

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 calibration

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	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%.

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 **Date:** 20-Oct-2018 **Company Chop:** SOILS AND MATERIALS ENGINEERING COMPANY LTD 綜合試驗有限公司

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.

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

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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 18CA1019 01-01 **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.

Test:	Subtest:	Status:	Expanded Uncertainty (dB)	Coverage Factor
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	
	C	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 $1/10^3$ at 4kHz	Pass	0.3	
	1 ms burst duty factor $1/10^4$ 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 Uncertainty (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: Fung Chi Yip Date: 19-Oct-2018

Checked by: shek Kwong Tat 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.

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

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CERTIFICATE OF CALIBRATION

Certificate No.: 19CA0311 02 **Page** 1 **of** 2

Item tested

Description:	Sound Level Meter (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.0[illegible].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 calibration

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

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 **Date:** 19-Mar-2019 **Company Chop:** SOILS & MATERIALS ENGINEERING COMPANY LTD. 綜合試驗有限公司

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.

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

HOKLAS 028 CAL

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.

Test:	Subtest:	Status:	Expanded Uncertainty (dB)	Coverage Factor
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	
	C	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 $1/10^3$ at 4kHz	Pass	0.3	
	1 ms burst duty factor $1/10^4$ 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 Uncertainty (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: Fong Chun Wai **Date:** 18-Mar-2019

Checked by: Fung Chi Yip **Date:** 19-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.

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

HOKLAS 028 CAL

CERTIFICATE OF CALIBRATION

Certificate No.: 17CA0902 02-02 **Page** 1 **of** 2

Item tested

Description:	Sound Level Meter (Type 1)	Microphone	Preamp
Manufacturer:	B & K	B & K	B & K
Type/Model No.:	2250	4950	ZC0032
Serial/Equipment No.:	2718890	2827088	24967
Adaptors used:	-	-	-

Item submitted by

Customer Name:	Anewr Consulting Limited
Address of Customer:	Unit 517, 5/F Tower A, Regent Centre, 63 Wo Yip Hop Road, Kwai Chung
Request No.:	-
Date of receipt:	02-Sep-2017

Date of test: 09-Sep-2017

Reference equipment used in the calibration

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.

Approved Signatory: Huang Jian Min/Feng Jun Qi **Date:** 09-Sep-2017 **Company Chop:** SOILS AND MATERIALS ENGINEERING COMPANY LTD. 綜合試驗有限公司

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.

綜合試驗有限公司
SOILS & MATERIALS ENGINEERING CO., LTD.
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Fax: (852) 2555 7533

CERTIFICATE OF CALIBRATION

(Continuation Page)

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.

Test:	Subtest:	Status:	Expanded Uncertainty (dB)	Coverage Factor
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	
	C	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 $1/10^3$ at 4kHz	Pass	0.3	
	1 ms burst duty factor $1/10^4$ 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 Uncertainty (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: Lai Sheng Jie
Date: 09-Sep-2017

Checked by: Fung Chi Yip
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.

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

HOKLAS 028
CAL

CERTIFICATE OF CALIBRATION

Certificate No.: 19CA0228 02 **Page** 1 **of** 2

Item tested

Description:	Sound Level Meter (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:	- (N-012-01)	,	-	-

Item submitted by

Customer Name:	AECOM ASIA CO LTD
Address of Customer:	-
Request No.:	-
Date of receipt:	28-Feb-2019

Date of test: 01-Mar-2019

Reference equipment used in the calibration

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

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 **Date:** 02-Mar-2019 **Company Chop:** SOILS AND MATERIALS ENGINEERING COMPANY LTD. 綜合試驗有限公司

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.

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(Continuation Page)

Certificate No.: 19CA0228 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.

Test:	Subtest:	Status:	Uncertainty (dB) / Coverage Factor	
Self-generated noise	A	Pass	0.3	
	C	Pass	1.0	2.1
	Lin	Pass	2.0	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	
	C	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 $1/10^3$ at 4kHz	Pass	0.3	
	1 ms burst duty factor $1/10^4$ 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	Uncertainty (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.

- End -

Calibrated by: Fong Chun Wai **Date:** 01-Mar-2019

Checked by: 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.

綜合試驗有限公司
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Certificate No.: 19CA0327 01-02 **Page:** 1 **of** 2

Item tested

Description:	Acoustical Calibrator (Class 1)
Manufacturer:	B & K
Type/Model No.:	4231
Serial/Equipment No.:	3006428 / N004.03
Adaptors used:	-

Item submitted by

Curstomer:	AECOM ASIA CO LIMITED
Address of Customer:	-
Request No.:	-
Date of receipt:	27-Mar-2019 (N.004.03)

Date of test: 27-Mar-2019

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2341427	20-Apr-2019	SCL
Preamplifier	B&K 2673	2743150	27-Apr-2019	CEPREI
Measuring amplifier	B&K 2610	2346941	08-May-2019	CEPREI
Signal generator	DS 360	33873	24-Apr-2019	CEPREI
Digital multi-meter	34401A	US36087050	23-Apr-2019	CEPREI
Audio analyzer	8903B	GB41300350	23-Apr-2019	CEPREI
Universal counter	53132A	MY40003662	24-Apr-2019	CEPREI

Ambient conditions

Temperature:	22 ± 1 °C
Relative humidity:	55 ± 10 %
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.

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: Feng Junqi **Date:** 29-Mar-2019 **Company Chop:** SOILS & MATERIALS ENGINEERING COMPANY LTD. 綜合試驗有限公司

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.

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CERTIFICATE OF CALIBRATION

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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.

(Output level in dB re 20 μPa)

Frequency 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 -

Calibrated by: Fung Chi Yip **Date:** 27-Mar-2019

Checked by: Fong Chun Wai **Date:** 29-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.

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Certificate No.: 18CA1008 02 **Page:** 1 **of** 2

Item tested

Description:	Acoustical Calibrator (Class 1)
Manufacturer:	Rion Co., Ltd.
Type/Model No.:	NC-74
Serial/Equipment No.:	34246490 / N.004.10
Adaptors used:	-

Item submitted by

Curstomer:	AECOM ASIA CO LIMITED
Address of Customer:	-
Request No.:	-
Date of receipt:	08-Oct-2018

Date of test: 10-Oct-2018

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2341427	20-Apr-2019	SCL
Preamplifier	B&K 2673	2743150	27-Apr-2019	CEPREI
Measuring amplifier	B&K 2610	2346941	08-May-2019	CEPREI
Signal generator	DS 360	61227	24-Apr-2019	CEPREI
Digital multi-meter	34401A	US36087050	23-Apr-2019	CEPREI
Audio analyzer	8903B	GB41300350	23-Apr-2019	CEPREI
Universal counter	53132A	MY40003662	24-Apr-2019	CEPREI

Ambient conditions

Temperature:	21 ± 1 °C
Relative humidity:	50 ± 10 %
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.

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: Feng Junqi **Date:** 10-Oct-2018 **Company Chop:** SOILS AND MATERIALS ENGINEERING COMPANY LTD. 綜合試驗有限公司

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.

綜合試驗有限公司
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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 18CA1008 02 **Page:** 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.

(Output level in dB re 20 μPa)

Frequency Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	Estimated Expanded Uncertainty 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.

- End -

Calibrated by: Fung Chi Yip **Checked by:** Shek Kwong Tat

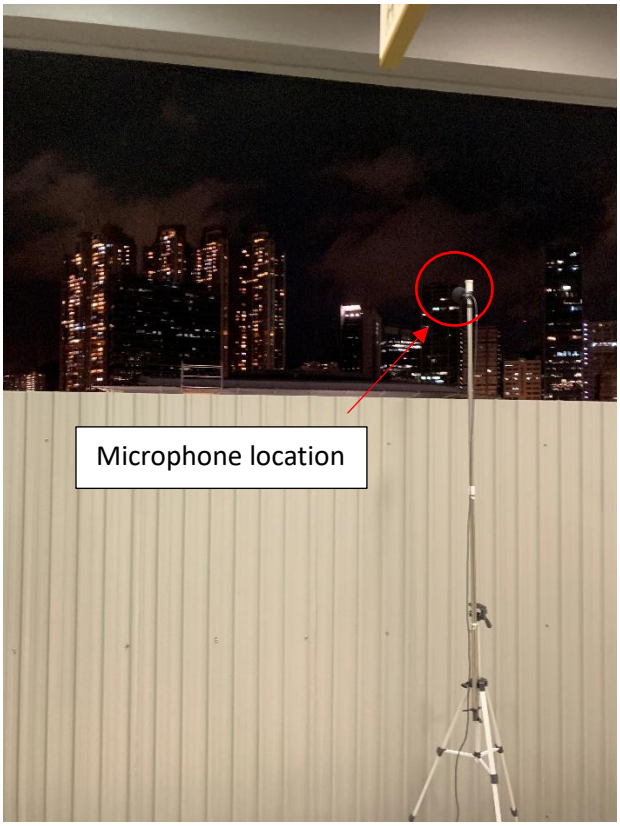
Date: 10-Oct-2018 **Date:** 10-Oct-2018

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.

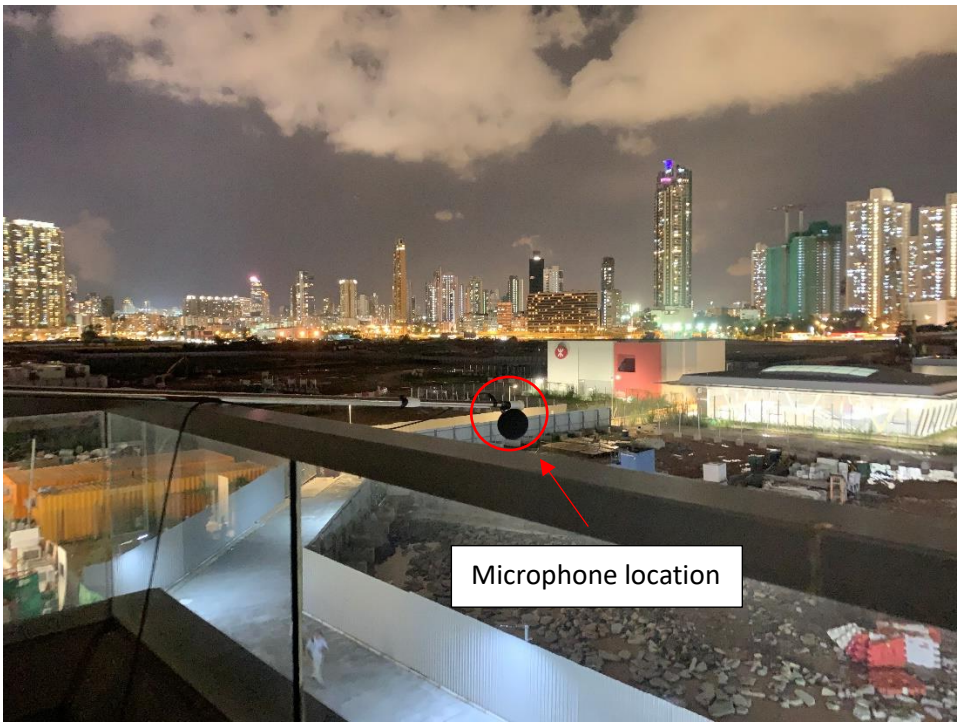
Appendix C2

Photographs – Noise Measurement at Representative NSRs

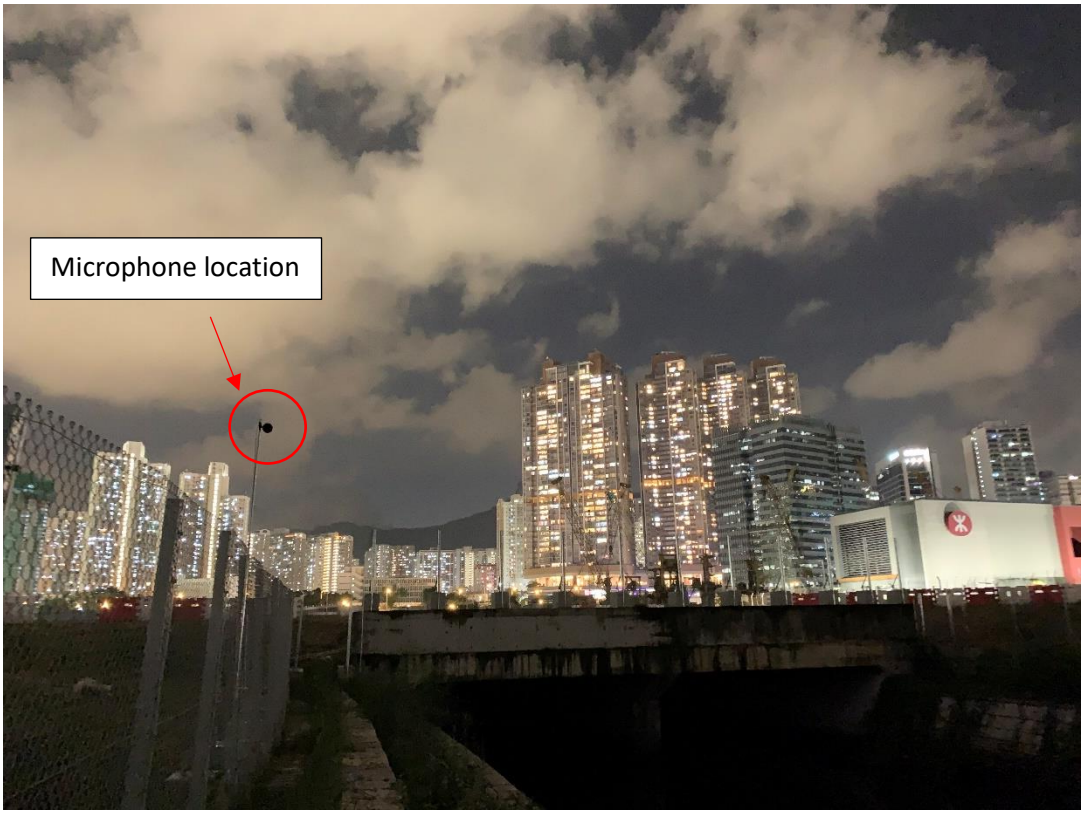
Appendix C2 Photographs – Noise Measurement at Representative NSRs



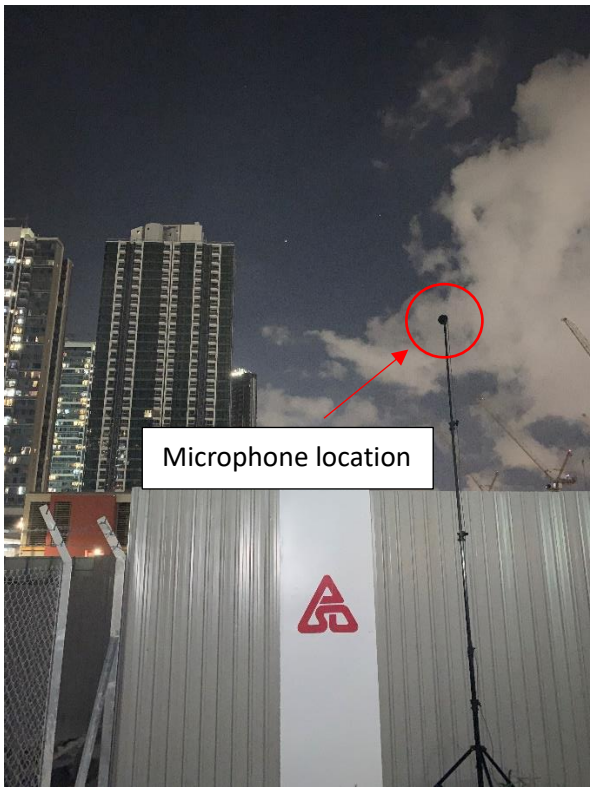
NSR Measurement Location at KAT-FN1



NSR Measurement Location at KAT-FN2



NSR Measurement Location at KAT-FN3



NSR Measurement Location at KAT-FN4

Appendix C3

Measurement Results at Representative NSRs

Appendix C3 Noise Measurement Results at Measurement Locations

Measurement Location ID	Measurement Date	Operation Scenario [1][2]	Fixed Plant Noise		Background Noise		Difference between Measured Noise Level and Background Level, dB(A)
			Measurement Time	Measured Noise Level, $L_{Aeq\ 30mins}$, dB(A)	Measurement Time	Background Noise Level, $L_{Aeq\ 5mins}$, dB(A)	
KAT-FN1	28/6/2019 - 29/6/2019	Daytime and Evening	22:29:00 - 22:58:59	54.9	21:57:00 - 22:01:59	56.5	-1.6
		Night-time	23:01:00 - 23:30:59	52.8	23:57:00 - 00:01:59	52.5	0.3
KAT-FN2	28/6/2019 - 29/6/2019	Daytime and Evening	22:29:00 - 22:58:59	58.1	21:57:00 - 22:01:59	57.8	0.3
		Night-time	23:01:00 - 23:30:59	56.9	23:57:00 - 00:01:59	56.6	0.3
KAT-FN3	28/6/2019 - 29/6/2019	Daytime and Evening	22:29:00 - 22:58:59	50.4	21:57:00 - 22:01:59	50.9	-0.5
		Night-time	23:01:00 - 23:30:59	50.2	23:57:00 - 00:01:59	51.1	-0.9
KAT-FN4	28/6/2019 - 29/6/2019	Daytime and Evening	22:29:00 - 22:58:59	54.6	21:57:00 - 22:01:59	55.8	-1.2
		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))

MTR Corporation Limited

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 2019

MTR Corporation Limited

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

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

July 2019

	Name	Signature
Prepared & Checked:	pp Isaac Chu	
Reviewed & Approved:	pp Josh Lam	

Version:	A	Date:	31 July 2019

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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.

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

Location	Fixed Plant ID.	Fixed Plant Source	Maximum Allowable SWL, dB(A)[1]	
			Daytime & Evening[2]	Night-time[2]
MCV	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
	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 Louvre	68	68
	VCU-001	Outdoor Unit	84	84
	VCU-002	Outdoor Unit	84	84
	VCU-003	Outdoor Unit	83	83

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 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 3.1 Noise Measurement Equipment

Equipment	Model	Serial Number
Sound Level Meter	SVANTEK SVAN 958	20890
	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 3.2 Measurement Schedule

Location	Date
MCV	10 September 2018
	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_{Aeq} (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_{Aeq} (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**.

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	3014024

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	Representative NSR (NSR ID)	Type	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)	Type	Measurement Height
DIH-21-1	Tin Wang Court – Wang King House	Residential	1st 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 3.5 Measurement 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**.

