

MTR Corporation Limited

Kwun Tong Line Extension

Fixed Plant Noise Audit report
(Batch 2 – Ho Man Tin Station (HOM))

(April 2019)

Certified by: Jacky Chan



Position: Independent Environmental Checker

Date: _____

15 Apr 2019

MTR Corporation Limited

Kwun Tong Line Extension

Fixed Plant Noise Audit report
(Batch 2 – Ho Man Tin Station (HOM))

(April 2019)

Certified by: Lisa Poon 

Position: Environmental Team Leader


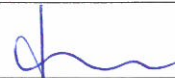


Date: 15 April 2019

MTR Corporation Limited

Consultancy Agreement No. C11033

Kwun Tong Line Extension (KTE)**Fixed Plant Noise Audit Report
(Batch 2 – Ho Man Tin Station (HOM))**

April 2019

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

Version: A Date: 8 April 2019

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

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1 INTRODUCTION

1.1 Background

- 1.1.1 Ho Man Tin Station (HOM) is the interchange station for Kwun Tong Line Extension (KTE) and Shatin to Central Link – Tai Wai to Hung Hom Section [SCL (TAW-HUH)] (hereinafter referred to as “the SCL project”). During the design process after the issuance of EIA Study Briefs of both Projects, engineering and programme considerations have supported the construction and operation of HOM to be implemented, under the KTE. Environmental impacts arising from the construction and operation of the HOM had hence been assessed in the KTE EIA Report.
- 1.1.2 Following the approval of the KTE EIA Report (Register No.: AEIAR-154/2010) under the Environmental Impact Assessment Ordinance (EIAO), the Environmental Permit (EP) (EP No: EP-399/2010), covering the construction and operation of KTE (hereinafter referred to as “the KTE project”), was granted on 27 September 2010. Variations of Environmental Permit (VEP) were subsequently applied for EP-399/2010 and the latest Environmental Permit (EP No: EP-399/2010/E) was issued by Director of Environmental Protection (DEP) on 4 October 2018.
- 1.1.3 Pursuant to EP Condition 4.6, at least one month before the commencement of operation of the KTE project, the Permit Holder shall carry out audit and confirm in writing to the Director that the design of the fixed plant noise sources associated with the KTE project complies with the maximum sound power levels determined in the EIA Report (Register No. AEIAR-154/2010) and all relevant documents in the Register, or otherwise approved by the Director in compliance with the requirements in the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) having due regard to the characteristics of tonality, impulsiveness and intermittency. The audit report shall be certified by the ET Leader and verified by the IEC.
- 1.1.4 Fixed noise audit for the noise sources related to the operation of KTE project was conducted and the Fixed Plant Noise Audit Report for KTE (September 2016) (FRNAR-KTE) was accepted by DEP in October 2016. However, some of the fixed plant sources, which supports the operation of SCL(TAW-HUH), in HOM were excluded in the fixed plant noise audit report (2016) and the associated fixed plant noise audit will be conducted after the installation of these sources. As discussed in Section 4.3 of FRNAR-KTE, fixed plant noise audit for SCL fixed plant will be conducted before the commencement of SCL project under KTE EP condition 4.6 to confirm the compliance of fixed plant operation for SCL.
- 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 operation of SCL.
- 1.1.6 Based on the latest design information of SCL, the maximum allowable SWLs of fixed plant items has been updated to reflect the latest design of the SCL at HOM, and therefore The Proposal for Updating Maximum Allowable Sound Power Levels of Louvers (Batch 2 – Ho Man Tai Station (HOM)) (hereinafter referred to as “the Proposal (Batch 2 – HOM)”) (**Appendix A** refers) was prepared to present the updated maximum allowable sound power levels (SWLs) of the fixed plant items at HOM. The Proposal (Batch 2 – HOM) was approved by DEP on 15 April 2019.
- 1.1.7 This Fixed Plant Noise Audit Report (Batch 2 – Ho Man Tin Station (HOM)) (hereinafter referred to as “the FPNAR (Batch 2 - HOM)”) presents the noise measurement methodology and measurement results at the SCL fixed plant noise sources of HOM and at the representative NSRs near HOM, for checking compliance with the maximum allowable sound power levels (SWLs) determined in the Proposal (Batch 2 – HOM).

1.2 Purpose of This Report

- 1.2.1 This Report presents the noise measurement methodology and measurement results at the SCL fixed plant noise sources of HOM and at the representative NSRs near HOM.

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 under SCL at HOM are extracted from the Proposal (Batch 2 – HOM) and are summarised in **Table 2.1**. The updated SCL fixed plant noise sources locations at HOM are shown in **Figure No. C1103/C/SCL/ACM/M52/045**. 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 under SCL at HOM

Location	Fixed Plant ID.	Fixed Plant Source	Maximum Allowable SWL, dB(A)	
			Daytime/Evening (1)	Night-time (1)
HOM	A1	Tunnel Ventilation Louver	98	87
	A2	Tunnel Ventilation Louver	105	93
	A3	Tunnel Ventilation Louver	96	87
	A4	Tunnel Ventilation Louver	98	86
	A5	Tunnel Ventilation Louver	97	86
	A6	Tunnel Ventilation Louver	97	86
	B1	Tunnel Ventilation Louver	99	89
	B2	Tunnel Ventilation Louver	104	94
	E5-3	Tunnel Ventilation Louver	96	85
	F2	Tunnel Ventilation Louver	100	82
	G1	Tunnel Ventilation Louver	89	86
	G2	Tunnel Ventilation Louver	87	84
	G3	Tunnel Ventilation Louver	88	83
	G4	Tunnel Ventilation Louver	84	74
	G5	Tunnel Ventilation Louver	89	77

Note:

(1) 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.

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 958	20890
	SVANTEK 958	28422
	SVANTEK 958A	59120
	SVANTEK 958A	69082
	SVANTEK 955	15234
Hand-held Acoustic Calibrator	SVANTEK SV30A	29088
	SVANTEK SV30A	10814

- 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 The noise measurements at HOM were all conducted during night-time periods at the fixed plant noise sources. Details of the noise measurement schedule are shown in **Table 3.2**.

Table 3.2 Measurement Schedule

Location	Date
HOM	29 Nov, 15 Dec, 20 Dec 2018 & 29 Jan 2019

3.2 Noise Measurement to Confirm any Tonal, Impulsive and Intermittent Characteristics from the Fixed Plant Noise 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 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 2250L	2681366
	B&K 2270	3007965
	B&K 2270	2644597
	B&K 2250	3001291
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/M52/046**. Photographs of measurement locations are shown in **Appendix C2**.

Table 3.4 Noise Measurement Locations

Measurement Location ID	Representative NSR	Type	Measurement Height
NSR 18	Yee Fu Building	Residential	~10m above ground level (free field condition)
NSR 21	Lok Ka House	Residential	~ 6m above ground level (free field condition)
NSR 40b	Residential Building, Ho Man Tin Station Development (Planned Future NSR)	Residential	~10m above ground level (free field condition)
NSR 40c	Residential Building, Ho Man Tin Station Development (Planned Future NSR)	Residential	~5m above station roof (free field condition)

Measurement Date and Time

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

Table 3.5 Measurement Schedule

Location	Date
NSR 18, NSR 21, NSR 40b, NSR40c	26 Feb 2019

4 MEASUREMENT RESULTS

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

- 4.1.1 The measured SWLs under conservative approach during daytime and evening, and night-time periods are presented in **Table 4.1**. Details of the measurement results are shown in **Appendix B4**.

Table 4.1 Summary of Measured SWLs for Fixed Plants

Plant Item	Measured SWL, dB(A)		Maximum allowable SWL, dB(A)		Compliance (Y/N)	
	Day/Evening-time ⁽¹⁾	Night-time ⁽¹⁾	Day/Evening-time ⁽¹⁾	Night-time ⁽¹⁾	Day/Evening-time ⁽¹⁾	Night-time ⁽¹⁾
A1	77	77	97	87	Y	Y
A2	77	77	105	93	Y	Y
A3	72	72	97	87	Y	Y
A4	86	86	97	86	Y	Y
A5	76	76	97	86	Y	Y
A6	75	75	97	86	Y	Y
B1	86	86	99	89	Y	Y
B2	87	87	104	94	Y	Y
E5-3	72	72	95	85	Y	Y
F2	82	82	93	82	Y	Y
G1	86	86	96	86	Y	Y
G2	84	84	94	84	Y	Y
G3	83	83	93	83	Y	Y
G4	77	73	85	74	Y	Y
G5	81	74	88	77	Y	Y

Note:

(1) 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 Noise Sources at NSRs

- 4.2.1 Noise measurement to confirm any characteristics of tonality, impulsiveness and intermittency at the representative NSRs were conducted during night-time period. Measurement results are summarised in **Table 4.2** below. No characteristics of tonality, impulsiveness and intermittency was observed at the selected NSR. 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 Result at Representative NSRs

Measurement Location ID	Representing NSRs	Operation Scenario ⁽¹⁾⁽²⁾	Measurement Result			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)		
NSR 18	Yee Fu Building	Daytime & Evening	58.9	58.1	0.8	Noise environment was dominated by traffic noise and human activities. Noise from SCL fixed plant was not noticeable at measurement locations.	N
		Night-time	59.2	57.6	1.6		N
NSR 21	Lok Ka House	Daytime & Evening	71.5	70.5	1.0		N
		Night-time	71.9	70.6	1.3		N
NSR 40b	Residential Building, Ho Man Tin Station Development (Planned Future NSR)	Daytime & Evening	56.8	55.4	1.4		N
		Night-time	57.9	55.8	2.1		N
NSR 40c	Residential Building, Ho Man Tin Station Development (Planned Future NSR)	Daytime & Evening	67.9	66.3	1.6		N
		Night-time	67.6	66.7	0.9		N

