

TISCH ENVIRONMENTAL, INC. 145 SOUTH MIAMI AVE VILLAGE OF CLEVES, OH 45002 513.467.9000 877.263.7610 TOLL FREE 513.467.9009 FAX

## ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

		/ Rootsmeter Orifice I.I		438320 0005	Ta (K) - Pa (mm) -	293 - 759.46
PLATE OR Run #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER DIFF Hg (mm)	ORFICE DIFF H2O (in.)
1 2 3 4 5	NA NA NA NA NA	NA NA NA NA NA	1.00 1.00 1.00 1.00 1.00	1.3960 0.9970 0.8910 0.8500 0.6990	3.2 6.4 7.8 8.7 12.7	2.00 4.00 5.00 5.50 8.00

## DATA TABULATION

Vstd	(x axis) Qstd	(y axis)		Va	(x axis) Qa	(y axis)
1.0120 1.0078 1.0058 1.0047 0.9993	0.7249 1.0108 1.1288 1.1820 1.4296	1.4257 2.0163 2.2543 2.3643 2.8514		0.9958 0.9916 0.9896 0.9885 0.9832	0.7133 0.9946 1.1107 1.1630 1.4066	0.8784 1.2423 1.3889 1.4567
Qstd slop intercept coefficie	t (b) = ent (r) =	2.02533 -0.03593 0.99983	n e n	Qa slope intercept coefficie	t (b) = ent (r) =	1.26823 -0.02214 0.99983
y axis =	SQRT[H20(I	Pa/760)(298/5	Γa)]	y axis =	SQRT[H20(	[a/Pa)]

## CALCULATIONS

Vstd = Diff. Vol[(Pa-Diff. Hg)/760](298/Ta)

Qstd = Vstd/Time

Va = Diff Vol [(Pa-Diff Hg)/Pa]

Qa = Va/Time

For subsequent flow rate calculations:

Qstd =  $1/m\{[SQRT(H2O(Pa/760)(298/Ta))] - b\}$ 

 $Qa = 1/m\{[SQRT H2O(Ta/Pa)] - b\}$ 



Location	:	CMA1b	Calibration Date	:	17-Jan-18
Equipment no.	:	HVS001	Calibration Due Date	:	17-Mar-18

## CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition										
Temperature, T <sub>a</sub> 293 Kelvin Pressure, P <sub>a</sub> 1014 mmHg										
Orifice Transfer Standard Information										
Equipment No.	Ori001	Slope, m <sub>c</sub>	2.02533	Intercept, bc	-0.03593					
Last Calibration Date	20-Mar-17		( H x P <sub>a</sub> /	1013.3 x 298 / T <sub>a</sub> )	1/2					
Next Calibration Date 20-Mar-18 $m_c \times Q_{std} + b_c$										
Calibration of TSP										

Calibration of TSP									
Calibration	Ma	nometer Re	eading	Q <sub>std</sub>	Continuous Flow	IC			
Point	Н (	(inches of v	water)	(m <sup>3</sup> / min.)	Recorder, W	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)			
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis			
1	1.6	1.6	3.2	0.9088	28	28.2476			
2	2.5	2.5	5.0	1.1316	36	36.3184			
3	3.9	3.9	7.8	1.4089	45	45.3980			
4	5.1	5.1	10.2	1.6086	52	52.4599			
5	6.4	6.4	12.8	1.7998	58	58.5130			
By Linear Regression of Y	n X								
	Slope, m	=	33.9	9466 In	tercept, b = -2.	3715			
Correlation Coefficient* = 0.				998	-				
Calibration	Accepted	=	Yes	/Ne**					

<sup>\*</sup> if Correlation Coefficient < 0.990, check and recalibration again.

**	Delete	as	appropriate.	
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Remarks :	As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been
tomano.	re-assigned from EL452 to HVS001 with respect to the update in quality management system.