Table 4.1 Summary of Measured SWLs for Fixed Plants

Plant Item	Measured SWL(1), dB(A)		Maximum allowable SWL(1), dB(A)		Compliance (Y/N)	
	Day / Evening-time(2)	Night-time(2)	Day / Evening - time(2)	Night-time(2)	Day / Evening - time(2)	Night-time(2)
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

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

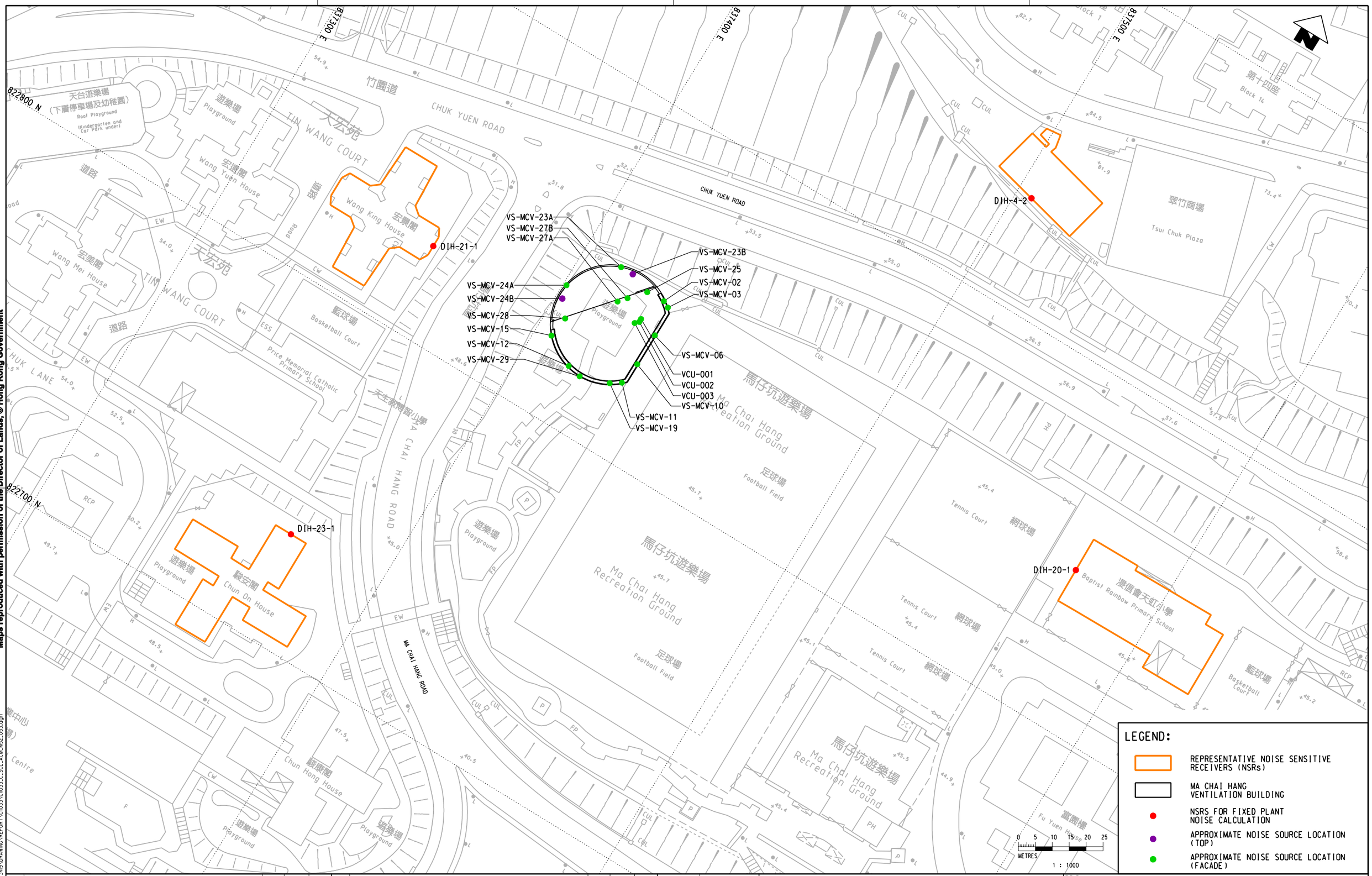
Measurement Location ID	Representing NSRs	Time Period[1]&[2]	Measurement Results			Site Observation	Characteristics of Tonality, Impulsiveness and Intermittency at NSRs (Y/N)
			Measured Noise Level $L_{Aeq(30mins)}$, dB(A)	Background Noise Level $L_{Aeq(5mins)}$, dB(A)	Difference between Measured Noise Level and Background Level, dB(A)		
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.	N
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 – Wang King House	Daytime & Evening	67.3	66.0	1.3	Noise environment was dominated by traffic noise. Noise from SCL fixed plant was not noticeable at measurement locations.	N
		Night-time	67.2	68.9	-1.7		N
DIH-23-1	Tin Ma Court – Chun On House	Daytime & Evening	63.8	63.6	0.2		N
		Night-time	63.4	64.6	-1.2		N

Note:
(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.

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



LEGEND:

- REPRESENTATIVE NOISE SENSITIVE RECEIVERS (NSRs)
- MA CHAI HANG VENTILATION BUILDING
- NSRS FOR FIXED PLANT NOISE CALCULATION
- APPROXIMATE NOISE SOURCE LOCATION (TOP)
- APPROXIMATE NOISE SOURCE LOCATION (FACADE)

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C11033
SCL (TAW - HUH)
LOCATIONS OF NSRs AND FIXED NOISE SOURCES
(MA CHAI HANG VENTILATION BUILDING)

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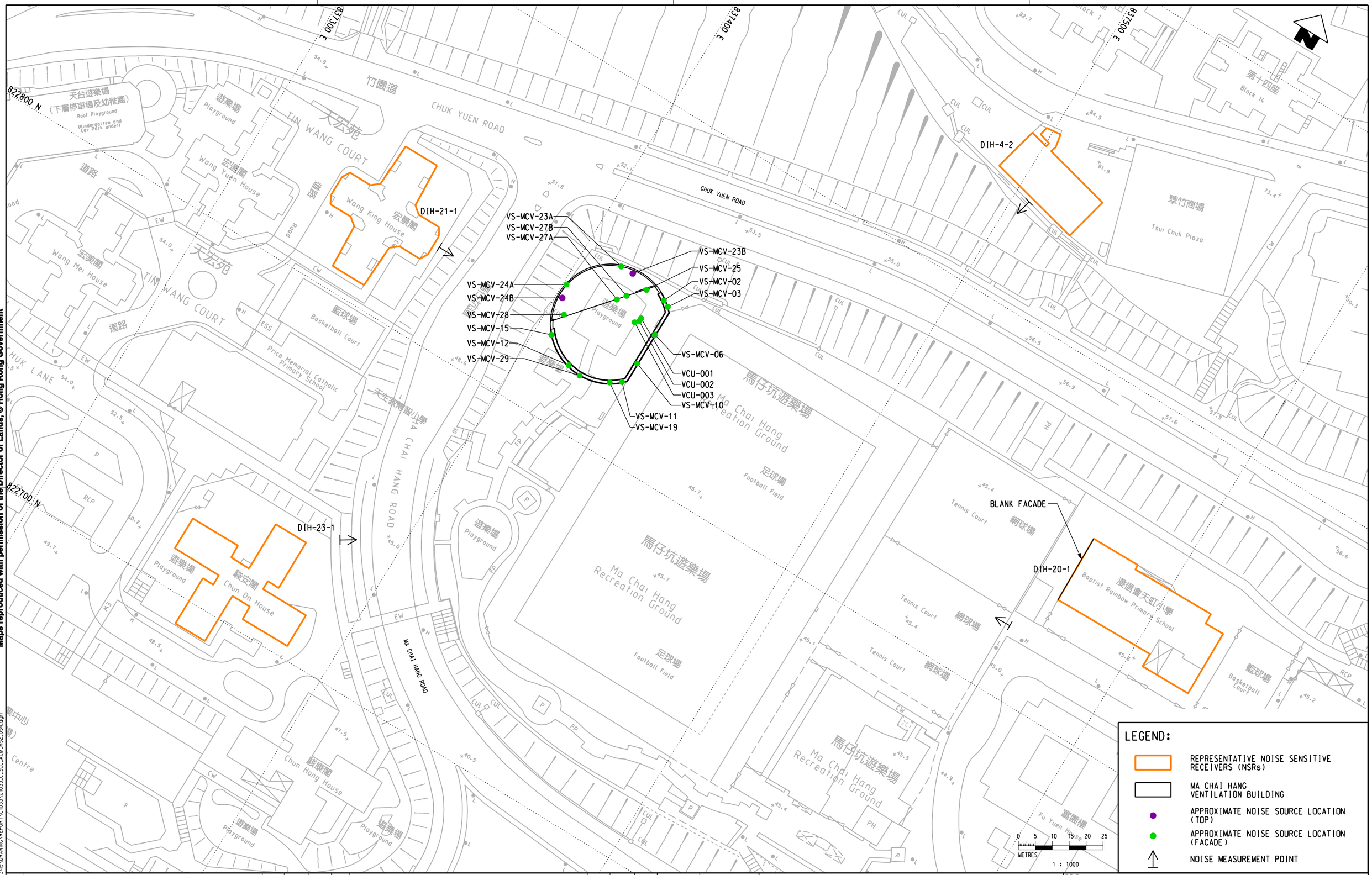

LEGEND:

- REPRESENTATIVE NOISE SENSITIVE RECEIVERS (NSRs)
- MA CHAI HANG VENTILATION BUILDING
- APPROXIMATE NOISE SOURCE LOCATION (TOP)
- APPROXIMATE NOISE SOURCE LOCATION (FACADE)
- NOISE MEASUREMENT POINT

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C11033
SCL (TAW - HUH)
LOCATIONS OF NOISE MEASUREMENT POINTS
(MA CHAI HANG VENTILATION BUILDING)

SCALE 1 : 1000 (A3)

FIGURE NO. C11033/C/SCL/ACM/M52/054

REV.

Appendix A

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

MTR Corporation Limited

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

Date: 20 June 2019

MTR Corporation Limited

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 

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	
Reviewed & Approved:	Josh Lam	

Version:	A	Date: 4 June 2019

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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).

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 Assessment of Noise from Fixed Sources

Time Period	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 (1)	Prevailing Background Noise Levels, dB(A) (2)	ASR	ANL-5, dB(A) (3)	Criteria, dB(A) (4)
Ma Chai Hang Ventilation Building					
Carbo Anglo-Chinese Kindergarten (DIH-4-2) (5)	Day & evening	66	B	60	60
	Night	58	B	50	50
Baptist Rainbow Primary School (DIH-20-1)	Day & evening	66	B	60	60
	Night	58	B	50	50
Wang King House (DIH-21-1)	Day & evening	69	B	60	60
	Night	56	B	50	50
Chun On House (DIH-23-1)	Day & evening	69	B	60	60
	Night	56	B	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.
(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**.

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

Location	Fixed Plant ID.	Fixed Plant Source	Maximum Allowable SWL, dB(A)[1]	
			Daytime & Evening[2]	Night-time[2]
MCV	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
	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

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

NSR ID	Description	Criteria, dB(A)		Predicted Sound Pressure Level, $L_{eq,30mins}$, dB(A)[1]	
		Daytime & Evening[2]	Night-time[2]	Daytime & Evening[2]	Night-time[2]
DIH-4-2	Tsui Chuk Peace Evangelical Centre[3]	60	N/A[4]	51	N/A[4]
DIH-20-1	Baptist Rainbow Primary School	60	N/A[4]	47	N/A[4]
DIH-21-1	Wang King House	60	50	52	46
DIH-23-1	Chun On House	60	50	60	50

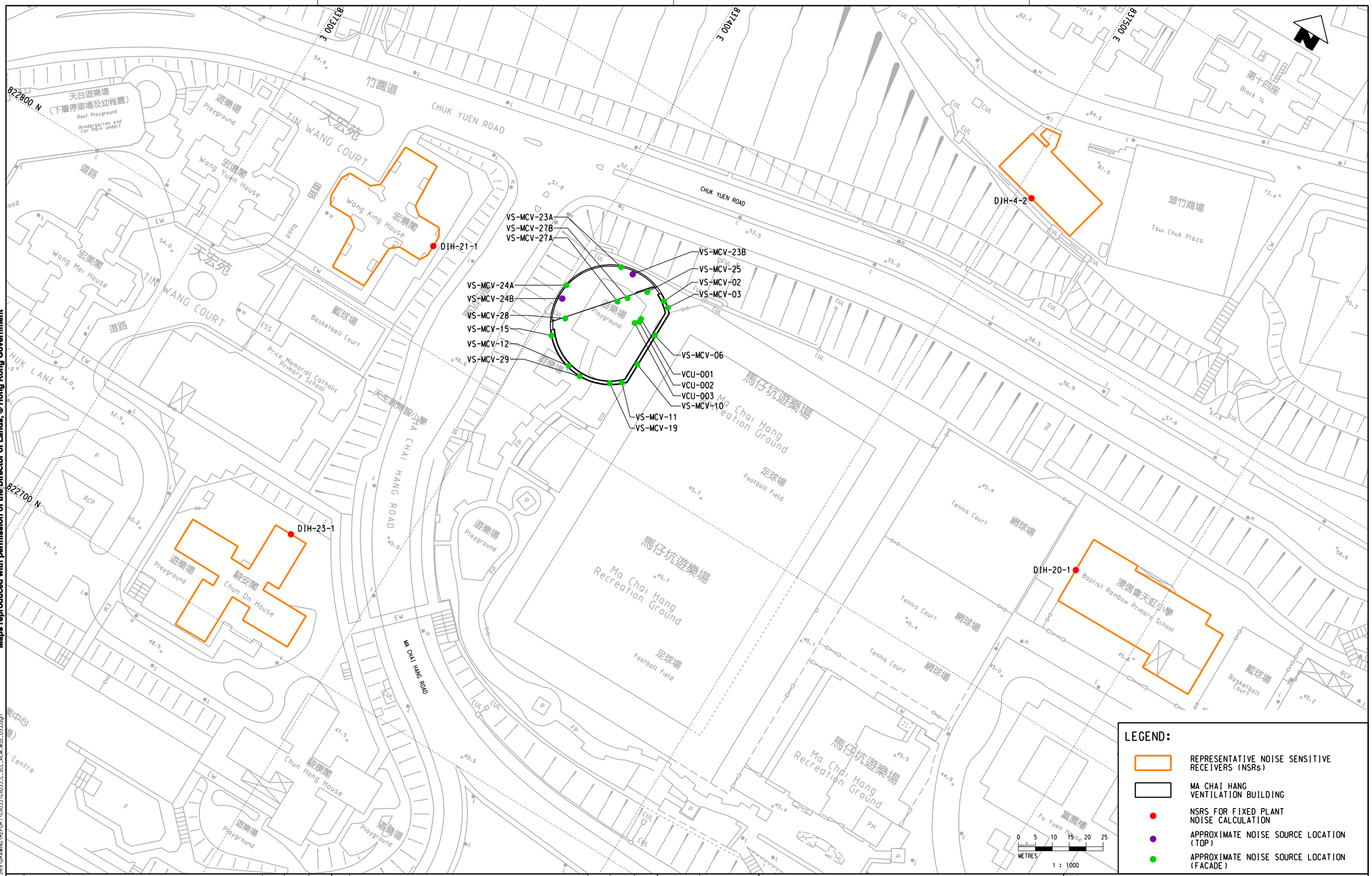
Notes:
(1) The predicted fixed plant noise levels have due regard to the characteristics of tonality, intermittency and impulsiveness.
(2) Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours.
(3) Carbo Anglo-Chinese Kindergarten (DIH-4-2) as a NSR in the approved SCL (TAW-HUH) EIA Report was no longer in operation and the building is currently occupied by Tsui Chuk Peace Evangelical Centre for use as place of worship.
(4) 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).

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



LEGEND:

- REPRESENTATIVE NOISE SENSITIVE RECEIVERS (NSRs)
- MA CHAI HANG VENTILATION BUILDING
- NSRS FOR FIXED PLANT NOISE CALCULATION
- APPROXIMATE NOISE SOURCE LOCATION (TOP)
- APPROXIMATE NOISE SOURCE LOCATION (FACADE)

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SHATIN TO CENTRAL LINK

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C11033
SCL (TAW - HUH)
LOCATIONS OF NSRs AND FIXED NOISE SOURCES
(MA CHAI HANG VENTILATION BUILDING)

SCALE	FIGURE NO.	REV.
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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	Horizontal Distance , m	SWL, dB(A)	Correction for line of sight [1], 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 Ventilation Building											
DIH-4-2											
DIH-4-2	Tsui Chuk Peace Evangelical Centre	VS-MCV-02	North	113	77	0	-49	3	31		
		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-15	South	148	78	-10	-51	3	20		
		VS-MCV-19	East	136	87	-5	-51	3	34		
		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	East	123	77	0	-50	3	30		
		VS-MCV-28	East	143	70	0	-51	3	22		
		VS-MCV-29	South	144	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											
DIH-20-1	Baptist Rainbow Primary School	VS-MCV-02	North	145	77	0	-51	3	29		
		VS-MCV-03	North	143	76	0	-51	3	28		
		VS-MCV-06	East	142	86	0	-51	3	38		
		VS-MCV-10	East	143	67	0	-51	3	19		
		VS-MCV-11	East	145	86	0	-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	Roof	157	86	0	-52	3	37		
		VS-MCV-24A	West	172	95	-10	-53	3	35		
		VS-MCV-24B	Roof	171	87	0	-53	3	37		
		VS-MCV-25	East	151	81	0	-52	3	32		
		VS-MCV-27A	East	157	67	0	-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	36		
		VCU-003	Roof	149	83	0	-51	3	35	**47**	**60**
DIH-23-1											
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-MCV-10	East	114	67	-5	-49	3	16		
		VS-MCV-11	East	107	86	0	-49	3	40		
		VS-MCV-12	South	96	76	0	-48	3	31		
		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	Roof	106	87	0	-49	3	41		
		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	**52**	**60**
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	86	-10	-45	3	34		
		VS-MCV-12	South	54	76	0	-43	3	36		
		VS-MCV-15	South	44	78	0	-41	3	40		
		VS-MCV-19	East	66	87	-10	-44	3	36		
		VS-MCV-23A	North	56	95	0	-43	3	55		
		VS-MCV-23B	Roof	60	86	0	-44	3	45		
		VS-MCV-24A	West	41	95	0	-40	3	58		
		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		
		VS-MCV-27B	East	60	77	-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	Roof	65	84	0	-44	3	43		
		VCU-003	Roof	64	83	0	-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	Horizontal Distance , m	SWL, dB(A)	Correction for line of sight [1], 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 Ventilation Building											
DIH-23-1											
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-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	Roof	60	71	0	-44	3	30		
		VS-MCV-24A	West	41	81	0	-40	3	44		
		VS-MCV-24B	Roof	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	77	-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	Roof	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.

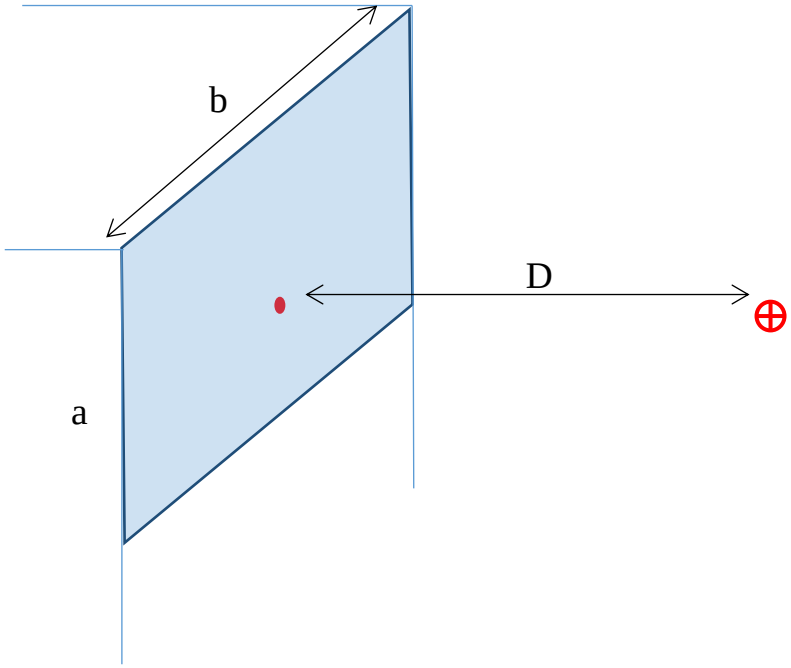
Appendix B

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.