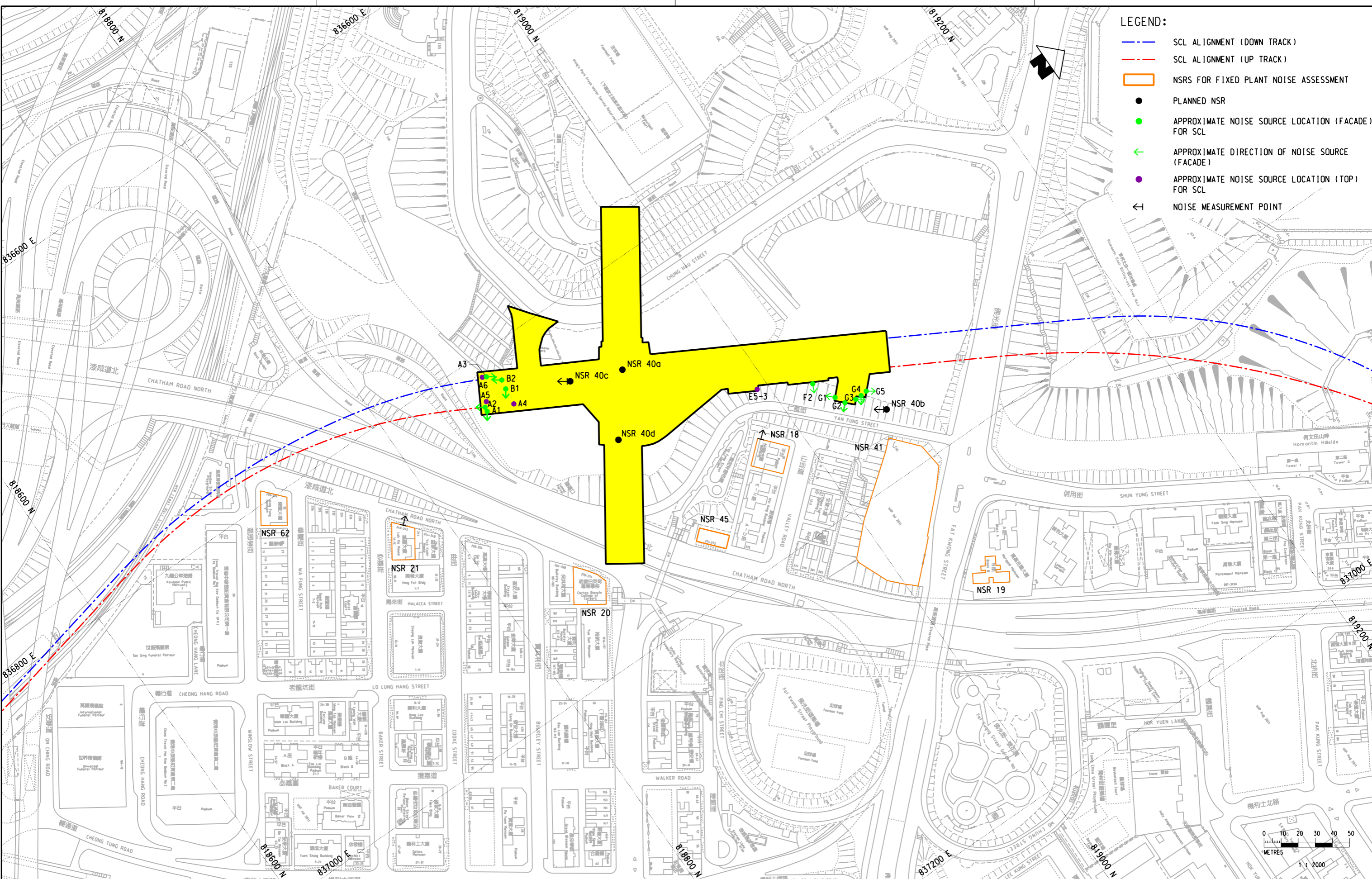
Notes:

- (1) Daytime and evening period (i.e 0700 to 2300 hours) and night-time period (i.e. Night: 2300 to 0700 hours).
(2) KTE Fixed plant noise operation during daytime/evening and night-time periods have been included according to corresponding fixed plant noise measurement.

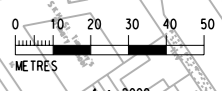
5 CONCLUSION

- 5.1.1 The fixed plant noise verification were undertaken and the measurement results indicated all the fixed plant noise sources under SCL comply with the updated maximum allowable SWLs. No characteristics of tonality, impulsiveness and intermittency was also observed at the representative NSRs. Result of data analysis also indicated no characteristics of tonality, impulsiveness and intermittency is found at the representative NSRs.

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 - ← APPROXIMATE DIRECTION OF NOISE SOURCE (FACADE)
 - APPROXIMATE NOISE SOURCE LOCATION (TOP) FOR SCL
 - ← NOISE MEASUREMENT POINT



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APPROVED	IMW
DATE	17/OCT/2018

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SHATIN TO CENTRAL LINK
AECOM

TITLE		C11033	
SCL (TAW - HUH)		LOCATIONS OF NOISE MEASUREMENT POINTS	
(HO MAN TIN STATION)			
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Appendix A

**Proposal for Updating Maximum Allowable Sound Power
Levels of Louvers (Batch 2 – Ho Man Tin Station (HOM))**

MTR Corporation Limited

Kwun Tong Line Extension

Proposal for Updating Maximum Allowable Sound Power

Levels of Fixed Plant Sources

(Batch 2 – Ho Man Tin Station (HOM))

(April 2019)

Certified by: Jacky Chan



Position: Independent Environmental Checker

Date: 8 Apr 2019

MTR Corporation Limited

Kwun Tong Line Extension

Proposal for Updating Maximum Allowable Sound Power

Levels of Fixed Plant Sources

(Batch 2 – Ho Man Tin Station (HOM))

(April 2019)

Certified by: Lisa Poon 

Position: Environmental Team Leader



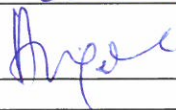
Date: 8 April 2019

MTR Corporation Limited

Consultancy Agreement No. C11033

Kwun Tong Line Extension (KTE)**Proposal for Updating Maximum Allowable
Sound Power Levels of Fixed Plant Sources
(Batch 2 - Ho Man Tin Station (HOM))**

April 2019

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

Version: B Date: 4 April 2019

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

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Annex A Detail Calculation of Fixed Plant Noise Assessment

1 INTRODUCTION

1.1 Background

- 1.1.1 Ho Man Tin Station (HOM) is the interchange station for Kwun Tong Line Extension (KTE) and Shatin to Central Link – Tai Wai to Hung Hom Section [SCL (TAW-HUH)] (hereinafter referred to as “the SCL project”). During the design process after the issuance of EIA Study Briefs of both Projects, engineering and programme considerations have supported the construction and operation of HOM to be implemented, under the KTE. Environmental impacts arising from the construction and operation of the HOM had hence been assessed in the KTE EIA Report.
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- 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 identified Noise Sensitive Receivers (NSRs) for investigation of any characteristics of tonality, impulsiveness and intermittency from the fixed plant noise sources associated with the operation of SCL.
- 1.1.6 Based on the latest design information of SCL, the maximum allowable SWLs of fixed plant items has been updated to reflect the latest design of the SCL at HOM, and therefore a Proposal will be prepared to present the updated maximum allowable sound power levels (SWLs) of the fixed plant items at HOM for supporting the operation of SCL.

1.2 Purpose of This Proposal

- 1.2.1 As discussed in **Section 1.1.6**, the maximum allowable SWLs of fixed plant items has been updated to reflect the latest design of the Project. This Proposal (Batch 2 – Ho Man Tin Station (HOM)) presents the updated maximum allowable SWLs of the fixed plant noise sources under SCL at HOM.

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 2.3 of the approved Proposal for Updating the Maximum Sound Power Level for Fixed Plant Noise Sources for KTE (KTE Proposal for Updating SWLs) dated on 26 August 2016 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 HOM are summarised in **Table 2.2**.

Table 2.2 Summary of noise criteria at representative NSRs for fixed noise sources (Reference from Table 2.3 of the approved KTE Proposal for Updating SWLs)

Area (NSR No.)	Time Period ⁽¹⁾	ASR	ANL-5, dB(A) ⁽²⁾	Criteria, dB(A) ⁽³⁾
Ho Man Tin				
Yee Fu Building (NSR 18)	Day & evening	C	65	65
	Night	C	55	55
Marigold Mansion (NSR 19)	Day & evening	C	65	65
	Night	C	55	55
Chinachem (Hung Hom) Commercial Centre (NSR 20) ⁽⁴⁾	Day & evening	C	65	65
	Night	C	55	55
Lok Ka House (NSR 21)	Day & evening	C	65	65
	Night	C	55	55
Residential Building, Ho Man Tin Station Development (Planned Future NSR) (NSR 40a)	Day & evening	C	65	65
	Night	C	55	55
	Day & evening	B	60	60

Area (NSR No.)	Time Period ⁽¹⁾	ASR	ANL-5, dB(A) ⁽²⁾	Criteria, dB(A) ⁽³⁾
Residential Building, Ho Man Tin Station Development (Planned Future NSR) (NSR 40b)	Night	B	50	50
Residential Building, Ho Man Tin Station Development (Planned Future NSR) (NSR 40c)	Day & evening	C	65	65
	Night	C	55	55
Residential Building, Ho Man Tin Station Development (Planned Future NSR) (NSR 40d)	Day & evening	C	65	65
	Night	C	55	55
Residential Building, Dormitory for The Hong Kong Polytechnics University (NSR 41)	Day & evening	C	65	65
	Night	C	55	55
271-273 Chatham Road North (NSR 45)	Day & evening	C	65	65
	Night	C	55	55
Wing Fung Building (NSR 62)	Day & evening	C	65	65
	Night	C	55	55

Notes:

- (1) Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours.
- (2) A 5 dB(A) has been deducted from ANL as specified in requirement of TM-EIAO.
- (3) As mentioned in KTE EIA, the Project areas are densely populated areas strongly influenced by traffic, the prevailing noise levels are unlikely to be 5dB(A) lower than the appropriate ANL. Thus ANL-5 is adopted for this urban Study Area.
- (4) Caritas Bianchi College of Careers (NSR 20) was named as Chinachem (Hung Hom) Commercial Centre and was occupied as office use since Year 2016. In January 2018, an application was submitted to change the use of the building to "Hotel" and was approved by Town Planning Board in May 2018.