Calibrated by	: _	Jackey MA	Checked by	Pauline Wong
Date	:	17-Jan-18	Date :	17-Jan-18

3.0980

Intercept, b =



# **Calibration Data for High Volume Sampler (TSP Sampler)**

Location :		CMA2a		Calibration Date : 17-Jan					17-Jan-18
Equipment no.		HVS002				Calibration	on Due Date	:	17-Mar-18
CALIBRATION OF CONTIN	NIIOUS FI	OW RECO	RDER						
<u></u>			<u></u>	Ambient C	ondition				
							<u> </u>		
Temperature, T <sub>a</sub>		293		Kelvin	Pressure, Pa	1	10	014	mmHg
			Orifice 1	Transfer Sta	ndard Inform	ation			
Equipment No.		Ori001		Slope, m <sub>c</sub>	2.02533 Intercept, bc			-0.03593	
Last Calibration Date		20-Mar-1	7	(HxP <sub>a</sub> /1013.3 x 298/T <sub>a</sub> ) <sup>1/2</sup>					
Next Calibration Date		20-Mar-1	8			m <sub>c</sub> >	$(Q_{std} + b_c)$		
				Calibration	n of TSP				
Calibration	Ма	nometer Re	eading	Q	std	Contin	uous Flow		IC
Point	н	(inches of v	vater)	(m <sup>3</sup> /	min.)	Rec	order, W	(W(P <sub>a</sub> /	1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)
	(up)	(down)	(difference)	X-a	axis	(	CFM)		Y-axis
1	1.8	1.8	3.6	0.9	628		33		33.2919
2	2.8	2.8	5.6	1.1	1.1965		41		41.3626
3	4.1	4.1	8.2	1.4	1.4441 50			50.4422	
4	5.4	5.4	10.8	1.6	547		56		56.4953
5	6.6	6.6	13.2	1.8	275		60		60.5307
By Linear Regression of Y	on X								

* if	Correlation	Coefficient	< 0.990.	check and	recalibration	again.

Slope, m

Correlation Coefficient\*

Calibration Accepted

** Delete as a	appropriate.				
Remarks :	As per client	's provided information, the equip	ment reference no. of the calibrated High Volume Sampler	has bee	en
	re-assigned	from EL449 to HVS002 with respe	ect to the update in quality management system.		
Calibrated b	y :	Jackey MA	Checked by	:	Pualine Wong
Date	:	17-Jan-18	Date	: _	17-Jan-18
		·			

31.9847

0.9970

Yes/No\*\*



Location	: _	CMA3a	Calibration Date	:	16-Jan-18
Equipment no.	: _	HVS012	Calibration Due Date	:	16-Mar-18

## **CALIBRATION OF CONTINUOUS FLOW RECORDER**

Ambient Condition								
Temperature, T <sub>a</sub>	291	Kelvin Pressure, P <sub>a</sub>	1015	mmHg				

Orifice Transfer Standard Information									
Equipment No.	Ori001	Slope, m <sub>c</sub>	2.02533	Intercept, bc	-0.03593				
Last Calibration Date	20-Mar-17		(HxP <sub>a</sub> /1013.3 x 298/T <sub>a</sub> ) <sup>1/2</sup>						
Next Calibration Date	20-Mar-18	$m_c \times Q_{std} + b_c$							

Calibration of TSP										
Calibration	Ma	nometer Re	eading	Q <sub>std</sub>	Continuous Flow	IC				
Point	Н (	inches of v	water)	(m <sup>3</sup> / min.)	Recorder, W	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)				
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis				
1	1.4	1.4	2.8	0.8545	35	35.4482				
2	2.2	2.2	4.4	1.0667	40	40.5122				
3	3.4	3.4	6.8	1.3218	48	48.6146				
4	4.4	4.4	8.8	1.5012	53	53.6786				
5	5.6	5.6	11.2	1.6913	58	58.7427				
By Linear Regression of Y	on X				•					
	Slope, m	=	28.3	766 Ir	ntercept, b = 1	0.8760				
Correlation C	oefficient*	=	0.99	991						
Calibration Accepted = Yes/F		No**								

<sup>\*</sup> if Correlation Coefficient < 0.990, check and recalibration again.

As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been Remarks :

re-assigned from EL333 to HVS012 with respect to the update in quality management system.

 Calibrated by
 : Jackey MA
 Checked by
 : Pauline Wong

 Date
 : 16-Jan-18
 Date
 : 16-Jan-18

<sup>\*\*</sup> Delete as appropriate.