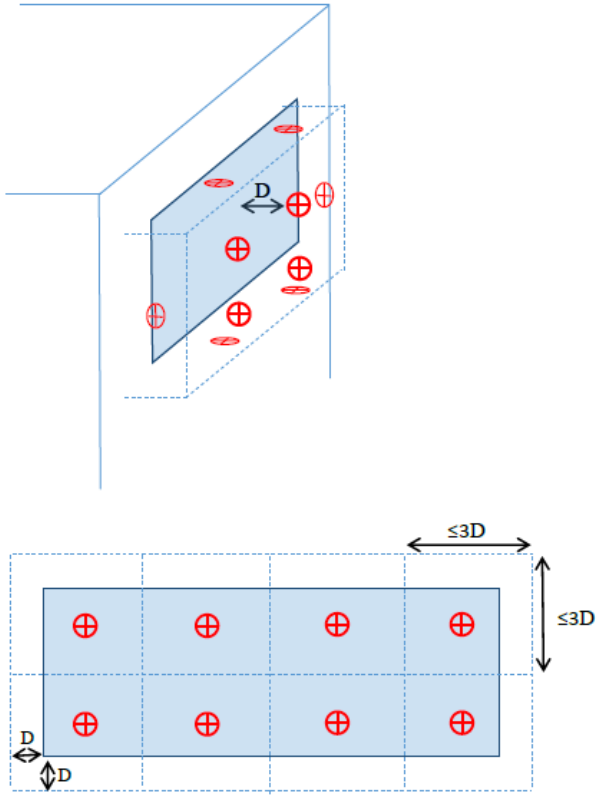
Louver opening
Proposed measurement point (microphone pointing perpendicular to the center of the louvre)

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 $L_{Aeq,\ 1\ min}$ 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)

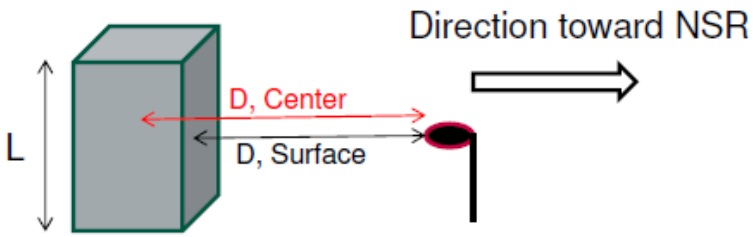
For method 2 (developed based on the principle of ISO3746:2010),

- 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



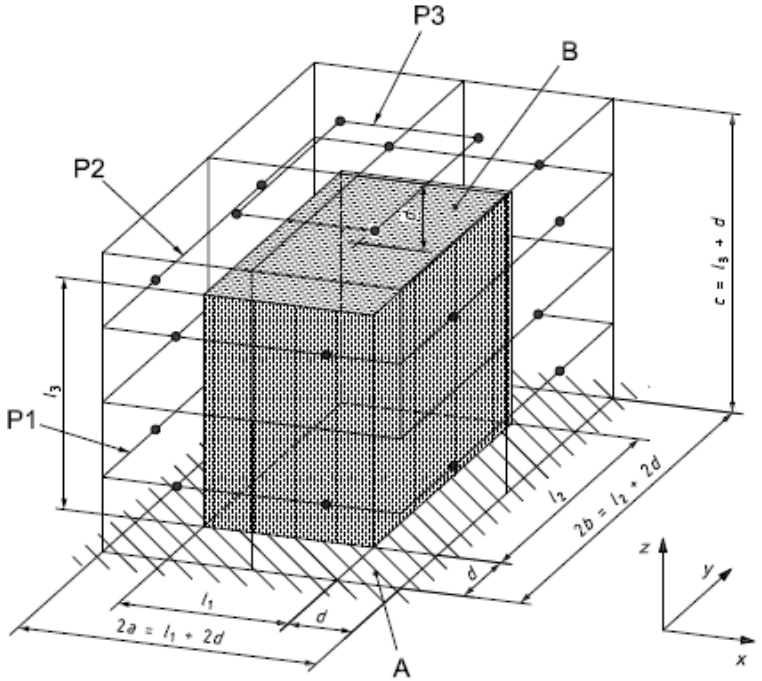
"L" is the longest side of the plant item
"D, Center" is the separation between center of the plant item and microphone
"D, Surface" is the separation between surface of the plant item and microphone

- "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



Key

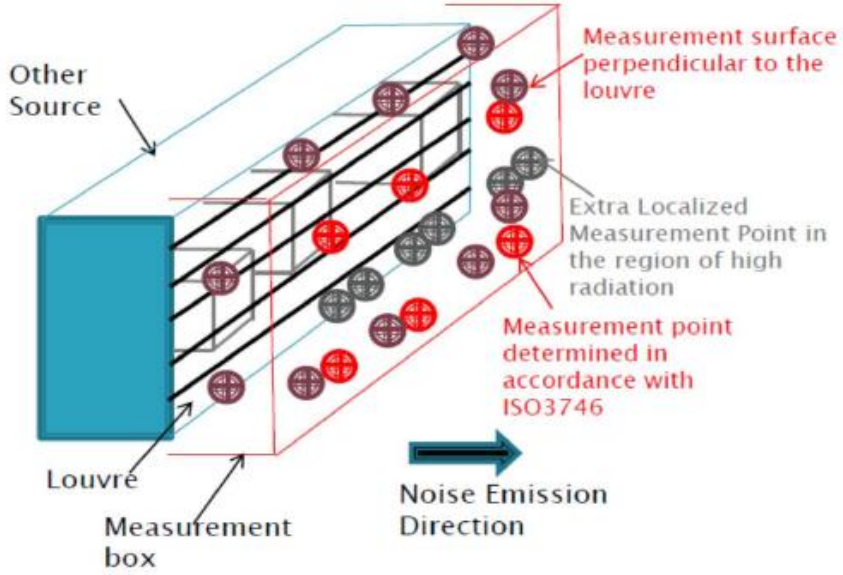
For Method 4 (based on ISO3746:2010),

- 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

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)

MAXLAB

CALIBRATION CERTIFICATE

Certificate Information

Date of Issue	23-Jun-2017	**Certificate Number**	MLCN1711375

Customer Information

Company Name	Wilson Accoustics Limited
Address	Unit 601, Block A, Shatin Industrial Centre, Yuen Shun Circuit, Shatin, N. T., Hong Kong

Equipment-under-Test (EUT)

Description	Sound & Vibration Analyser
Manufacturer	Svantek
Model Number	SVAN 958
Serial Number	20890
Equipment Number	--

Calibration Particular

Date of Calibration	23-Jun-2017		
Calibration Equipment	4231(ML1E008) / PA160059 / 20-May-2018		
Calibration Procedure	MLCG00, MLCG15		
Calibration Conditions	Laboratory	Temperature	23 °C ± 5 °C
		Relative Humidity	55% ± 25%
	EUT	Stabilizing Time	Over 3 hours
		Warm-up Time	10 minutes
		Power Supply	Internal battery
Calibration Results	Calibration data were detailed in the continuation pages.		

Approved By & Date

K.O. Lo 23-Jun-2017

Statements

* Calibration equipment used for this calibration are traceable to national / international standards.
* The results on this Calibration Certificate only relate to the values measured at the time of the calibration and the uncertainties quoted will not include allowance for the EUT long term drift, variation with environmental changes, vibration and shock during transportation, overloading, mishandling, misuse, and the capacity of any other laboratory to repeat the measurement.
* MaxLab Calibration Centre Limited shall not be liable 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 Certificate may be reproduced without the prior written approval of MaxLab Calibration Centre Limited.

Page 1 of 2

萬儀校正中心有限公司
MaxLab Calibration Centre Limited
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Unit B2, 9/F., Boldwin Industrial Bldg., 16-18 Wah Sing Street, Kwai Chung, N.T., Hong Kong Tel: (852) 2116 1389 Fax: (852) 2264 8480 Email: info@maxlab.com.hk

MAXLAB

Certificate No.MLCN171137S

Calibration Data

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

- END -

Calibrated By : Patrick
Date : 23-Jun-2017

Checked By : K.O. Lo
Date : 23-Jun-2017

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

SVANTEK

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, f_{sin}=1kHz

	Range 105dB		Range 130dB	
	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
MAX	Fast	1	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
			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
			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
		3	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
			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
		4	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
			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
	Slow	1	Indication [dB]	109.9	107.9	104.6	101.8	98.9	95.0	92.0	89.0	85.0	-	-	-
			Error [dB]	-0.1	0.0	-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	-	-	-
			Error [dB]	-0.1	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-	-	-
		3	Indication [dB]	109.9	108.0	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	-	-	-
		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	-	-	-
SEL	-	1	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
			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
			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
		3	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
			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
MAX	Fast	1	Indication [dB]	52.0	51.9	51.0	49.4	47.2	43.7	40.9	37.9
			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
			Error [dB]	0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0	0.0
		3	Indication [dB]	52.0	51.9	51.0	49.4	47.2	43.7	40.9	38.0
			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
			Error [dB]	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	0.0
	Slow	1	Indication [dB]	49.8	47.9	44.6	41.8	38.9	35.0	32.0	29.0
			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
			Error [dB]	-0.2	0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0
		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
		4	Indication [dB]	49.8	47.9	44.6	41.8	38.9	34.9	32.0	29.0
			Error [dB]	-0.2	0.1	-0.0	-0.0	-0.0	-0.0	0.0	0.0
SEL	-	1	Indication [dB]	51.7	49.0	45.0	42.0	39.0	35.0	32.1	29.1
			Error [dB]	-0.3	-0.0	0.0	0.0	0.0	0.0	0.1	0.1
		2	Indication [dB]	51.7	49.0	45.0	42.0	39.0	35.0	32.0	29.1
			Error [dB]	-0.3	-0.0	0.0	-0.0	0.0	0.0	0.1	0.1
		3	Indication [dB]	51.7	49.0	45.0	42.0	39.0	35.1	32.1	29.1
			Error [dB]	-0.3	0.0	0.0	0.0	0.0	0.1	0.1	0.1
		4	Indication [dB]	51.7	49.0	45.0	42.0	39.0	35.0	32.0	29.1
			Error [dB]	-0.3	-0.0	0.0	0.0	0.0	0.0	0.1	0.1

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

Result	Detector	Ch.	Duration [ms]	1000	500
MAX	Fast	1	Indication [dB]	34.1	34.0
			Error [dB]	0.0	0.1
		2	Indication [dB]	34.0	34.0
			Error [dB]	0.0	0.0
		3	Indication [dB]	34.0	34.0
			Error [dB]	-0.0	0.0
		4	Indication [dB]	34.0	33.9
			Error [dB]	0.0	0.1
	Slow	1	Indication [dB]	31.9	30.1
			Error [dB]	-0.1	0.1
		2	Indication [dB]	31.9	30.0
			Error [dB]	-0.1	0.1
		3	Indication [dB]	31.9	30.1
			Error [dB]	-0.1	0.1
		4	Indication [dB]	31.8	30.0
			Error [dB]	-0.1	0.1
SEL	-	1	Indication [dB]	33.8	31.1
			Error [dB]	-0.2	0.1
		2	Indication [dB]	33.8	31.1
			Error [dB]	-0.2	0.1
		3	Indication [dB]	33.8	31.1
			Error [dB]	-0.2	0.0
		4	Indication [dB]	33.8	31.1
			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
MAX	Fast	1	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
		2	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
			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
		3	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
			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
		4	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
			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
	Slow	1	Indication [dB]	131.8	129.9	126.6	123.8	120.9	117.0	114.0	111.0	107.0	-	-	-
			Error [dB]	-0.2	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-	-	-
		2	Indication [dB]	131.8	129.9	126.6	123.8	120.9	117.0	114.0	111.0	107.0	-	-	-
			Error [dB]	-0.2	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-	-	-
		3	Indication [dB]	131.9	130.0	126.6	123.8	120.9	117.0	114.0	111.0	107.0	-	-	-
			Error [dB]	-0.2	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-	-	-
		4	Indication [dB]	131.8	129.9	126.6	123.8	120.9	117.0	114.0	111.0	107.0	-	-	-
			Error [dB]	-0.2	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-	-	-
SEL	-	1	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
			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
		2	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
			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
		3	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
			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
		4	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
			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

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

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

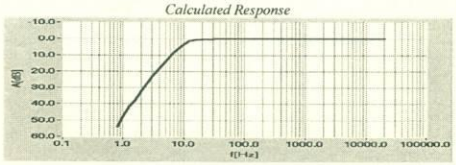
Range: **130dB**; Equivalent input steady level = 54dB

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

6. FREQUENCY RESPONSE (electrical)

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

Calculated Response



Measured Response with Preamplifier SV12 (f-frequency, An-attenuation in channel n)

f [Hz]	A1[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	C
Channel 1	**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^2), f_{sin}=79,6Hz

	Range 145dB		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;

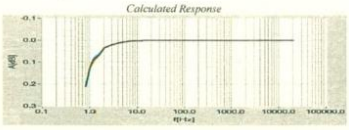
Filter	HP1		HP10		Wd		Wm		Wh	
	Indication [dB]	**Error** [dB]	**Indication** [dB]	**Error** [dB]	**Indication** [dB]	**Error** [dB]	**Indication** [dB]	**Error** [dB]	**Indication** [dB]	**Error** [dB]
Channel 1	120.0	0.0	120.0	0.0	106.1	0.0	102.0	-0.0	110.5	-0.0
Channel 2	120.0	0.0	120.0	0.0	106.1	0.0	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

3. FREQUENCY RESPONSE (electrical)

1/3 OCTAVE; Filter: HP; Range: 170 dB; input=175 dB;

Calculated Response



Measured Response (f-frequency, An-attenuation in channel n)

f [Hz]	A1[dB]	A2[dB]	A3[dB]	A4[dB]	f [Hz]	A1[dB]	A2 [dB]	A3[dB]	A4[dB]	f [Hz]	A1[dB]	A2[dB]	A3[dB]	A4[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 frequencies are nominal center values for the 1/3 octave bands

4. INTERNAL NOISE LEVEL (electrical)

LEVEL METER func.; Range: 145 dB; Back-light – off

	Filter	HP1	HP10	Wd	Wm	Wh
Channel 1	Indication [dB]	54.8	52.0	42.6	38.8	36.2
Channel 2	Indication [dB]	55.0	52.4	42.6	39.0	36.8
Channel 3	Indication [dB]	55.5	53.3	42.8	39.1	36.1
Channel 4	Indication [dB]	54.8	52.4	42.4	39.0	36.2

ENVIRONMENTAL CONDITIONS

Temperature	Relative humidity	Ambient pressure
26 °C	47 %	1000 hPa

TEST EQUIPMENT

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.

3. 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.

4. This calibration sheet shall not be reproduced except in full, without written permission of the SVANTEK Ltd.

Calibration specialist: Krzysztof Kubeł ..... Test date: 2018-08-13

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 No. 806605 Page 1 of 3 Pages

Customer : Gammon Construction Limited

Address : 28/F, Devon House, Taikoo Place, 979 King's Road, Quarry Bay, Hong Kong.

Order No. : Q82354 **Date of receipt :** 29-Jun-18

Item Tested

Description : Sound Level Meter
Manufacturer : Rion **I.D.** : --
Model : NL-52 **Serial No.** : 00564841

Test Conditions

Date of Test : 11-Jul-18 **Supply Voltage** : --
Ambient Temperature : (23 ± 3)°C **Relative Humidity :** (50 ± 25) %

Test Specifications

Calibration check.
Ref. Document/Procedure: Z01, IEC 61672.

Test Results

All results were within the IEC 61672 Type 1 specification. (where applicable)
The results are shown in the attached page(s).

Main Test equipment used:

Equipment No.	Description	Cert. No.	Traceable to
S017	Multi-Function Generator	C170120	SCL-HKSAR
S240	Sound Level Calibrator	803357	NIM-PRC & SCL-HKSAR

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 : Elva Chong

Approved by : Kin Wong

Date: 11-Jul-18

This Certificate is issued by:
Hong Kong Calibration Ltd.
Unit 8B, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street,Kwai Chung, NT,Hong Kong.
Tel: 2425 8601 Fax: 2425 8646

E

Calibration Certificate

Results :

1. **Self-generated noise:** 17.3 dBA

2. **Acoustical signal test**

UUT Setting				Applied Value (dB)	UUT Reading (dB)
Range (dB)	Frequency Weighting	Time Weighting	Octave Filter		
20 ~ 130	A	F	OFF	94.0	94.0
		S	OFF		94.0
	C	F	OFF		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. : ± 1.1 dB
Uncertainty : ± 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	- 3.2 dB, ± 1.4 dB
1 kHz	0.0 (Ref)	0 dB, ± 1.1 dB
2 kHz	+1.2	+ 1.2 dB, ± 1.6 dB
4 kHz	+0.9	+ 1.0 dB, ± 1.6 dB
8 kHz	-1.1	- 1.1 dB, + 2.1 dB ~ -3.1 dB
16 kHz	-8.1	- 6.6 dB, + 3.5 dB ~ - 17.0 dB

Uncertainty : ± 0.1 dB

Calibration Certificate

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.
A	94.0	94.0 (Ref.)	- -	± 0.4 dB
C	94.0	94.0	0.0	
Z	94.0	94.0	0.0	

4.2 Time Weighting (A-weighted)

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

Cert B4: Calibration Certificate of Sound Level Meter NTi M2211 (SN: 7684)

NTi AUDIO

Manufacturer Calibration Certificate

The following instrument has been tested and calibrated to the manufacturer specifications.
The calibration is traceable in accordance with ISO/IEC 17025 covering all instrument functions.

- Device Type: **M2211 Measurement Microphone**
  consisting of
  MA220 Serial Number: **7684**
  Capsule Serial Number: **72076**

- Certificate Issued: **05 October 2018**
- Certificate Number: **43378-7684-M2211**
- Results: **PASSED**
  (for detailed report see next page)

Tested by: M. Frick

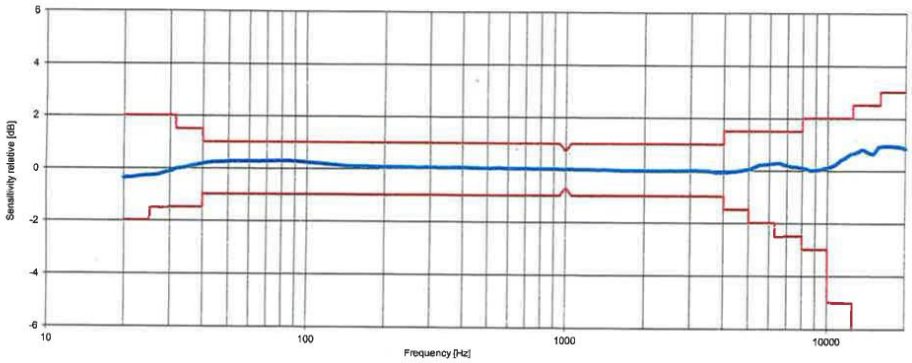
Signature:

Stamp: NTi Audio AG
Im alten Riet 102
LI - 9494 Schaan
www.nti-audio.com

Date:	05 October 2018			
Calibration of:	M2211	consisting of		
		MA220	Serial Number:	7684
		Capsule	Serial Number:	72076

- Detailed Calibration Test Results:

		actual	tolerance	calibration uncertainty[1]
Sensitivity @ 1 kHz, 114 dBSPL		**22.3 mV/Pa**	14-28 mV/Pa	±2.85%
Frequency response	Class 1	acc. IEC 61672		



- Test Conditions:

Temperature:	**23.5°C**	±0.5 °C
Relative Humidity:	**48.9%**	±2%
Air Pressure:	**96.06 kPa**	±0.25 kPa

- Calibration Equipment Used:

  - Norsonic Sound Calibrator, Type 1251, S/No. 30930
    Last Calibration: 05.12.2016, Next Calibration: 05.12.2018
    Calibrated by Metas, Switzerland
  - NTi Audio FX100, S/No. 11094
    Last Calibration: 14.08.2018, Next Calibration: 14.08.2019
    Calibrated by NTi Audio meeting product specifications
  - MTG MV203, S/No. 0630 / Mic Capsule, MK221 S./No. 16502
    Last Calibration: 11.12.2017, Next Calibration: 11.12.2019
    Calibrated by MTG, Germany

[1] The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with the regulations of the GUM.

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

MAXLAB

CALIBRATION CERTIFICATE

Certificate Information

Date of Issue	21-Jul-2018	**Certificate Number**	MLCN181526S

Customer Information

Company Name	Wilson Accoustics Limited
Address	Unit 601, Block A, Shatin Industrial Centre, Yuen Shun Circuit, Shatin, N. T., Hong Kong

Equipment-under-Test (EUT)

Description	Acoustic Calibrator
Manufacturer	Svantek
Model Number	SV 30A
Serial Number	10814
Equipment Number	--

Calibration Particular

Date of Calibration	21-Jul-2018		
Calibration Equipment	4231(MLTE008) / AV180068 / 13-May-20 1351(MLTE049) / MLEC18/06/02 / 6-Jun-19		
Calibration Procedure	MLCG00, MLCG15		
Calibration Conditions	Laboratory	Temperature	23 °C ± 5 °C
		Relative Humidity	55% ± 25%
	EUT	Stabilizing Time	Over 3 hours
		Warm-up Time	Not applicable
		Power Supply	Internal battery
Calibration Results	Calibration data were detailed in the continuation pages. All calibration results were within EUT specification.		

Approved By & Date

K.O. Lo 21-Jul-2018

Statements

* Calibration equipment used for this calibration are traceable to national / international standards.
* The results on this Calibration Certificate only relate to the values measured at the time of the calibration and the uncertainties quoted will not include allowance for the EUT long term drift, variation with environmental changes, vibration and shock during transportation, overloading, mishandling, misuse, and the capacity of any other laboratory to repeat the measurement.
* MaxLab Calibration Centre Limited shall not be liable 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 Certificate may be reproduced without the prior written approval of MaxLab Calibration Centre Limited.