2.3 Review of Area Sensitivity Rating

2.3.1 Area Sensitive Ratings (ASR) as defined in the approved Table 2.3 of Proposal for Updating SWLs 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 Annual Traffic Census 2017, Chatham Road North, has been identified in the vicinity of NSRs in Ho Man Tin area, and the details are listed in **Table 2.3** below.

Table 2.3 Major road in the Vicinity of HOM

Area	Road Name	From	To	A.A.D.T. ⁽¹⁾ (2017)
Ho Man Tin	Chatham Road North	Wuhu Street	Chatham Road North (GL)	109,170

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 According to Annual Traffic Census 2017, Chatham Road North, with annual average daily traffic (A.A.D.T.) greater than 30,000, remains as Influencing Factor (IF) located in the vicinity of NSRs in Ho Man Tin area, and thus the ASRs of NSRs in this area as defined in **Table 2.2** remains unchanged, except NSR40b. Site inspection has been conducted recently to determine the degree to which NSR 40b is affected by the IF. Site observation revealed that NSR 40b has direct line of sight to Chatham Road North, and traffic noise from Chatham Road North was noticeable, but was not a dominant feature of the noise climate of the NSR. As

NSR 40b is located in urban area, the ASR for NSR 40b should be revised as ASR “C” in accordance with the IND-TM. Details of ASR for NSR 40b is presented in **Table 2.4** below.

Table 2.4 Review of ASRs

Area (NSR No.)	Type of Area ⁽¹⁾	Influencing Factor (IF)	Degree to which NSR is affected by IF	ASR	Time Period ⁽²⁾	ANL-5, dB(A) ⁽³⁾	Criteria, dB(A) ⁽⁴⁾
Ho Man Tin							
Residential Building, Ho Man Tin Station Development (Planned Future NSR) (NSR 40b)	Urban Area	Chatham Road North	Indirectly Affected	C	Day & evening	65	65
					Night	55	55

Notes:

- (1) Reference is made from Appendix 7.1 of the approved KTE EIA report.
- (2) Day: 0700 to 1900 hours, Evening: 1900 to 2300 hours, Night: 2300 to 0700 hours.
- (3) A 5 dB(A) has been deducted from ANL as specified in requirement of TM-EIAO.
- (4) As mentioned in KTE EIA report, the Project areas are densely populated areas strongly influenced by traffic, the prevailing noise levels are unlikely to be 5dB(A) lower than the appropriate ANL. Thus ANL-5 is adopted for this urban Study Area.

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 under SCL at HOM are shown in **Figure No. C1103/C/SCL/ACM/M52/045**. 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 Under SCL

Location	Fixed Plant ID.	Fixed Plant Source	Maximum Allowable SWL, dB(A) ⁽¹⁾	
			Daytime & Evening ⁽²⁾	Night-time ⁽²⁾
HOM	A1	Tunnel Ventilation Louver	97	87
	A2	Tunnel Ventilation Louver	105	93
	A3	Tunnel Ventilation Louver	97	87
	A4	Tunnel Ventilation Louver	97	86
	A5	Tunnel Ventilation Louver	97	86
	A6	Tunnel Ventilation Louver	97	86
	B1	Tunnel Ventilation Louver	99	89
	B2	Tunnel Ventilation Louver	104	94
	E5-3	Tunnel Ventilation Louver	95	85
	F2	Tunnel Ventilation Louver	93	82
	G1	Tunnel Ventilation Louver	96	86
	G2	Tunnel Ventilation Louver	94	84
	G3	Tunnel Ventilation Louver	93	83
	G4	Tunnel Ventilation Louver	85	74
	G5	Tunnel Ventilation Louver	88	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, Leq,30mins, dB(A) ⁽¹⁾	
		Daytime & Evening ⁽²⁾	Night-time ⁽²⁾	Daytime & Evening ⁽²⁾	Night-time ⁽²⁾
NSR 18	Yee Fu Building	65	55	64	55
NSR 19	Marigold Mansion	65	55	47	37
NSR 20	Chinachem (Hung Hom) Commercial Centre ⁽¹⁾	65	55	62	54
NSR 21	Lok Ka House	65	55	65	55

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⁾
NSR 40a	Residential Building, Ho Man Tin Station Development (Planned Future NSR)	65	55	62	50
NSR 40b	Residential Building, Ho Man Tin Station Development (Planned Future NSR)	65	55	65	55
NSR 40c	Residential Building, Ho Man Tin Station Development (Planned Future NSR)	65	55	65	55
NSR 40d	Residential Building, Ho Man Tin Station Development (Planned Future NSR)	65	55	64	55
NSR 41	Residential Building, Dormitory for The Hong Kong Polytechnics University	65	55	60	51
NSR 45	271-273 Chatham Road North	65	55	60	53
NSR 62	Wing Fung Building	65	55	62	52

Notes:

- (1) Cumulative fixed plant noise levels from the fixed plant under KTE have been considered according to the measured SWLs for the operation during daytime/evening periods and the operation during night-time period as specified in FRNAR-KTE. The predicted cumulative 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

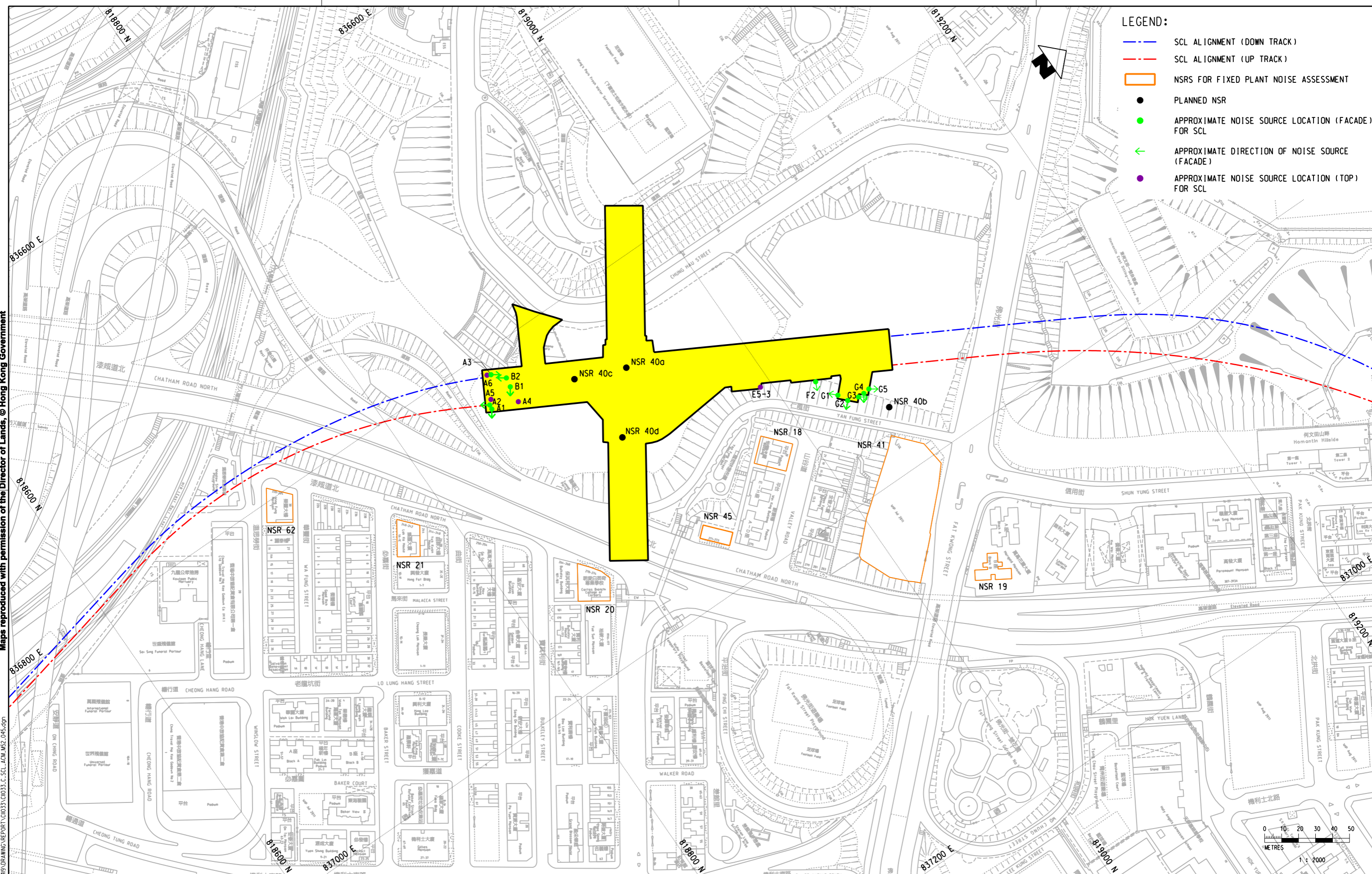
- 4.1.1 The maximum allowable SWLs of fixed plant noise sources under SCL at HOM has been updated based on the latest design information. The predicted noise levels at representative NSRs comply with the noise criteria based on the updated maximum allowable SWLs of fixed plant noise sources.
- 4.1.2 The measured SWLs at each louver under SCL 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