Page 1 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

MAXLAB

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

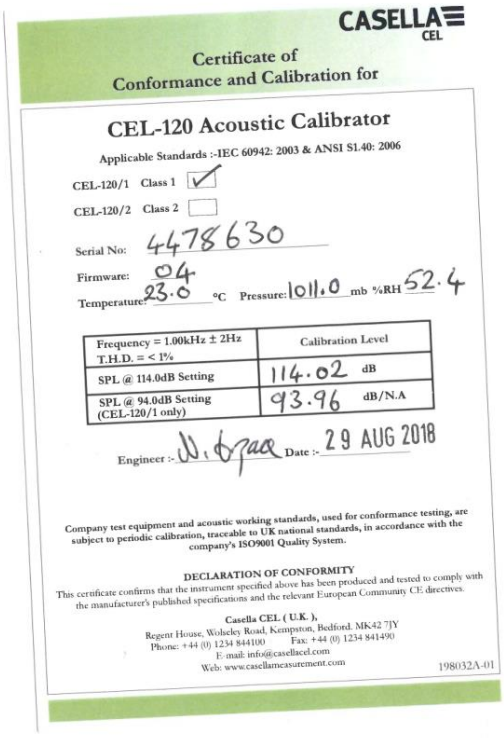
- END -

Calibrated By : Dan
Date : 21-Jul-18

Checked By : K.O. Lo
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

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



CASELLA CEL

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: 1011.0 mb %RH 52.4

Frequency = 1.00kHz ± 2Hz T.H.D. = < 1%	Calibration Level
SPL @ 114.0dB Setting	114.02 dB
SPL @ 94.0dB Setting (CEL-120/1 only)	93.96 dB/N.A

Engineer :- W. Draa 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

This certificate confirms that the instrument specified above has been produced and tested to comply with the manufacturer's published specifications and the relevant European Community CE directives.

Casella CEL (U.K.),
Regent House, Wolseley Road, Kempston, Bedford. MK42 7JY
Phone: +44 (0) 1234 844100 Fax: +44 (0) 1234 841490
E- mail: info@casellacel.com
Web: www.casellameasurement.com

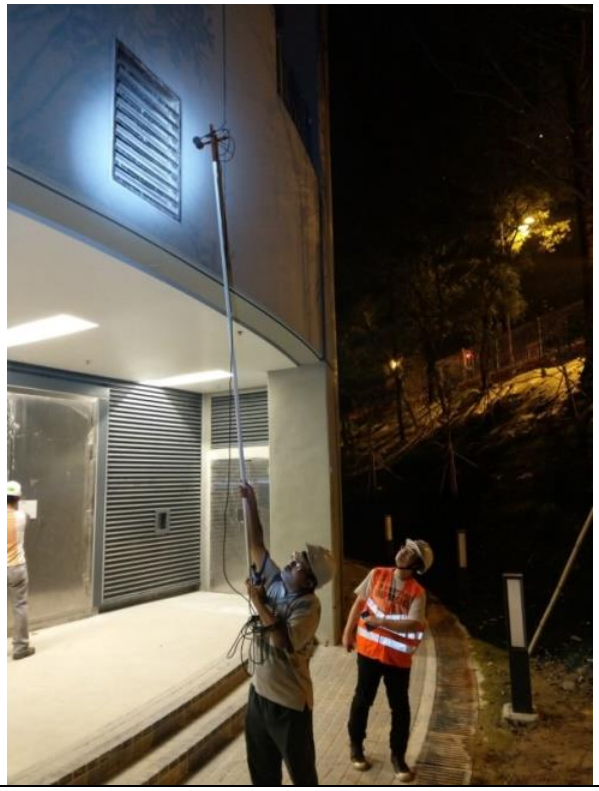
198032A-01

Appendix B3

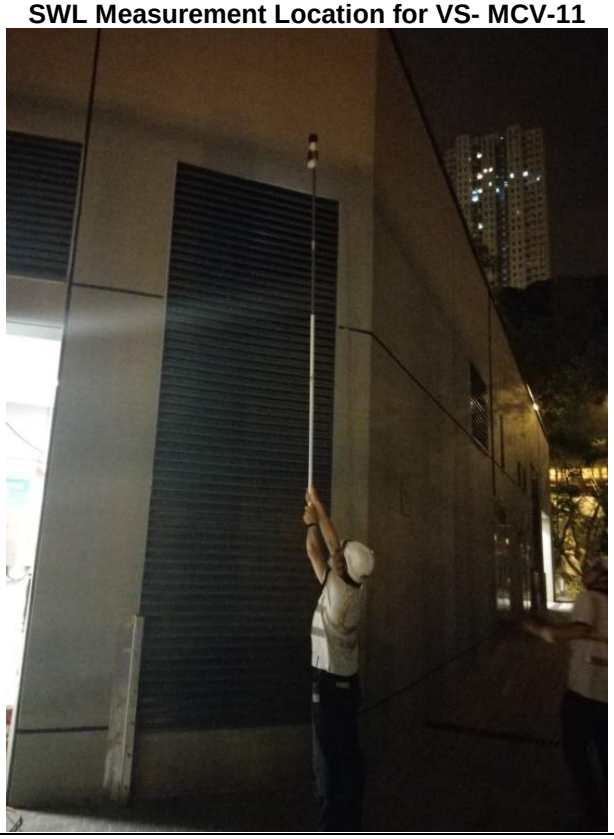
Photographs showing the Examples of Noise Measurement for Fixed Plant Noise

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

SWL Measurement Location for VS-MCV-02

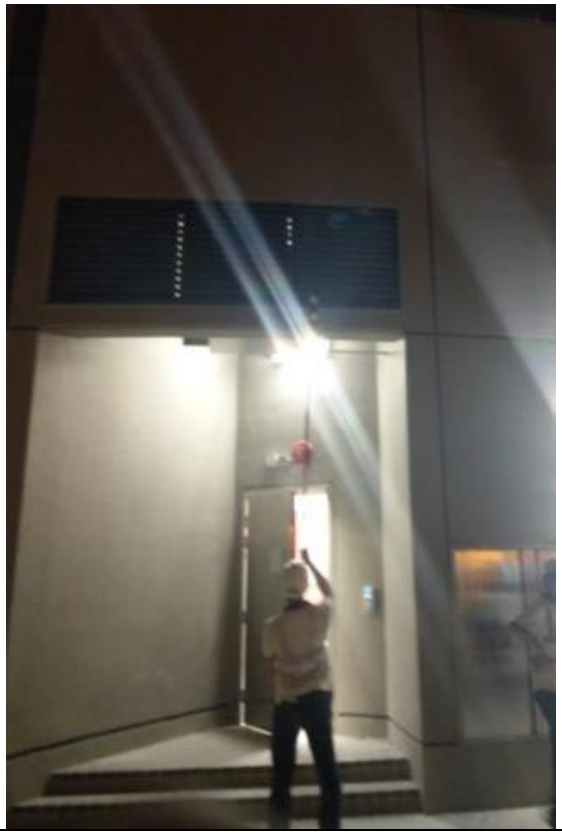


SWL Measurement Location for VS- MCV-11

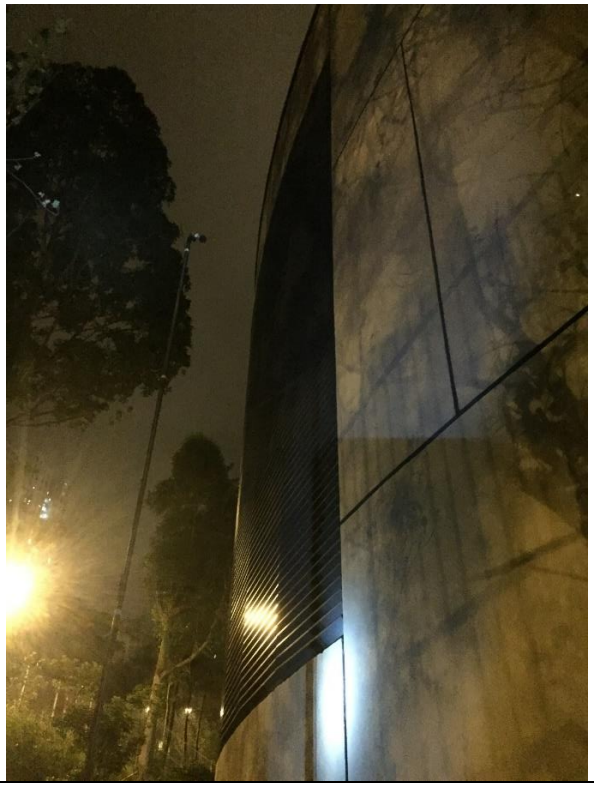


SWL Measurement Location for VS- MCV-15

SWL Measurement Location for VS- MCV-19



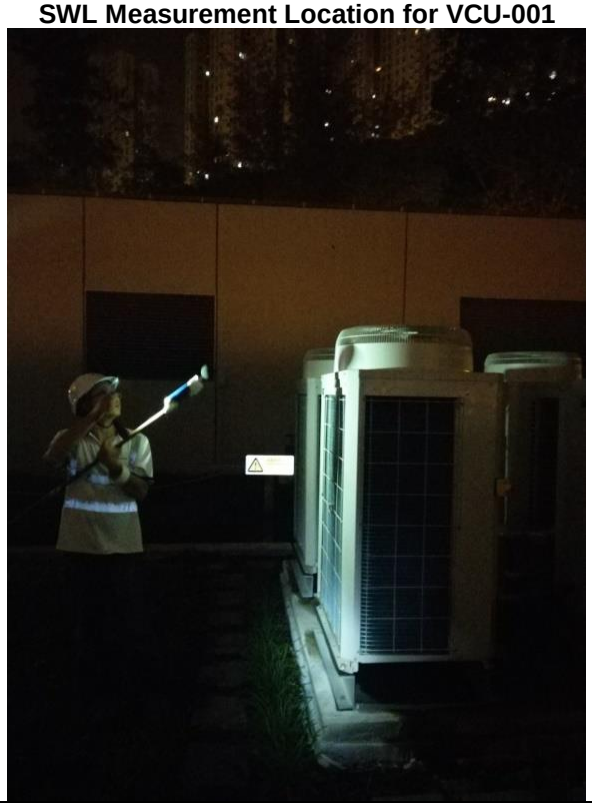
SWL Measurement Location for VS-MCV-23A



SWL Measurement Location for VS-MCV-23B

SWL Measurement Location for VS- MCV-28

SWL Measurement Location for VCU-001



Appendix B4

Noise Measurement Results

Appendix B4 Noise Measurement Results

Fixed Plant Source ID	Plant Type	Method	Size of Louvre/Outdoor AC unit (mm)			Measurement Distance (m) D [(a)]	Averaged Measured L_{Aeq} ,dB(A) [(b)]	Background L_{Aeq} ,dB(A)	Difference L_{Aeq} ,dB(A)	Background Corrected L_{Aeq} ,dB(A)[(c)]	Calculated SWL, dB(A)
			Length	Width	Height						
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[(d)]	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[(d)]	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[(d)]	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[(d)]	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

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

HOKLAS 028
CAL

CERTIFICATE OF CALIBRATION

Certificate No.: 18CA1019 01-01 **Page** 1 **of** 2

Item tested

Description:	Sound Level Meter (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

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 calibration

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	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%.

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 **Date:** 20-Oct-2018 **Company Chop:** SOILS AND MATERIALS ENGINEERING COMPANY LTD 綜合試驗有限公司

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.

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

HOKLAS 028
CAL

CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 18CA1019 01-01 **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.

Test:	Subtest:	Status:	Expanded Uncertainty (dB)	Coverage Factor
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	
	C	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 $1/10^3$ at 4kHz	Pass	0.3	
	1 ms burst duty factor $1/10^4$ 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 Uncertainty (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: Fung Chi Yip Date: 19-Oct-2018

Checked by: shek Kwong Tat 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.

綜合試驗有限公司
SOILS & MATERIALS ENGINEERING CO., LTD.
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E-mail: smec@cigismec.com Website: www.cigismec.com
Tel: (852) 2873 6860
Fax: (852) 2555 7533

CERTIFICATE OF CALIBRATION

Certificate No.: 18CA0321 01-02

Item tested

Description:	Sound Level Meter (Type 1)	Microphone	Preamp
Manufacturer:	B & K	B & K	B & K
Type/Model No.:	2250-L	4950	ZC0032
Serial/Equipment No.:	2681366	2665582	17190
Adaptors used:	(N 011 01)		

Item submitted by

Customer Name:	AECOM ASIA CO LTD
Address of Customer:	-
Request No.:	-
Date of receipt:	21-Mar-2018

Date of test: 23-Mar-2018

Reference equipment used in the calibration

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:	1000 ± 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 Jun Qi **Date:** 24-Mar-2018 **Company Chop:** SOILS AND MATERIALS ENGINEERING COMPANY LTD. 綜合試驗有限公司

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.

綜合試驗有限公司
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CERTIFICATE OF CALIBRATION

(Continuation Page)

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.

Test:	Subtest:	Status:	Expanded Uncertainty (dB)	Coverage Factor
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	
	C	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 $1/10^3$ at 4kHz	Pass	0.3	
	1 ms burst duty factor $1/10^4$ 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 Uncertainty (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: Fung Chi Yip **Date:** 23-Mar-2018

Checked by: Lam Tze Wai **Date:** 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.

綜合試驗有限公司
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HOKLAS 028
CAL

CERTIFICATE OF CALIBRATION

Certificate No.: 19CA0228 02 **Page** 1 **of** 2

Item tested

Description:	Sound Level Meter (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:	- (N-012-01)	,	-	-

Item submitted by

Customer Name:	AECOM ASIA CO LTD
Address of Customer:	-
Request No.:	-
Date of receipt:	28-Feb-2019

Date of test: 01-Mar-2019

Reference equipment used in the calibration

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

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 **Date:** 02-Mar-2019 **Company Chop:** SOILS AND MATERIALS ENGINEERING COMPANY LTD. 綜合試驗有限公司

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.

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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 19CA0228 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.

Test:	Subtest:	Status:	Uncertainty (dB) / Coverage Factor	
Self-generated noise	A	Pass	0.3	
	C	Pass	1.0	2.1
	Lin	Pass	2.0	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	
	C	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 $1/10^3$ at 4kHz	Pass	0.3	
	1 ms burst duty factor $1/10^4$ 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	Uncertainty (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.

- End -

Calibrated by: Fong Chun Wai **Date:** 01-Mar-2019

Checked by: 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.

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CERTIFICATE OF CALIBRATION

Certificate No.: 18CA0920 02 **Page** 1 **of** 2

Item tested

Description:	Sound Level Meter (Type 1)	,	Microphone	Pream
Manufacturer:	B & K	,	B & K	B & K
Type/Model No.:	2270	,	4189	ZC0032
Serial/Equipment No.:	3007965 (CN.012.02)	,	284646	17965
Adaptors used:	-	,	-	-

Item submitted by

Customer Name:	AECOM ASIA CO. LTD.
Address of Customer:	-
Request No.:	-
Date of receipt:	20-Sep-2018

Date of test: 22-Sep-2018

Reference equipment used in the calibration

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	23-Apr-2019	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 **Date:** 22-Sep-2018 **Company Chop:** SOILS & MATERIALS ENGINEERING COMPANY LTD. 綜合試驗有限公司

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.

綜合試驗有限公司
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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 18CA0920 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.

Test:	Subtest:	Status:	Uncertainty (dB) / Coverage Factor	
Self-generated noise	A	Pass	0.3	
	C	Pass	1.0	2.1
	Lin	Pass	2.0	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	
	C	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 $1/10^3$ at 4kHz	Pass	0.3	
	1 ms burst duty factor $1/10^4$ 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	Uncertainty (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.

\- End -

Calibrated by: Fung Chi Yip **Date:** 22-Sep-2018

Checked by: Shek Kwong Tat **Date:** 22-Sep-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.

綜合試驗有限公司
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CERTIFICATE OF CALIBRATION

Certificate No.: 18CA1019 01-02 **Page:** 1 **of** 2

Item tested

Description:	Acoustical Calibrator (Class 1)
Manufacturer:	B & K
Type/Model No.:	4231
Serial/Equipment No.:	3014024 / N004.04
Adaptors used:	-

Item submitted by

Curstomer:	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 calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2341427	20-Apr-2019	SCL
Preamplifier	B&K 2673	2743150	27-Apr-2019	CEPREI
Measuring amplifier	B&K 2610	2346941	08-May-2019	CEPREI
Signal generator	DS 360	61227	24-Apr-2019	CEPREI
Digital multi-meter	34401A	US36087050	23-Apr-2019	CEPREI
Audio analyzer	8903B	GB41300350	23-Apr-2019	CEPREI
Universal counter	53132A	MY40003662	24-Apr-2019	CEPREI

Ambient conditions

Temperature:	20 ± 1 °C
Relative humidity:	50 ± 10 %
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.

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: Feng Junqi **Date:** 20-Oct-2018 **Company Chop:** SOILS AND MATERIALS ENGINEERING COMPANY LTD. 綜合試驗有限公司

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.

綜合試驗有限公司
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CERTIFICATE OF CALIBRATION

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Certificate No.: 18CA1019 01-02 **Page:** 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.

(Output level in dB re 20 μPa)

Frequency Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	Estimated Expanded Uncertainty 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.

- End -

Calibrated by: Fung Chi Yip **Checked by:** Shek Kwong Tat

Date: 19-Oct-2018 **Date:** 20-Oct-2018

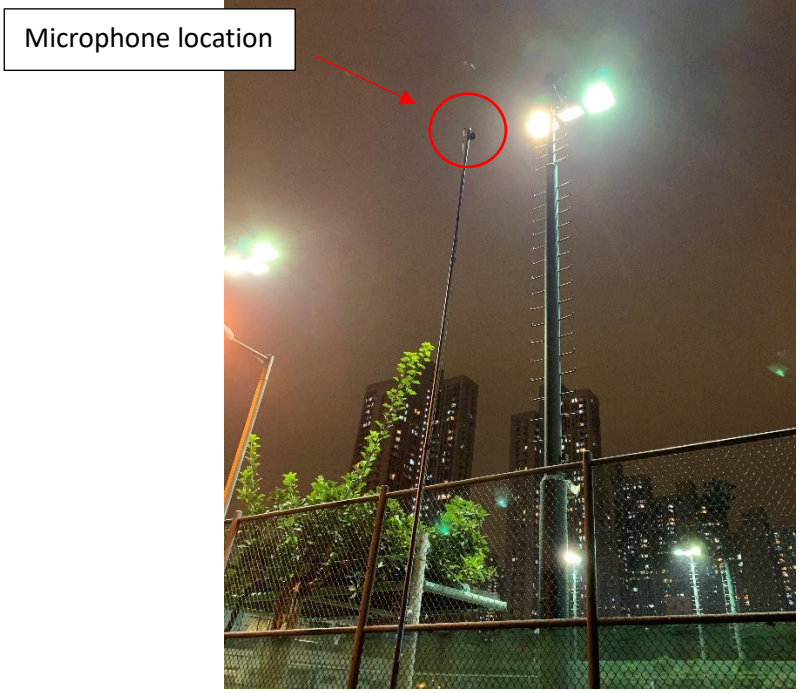
The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

Appendix C2

Photographs – Noise Measurement at Representative NSRs

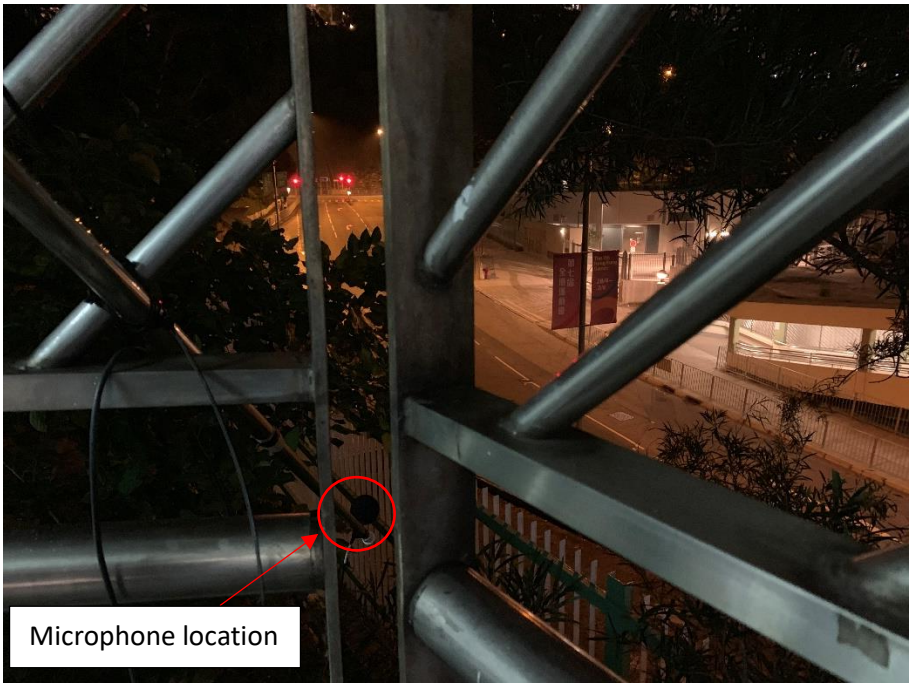
Appendix C2 Photographs – Noise Measurement at Representative NSRs

NSR Measurement Location at DIH-4-2



NSR Measurement Location at DIH-20-1

NSR Measurement Location at DIH-21-1



NSR Measurement Location at DIH-23-1

Appendix C3

Measurement Results at Representative NSRs

Appendix C3 Noise Measurement Results at Measurement Locations

Measurement Location ID	Measurement Date	Operation Scenario [1][2]	Fixed Plant Noise		Background Noise		Difference between Measured Noise Level and Background Level, dB(A)
			Measurement Time	Measured Noise Level, $L_{Aeq\ 30mins}$, dB(A)	Measurement Time	Background Noise Level, $L_{Aeq\ 5mins}$, dB(A)	
DIH-4-2 [3]	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 [3]	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
DIH-21-1	24/5/2019 - 25/5/2019	Daytime and Evening	22:19:00 - 22:48:59	67.3	21:00:09 - 21:05:08	66	1.3
		Night-time	23:08:00 - 23:37:59	67.2	00:03:31 - 00:08:30	68.9	-1.7
DIH-23-1	24/5/2019 - 25/5/2019	Daytime and Evening	22:19:00 - 22:48:59	63.8	21:00:09 - 21:05:08	63.6	0.2
		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))

MTR Corporation Limited

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)

Certified by: Fredrick Leong

Position: Independent Environmental Checker

Date: 1 Aug 2019

MTR Corporation Limited

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)

Certified by: Lisa Poon

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:	pp Josh Lam	

Version:	A	Date: 25 July 2019

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

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

Location	Fixed Plant ID.	Fixed Plant Source	Maximum Allowable SWL, dB(A)[1]	
			Daytime & Evening[2]	Night-time[2]
SUW	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
	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

Location	Fixed Plant ID.	Fixed Plant Source	Maximum Allowable SWL, dB(A)[1]	
			Daytime & Evening[2]	Night-time[2]
	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
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 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_{Aeq} (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_{Aeq} (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**.