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PLOT DRW: V:\ustmset\NTR\PI\DRIVER\WINDOWS\3 COLOR\04.dwg 15:40:00 PM
 MODEL: C:\Program Files\Autodesk\AutoCAD 2018\acad.dwg
 FILENAME: P:\proj\181033\181033_C_SCL_ACM_M52_045.dgn

- LEGEND:**
- SCL ALIGNMENT (DOWN TRACK)
 - SCL ALIGNMENT (UP TRACK)
 - NSRS FOR FIXED PLANT NOISE ASSESSMENT
 - PLANNED NSR
 - APPROXIMATE NOISE SOURCE LOCATION (FACADE) FOR SCL
 - ← APPROXIMATE DIRECTION OF NOISE SOURCE (FACADE)
 - APPROXIMATE NOISE SOURCE LOCATION (TOP) FOR SCL



REV	DESCRIPTION	BY	DATE	APPROVED	REV	DESCRIPTION	BY	DATE	APPROVED

DRAWN	XH
DESIGNED	LCLL
CHECKED	LCLL
APPROVED	IMW
DATE	17/OCT/2018

MTR

SHATIN TO CENTRAL LINK

AECOM

ORIGINATOR

CADD REF. C11033_C_SCL_ACM_M52_045.dgn

TITLE	C11033 SCL (TAW - HUH) LOCATIONS OF NSRS AND FIXED PLANT NOISE SOURCES AT HOM		
SCALE	1 : 2000 (A3)	FIGURE NO.	C11033/C/SCL/ACM/M52/045
REV.	A		

Annex A

Detail Calculation of Fixed Plant Noise Assessment

Annex A Detail Calculation of Fixed Plant Noise Assessment

Fixed Plant Noise Calculation - HOM NSRs

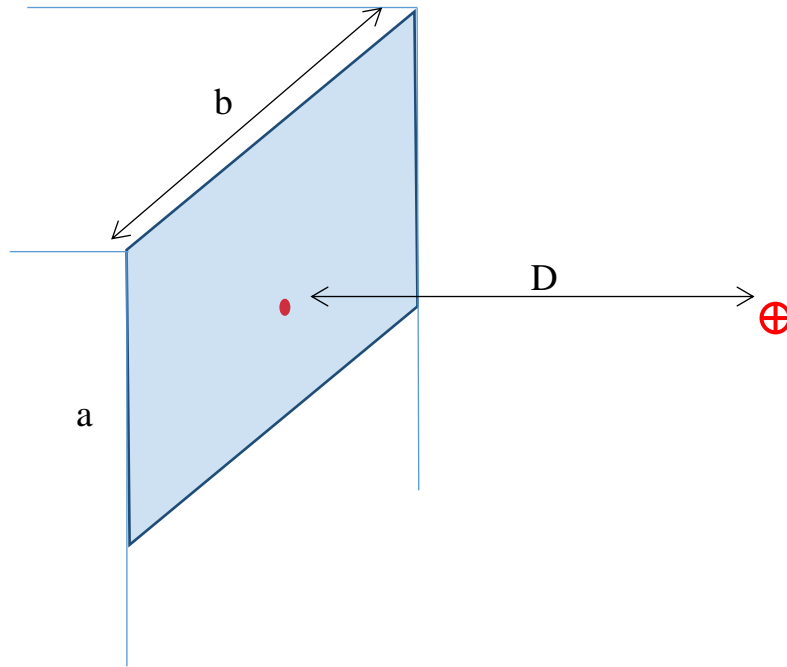
NSR	Louver	Distance from Louver, m	Distance Attenuation, dB(A)	Barrier Correction ^(a) , dB	Façade Effect, dB(A)	Daytime ^(b)				Night-time			
						Louver SWL, dB(A)	Individual SPL, dB(A)	Total SPL, dB(A)	Noise Criterion under the EIAO-TM, dB(A)	Louver SWL, dB(A)	Individual SPL, dB(A)	Total SPL, dB(A)	Noise Criterion under the EIAO-TM, dB(A)
NSR 40d	A1	82.7	-46.4	0	3	97.0	53.6	63	65	87.0	43.6	55	55
(with operation of tunnel ventilation shaft I)	A3	86.3	-46.7	-10	3	97.0	43.3	--	--	87.0	33.3	--	--
	A4	67.1	-44.5	0	3	97.0	55.5	--	--	86.0	44.5	--	--
	A5	82.1	-46.3	0	3	97.0	53.7	--	--	86.0	42.7	--	--
	A6	87.7	-46.9	0	3	97.0	53.1	--	--	86.0	42.1	--	--
	B1	70.0	-44.9	-10	3	99.0	47.1	--	--	89.0	37.1	--	--
	B3a	73.3	-45.3	-10	3	82.0	29.7	--	--	82.0	29.7	--	--
	B3b	73.3	-45.3	-10	3	82.0	29.7	--	--	70.0	17.7	--	--
	B4	52.1	-42.3	-10	3	96.0	46.7	--	--	--	--	--	--
	B4a	50.9	-42.1	0	3	81.0	41.9	--	--	81.0	41.9	--	--
	B5	42.8	-40.6	-10	3	82.0	34.4	--	--	82.0	34.4	--	--
	B8	55.8	-42.9	0	3	85.0	45.1	--	--	--	--	--	--
	C1a	73.4	-45.3	0	3	77.0	34.7	--	--	77.0	34.7	--	--
	C1b	70.9	-45.0	0	3	80.0	38.0	--	--	80.0	38.0	--	--
	C2a	63.1	-44.0	0	3	80.0	39.0	--	--	80.0	39.0	--	--
	C2b	57.7	-43.2	0	3	82.0	41.8	--	--	82.0	41.8	--	--
	C2c	57.7	-43.2	0	3	76.0	35.8	--	--	--	--	--	--
	C2d	57.7	-43.2	0	3	83.0	42.8	--	--	83.0	42.8	--	--
	C2e	57.7	-43.2	0	3	83.0	42.8	--	--	83.0	42.8	--	--
	C3	52.6	-42.4	0	3	81.0	41.6	--	--	81.0	41.6	--	--
	C4	48.2	-41.7	-10	3	80.0	31.3	--	--	80.0	31.3	--	--
	C4a	44.3	-40.9	-10	3	86.0	38.1	--	--	86.0	38.1	--	--
	C5	42.5	-40.6	-10	3	80.0	32.4	--	--	80.0	32.4	--	--
	C6	41.4	-40.3	-10	3	83.0	35.7	--	--	78.0	30.7	--	--
	C7c	36.5	-39.2	-10	3	78.0	31.8	--	--	--	--	--	--
	D1	29.7	-37.4	-10	3	89.0	44.6	--	--	89.0	44.6	--	--
	D2	25.3	-37.1	-10	3	87.0	43.9	--	--	87.0	43.9	--	--
	D3	33.0	-38.4	-10	3	85.0	39.6	--	--	84.0	38.6	--	--
	D5	23.3	-35.3	-10	3	83.0	40.7	--	--	83.0	40.7	--	--
	D6	24.8	-35.9	-10	3	85.0	42.1	--	--	85.0	42.1	--	--
	D7	29.0	-37.3	-10	3	82.0	37.7	--	--	82.0	37.7	--	--
	D8	33.4	-38.5	-10	3	79.0	33.5	--	--	--	--	--	--
	D9	39.4	-39.9	-10	3	77.0	30.1	--	--	77.0	30.1	--	--
	D10	44.9	-41.0	-10	3	80.0	32.0	--	--	77.0	29.0	--	--
D11	47.1	-41.5	-10	3	77.0	28.5	--	--	77.0	28.5	--	--	
H1	29.0	-37.3	-10	3	--	--	--	--	--	--	--	--	
H2	27.9	-36.9	0	3	--	--	--	--	--	--	--	--	
H3	28.5	-37.1	0	3	--	--	--	--	--	--	--	--	
H4	29.7	-37.5	-10	3	--	--	--	--	--	--	--	--	
I1	31.9	-38.1	-10	3	92.0	46.9	--	--	--	--	--	--	
I2	32.2	-38.2	-10	3	91.0	45.8	--	--	--	--	--	--	
I3	30.3	-37.6	0	3	89.0	54.4	--	--	--	--	--	--	
I4	30.0	-37.5	0	3	90.0	55.5	--	--	--	--	--	--	
K1b	53.8	-42.6	0	3	84.0	44.4	--	--	84.0	44.4	--	--	
K3	78.8	-45.9	-10	3	79.0	26.1	--	--	--	--	--	--	
NSR 41	E1	131.3	-50.4	0	3	76.0	28.6	60	65	76.0	28.6	51	55
	E2	122.4	-49.8	0	3	74.0	27.2	--	--	74.0	27.2	--	--
	E3	109.5	-48.8	0	3	76.0	30.2	--	--	76.0	30.2	--	--
	E4	101.5	-48.1	0	3	76.0	30.9	--	--	76.0	30.9	--	--
	E5-1	106.3	-48.5	0	3	76.0	30.5	--	--	76.0	30.5	--	--
	E5-3	104.4	-48.4	0	3	95.0	49.6	--	--	85.0	39.6	--	--
	F1	76.6	-45.7	0	3	80.0	37.3	--	--	73.0	30.3	--	--
	F1a	91.5	-47.2	0	3	68.0	23.8	--	--	68.0	23.8	--	--
	F1b	90.4	-47.1	0	3	66.0	21.9	--	--	66.0	21.9	--	--
	F1c	89.5	-47.0	0	3	68.0	24.0	--	--	68.0	24.0	--	--
	F1d	83.6	-46.4	0	3	73.0	29.6	--	--	--	--	--	--
	F2	66.0	-44.4	0	3	93.0	51.6	--	--	82.0	40.6	--	--
	F3a	59.0	-43.4	-10	3	69.0	18.6	--	--	69.0	18.6	--	--
	F3b	58.1	-43.3	-10	3	70.0	19.7	--	--	70.0	19.7	--	--
	F3d	56.1	-43.0	-10	3	68.0	18.0	--	--	68.0	18.0	--	--
	F4a	45.9	-41.2	0	3	80.0	41.8	--	--	--	--	--	--
	F4b	45.9	-41.2	0	3	--	--	--	--	69.0	30.8	--	--
	G1	53.2	-42.5	-10	3	96.0	46.5	--	--	86.0	36.5	--	--
	G2	49.3	-41.9	0	3	94.0	55.1	--	--	84.0	45.1	--	--
	G3	48.2	-41.7	0	3	93.0	54.3	--	--	83.0	44.3	--	--
	G4	40.6	-40.2	0	3	85.0	47.8	--	--	74.0	36.8	--	--
	G5	40.6	-40.2	0	3	88.0	50.8	--	--	77.0	39.8	--	--
	J3	82.9	-46.4	0	3	75.0	31.6	--	--	75.0	31.6	--	--
	J4	79.1	-46.0	0	3	75.0	32.0	--	--	75.0	32.0	--	--
	J5	78.1	-45.9	0	3	74.0	31.1	--	--	74.0	31.1	--	--
	J6	74.3	-45.4	0	3	74.0	31.6	--	--	74.0	31.6	--	--

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

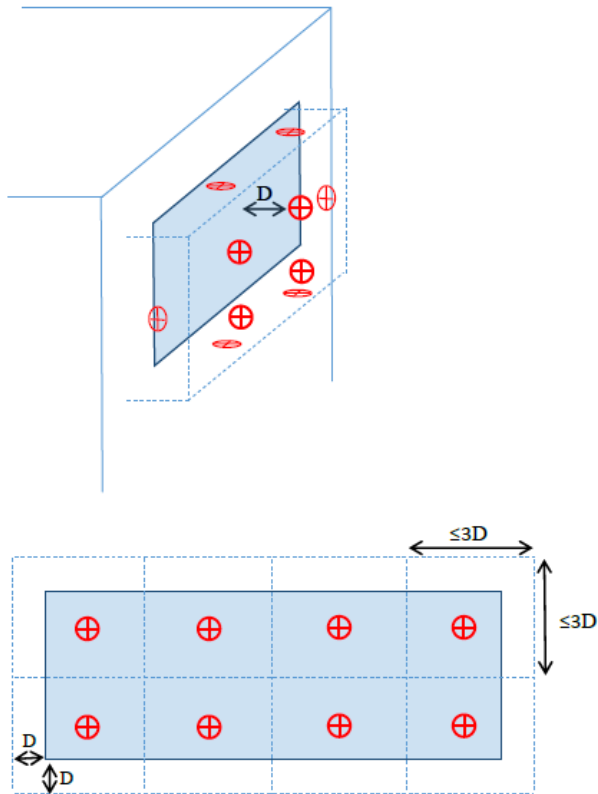
⊕ Proposed measurement point (microphone pointing perpendicular to the center of the louvre)

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 $L_{Aeq, 1 \text{ min}}$ 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 characteristics at representative NSRs.

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

Method 2: Near-Field Testing Method for Louvre



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),

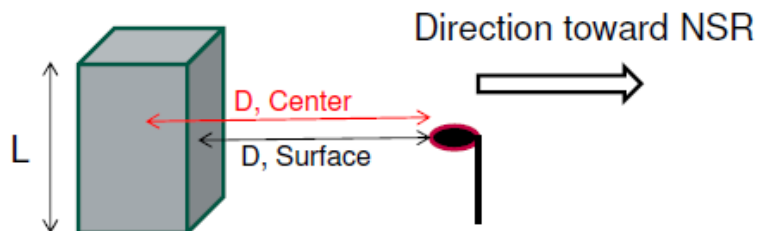
- First step is to determine a hypothetical measurement surfaces with at least 1m separation (D, measured from the centre of the louvre or its nearest edges as appropriate) from the louvre.
- For louvre with largest dimension $\leq 3D$, at least one measurement at the centre of the measurement surface 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 louvre 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 characteristics at representative NSRs.

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

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

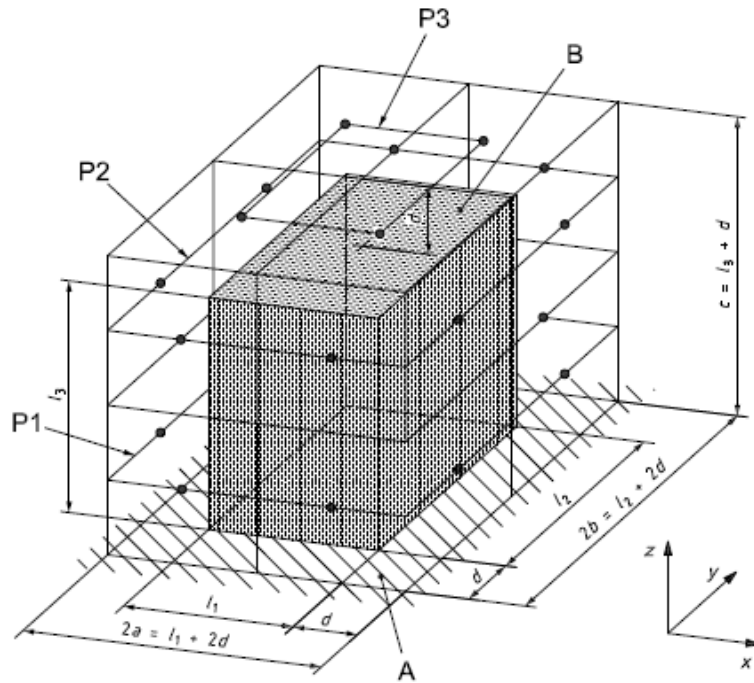
“D, Center” is the separation between center of the plant item and microphone

“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 $L_{Aeq, 1 \text{ min}}$ 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 characteristics at representative NSRs.

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

Method 4 – Near Field Testing Method for Plant Item



For Method 4 (based on ISO3746:2010),

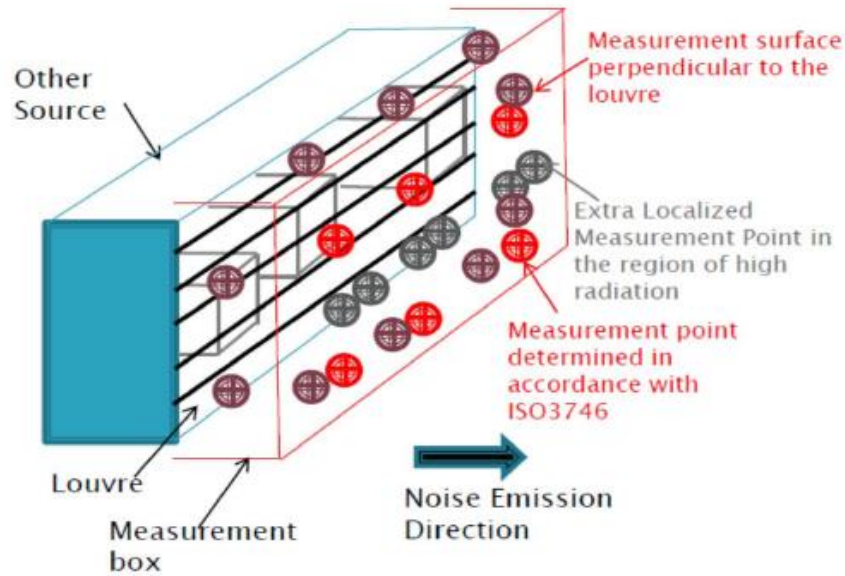
- Please refer to latest edition of ISO3746 for measurement requirement.
- The locations of measurement points are depended on the size of the plant, which cannot be easily generalized (see figure for example)
- Background noise measurement should be obtained for determination of background correction 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 characteristics at representative NSRs.

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

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 louvre.
- 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 characteristics at representative NSRs.

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

K1A refers to background noise correction factor

K2A refers to environmental correction for sound absorption and reflection

Appendix B2


**Calibration Certificates –
Noise Measurement for Fixed Plant Noise**

Appendix B2 Calibration Certificates – Noise Measurement for Fixed Plant Noise

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



CALIBRATION CERTIFICATE

Certificate Information			
Date of Issue	23-Jun-2017	Certificate Number MLCN171137S	
Customer Information			
Company Name	Wilson Acoustics 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			
<ul style="list-style-type: none"> * 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. 			

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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

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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
Unit B2, 9/F., Baldwin Industrial Bldg., 16-18 Wah Sing Street, Kwai Chung, N.T., Hong Kong Tel: (852) 2116 1380 Fax: (852) 2264 6480 Email: info@maxlab.com.hk

Cert B2: Calibration Certificate of Sound Level Meter SVANTEK 958 (SN: 28422)



CALIBRATION CERTIFICATE

<i>Certificate Information</i>			
Date of Issue	7-May-2018		
Certificate Number	MLCN180788S		
<i>Customer Information</i>			
Company Name	Wilson Acoustics Limited		
Address	Unit 601, Block A, Shatin Industrial Centre, Yuen Shun Circuit, Shatin, N. T., Hong Kong		
<i>Equipment-under-Test (EUT)</i>			
Description	Sound & Vibration Analyser		
Manufacturer	SvanteK		
Model Number	SVAN 958		
Serial Number	28422		
Equipment Number	--		
<i>Calibration Particular</i>			
Date of Calibration	7-May-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.		
<i>Approved By & Date</i>			
			K.O. Lo
			7-May-2018
<i>Statements</i>			
<ul style="list-style-type: none"> * 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. 			