Table 3.4 Noise Measurement Locations

NSR ID (1)	Description	Type	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)

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 3.5 Measurement 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 **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**.

Table 4.1 Summary of Measured SWLs for Fixed Plants

Plant Item	Measured SWL[(1)], dB(A)		Maximum allowable SWL, dB(A)		Compliance (Y/N)	
	Day / Evening-time[(2)]	Night-time[(2)]	Day / Evening - time[(2)]	Night-time[(2)]	Day / Evening - time[(2)]	Night-time[(2)]
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

Plant Item	Measured SWL[(1)], dB(A)		Maximum allowable SWL, dB(A)		Compliance (Y/N)	
	Day / Evening-time[(2)]	Night-time[(2)]	Day / Evening - time[(2)]	Night-time[(2)]	Day / Evening - time[(2)]	Night-time[(2)]
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	Description	Time Period[1]&[2]	Measurement Results			Site Observation	Characteristics of Tonality, Impulsiveness and Intermittency at NSRs (Y/N)
			Measured Noise Level $L_{Aeq(30mins)}$, dB(A)	Background Noise Level $L_{Aeq(5mins)}$, dB(A)	Difference between Measured Noise Level and Background Level, dB(A)[3]		
SUW-1-1	Parc 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.	N
		Night-time	67.4	66.6	0.8		N
SUW-3-2	Prosperity House	Daytime & Evening	75.0	75.1	-0.1		N
		Night-time	74.4	73.1	1.3		N
SUW-P1-1	Planned NSR	Daytime & Evening	50.8	49.9	0.9	Background noise was relative low and noise from SCL fixed plant was not noticeable at the measurement location.	N
		Night-time	51.3	51.0	0.3		N
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.	N

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

820600N
820800N
821000N
837400E
837600E

CHUN SEEN MEI CHUEN
MA TAU CHUNG ROAD
馬頭涌道
ARGYLE STREET
PRINCE EDWARD ROAD WEST
PRINCE EDWARD ROAD EAST
太子道東
MAN KOK ROAD
LUNG KONG ROAD
NGA TSIN WAI ROAD
SOUTH WALL ROAD
FUK CHUNG STREET
SHING TAK STREET
TAM KUNG ROAD
PAK TAI STREET
MOK CHONG STREET
HANKOW ROAD
SUNG WONG TOI ROAD
SUNG WONG TOI ROAD EAST
KAI TAK ROAD

TKW-19-1
TKW-6-1
SUW-1-1
SUW-3-1
SUW-3-2
SUW-P1-1

SUW-02
SUW-01A,B
SUW-03
SUW-14
SUW-09
SUW-04,
SUW-10
SUW-06
SUW-05
SUW-07
SUW-66
SUW-08
SUW-11
SUW-58
SUW-45
SUW-40
SUW-13
SUW-12
SUW-32
VCU-103
VCU-101
SUW-31
VCU-102-01
VCU-102-02
VCU-104
SUW-53
SUW-50
SUW-51
VCU-171,172
SUW
SUW-26
SUW-25
SUW-24
SUW-29
SUW-28
SUW-37
SUW-19
SUW-35
VCU-033
VCU-032
SUW-15
SUW-17,18
VCU-031
VCU-035
SUW-22,23
SUW-16

LEGEND:
- SCL ALIGNMENT
- APPROXIMATE NOISE SOURCE LOCATION (FACADE)
- APPROXIMATE NOISE SOURCE LOCATION (TOP)
- ASSESSMENT POINT FOR FIXED PLANT NOISE CALCULATION
- REPRESENTATIVE NOISE SENSITIVE RECEIVERS (NSRs)

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MTR

SHATIN TO CENTRAL LINK

ORIGINATOR

AECOM

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TITLE
C11033
SCL (TAW - HUH)
LOCATIONS OF NSRs AND FIXED NOISE SOURCES
(SUNG WONG TOI STATION)

SCALE 1 : 2000 (A3)

FIGURE NO. C11033/C/SCL/ACM/M52/055

REV. -

LEGEND:

- SCL ALIGNMENT
- APPROXIMATE NOISE SOURCE LOCATION (FACADE)
- APPROXIMATE NOISE SOURCE LOCATION (TOP)
- REPRESENTATIVE NOISE SENSITIVE RECEIVERS (NSRs)
- REPRESENTATIVE NOISE SENSITIVE RECEIVERS (NSRs)

820600N
820800N
821000N
837400E
837600E
CHUN SEEN MEI CHUEN
MA TAU CHUNG ROAD
馬頭涌道
TKW-19-1
TKW-6-1
SUW-1-1
SUW-3-1
SUW-3-2
SUW-P1-1
SUW
SUW-01A,B
SUW-02
SUW-03
SUW-04
SUW-05
SUW-06
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SUW-53
SUW-58
SUW-66
VCU-031
VCU-032
VCU-033
VCU-035
VCU-101
VCU-102-01
VCU-102-02
VCU-103
VCU-104
VCU-171,172
ARGYLE STREET
PRINCE EDWARD ROAD WEST
PRINCE EDWARD ROAD EAST
SOUTH WALL ROAD
NGA TSIN WAI ROAD
LUNG KONG ROAD
MAN KOK ROAD
FUK CHUNG STREET
SHING TAK STREET
WAI YIP STREET
TAM KUNG ROAD
PAK TAI STREET
MOK CHONG STREET
SUNG WONG TOI ROAD
HANOVER AVENUE
太子道東
世運道
宋王臺花園
Sung Wong Toi Garden
Sung Wong Toi Playground
Sung Wong Toi Public Cargo Working Area

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DESIGNED	LCLL
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APPROVED	IMW
DATE	29/MAY/2019

MTR

SHATIN TO CENTRAL LINK

ORIGINATOR

AECOM

CADD REF. C11033_C_SCL_ACM_M52_056.dgn

TITLE
C11033
SCL (TAW - HUH)
LOCATIONS OF NOISE MEASUREMENT POINTS
(SUNG WONG TOI STATION)

SCALE 1 : 2000 (A3)

FIGURE NO. C11033/C/SCL/ACM/M52/056

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Appendix A

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

MTR Corporation Limited

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

Date: 20 June 2019

MTR Corporation Limited

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 

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	
Reviewed & Approved:	Josh Lam	

Version:	A	Date: 13 June 2019

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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**.

Table 2.1 ANLs for Assessment of Noise from Fixed Sources

Time Period	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 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 2.2 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 (1)	Prevailing Background Noise Levels, dB(A) (2)	ASR	ANL-5, dB(A) (3)	Criteria, dB(A) (4)
Sung Wong Toi Station					
Parc 22 (SUW-1-1)	Day & evening	66	C	65	65
	Night	61	C	55	55
Prince Ritz (SUW-3-1)	Day & evening	67	B	60	60
	Night	61	B	50	50
Prosperity House (SUW-3-2)	Day & evening	67	B	60	60
	Night	61	B	50	50
Planned NSR (SUW-P1-1)	Day & evening	66	B	60	60
	Night	61	B	50	50
Fok On Building (TKW-6-1)	Day & evening	66	C	65	65
	Night	61	C	55	55
	Day & evening	66	C	65	65

Area (NSR No.)	Time Period (1)	Prevailing Background Noise Levels, dB(A) (2)	ASR	ANL-5, dB(A) (3)	Criteria, dB(A) (4)
Holy Trinity Church (TKW-19-1)	Night	61	C	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 Major Roads in the Vicinity of SUW

Area	Road Name	From	To	A.A.D.T.(1) (2017)
SUW	Prince Edward Road East & Flyover <K10A>	Kai Tak River	Prince Edward Road West #456	155,360
	Prince Edward Road West & Flyover <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.) (1)	Type of Area (2)	Influencing Factor (IF)	Degree to which NSR is affected by IF	ASR	Time Period(3)	Prevailing Background Noise Levels, dB(A) (4)	ANL-5, dB(A) (5)	Criteria, dB(A) (6)
Sung Wong Toi								
Parc 22 (SUW-1-1)	Urban Area	Ma Tau Chung Road	Directly Affected	C	Day & evening	66	65	65
					Night	61	55	55
Prince Ritz (SUW-3-1)	Urban Area	Prince Edward Road West & Flyover <K11A>	Directly Affected	C	Day & evening	67	65	65
					Night	61	55	55
Prosperity House (SUW-3-2)	Urban Area	Prince Edward Road West & Flyover <K11A>	Directly Affected	C	Day & evening	67	65	65
					Night	61	55	55
Planned NSR (SUW-P1-1)	Urban Area	Prince Edward Road East & Flyover <K10A>	Indirectly Affected	C	Day & evening	66	65	65
					Night	61	55	55
Fok On Building (TKW-6-1)	Urban Area	Ma Tau Chung Road	Directly Affected	C	Day & evening	66	65	65
					Night	61	55	55
Holy Trinity Church (TKW-19-1)	Urban Area	Ma Tau Chung Road	Directly Affected	C	Day & evening	66	65	65
					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**.

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

Location	Fixed Plant ID.	Fixed Plant Source	Maximum Allowable SWL, dB(A)[1]	
			Daytime & Evening[2]	Night-time[2]
SUW	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
	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

Location	Fixed Plant ID.	Fixed Plant Source	Maximum Allowable SWL, dB(A)[1]	
			Daytime & Evening[2]	Night-time[2]
	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

NSR ID	Description	Criteria, dB(A)		Predicted Sound Pressure Level, $L_{eq,30mins}$, dB(A)[1]	
		Daytime & Evening[2]	Night-time[2]	Daytime & Evening[2]	Night-time[2]
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 [3]	64	N/A [3]

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

820600N
820800N
821000N
837400E
837600E

CHUN SEEN MEI CHUEN
MA TAU CHUNG ROAD
馬頭涌道
ARGYLE STREET
PRINCE EDWARD ROAD WEST
PRINCE EDWARD ROAD EAST
太子道東
MAN KOK ROAD
LUNG KONG ROAD
NGA TSIN WAI ROAD
SOUTH WALL ROAD
FUK CHUNG STREET
SHING TAK STREET
TAM KUNG ROAD
PAK TAI STREET
MOK CHONG STREET
HANKOW ROAD
SUNG WONG TOI ROAD
SUNG WONG TOI ROAD EAST
KAI TAK ROAD

TKW-19-1
TKW-6-1
SUW-1-1
SUW-3-1
SUW-3-2
SUW-P1-1

SUW-02
SUW-01A,B
SUW-03
SUW-14
SUW-09
SUW-04,
SUW-10
SUW-06
SUW-05
SUW-07
SUW-66
SUW-08
SUW-11
SUW-58
SUW-45
SUW-40
SUW-13
SUW-12
SUW-32
VCU-103
VCU-101
SUW-31
VCU-102-01
VCU-102-02
VCU-104
SUW-53
SUW-50
SUW-51
VCU-171,172
SUW
SUW-26
SUW-25
SUW-24
SUW-29
SUW-28
SUW-37
SUW-19
SUW-35
VCU-033
VCU-032
SUW-15
SUW-17,18
VCU-031
VCU-035
SUW-22,23
SUW-16

LEGEND:
- SCL ALIGNMENT
- APPROXIMATE NOISE SOURCE LOCATION (FACADE)
- APPROXIMATE NOISE SOURCE LOCATION (TOP)
- ASSESSMENT POINT FOR FIXED PLANT NOISE CALCULATION
- REPRESENTATIVE NOISE SENSITIVE RECEIVERS (NSRs)

PLOT DRV: v:\ustnset\MTR\PLOTDRVER\WINDOWS\A3 COLOUR.pltMODEL: PRINTED BY: GdoYU 5/30 ... 16:09:27
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REV	DESCRIPTION	BY	DATE	APPROVED	REV	DESCRIPTION	BY	DATE	APPROVED

DRAWN	XH
DESIGNED	LCLL
CHECKED	LCLL
APPROVED	IMW
DATE	29/MAY/2019

MTR

SHATIN TO CENTRAL LINK

ORIGINATOR

AECOM

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TITLE
C11033
SCL (TAW - HUH)
LOCATIONS OF NSRs AND FIXED NOISE SOURCES
(SUNG WONG TOI STATION)

SCALE 1 : 2000 (A3)

FIGURE NO. C11033/C/SCL/ACM/M52/055

REV. -

Annex A

Detail Calculation of Fixed Plant Noise Assessment

Annex A Detail Calculation of Fixed Plant Noise Assessment

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

Noise Assessment Points	Description	Plant item	Direction Facing	Horizontal Distance , m	SWL, dB(A)	Correction for line of sight [1], dB(A)	Distance Correction of Point Source, dB(A)	Façade Correction, dB(A)	Predicted SPL, dB(A)[2]	Total SPL, dB(A)	Daytime Noise Criteria, dB(A)
Sung Wong Toi Station											
SUW-1-1											
SUW-1-1	Parc 22	SUW-01A	West	170	102	0	-53	3	52		
		SUW-01B	West	170	100	0	-53	3	50		
		SUW-02	Top	171	97	0	-53	3	47		
		SUW-03	Southwest	161	106	0	-52	3	57		
		SUW-04	East	167	92	0	-52	3	43		
		SUW-05	East	178	87	0	-53	3	37		
		SUW-06	Top	172	97	0	-53	3	47		
		SUW-07	East	183	83	0	-53	3	33		
		SUW-08	East	189	85	0	-54	3	34		
		SUW-09	South	158	88	0	-52	3	39		
		SUW-10	East	167	81	0	-52	3	32		
		SUW-11	Top	196	84	0	-54	3	33		
		SUW-12	Top	193	85	0	-54	3	34		
		SUW-13	Top	193	89	0	-54	3	38		
		SUW-14	Top	159	94	0	-52	3	45		
		SUW-15	Southwest	330	100	0	-58	3	N/A		
		SUW-16	Southeast	335	99	-5	-59	3	N/A		
		SUW-17, 18	Northeast	343	82	-10	-59	3	N/A		
		SUW-19	Northeast	343	94	-10	-59	3	N/A		
		SUW-22	Northeast	343	82	-10	-59	3	N/A		
		SUW-23	Northeast	343	87	-10	-59	3	N/A		
		SUW-24	Northwest	338	85	0	-59	3	N/A		
		SUW-25	Northwest	335	83	0	-59	3	N/A		
		SUW-26	Southwest	334	81	0	-58	3	N/A		
		SUW-28	Northwest	329	103	0	-58	3	N/A		
		SUW-29	Top	334	82	0	-58	3	N/A		
		SUW-31	East	205	96	-10	-54	3	35		
		SUW-32	North	201	96	0	-54	3	45		
		SUW-35	East	343	89	-10	-59	3	N/A		
		SUW-37	East	343	88	-10	-59	3	N/A		
		SUW-40	North	180	102	-10	-53	3	42		
		SUW-45	West	183	88	0	-53	3	38		
		SUW-50	West	322	87	-10	-58	3	N/A		
		SUW-51	East	321	104	0	-58	3	N/A		
		SUW-53	West	325	90	-10	-58	3	N/A		
		SUW-58	West	176	86	0	-53	3	36		
		SUW-66	South	221	80	0	-55	3	28		
		VCU-101	-	200	82	0	-54	3	31		
		VCU-102-01	-	202	84	0	-54	3	33		
		VCU-102-02	-	200	81	0	-54	3	30		
		VCU-103	-	198	84	0	-54	3	33		
		VCU-104	-	199	85	0	-54	3	34		
		VCU-031	-	335	81	0	-59	3	N/A		
		VCU-032	-	335	88	0	-59	3	N/A		
		VCU-033	-	335	82	0	-58	3	N/A		
		VCU-035	-	335	82	0	-58	3	N/A		
		VCU-171-1	-	324	85	0	-58	3	N/A		
		VCU-171-2	-	324	85	0	-58	3	N/A	**60**	**65**
SUW-3-1											
SUW-3-1	Prince Ritz	SUW-01A	West	288	102	0	-57	3	48		
		SUW-01B	West	288	100	0	-57	3	46		
		SUW-02	Top	288	97	0	-57	3	43		
		SUW-03	Southwest	299	106	-10	-58	3	41		
		SUW-04	East	296	92	-10	-57	3	28		
		SUW-05	East	286	87	-10	-57	3	23		
		SUW-06	Top	289	97	0	-57	3	43		
		SUW-07	East	281	83	-10	-57	3	19		
		SUW-08	East	275	85	-10	-57	3	21		
		SUW-09	South	303	88	-10	-58	3	N/A		
		SUW-10	East	296	81	-10	-57	3	17		
		SUW-11	Top	268	84	0	-57	3	30		
		SUW-12	Top	268	85	0	-57	3	31		
		SUW-13	Top	266	89	0	-57	3	35		
		SUW-14	Top	303	94	0	-58	3	N/A		
		SUW-15	Southwest	249	100	-10	-56	3	37		
		SUW-16	Southeast	258	99	-10	-56	3	36		
		SUW-17, 18	Northeast	245	82	0	-56	3	29		
		SUW-19	Northeast	235	94	0	-55	3	42		
		SUW-22	Northeast	252	82	0	-56	3	29		
		SUW-23	Northeast	252	87	0	-56	3	34		
		SUW-24	Northwest	231	85	0	-55	3	33		
		SUW-25	Northwest	228	83	0	-55	3	31		
		SUW-26	Southwest	230	81	-10	-55	3	19		
		SUW-28	Northwest	237	103	0	-56	3	50		
		SUW-29	Top	239	82	0	-56	3	29		
		SUW-31	East	257	96	0	-56	3	43		
		SUW-32	North	258	96	0	-56	3	43		
		SUW-35	East	239	89	0	-56	3	36		
		SUW-37	East	232	88	0	-55	3	36		
		SUW-40	North	281	102	0	-57	3	48		
		SUW-45	West	276	88	0	-57	3	34		
		SUW-50	West	149	87	0	-51	3	39		
		SUW-51	East	148	104	0	-51	3	56		
		SUW-53	West	149	90	0	-51	3	42		
		SUW-58	West	283	86	0	-57	3	32		
		SUW-66	South	294	80	-10	-57	3	16		
		VCU-101	-	261	82	0	-56	3	29		
		VCU-102-01	-	260	84	0	-56	3	31		
		VCU-102-02	-	262	81	0	-56	3	28		
		VCU-103	-	263	84	0	-56	3	31		
		VCU-104	-	264	85	0	-56	3	32		
		VCU-031	-	253	81	0	-56	3	28		
		VCU-032	-	247	88	0	-56	3	35		
		VCU-033	-	249	82	0	-56	3	29		
		VCU-035	-	255	82	0	-56	3	29		
		VCU-171-1	-	149	85	0	-51	3	37		
		VCU-171-2	-	149	85	0	-51	3	37	**59**	**65**