MAXLAB

Certificate No. MLCN180788S

Calibration Data						
Channel / Mode	Filter / Detector	Range	EUT Reading	Standard Reading	EUT Error	Calibration Uncertainty
CH4 / Sound	A / FAST (1 kHz Input)	105 dB	93.9 dB	94.0 dB	-0.1 dB	0.2 dB
		130 dB	94.0 dB	94.0 dB	0.0 dB	0.2 dB
			114.0 dB	114.0 dB	0.0 dB	0.2 dB
	C / FAST (1 kHz Input)	105 dB	93.9 dB	94.0 dB	-0.1 dB	0.2 dB
		130 dB	94.0 dB	94.0 dB	0.0 dB	0.2 dB
			114.0 dB	114.0 dB	0.0 dB	0.2 dB
	LIN / FAST (1 kHz Input)	105 dB	93.9 dB	94.0 dB	-0.1 dB	0.2 dB
		130 dB	94.0 dB	94.0 dB	0.0 dB	0.2 dB
			114.0 dB	114.0 dB	0.0 dB	0.2 dB
	A / SLOW (1 kHz Input)	105 dB	93.9 dB	94.0 dB	-0.1 dB	0.2 dB
		130 dB	114.0 dB	114.0 dB	0.0 dB	0.2 dB
	C / SLOW (1 kHz Input)	105 dB	93.9 dB	94.0 dB	-0.1 dB	0.2 dB
		130 dB	114.0 dB	114.0 dB	0.0 dB	0.2 dB
	LIN / SLOW (1 kHz Input)	105 dB	93.9 dB	94.0 dB	-0.1 dB	0.2 dB
		130 dB	114.0 dB	114.0 dB	0.0 dB	0.2 dB
	A / IMPULSE (1 kHz Input)	105 dB	93.9 dB	94.0 dB	-0.1 dB	0.2 dB
		130 dB	114.0 dB	114.0 dB	0.0 dB	0.2 dB
	C / IMPULSE (1 kHz Input)	105 dB	93.9 dB	94.0 dB	-0.1 dB	0.2 dB
130 dB		114.0 dB	114.0 dB	0.0 dB	0.2 dB	
LIN / IMPULSE (1 kHz Input)	105 dB	93.9 dB	94.0 dB	-0.1 dB	0.2 dB	
	130 dB	114.0 dB	114.0 dB	0.0 dB	0.2 dB	

- END -

Calibrated By :
Date :

Dan
7-May-2018

Checked By :
Date :

K.O. Lo
7-May-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

Unit B2, 9/F., Boldwin Industrial Bldg., 16-18 Wah Sing Street, Kwai Chung, N.T., Hong Kong Tel: (852) 2116 1380 Fax: (852) 2264 6480 Email: info@maxlab.com.hk

Cert B3: Calibration Certificate of Sound Level Meter SVANTEK 958A (SN: 59120)



CALIBRATION CERTIFICATE

Certificate Information																
Date of Issue	7-Nov-2018															
Certificate Number	MLCN182746S															
Customer Information																
Company Name	Wilson Acoustics 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 958A															
Serial Number	59120															
Equipment Number	--															
Calibration Particular																
Date of Calibration	7-Nov-2018															
Calibration Equipment	4231(MLTE008) / AV180068 / 13-May-2020															
Calibration Procedure	MLCG00, MLCG15															
Calibration Conditions	<table border="0"> <tr> <td>Laboratory</td> <td>Temperature</td> <td>23 °C ± 5 °C</td> </tr> <tr> <td></td> <td>Relative Humidity</td> <td>55% ± 25%</td> </tr> <tr> <td>EUT</td> <td>Stabilizing Time</td> <td>Over 3 hours</td> </tr> <tr> <td></td> <td>Warm-up Time</td> <td>10 minutes</td> </tr> <tr> <td></td> <td>Power Supply</td> <td>Internal battery</td> </tr> </table>	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
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 7-Nov-2018															
Statements																
<ul style="list-style-type: none"> * 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. 																

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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

Unit B2, 9/F., Baldwin Industrial Bldg., 16-18 Wah Sing Street, Kwai Chung, N.T., Hong Kong Tel: (852) 2116 1380 Fax: (852) 2264 6480 Email: info@maxlab.com.hk



Certificate No. MLCN182746S

<i>Calibration Data</i>						
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	94.0 dB	94.0 dB	0.0 dB	0.2 dB
			114.0 dB	114.0 dB	0.0 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	94.0 dB	94.0 dB	0.0 dB	0.2 dB
			114.0 dB	114.0 dB	0.0 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	94.0 dB	94.0 dB	0.0 dB	0.2 dB
			114.0 dB	114.0 dB	0.0 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	114.0 dB	114.0 dB	0.0 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	114.0 dB	114.0 dB	0.0 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	114.0 dB	114.0 dB	0.0 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	114.0 dB	114.0 dB	0.0 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		114.0 dB	114.0 dB	0.0 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	114.0 dB	114.0 dB	0.0 dB	0.2 dB	

- END -

Calibrated By :
Date :

Dan
7-Nov-2018

Checked By :
Date :

K.O. Lo
7-Nov-2018

Page 2 of 2

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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

Unit B2, 9/F., Baldwin 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 Sound Level Meter SVANTEK 958A (SN: 69082)



ISO9001 certified

FACTORY CALIBRATION DATA OF THE SVAN 958 No. 69082

SOUND LEVEL METER

1. CALIBRATION (electrical)

LEVEL METER; Filter: LIN; Input signal =114.0dB, f_{in} =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_{in} = 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_{in} = 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_{in} = 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

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	Fast	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
	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	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				
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 = 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	Fast	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	

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

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	

***S14N958 No. 69082 page 3 ***

Range: 130dB, Equivalent input steady level = 74dB

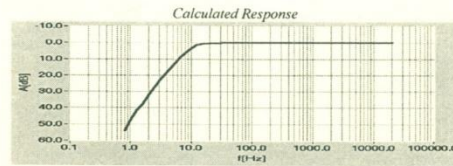
Result	Detector	Ch.	Duration [ms]	1000	500	200	100	50	20	10	5
MAX	Fast	1	Indication [dB]	74.0	73.9	73.0	71.4	69.2	65.7	62.9	59.9
			Error [dB]	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	0.0
		2	Indication [dB]	74.0	73.9	73.0	71.4	69.2	65.7	62.9	59.9
			Error [dB]	0.0	0.0	73.0	0.0	-0.0	-0.0	-0.0	-0.0
		3	Indication [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
	Slow	4	Indication [dB]	54.0	53.9
			Error [dB]	0.0	0.0
		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		
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;



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/s²), f_m=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;

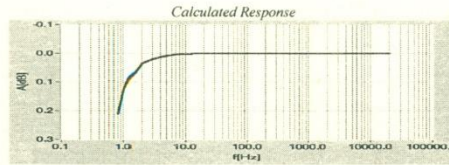
Filter	HP1		HP10		Wd		Wm		Wh	
	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]	Indication [dB]	Error [dB]
Channel 1	120.0	0.0	120.0	0.0	106.1	0.0	102.0	-0.0	110.5	-0.0
Channel 2	120.0	0.0	120.0	0.0	106.1	0.0	102.0	-0.0	110.5	-0.0
Channel 3	120.0	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

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3. FREQUENCY RESPONSE (electrical)

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



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 Kubel 

Test date: 2018-08-13

*** SI LAN 958 No. 69082 page 6 ***

Cert B5: 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			
<ul style="list-style-type: none"> • 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. 			

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., Baldwin Industrial Bldg., 16-18 Wah Sing Street, Kwai Chung, N.T., Hong Kong Tel: (852) 2116 1380 Fax: (852) 2264 6480 Email: info@maxlab.com.hk



Certificate No. 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 :
Date :

Patrick
6-Feb-2018


Checked By :
Date :

K.O. Lo
6-Feb-2018
Page 2 of 2

Cert B6: Calibration Certificate of Acoustic Calibrator SV30A (SN: 29088)



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		
<ul style="list-style-type: none"> * 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. 		



Certificate No. MLCN180297S

<i>Calibration Data</i>				
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

Page 2 of 2

萬儀校正中心有限公司
MaxLab Calibration Centre Limited


香港新界葵涌華星街16-18號保盈工業大廈9樓B2室

Unit B2, 9/F., Baldwin 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 B7: Calibration Certificate of Acoustic Calibrator SV30A (SN: 10814)



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		
<ul style="list-style-type: none"> * 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. 		