Annex A Detail Calculation of Fixed Plant Noise Assessment

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

Noise Assessment Points	Description	Plant item	Direction Facing	Horizontal Distance , m	SWL, dB(A)	Correction for line of sight [1], dB(A)	Distance Correction of Point Source, dB(A)	Façade Correction, dB(A)	Predicted SPL, dB(A)[2]	Total SPL, dB(A)	Daytime Noise Criteria, dB(A)
SUW-3-2											
SUW-3-2	Prosperity House	SUW-01A	West	272	102	0	-57	3	48		
		SUW-01B	West	272	100	0	-57	3	46		
		SUW-02	Top	272	97	0	-57	3	43		
		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	Top	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	South	289	88	-10	-57	3	24		
		SUW-10	East	283	81	-10	-57	3	17		
		SUW-11	Top	258	84	0	-56	3	31		
		SUW-12	Top	256	85	0	-56	3	32		
		SUW-13	Top	253	89	0	-56	3	36		
		SUW-14	Top	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	Northeast	298	87	-10	-57	3	23		
		SUW-24	Northwest	275	85	0	-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	Top	282	82	0	-57	3	28		
		SUW-31	East	248	96	0	-56	3	43		
		SUW-32	North	245	96	0	-56	3	43		
		SUW-35	East	285	89	-5	-57	3	30		
		SUW-37	East	278	88	-5	-57	3	29		
		SUW-40	North	268	102	0	-57	3	48		
		SUW-45	West	261	88	0	-56	3	35		
		SUW-50	West	104	87	0	-48	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	0	-48	3	39		
		VCU-104	-	104	85	0	-48	3	40		
		VCU-031	-	105	81	0	-48	3	36		
		VCU-032	-	105	88	0	-48	3	43		
		VCU-033	-	101	82	0	-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											
SUW-P1-1	Planned NSR	SUW-01A	West	220	102	-10	-55	3	40		
		SUW-01B	West	220	100	-10	-55	3	38		
		SUW-02	Top	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	Top	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-09	South	218	88	0	-55	3	36		
		SUW-10	East	210	81	0	-54	3	30		
		SUW-11	Top	195	84	0	-54	3	33		
		SUW-12	Top	202	85	0	-54	3	34		
		SUW-13	Top	206	89	0	-54	3	38		
		SUW-14	Top	218	94	0	-55	3	42		
		SUW-15	Southwest	47	100	-10	-41	3	52		
		SUW-16	Southeast	36	99	0	-39	3	63		
		SUW-17, 18	Northeast	46	82	0	-41	3	44		
		SUW-19	Northeast	57	94	0	-43	3	54		
		SUW-22	Northeast	39	82	0	-40	3	45		
		SUW-23	Northeast	39	87	0	-40	3	50		
		SUW-24	Northwest	62	85	-10	-44	3	34		
		SUW-25	Northwest	66	83	-10	-44	3	32		
		SUW-26	Southwest	65	81	-10	-44	3	30		
		SUW-28	Northwest	59	103	-10	-43	3	53		
		SUW-29	Top	56	82	0	-43	3	42		
		SUW-31	East	194	96	0	-54	3	45		
		SUW-32	North	204	96	-10	-54	3	35		
		SUW-35	East	52	89	0	-42	3	50		
		SUW-37	East	60	88	0	-43	3	48		
		SUW-40	North	208	102	0	-54	3	51		
		SUW-45	West	213	88	-10	-55	3	26		
		SUW-50	West	283	87	-10	-57	3	23		
		SUW-51	East	279	104	0	-57	3	50		
		SUW-53	West	288	90	-10	-57	3	26		
		SUW-58	West	217	86	-10	-55	3	24		
		SUW-66	South	132	80	0	-50	3	33		
		VCU-101	-	199	82	0	-54	3	31		
		VCU-102-01	-	195	84	0	-54	3	33		
		VCU-102-02	-	196	81	0	-54	3	30		
		VCU-103	-	200	84	0	-54	3	33		
		VCU-104	-	197	85	0	-54	3	34		
		VCU-031	-	41	81	0	-40	3	44		
		VCU-032	-	47	88	0	-41	3	50		
		VCU-033	-	45	82	0	-41	3	44		
		VCU-035	-	39	82	0	-40	3	45		
		VCU-171-1	-	287	85	0	-57	3	31		
		VCU-171-2	-	287	85	0	-57	3	31	**65**	**65**

Annex A Detail Calculation of Fixed Plant Noise Assessment

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

Noise Assessment Points	Description	Plant item	Direction Facing	Horizontal Distance , m	SWL, dB(A)	Correction for line of sight [1], dB(A)	Distance Correction of Point Source, dB(A)	Façade Correction, dB(A)	Predicted SPL, dB(A)[2]	Total SPL, dB(A)	Daytime Noise Criteria, dB(A)
TKW-6-1											
TKW-6-1	Fok On Building	SUW-01A	West	187	102	0	-53	3	52		
		SUW-01B	West	187	100	0	-53	3	50		
		SUW-02	Top	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	0	-54	3	46		
		SUW-07	East	204	83	-10	-54	3	22		
		SUW-08	East	209	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	Top	216	84	0	-55	3	32		
		SUW-12	Top	210	85	0	-54	3	34		
		SUW-13	Top	209	89	0	-54	3	38		
		SUW-14	Top	181	94	0	-53	3	44		
		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	Northeast	379	87	-10	-60	3	N/A		
		SUW-24	Northwest	370	85	0	-59	3	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	Top	368	82	0	-59	3	N/A		
		SUW-31	East	223	96	-10	-55	3	34		
		SUW-32	North	216	96	0	-55	3	44		
		SUW-35	East	377	89	-10	-60	3	N/A		
		SUW-37	East	376	88	-10	-60	3	N/A		
		SUW-40	North	199	102	-10	-54	3	41		
		SUW-45	West	199	88	0	-54	3	37		
		SUW-50	West	311	87	-10	-58	3	N/A		
		SUW-51	East	311	104	0	-58	3	N/A		
		SUW-53	West	313	90	-10	-58	3	N/A		
		SUW-58	West	192	86	0	-54	3	35		
		SUW-66	South	259	80	0	-56	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	-	372	81	0	-59	3	N/A		
		VCU-032	-	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		
		VCU-171-2	-	312	85	0	-58	3	N/A	**59**	**65**
TKW-19-1											
TKW-19-1	Holy Trinity Church	SUW-01A	West	117	102	0	-49	3	56		
		SUW-01B	West	117	100	0	-49	3	54		
		SUW-02	Top	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-06	Top	127	97	0	-50	3	50		
		SUW-07	East	135	83	-10	-51	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	Top	139	84	0	-51	3	36		
		SUW-12	Top	131	85	0	-50	3	38		
		SUW-13	Top	127	89	0	-50	3	42		
		SUW-14	Top	127	94	0	-50	3	47		
		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	-10	-57	3	30		
		SUW-22	Northeast	307	82	-10	-58	3	N/A		
		SUW-23	Northeast	307	87	-10	-58	3	N/A		
		SUW-24	Northwest	290	85	0	-57	3	31		
		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-31	East	138	96	-10	-51	3	38		
		SUW-32	North	128	96	0	-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	West	121	88	0	-50	3	41		
		SUW-50	West	163	87	-10	-52	3	28		
		SUW-51	East	163	104	0	-52	3	55		
		SUW-53	West	163	90	-10	-52	3	31		
		SUW-58	West	119	86	0	-49	3	40		
		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	-	136	81	0	-51	3	33		
		VCU-103	-	133	84	0	-50	3	37		
		VCU-104	-	136	85	0	-51	3	37		
		VCU-031	-	300	81	0	-58	3	N/A		
		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-171-1	-	163	85	0	-52	3	36		
		VCU-171-2	-	163	85	0	-52	3	36	**64**	**65**

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.

Annex A Detail Calculation of Fixed Plant Noise Assessment

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

Noise Assessment Points	Description	Plant item	Direction Facing	Horizontal Distance , m	SWL, dB(A)	Correction for line of sight [1], dB(A)	Distance Correction of Point Source, dB(A)	Façade Correction, dB(A)	Predicted SPL, dB(A)[2]	Total SPL, dB(A)	Night-time Noise Criteria, dB(A)
Sung Wong Toi Station											
SUW-1-1											
SUW-1-1	Parc 22	SUW-01A	West	170	94	0	-53	3	44		
		SUW-01B	West	170	92	0	-53	3	42		
		SUW-02	Top	171	89	0	-53	3	39		
		SUW-03	Southwest	161	98	0	-52	3	49		
		SUW-04	East	167	84	0	-52	3	35		
		SUW-05	East	178	79	0	-53	3	29		
		SUW-06	Top	172	89	0	-53	3	39		
		SUW-07	East	183	77	0	-53	3	27		
		SUW-08	East	189	77	0	-54	3	26		
		SUW-09	South	158	80	0	-52	3	31		
		SUW-10	East	167	73	0	-52	3	24		
		SUW-11	Top	196	76	0	-54	3	25		
		SUW-12	Top	193	77	0	-54	3	26		
		SUW-13	Top	193	81	0	-54	3	30		
		SUW-14	Top	159	86	0	-52	3	37		
		SUW-15	Southwest	330	87	0	-58	3	N/A		
		SUW-16	Southeast	335	87	-5	-59	3	N/A		
		SUW-17, 18	Northeast	343	74	-10	-59	3	N/A		
		SUW-19	Northeast	343	86	-10	-59	3	N/A		
		SUW-22	Northeast	343	72	-10	-59	3	N/A		
		SUW-23	Northeast	343	73	-10	-59	3	N/A		
		SUW-24	Northwest	338	77	0	-59	3	N/A		
		SUW-25	Northwest	335	75	0	-59	3	N/A		
		SUW-26	Southwest	334	73	0	-58	3	N/A		
		SUW-28	Northwest	329	95	0	-58	3	N/A		
		SUW-29	Top	334	74	0	-58	3	N/A		
		SUW-31	East	205	88	-10	-54	3	27		
		SUW-32	North	201	88	0	-54	3	37		
		SUW-35	East	343	81	-10	-59	3	N/A		
		SUW-37	East	343	80	-10	-59	3	N/A		
		SUW-40	North	180	94	-10	-53	3	34		
		SUW-45	West	183	80	0	-53	3	30		
		SUW-50	West	322	79	-10	-58	3	N/A		
		SUW-51	East	321	93	0	-58	3	N/A		
		SUW-53	West	325	82	-10	-58	3	N/A		
		SUW-58	West	176	78	0	-53	3	28		
		SUW-66	South	221	72	0	-55	3	20		
		VCU-101	-	200	74	0	-54	3	23		
		VCU-102-01	-	202	76	0	-54	3	25		
		VCU-102-02	-	200	73	0	-54	3	22		
		VCU-103	-	198	76	0	-54	3	25		
		VCU-104	-	199	77	0	-54	3	26		
		VCU-031	-	335	73	0	-59	3	N/A		
		VCU-032	-	335	80	0	-59	3	N/A		
		VCU-033	-	335	74	0	-58	3	N/A		
		VCU-035	-	335	74	0	-58	3	N/A		
		VCU-171-1	-	324	77	0	-58	3	N/A		
		VCU-171-2	-	324	77	0	-58	3	N/A	**52**	**55**
SUW-3-1											
SUW-3-1	Prince Ritz	SUW-01A	West	288	94	0	-57	3	40		
		SUW-01B	West	288	92	0	-57	3	38		
		SUW-02	Top	288	89	0	-57	3	35		
		SUW-03	Southwest	299	98	-10	-58	3	33		
		SUW-04	East	296	84	-10	-57	3	20		
		SUW-05	East	286	79	-10	-57	3	15		
		SUW-06	Top	289	89	0	-57	3	35		
		SUW-07	East	281	77	-10	-57	3	13		
		SUW-08	East	275	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-11	Top	268	76	0	-57	3	22		
		SUW-12	Top	268	77	0	-57	3	23		
		SUW-13	Top	266	81	0	-57	3	27		
		SUW-14	Top	303	86	0	-58	3	N/A		
		SUW-15	Southwest	249	87	-10	-56	3	24		
		SUW-16	Southeast	258	87	-10	-56	3	24		
		SUW-17, 18	Northeast	245	74	0	-56	3	21		
		SUW-19	Northeast	235	86	0	-55	3	34		
		SUW-22	Northeast	252	72	0	-56	3	19		
		SUW-23	Northeast	252	73	0	-56	3	20		
		SUW-24	Northwest	231	77	0	-55	3	25		
		SUW-25	Northwest	228	75	0	-55	3	23		
		SUW-26	Southwest	230	73	-10	-55	3	11		
		SUW-28	Northwest	237	95	0	-56	3	42		
		SUW-29	Top	239	74	0	-56	3	21		
		SUW-31	East	257	88	0	-56	3	35		
		SUW-32	North	258	88	0	-56	3	35		
		SUW-35	East	239	81	0	-56	3	28		
		SUW-37	East	232	80	0	-55	3	28		
		SUW-40	North	281	94	0	-57	3	40		
		SUW-45	West	276	80	0	-57	3	26		
		SUW-50	West	149	79	0	-51	3	31		
		SUW-51	East	148	93	0	-51	3	45		
		SUW-53	West	149	82	0	-51	3	34		
		SUW-58	West	283	78	0	-57	3	24		
		SUW-66	South	294	72	-10	-57	3	8		
		VCU-101	-	261	74	0	-56	3	21		
		VCU-102-01	-	260	76	0	-56	3	23		
		VCU-102-02	-	262	73	0	-56	3	20		
		VCU-103	-	263	76	0	-56	3	23		
		VCU-104	-	264	77	0	-56	3	24		
		VCU-031	-	253	73	0	-56	3	20		
		VCU-032	-	247	80	0	-56	3	27		
		VCU-033	-	249	74	0	-56	3	21		
		VCU-035	-	255	74	0	-56	3	21		
		VCU-171-1	-	149	77	0	-51	3	29		
		VCU-171-2	-	149	77	0	-51	3	29	**50**	**55**

Annex A Detail Calculation of Fixed Plant Noise Assessment

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

Noise Assessment Points	Description	Plant item	Direction Facing	Horizontal Distance , m	SWL, dB(A)	Correction for line of sight [1], dB(A)	Distance Correction of Point Source, dB(A)	Façade Correction, dB(A)	Predicted SPL, dB(A)[2]	Total SPL, dB(A)	Night-time Noise Criteria, dB(A)
SUW-3-2											
SUW-3-2	Prosperity House	SUW-01A	West	272	94	0	-57	3	40		
		SUW-01B	West	272	92	0	-57	3	38		
		SUW-02	Top	272	89	0	-57	3	35		
		SUW-03	Southwest	283	98	-10	-57	3	34		
		SUW-04	East	283	84	-10	-57	3	20		
		SUW-05	East	274	79	-10	-57	3	15		
		SUW-06	Top	275	89	0	-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-11	Top	258	76	0	-56	3	23		
		SUW-12	Top	256	77	0	-56	3	24		
		SUW-13	Top	253	81	0	-56	3	28		
		SUW-14	Top	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-17, 18	Northeast	291	74	-10	-57	3	10		
		SUW-19	Northeast	281	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	Southwest	273	73	0	-57	3	19		
		SUW-28	Northwest	279	95	0	-57	3	41		
		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		
		SUW-37	East	278	80	-5	-57	3	21		
		SUW-40	North	268	94	0	-57	3	40		
		SUW-45	West	261	80	0	-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	West	267	78	0	-57	3	24		
		SUW-66	South	305	72	-10	-58	3	N/A		
		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	-	254	77	0	-56	3	24		
		VCU-031	-	297	73	0	-57	3	19		
		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		
		VCU-171-2	-	102	77	0	-48	3	32	**49**	**55**
SUW-P1-1											
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	Top	218	89	0	-55	3	37		
		SUW-03	Southwest	221	98	-10	-55	3	36		
		SUW-04	East	210	84	0	-54	3	33		
		SUW-05	East	204	79	0	-54	3	28		
		SUW-06	Top	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-09	South	218	80	0	-55	3	28		
		SUW-10	East	210	73	0	-54	3	22		
		SUW-11	Top	195	76	0	-54	3	25		
		SUW-12	Top	202	77	0	-54	3	26		
		SUW-13	Top	206	81	0	-54	3	30		
		SUW-14	Top	218	86	0	-55	3	34		
		SUW-15	Southwest	47	87	-10	-41	3	39		
		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	Northeast	39	73	0	-40	3	36		
		SUW-24	Northwest	62	77	-10	-44	3	26		
		SUW-25	Northwest	66	75	-10	-44	3	24		
		SUW-26	Southwest	65	73	-10	-44	3	22		
		SUW-28	Northwest	59	95	-10	-43	3	45		
		SUW-29	Top	56	74	0	-43	3	34		
		SUW-31	East	194	88	0	-54	3	37		
		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	West	213	80	-10	-55	3	18		
		SUW-50	West	283	79	-10	-57	3	15		
		SUW-51	East	279	93	0	-57	3	39		
		SUW-53	West	288	82	-10	-57	3	18		
		SUW-58	West	217	78	-10	-55	3	16		
		SUW-66	South	132	72	0	-50	3	25		
		VCU-101	-	199	74	0	-54	3	23		
		VCU-102-01	-	195	76	0	-54	3	25		
		VCU-102-02	-	196	73	0	-54	3	22		
		VCU-103	-	200	76	0	-54	3	25		
		VCU-104	-	197	77	0	-54	3	26		
		VCU-031	-	41	73	0	-40	3	36		
		VCU-032	-	47	80	0	-41	3	42		
		VCU-033	-	45	74	0	-41	3	36		
		VCU-035	-	39	74	0	-40	3	37		
		VCU-171-1	-	287	77	0	-57	3	23		
		VCU-171-2	-	287	77	0	-57	3	23	**55**	**55**

Annex A Detail Calculation of Fixed Plant Noise Assessment

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

Noise Assessment Points	Description	Plant item	Direction Facing	Horizontal Distance , m	SWL, dB(A)	Correction for line of sight [1], dB(A)	Distance Correction of Point Source, dB(A)	Façade Correction, dB(A)	Predicted SPL, dB(A)[2]	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	Top	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	Top	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	Top	216	76	0	-55	3	24		
		SUW-12	Top	210	77	0	-54	3	26		
		SUW-13	Top	209	81	0	-54	3	30		
		SUW-14	Top	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	Top	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.

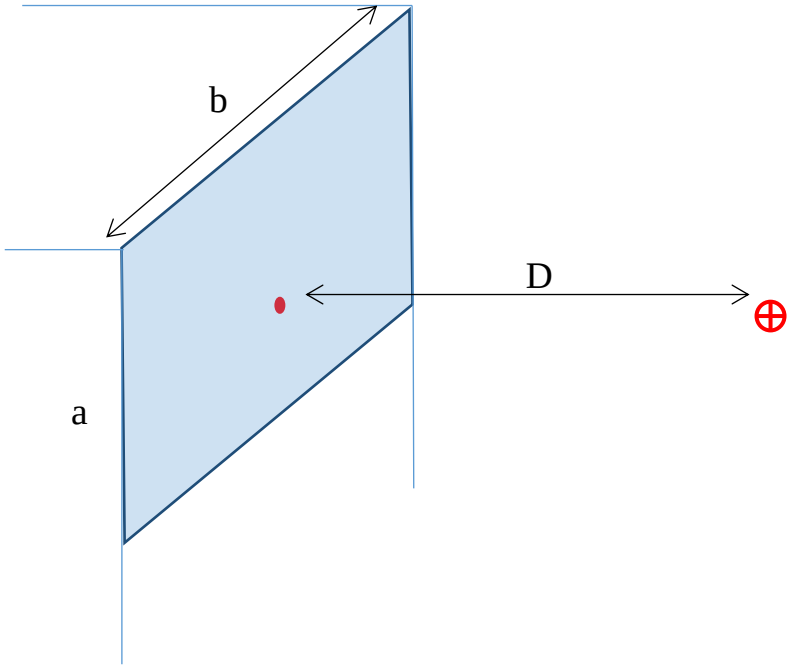
Appendix B

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.

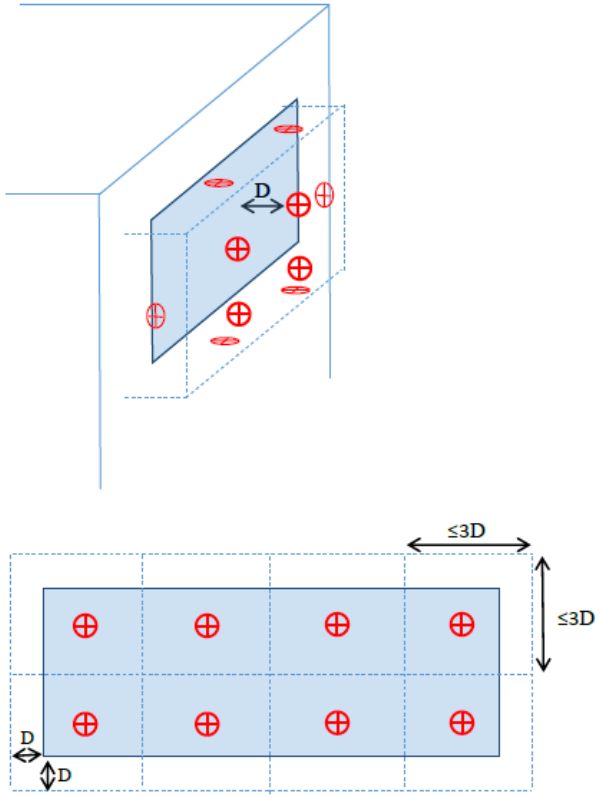
Louver opening
Proposed measurement point (microphone pointing perpendicular to the center of the louvre)

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 $L_{Aeq,\ 1\ min}$ 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)

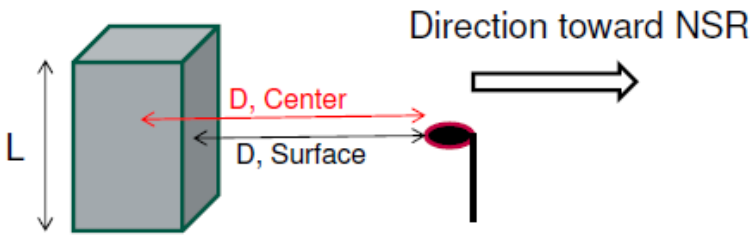
For method 2 (developed based on the principle of ISO3746:2010),

- 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



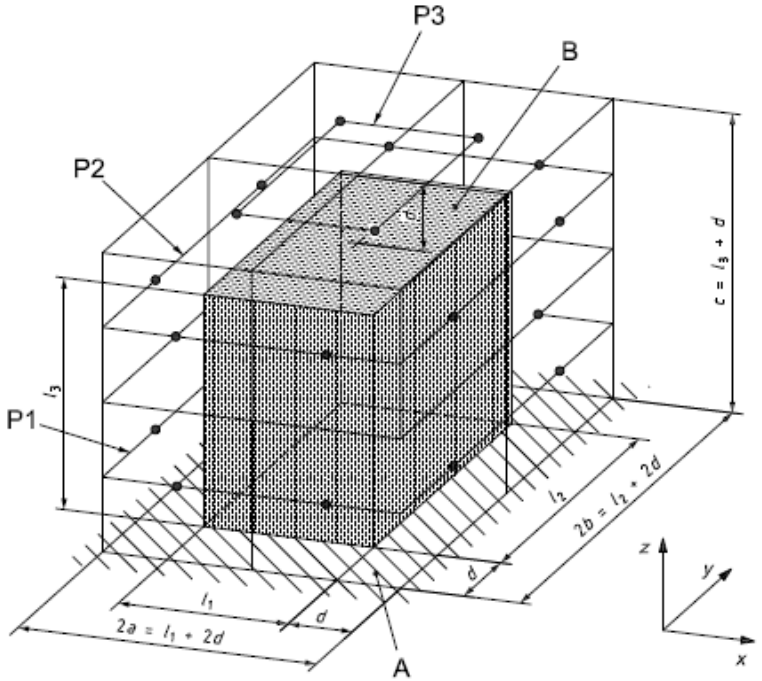
"L" is the longest side of the plant item
"D, Center" is the separation between center of the plant item and microphone
"D, Surface" is the separation between surface of the plant item and microphone

- "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



Key

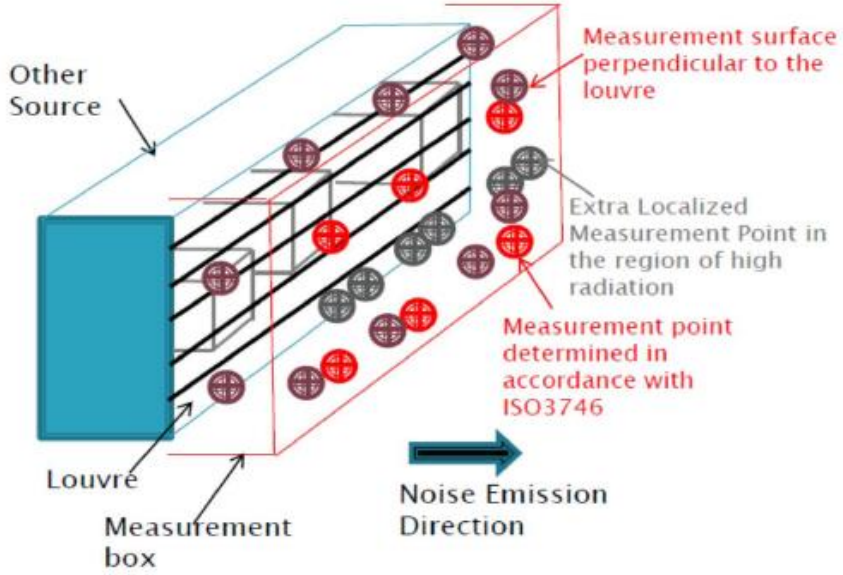
For Method 4 (based on ISO3746:2010),

- 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

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)

MAXLAB

CALIBRATION CERTIFICATE

Certificate Information

Date of Issue	6-Feb-2018	**Certificate Number**	MLCN180200S

Customer Information

Company Name	Wilson Acoustics Limited
Address	Unit 601, Block A, Shatin Industrial Centre, Yuen Shun Circuit, Shatin, N. T.

Equipment-under-Test (EUT)

Description	Sound Level Meter
Manufacturer	Svantek
Model Number	SVAN 955
Serial Number	15234
Equipment Number	--

Calibration Particular

Date of Calibration	6-Feb-2018		
Calibration Equipment	4231(MLTE008) / PA160059 / 20-May-2018		
Calibration Procedure	MLCG00, MLCG15		
Calibration Conditions	Laboratory	Temperature	23 °C ± 5 °C
		Relative Humidity	55% ± 25%
	EUT	Stabilizing Time	Over 3 hours
		Warm-up Time	10 minutes
		Power Supply	Internal battery
Calibration Results	Calibration data were detailed in the continuation pages.		

Approved By & Date

K.O. Lo 6-Feb-2018

Statements

* Calibration equipment used for this calibration are traceable to national / international standards.
* The results on this Calibration Certificate only relate to the values measured at the time of the calibration and the uncertainties quoted will not include allowance for the EUT long term drift, variation with environmental changes, vibration and shock during transportation, overloading, mishandling, misuse, and the capacity of any other laboratory to repeat the measurement.
* MaxLab Calibration Centre Limited shall not be liable 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 Certificate may be reproduced without the prior written approval of MaxLab Calibration Centre Limited.

Page 1 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

MAXLAB

Certificate No. MLCN180200S

Calibration Data

Parameter	Frequency Weighting	Range (dB)	Time Weighting	EUT Reading	Standard Reading	EUT Error	Calibration Uncertainty
SPL	A (1 kHz Input)	25 - 130	F	94 dB	94.0 dB	0.0 dB	0.2 dB
			S	94 dB	94.0 dB	0.0 dB	0.2 dB
			I	94 dB	94.0 dB	0.0 dB	0.2 dB
	C (1 kHz Input)	25 - 130	F	94 dB	94.0 dB	0.0 dB	0.2 dB
			S	94 dB	94.0 dB	0.0 dB	0.2 dB
			I	94 dB	94.0 dB	0.0 dB	0.2 dB
	Z (1 kHz Input)	25 - 130	F	94 dB	94.0 dB	0.0 dB	0.2 dB
			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 (1 kHz Input)	25 - 130	F	114 dB	114.0 dB	0.0 dB	0.2 dB
			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 (1 kHz Input)	25 - 130	F	114 dB	114.0 dB	0.0 dB	0.2 dB
			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 (1 kHz Input)	25 - 130	F	114 dB	114.0 dB	0.0 dB	0.2 dB
			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 By : Patrick
Date : 6-Feb-2018

Checked By : K.O. Lo
Date : 6-Feb-2018

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

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 (Type 1)	Microphone	Preamp
Manufacturer:	Rion Co., Ltd.	Rion Co., Ltd.	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 Venture
Address of Customer:	5C, Hong Kong Spinners Industrial Building, Phase 1, 601-603 Tai Nan West Street, Cheung Sha Wan, Kowloon, Hong Kong
Request No.:	2000072119
Date of receipt:	24-Jun-2017

Date of test: 28-Jun-2017

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	17-Jun-2018	CIGISMEC
Signal generator	DS 360	33873	25-Apr-2018	CEPREI
Signal generator	DS 360	61227	01-Apr-2018	CEPREI

Ambient conditions

Temperature:	24 ± 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.

Approved Signatory: Huang Jian Min/Feng Jun Qi **Date:** 29-Jun-2017 **Company Chop:** SOILS AND MATERIALS ENGINEERING COMPANY LTD. 綜合試驗有限公司

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.

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.: 17CA0624 01-02 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.

Test:	Subtest:	Status:	Expanded Uncertainty (dB)	Coverage Factor
Self-generated noise	A	Pass	0.3	
	C	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	
	C	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 $1/10^3$ at 4kHz	Pass	0.3	
	1 ms burst duty factor $1/10^4$ 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 Uncertainty (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: Lai Sheng Jie Date: 28-Jun-2017

Checked by: Fung Chi Yip Date: 29-Jun-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.

Cert B3: Calibration Certificate of Acoustic Calibrator SV30A (SN: 29088)

MAXLAB

CALIBRATION CERTIFICATE

Certificate Information

Date of Issue	5-Mar-2018	**Certificate Number**	MLCN180297S

Customer Information

Company Name	Wilson Accoustics Limited
Address	Unit 601, Block A, Shatin Industrial Centre, Yuen Shun Circuit, Shatin, N. T., Hong Kong

Equipment-under-Test (EUT)

Description	Acoustic Calibrator
Manufacturer	Svantek
Model Number	SV 30A
Serial Number	29088
Equipment Number	--

Calibration Particular

Date of Calibration	5-Mar-2018		
Calibration Equipment	4231(MLTE008) / PA160059 / 20-May-18 1351(MLTE049) / MLEC17/06/02 / 6-Jun-18		
Calibration Procedure	MLCG00, MLCG15		
Calibration Conditions	Laboratory	Temperature	23 °C ± 5 °C
		Relative Humidity	55% ± 25%
	EUT	Stabilizing Time	Over 3 hours
		Warm-up Time	Not applicable
		Power Supply	Internal battery
Calibration Results	Calibration data were detailed in the continuation pages. All calibration results were within EUT specification.		

Approved By & Date

K.O. Lo 5-Mar-2018

Statements

* Calibration equipment used for this calibration are traceable to national / international standards.
* The results on this Calibration Certificate only relate to the values measured at the time of the calibration and the uncertainties quoted will not include allowance for the EUT long term drift, variation with environmental changes, vibration and shock during transportation, overloading, mishandling, misuse, and the capacity of any other laboratory to repeat the measurement.
* MaxLab Calibration Centre Limited shall not be liable 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 Certificate may be reproduced without the prior written approval of MaxLab Calibration Centre Limited.

Page 1 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

MAXLAB

Certificate No. MLCN180297S

Calibration Data

EUT Setting	Standard Reading	EUT Error	Calibration Uncertainty	EUT 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
Date : 5-Mar-18

Checked By : K.O. Lo
Date : 5-Mar-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

Cert B4: Calibration Certificate of Acoustic Calibrator CIRRUS CR-515 (SN: 78572)

Hong Kong Calibration Ltd.
香港校正有限公司

Calibration Certificate

COPY

Certificate No. 811336 Page 1 of 2 Pages

Customer : Leighton M&E Limited

Address : 3 Dakota Drive, Kowloon City, Kowloon, Hong Kong

Order No. : Q84453 **Date of receipt :** 14-Nov-18

Item Tested

Description : Sound Level Calibrator
Manufacturer : CIRRUS **I.D.** : --
Model : CR:515 **Serial No.** : 78572

Test Conditions

Date of Test : 16-Nov-18 **Supply Voltage** : --
Ambient Temperature : (23 ± 3)°C **Relative Humidity :** (50 ± 25) %

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:

Equipment No.	Description	Cert. No.	Traceable to
S014	Spectrum Analyzer	805025	NIM-PRC & SCL-HKSAR
S041	Universal Counter	802061	SCL-HKSAR
S240	Sound Level Calibrator	803357	NIM-PRC & SCL-HKSAR
S206	Sound Level Meter	805027	SCL-HKSAR

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 : Elva Chong **Approved by :** Kin Wong

Date: 16-Nov-18

This Certificate is issued by:
Hong Kong Calibration Ltd.
Unit 8B, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street,Kwai Chung, NT,Hong Kong.
Tel: 2425 8801 Fax: 2425 8646

E

Hong Kong Calibration Ltd.
香港校正有限公司

Calibration Certificate

COPY

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 : ± 0.2 dB

2. **Short-term Level Fluctuation** : 0.0 dB
IEC 60942 Class 1 Spec. : ± 0.1 dB
Uncertainty : ± 0.01 dB

3. **Frequency**

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

Uncertainty : $\pm 3.6 \times 10^{-6}$

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 ----------

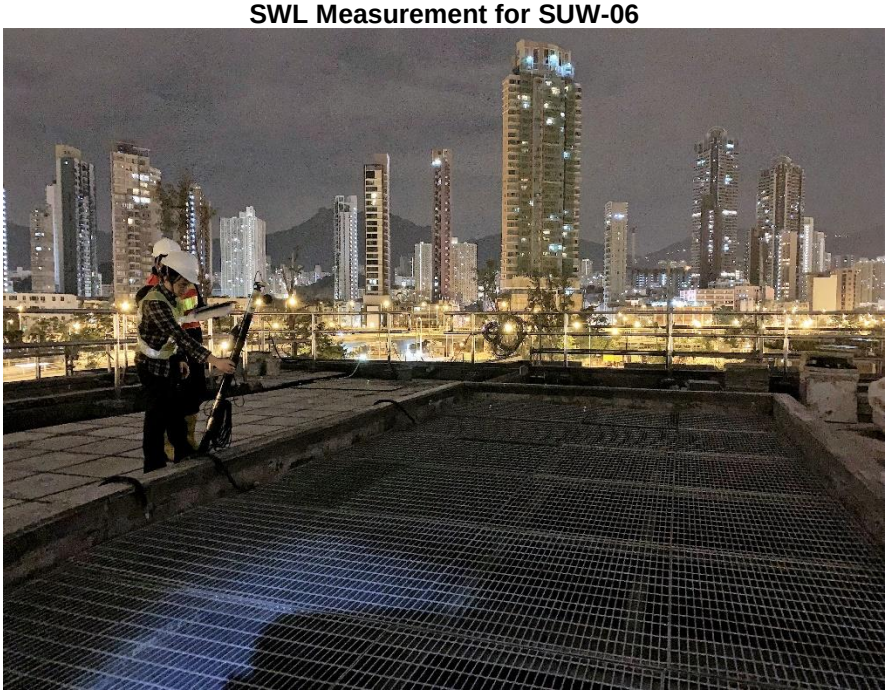
Appendix B3

Photographs showing the Examples of Noise Measurement for Fixed Plant Noise

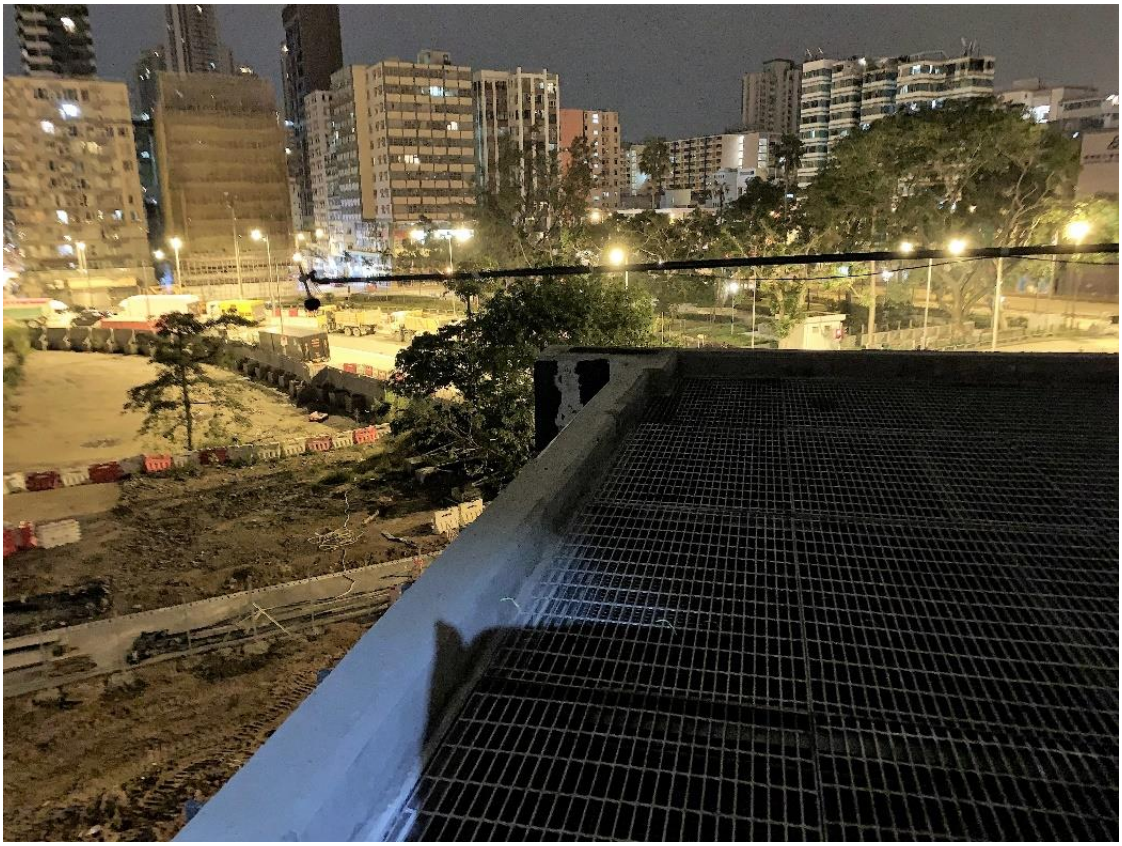
Appendix B3 Photographs showing the Examples of Noise Measurement for Fixed Plant Noise