Certificate No. MLCN181526S

<i>Calibration Data</i>				
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 :
Date :

Dan
21-Jul-18

Checked By :
Date :

K.O. Lo
21-Jul-18

Page 2 of 2

萬儀校正中心有限公司
MaxLab Calibration Centre Limited

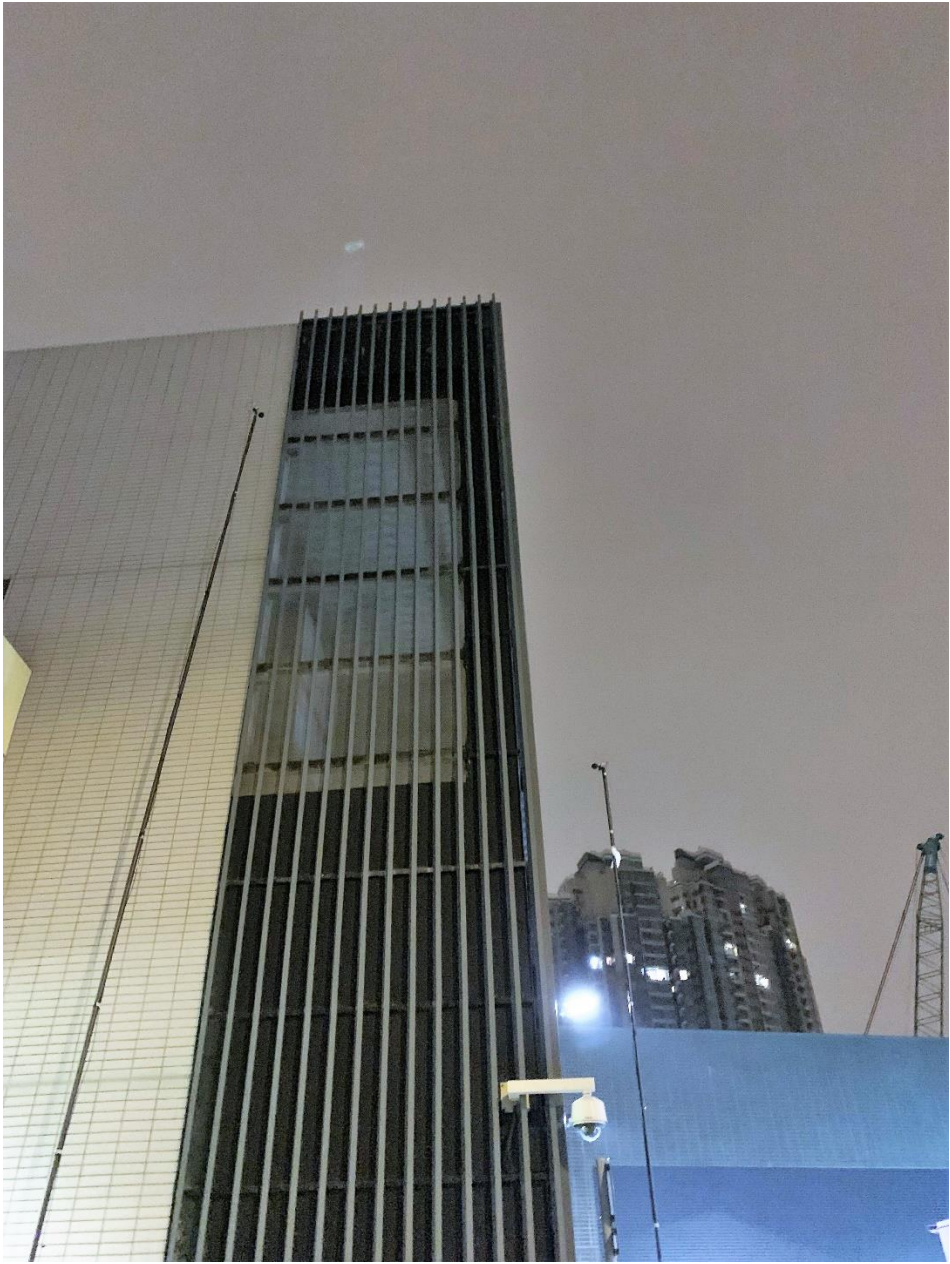
香港新界葵涌華星街 16-18 號保盈工業大廈 9 樓 B2 室

Unit B2, 9/F., Baldwin Industrial Bldg., 16-18 Wah Sing Street, Kwai Chung, N.T., Hong Kong Tel: (852) 2116 1380 Fax: (852) 2264 6480 Email: info@maxlab.com.hk

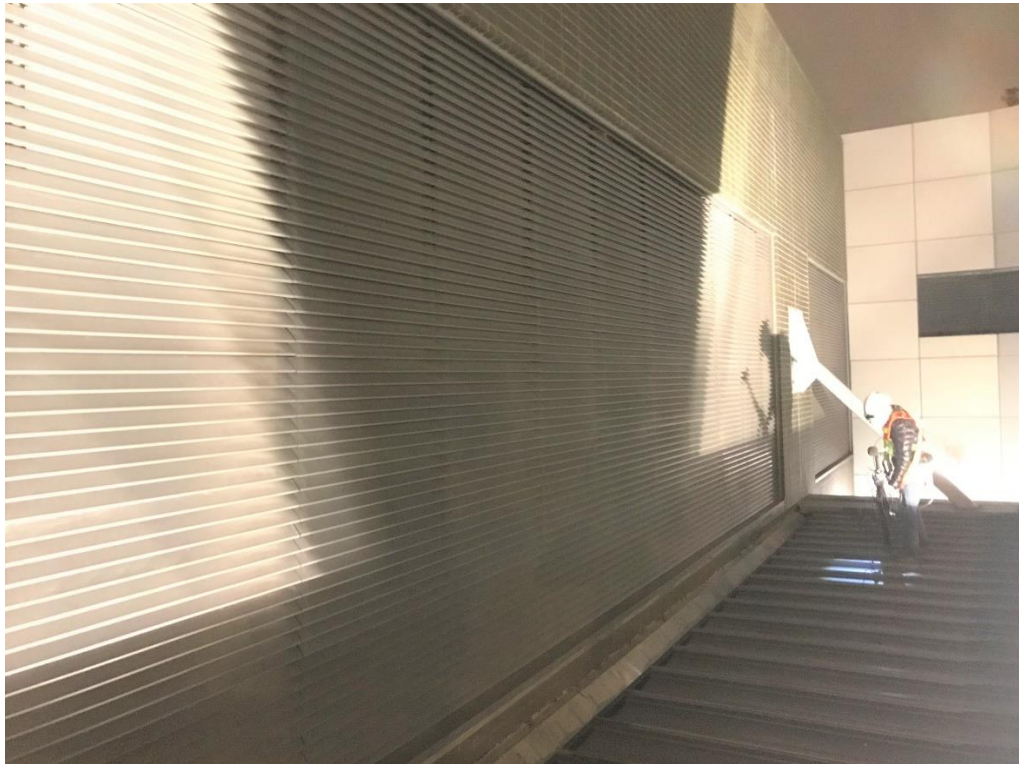
Appendix B3

**Photographs showing the Examples of Noise Measurement
for Fixed Plant Noise**

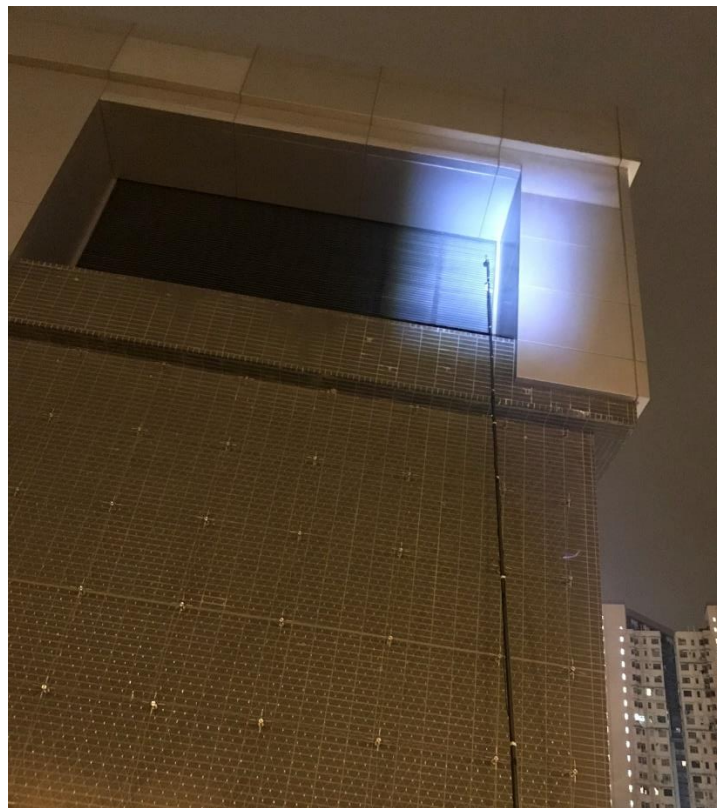
Appendix B3 Photographs showing the Examples of Noise Measurement for Fixed Plant Noise



SWL Measurement for Louver G4



SWL Measurement for Louver F2



SWL Measurement for Louver A2



SWL Measurement for Louver A5

Appendix B4

Noise Measurement Results

Appendix B4 Noise Measurement Results

Fixed Plant Source ID	Plant Type	Method	Louvre Size (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)
			Height	Width						
A1	Louvre	2	3000	2600	1.0	63.3	61.7	1.6	60.3	77
A2	Louvre	2	3500	6300	0.5	63.7	61.0	2.7	60.7	77
A3	Louvre	2	2000	7000	0.5	60.4	59.1	1.3	57.4	72
A4	Louvre	2	5050	11700	1.0	65.6	60.0	5.6	64.1	86
A5	Louvre	2	2100	5000	1.0	61.9	59.7	2.2	58.9	76
A6	Louvre	2	4000	7000	1.0	58.6	57.8	0.8	55.6	75
B1	Louvre	2	3150	5965	1.0	71.1	69.1	2.0	68.1	86
B2	Louvre	2	3130	10890	1.0	69.6	65.8	3.8	67.3	87
E5-3	Louvre	2	2600	5800	0.5	59.3	58.0	1.3	56.3	72
F2	Louvre	2	3100	8000	1.0	67.0	63.3	3.7	64.6	82
G1	Louvre	2	5200	3400	1.0	69.2	62.8	6.4	68.1	86
G2	Louvre	2	5200	4500	1.0	67.2	61.9	5.3	65.7	84
G3	Louvre	2	3650	4507	1.0	67.7	62.1	5.6	66.4	83
G4 ^(d)	Louvre	2	5200	2141	1.0	61.8	57.9	3.9	59.6	77
G4	Louvre	2	5200	2141	1.0	58.4	56.2	2.2	55.4	73
G5 ^(d)	Louvre	2	5200	5540	1.0	62.6	55.5	7.1	61.7	81
G5	Louvre	2	5200	5540	1.0	57.8	55.0	2.8	54.8	74

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 to check against the noise criterion during daytime/evening period only.