SWL Measurement for SUW-02

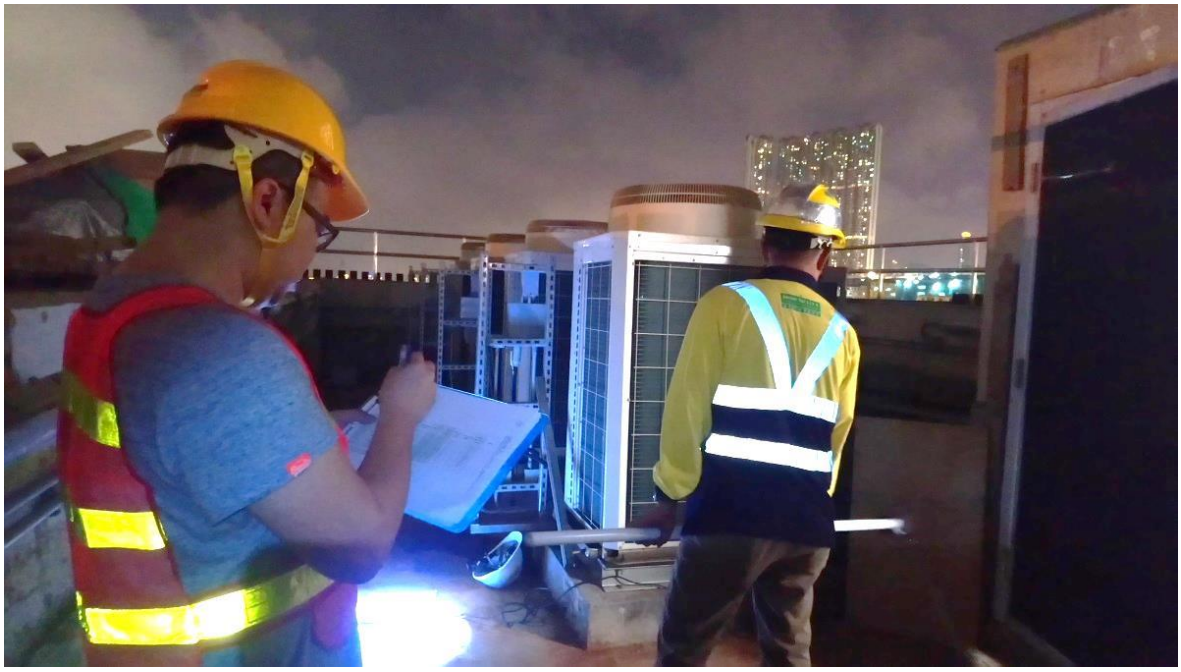
SWL Measurement for SUW-06



SWL Measurement for SUW-14



SWL Measurement for SUW-VCUs



Appendix B4

Noise Measurement Results

Appendix B4 Noise Measurement Results

Fixed Plant Source ID	Plant Type	Method	Size of Louvre/Outdoor AC unit (mm)			Measurement Distance (m) D [(a)]	Averaged Measured L_{Aeq} ,dB(A) [(b)]	Background L_{Aeq} ,dB(A)	Difference L_{Aeq} ,dB(A)	Background Corrected L_{Aeq} ,dB(A)[(c)]	Calculated SWL, dB(A)
			Length	Width	Height						
SUW-01A	Louvre	2	7120	3980	N/A	1.0	69.4	62.5	6.9	68.4	88
SUW-01B	Louvre	2	3200	6165	N/A	1.0	69.4	62.5	6.9	68.4	86
SUW-02	Louvre	2	8030	1365	N/A	1.0	66.3	59.0	7.3	65.4	83
SUW-03	Louvre	2	7120	5280	N/A	1.0	72.5	61.2	11.3	72.5	92
SUW-04	Louvre	2	3320	6300	N/A	1.0	63.8	60.1	3.7	61.4	78
SUW-05	Louvre	2	7120	4750	N/A	1.0	57.2	54.3	2.9	54.2	73
SUW-06	Louvre	2	5100	3810	N/A	1.0	65.4	55.8	9.6	64.9	83
SUW-07	Louvre	2	4640	1970	N/A	1.0	57.5	54.8	2.7	54.5	71
SUW-08	Louvre	2	5270	1970	N/A	1.0	56.2	51.9	4.3	54.1	71
SUW-09	Louvre	2	4400	2790	N/A	1.0	59.8	56.6	3.2	56.9	74
SUW-10	Louvre	2	6300	800	N/A	1.0	53.9	52.0	1.9	50.9	67
SUW-11	Louvre	2	2220	1900	N/A	1.0	57.7	56.9	0.8	54.7	70
SUW-12	Louvre	2	1600	1100	N/A	1.0	60.1	57.5	2.6	57.1	71
SUW-13	Louvre	2	1600	2595	N/A	1.0	62.6	59.5	3.1	59.7	75
SUW-14	Louvre	2	5000	2650	N/A	1.0	63.8	58.2	5.6	62.4	80
SUW-15 [(d)]	Louvre	2	3065	9905	N/A	1.0	73.3	57.0	16.3	73.3	92
SUW-15	Louvre	2	3065	9905	N/A	1.0	63.3	57.0	6.3	62.1	81
SUW-16 [(d)]	Louvre	2	3065	10055	N/A	1.0	72.9	52.9	20.0	72.9	91
SUW-16	Louvre	2	3065	10055	N/A	1.0	63.6	52.1	11.5	63.6	82
SUW-17, 18	Louvre	2	8300	2400	N/A	1.0	56.6	54.1	2.5	53.6	68
SUW-19	Louvre	2	2600	7000	N/A	1.0	62.8	56.7	6.1	61.6	80
SUW-22	Louvre	2	2820	4800	N/A	1.0	53.3	51.1	2.2	50.3	68
SUW-23	Louvre	2	3700	3065	N/A	1.0	57.2	51.0	6.2	56.0	73
SUW-24	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	54.5	69
SUW-26	Louvre	2	1950	2200	N/A	1.0	55.2	55.2	0.0	52.2	67
SUW-28	Louvre	2	1700	1800	N/A	1.0	74.2	56.7	17.5	74.2	89
SUW-29	Louvre	2	2130	6575	N/A	1.0	53.2	54.4	-1.2	50.2	68
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-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	63.3	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	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-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	3800	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-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

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

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

HOKLAS 028
CAL

CERTIFICATE OF CALIBRATION

Certificate No.: 18CA1019 01-01 **Page** 1 **of** 2

Item tested

Description:	Sound Level Meter (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

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 calibration

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	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%.

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 **Date:** 20-Oct-2018 **Company Chop:** SOILS AND MATERIALS ENGINEERING COMPANY LTD 綜合試驗有限公司

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.

綜合試驗有限公司
SOILS & MATERIALS ENGINEERING CO., LTD.
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12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.
E-mail: smec@cigismec.com Website: www.cigismec.com
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Fax: (852) 2555 7533

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CAL

CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 18CA1019 01-01 **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.

Test:	Subtest:	Status:	Expanded Uncertainty (dB)	Coverage Factor
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	
	C	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 $1/10^3$ at 4kHz	Pass	0.3	
	1 ms burst duty factor $1/10^4$ 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 Uncertainty (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: Fung Chi Yip Date: 19-Oct-2018

Checked by: shek Kwong Tat 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.

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

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CERTIFICATE OF CALIBRATION

Certificate No.: 19CA0311 02 **Page** 1 **of** 2

Item tested

Description:	Sound Level Meter (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.0[illegible].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 calibration

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

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 **Date:** 19-Mar-2019 **Company Chop:** SOILS & MATERIALS ENGINEERING COMPANY LTD. 綜合試驗有限公司

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.

綜合試驗有限公司
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HOKLAS 028 CAL

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.

Test:	Subtest:	Status:	Expanded Uncertainty (dB)	Coverage Factor
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	
	C	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 $1/10^3$ at 4kHz	Pass	0.3	
	1 ms burst duty factor $1/10^4$ 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 Uncertainty (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: Fong Chun Wai **Date:** 18-Mar-2019

Checked by: Fung Chi Yip **Date:** 19-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.

綜合試驗有限公司
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CERTIFICATE OF CALIBRATION

Certificate No.: 19CA0228 02 **Page** 1 **of** 2

Item tested

Description:	Sound Level Meter (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:	- (N-012-01)	,	-	-

Item submitted by

Customer Name:	AECOM ASIA CO LTD
Address of Customer:	-
Request No.:	-
Date of receipt:	28-Feb-2019

Date of test: 01-Mar-2019

Reference equipment used in the calibration

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

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 **Date:** 02-Mar-2019 **Company Chop:** SOILS AND MATERIALS ENGINEERING COMPANY LTD. 綜合試驗有限公司

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.

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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 19CA0228 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.

Test:	Subtest:	Status:	Uncertainty (dB) / Coverage Factor	
Self-generated noise	A	Pass	0.3	
	C	Pass	1.0	2.1
	Lin	Pass	2.0	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	
	C	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 $1/10^3$ at 4kHz	Pass	0.3	
	1 ms burst duty factor $1/10^4$ 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	Uncertainty (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.

- End -

Calibrated by: Fong Chun Wai **Date:** 01-Mar-2019

Checked by: 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.

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SOILS & MATERIALS ENGINEERING CO., LTD.
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CAL

CERTIFICATE OF CALIBRATION

Certificate No.: 18CA0920 02 **Page** 1 **of** 2

Item tested

Description:	Sound Level Meter (Type 1)	,	Microphone	Pream
Manufacturer:	B & K	,	B & K	B & K
Type/Model No.:	2270	,	4189	ZC0032
Serial/Equipment No.:	3007965 (CN.012.02)	,	284646	17965
Adaptors used:	-	,	-	-

Item submitted by

Customer Name:	AECOM ASIA CO. LTD.
Address of Customer:	-
Request No.:	-
Date of receipt:	20-Sep-2018

Date of test: 22-Sep-2018

Reference equipment used in the calibration

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	23-Apr-2019	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 **Date:** 22-Sep-2018 **Company Chop:** SOILS & MATERIALS ENGINEERING COMPANY LTD. 綜合試驗有限公司

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.

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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 18CA0920 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.

Test:	Subtest:	Status:	Uncertainty (dB) / Coverage Factor	
Self-generated noise	A	Pass	0.3	
	C	Pass	1.0	2.1
	Lin	Pass	2.0	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	
	C	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 $1/10^3$ at 4kHz	Pass	0.3	
	1 ms burst duty factor $1/10^4$ 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	Uncertainty (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.

\- End -

Calibrated by: Fung Chi Yip **Date:** 22-Sep-2018

Checked by: Shek Kwong Tat **Date:** 22-Sep-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.

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CAL

CERTIFICATE OF CALIBRATION

Certificate No.: 19CA0327 01-02 **Page:** 1 **of** 2

Item tested

Description:	Acoustical Calibrator (Class 1)
Manufacturer:	B & K
Type/Model No.:	4231
Serial/Equipment No.:	3006428 / N004.03
Adaptors used:	-

Item submitted by

Curstomer:	AECOM ASIA CO LIMITED
Address of Customer:	-
Request No.:	-
Date of receipt:	27-Mar-2019 (N.004.03)

Date of test: 27-Mar-2019

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2341427	20-Apr-2019	SCL
Preamplifier	B&K 2673	2743150	27-Apr-2019	CEPREI
Measuring amplifier	B&K 2610	2346941	08-May-2019	CEPREI
Signal generator	DS 360	33873	24-Apr-2019	CEPREI
Digital multi-meter	34401A	US36087050	23-Apr-2019	CEPREI
Audio analyzer	8903B	GB41300350	23-Apr-2019	CEPREI
Universal counter	53132A	MY40003662	24-Apr-2019	CEPREI

Ambient conditions

Temperature:	22 ± 1 °C
Relative humidity:	55 ± 10 %
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.

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: Feng Junqi **Date:** 29-Mar-2019 **Company Chop:** SOILS & MATERIALS ENGINEERING COMPANY LTD. 綜合試驗有限公司

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.

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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 19CA0327 01-02 **Page:** 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.

(Output level in dB re 20 μPa)

Frequency 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 -

Calibrated by: Fung Chi Yip **Date:** 27-Mar-2019

Checked by: Fong Chun Wai **Date:** 29-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.

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CERTIFICATE OF CALIBRATION

Certificate No.: 18CA1008 02 **Page:** 1 **of** 2

Item tested

Description:	Acoustical Calibrator (Class 1)
Manufacturer:	Rion Co., Ltd.
Type/Model No.:	NC-74
Serial/Equipment No.:	34246490 / N.004.10
Adaptors used:	-

Item submitted by

Curstomer:	AECOM ASIA CO LIMITED
Address of Customer:	-
Request No.:	-
Date of receipt:	08-Oct-2018

Date of test: 10-Oct-2018

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2341427	20-Apr-2019	SCL
Preamplifier	B&K 2673	2743150	27-Apr-2019	CEPREI
Measuring amplifier	B&K 2610	2346941	08-May-2019	CEPREI
Signal generator	DS 360	61227	24-Apr-2019	CEPREI
Digital multi-meter	34401A	US36087050	23-Apr-2019	CEPREI
Audio analyzer	8903B	GB41300350	23-Apr-2019	CEPREI
Universal counter	53132A	MY40003662	24-Apr-2019	CEPREI

Ambient conditions

Temperature:	21 ± 1 °C
Relative humidity:	50 ± 10 %
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.

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: Feng Junqi **Date:** 10-Oct-2018 **Company Chop:** SOILS AND MATERIALS ENGINEERING COMPANY LTD. 綜合試驗有限公司

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.

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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 18CA1008 02 **Page:** 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.

(Output level in dB re 20 μPa)

Frequency Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	Estimated Expanded Uncertainty 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.

- End -

Calibrated by: Fung Chi Yip **Checked by:** Shek Kwong Tat

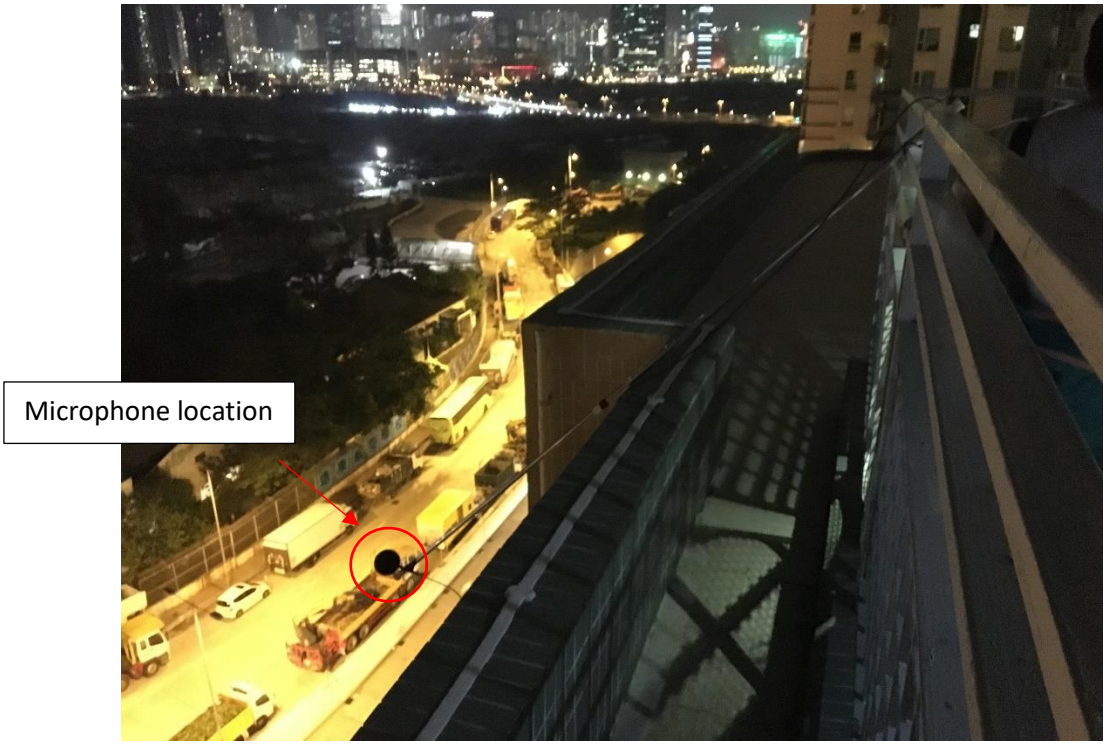
Date: 10-Oct-2018 **Date:** 10-Oct-2018

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.

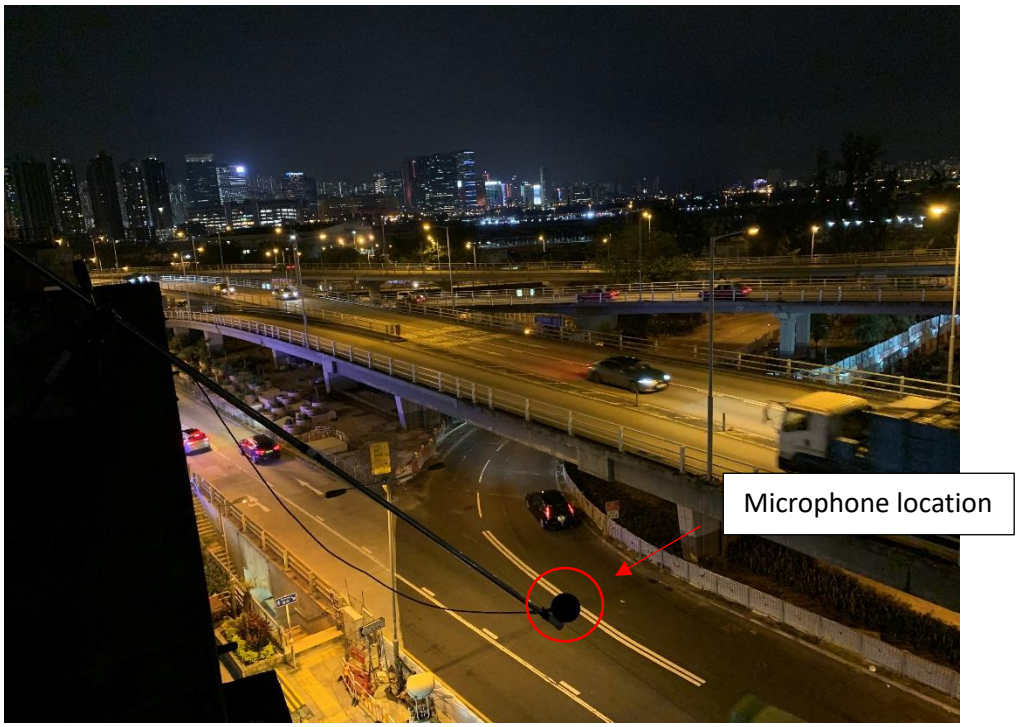
Appendix C2

Photographs – Noise Measurement at Representative NSRs

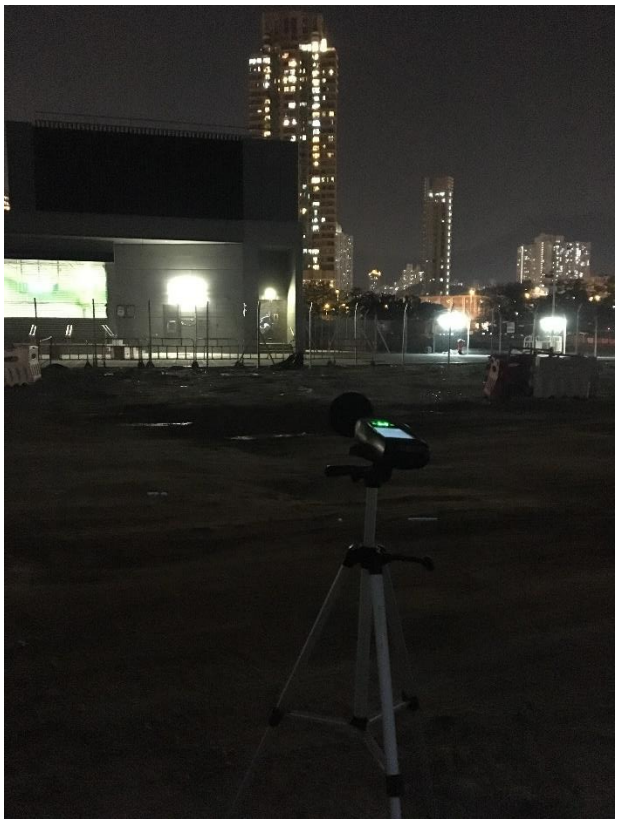
Appendix C2 Photographs – Noise Measurement at Representative NSRs



NSR Measurement Location at SUW-1-1



NSR Measurement Location at SUW-3-2



NSR Measurement Location at SUW-P1-1

NSR Measurement Location at TKW-19-1

Appendix C3

Measurement Results at Representative NSRs

Appendix C3 Noise Measurement Results at Measurement Locations

Measurement Location ID	Measurement Date	Operation Scenario [1][2]	Fixed Plant Noise		Background Noise		Difference between Measured Noise Level and Background Level, dB(A)
			Measurement Time	Measured Noise Level, $L_{Aeq\ 30mins}$, dB(A)	Measurement Time	Background Noise Level, $L_{Aeq\ 5mins}$, dB(A)	
SUW-1-1	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
	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
SUW-3-2	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
	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
SUW-P1-1	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
	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 [3]	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).