Appendix C

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

Appendix C1
Calibration Certificates –
Noise Measurement at Representative NSRs



CERTIFICATE OF CALIBRATION

Certificate No.: 18CA0321 01-02 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	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

- The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- 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 responses 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:



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.



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 18CA0321 01-02

Page 2 of 2

1, Electrical Tests

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

Test:	Subtest:	Status:	Expanded 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			
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:

Date:

Fung Chi Yip
23-Mar-2018

Checked by:

Date:

Lam Tze Wai
24-Mar-2018

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



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	284646	17965
Adaptors used:	-	-	-

CN.012.02)

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

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



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.

CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 18CA0920 02

Page 2 of 2

1, Electrical Tests

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

Test:	Subtest:	Status:	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	
	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Linearity range for SPL	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	
	1 ms burst duty factor 1/10 ³ at 4kHz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 ⁴ at 4kHz	Pass	0.3	
	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
22-Sep-2018

Checked by:

Shek Kwong Tat
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.



CERTIFICATE OF CALIBRATION

Certificate No.: 18CA0321 01-01

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: 21-Mar-2018

Date of test: 24-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: 1005 ± 5 hPa

Test specifications

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



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.



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 18CA0321 01-01 Page 2 of 2

1, Electrical Tests

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

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
		Pass	0.3
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3
		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

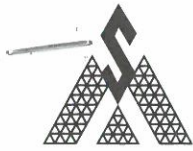
Date: 24-Mar-2018

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.



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

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

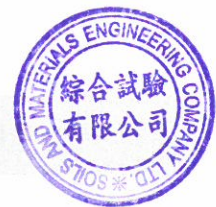
Actual Measurement data are documented on worksheets.

Approved Signatory:


Feng Junqi

Date: 20-Oct-2018

Company Chop:



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.



CERTIFICATE OF CALIBRATION

(Continuation Page)

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

1, Electrical Tests

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

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			
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:

Date: 19-Oct-2018

Checked by:

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.



CERTIFICATE OF CALIBRATION

Certificate No.: 18CA0406 02-02

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

Customer: AECOM ASIA CO LIMITED
Address of Customer: -
Request No.: -
Date of receipt: 06-Apr-2018

Date of test: 09-Apr-2018

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2341427	11-Apr-2018	SCL
Preamplifier	B&K 2673	2743150	05-May-2018	CEPREI
Measuring amplifier	B&K 2610	2346941	03-May-2018	CEPREI
Signal generator	DS 360	33873	25-Apr-2018	CEPREI
Digital multi-meter	34401A	US36087050	25-Apr-2018	CEPREI
Audio analyzer	8903B	GB41300350	21-Apr-2018	CEPREI
Universal counter	53132A	MY40003662	22-Apr-2018	CEPREI

Ambient conditions

Temperature: 21 ± 1 °C
Relative humidity: 50 ± 10 %
Air pressure: 1005 ± 5 hPa

Test specifications

- 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.
- The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
- The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

Test results

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

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

Approved Signatory:

Feng Jun Qi

Date: 11-Apr-2018

Company Chop:



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



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 18CA0406 02-02

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.

Frequency Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	(Output level in dB re 20 μ Pa)	
			Estimated	Expanded Uncertainty dB
1000	94.00	94.20		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 = 0.015 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 a 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 = 999.96 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 = 0.4 %**

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:

Date: 09-Apr-2018

Fung Chi Yip

Checked by:

Date: 11-Apr-2018

Lam Tze Wai

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.



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

Customer: 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

- 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.
- The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
- The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

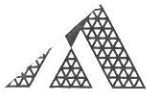
Test results

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

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

Approved Signatory:  Date: 10-Oct-2018 Company Chop: 

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



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.

Frequency Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	(Output level in dB re 20 μ Pa)
			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:

Date:

Fung Chi Yip
10-Oct-2018

Checked by:

Date:

Shek Kwong Tat
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

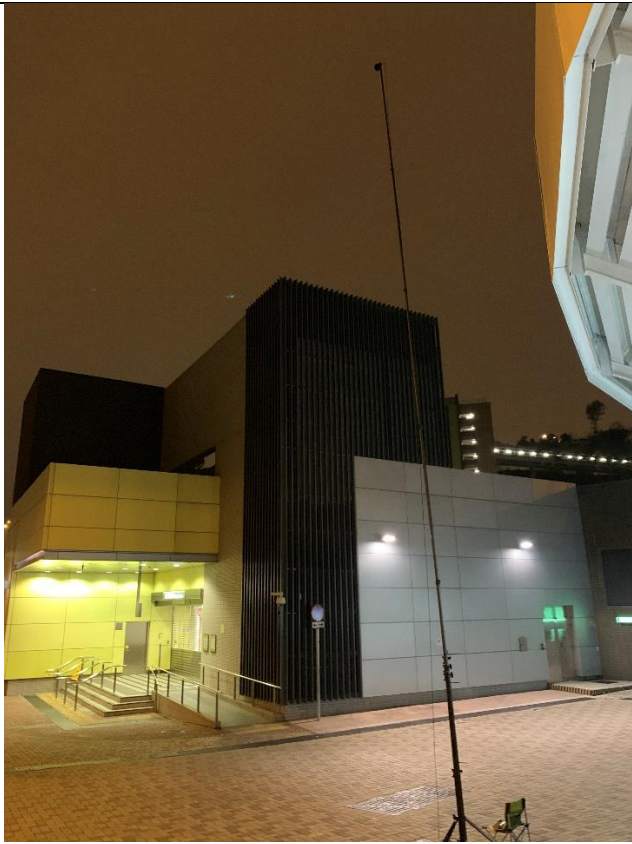
Appendix C2 Photographs – Noise Measurement at Representative NSRs



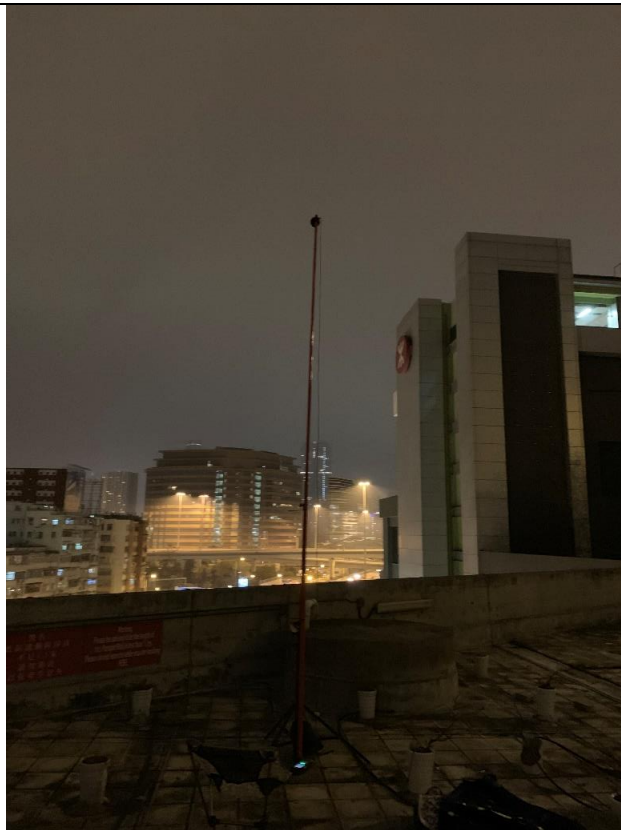
NSR Measurement Location at NSR 18



NSR Measurement Location at NSR 21



NSR Measurement Location at NSR 40b



NSR Measurement Location at NSR 40c

Appendix C3

Measurement Results at Representative NSRs

Appendix C3 Noise Measurement Results at Representative NSRs

NSR ID	Measurement Date	Operation Scenario ⁽¹⁾⁽²⁾	Fixed Plant Noise		Background Noise		Difference, dB(A)
			Measurement Time	Measured Noise Level, L_{Aeq} 30mins, dB(A)	Measurement Time	Background Level, L_{Aeq} 5mins, dB(A)	
NSR 18	26/2/2019	Daytime and Evening	03:00:00 - 03:29:59	58.9	03:50:00 - 03:54:59	58.1	0.8
		Night-time	02:13:00 - 02:42:59	59.2	03:55:00 - 03:59:59	57.6	1.6
NSR 21	26/2/2019	Daytime and Evening	03:00:00 - 03:29:59	71.5	03:50:00 - 03:54:59	70.5	1.0
		Night-time	02:13:00 - 02:42:59	71.9	03:55:00 - 03:59:59	70.6	1.3
NSR 40b	26/2/2019	Daytime and Evening	03:00:00 - 03:29:59	56.8	03:50:00 - 03:54:59	55.4	1.4
		Night-time	02:13:00 - 02:42:59	57.9	03:53:00 - 03:57:59	55.8	2.1
NSR 40c	26/2/2019	Daytime and Evening	03:00:00 - 03:29:59	67.9	03:50:00 - 03:54:59	66.3	1.6
		Night-time	02:13:00 - 02:42:59	67.6	03:55:00 - 03:59:59	66.7	0.9

Note:

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

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