24.3073

33.4225

42.5378

50.6402 55.7042



# **Calibration Data for High Volume Sampler (TSP Sampler)**

Location	:	CMA4a	Calibration Date	:	16-Jan-18
Equipment no.	:	HVS004	Calibration Due Date	:	16-Mar-18

#### **CALIBRATION OF CONTINUOUS FLOW RECORDER**

Ambient Condition												
Ambient Condition       Temperature, T <sub>a</sub> 291     Kelvin     Pressure, P <sub>a</sub> 1015     mmHg												
Orifice Transfer Standard Information												
Equipment No.	Ori001	Slope, m <sub>c</sub> 2.02533 Intercept, bc -0.03593										
Last Calibration Date	20-Mar-17	(HxP <sub>a</sub> /1013.3 x 298/T <sub>a</sub> ) <sup>1/2</sup>										
Next Calibration Date	20-Mar-18			$m_c x Q_{std} + b_c$								
		Calibration	n of TSP									
Calibration	Manometer Reading	Q <sub>s</sub>	std	Continuous Flow	IC							
Point	H (inches of water)	(m <sup>3</sup> / r	min.)	Recorder, W	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)							
	(up) (down) (difference)	X-ax	xis	(CFM)	Y-axis							

0.8839

1.1133

1.3781

4	4.8	4.8	9.6	1.5671	50
5	5.7	5.7	11.4	1.7062	55
By Linear Regression of Y	on X				

3.0

4.8

7.4

Intercept, b = -9.3021

24

33

42

Correlation Coefficient\* = 0.9995

Calibration Accepted = Yes/Ne\*\*

1.5

2.4

3.7

1.5

3.7

Slope, m

2

3

Remarks : As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been

38.0715

re-assigned from EL390 to HVS004 with respect to the update in quality management system.

Calibrated by : Jackey MA Checked by : Pauline Wong

Date Date Checked by : Pauline Wong

16-Jan-18

 $<sup>\</sup>ensuremath{^*}$  if Correlation Coefficient < 0.990, check and recalibration again.

<sup>\*\*</sup> Delete as appropriate.



Location	: <u></u>	CMA5b	Calibration Date	:	16-Jan-18
Equipment no.	:	HVS010	Calibration Due Date	:	16-Mar-18

## CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition							
Temperature, T <sub>a</sub>	291	Kelvin F	Pressure, P <sub>a</sub>	1015	mmHg		

Orifice Transfer Standard Information										
Equipment No.	Ori001	Slope, m <sub>c</sub>	2.02533	Intercept, bc	-0.03593					
Last Calibration Date	20-Mar-17	(HxP <sub>a</sub> /1013.3 x 298/T <sub>a</sub> ) <sup>1/2</sup>								
Next Calibration Date	20-Mar-18		= <b>m</b>	$n_c \times Q_{std} + b_c$						

Calibration of TSP										
Calibration	Ма	nometer Re	eading	Q <sub>std</sub>	Continuous Flow	IC				
Point	н	inches of v	water)	(m <sup>3</sup> / min.)	Recorder, W	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)				
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis				
1	1.4	1.4	2.8	0.8545	40	40.5122				
2	2.1	2.1	4.2	1.0426	46	46.5890				
3	3.1	3.1	6.2	1.2629	53	53.6786				
4	3.9	3.9	7.8	1.4144	58	58.7427				
5	4.7	4.7	9.4	1.5509	63	63.8067				
By Linear Regression of Y	y Linear Regression of Y on X									
	Slope, m	=	33.2	2153 In	tercept, b =	11.9753				

Correlation Coefficient\* = 0.9997

Calibration Accepted = Yes/Ne\*\*

**	Delete	as	appro	priate.

Remarks: As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been

re-assigned from EL222 to HVS010 with respect to the update in quality management system.

 Calibrated by
 :
 Jackey MA
 Checked by
 :
 Pauline Wong

 Date
 :
 16-Jan-18
 Date
 :
 16-Jan-18

 $<sup>\</sup>ensuremath{^*}$  if Correlation Coefficient < 0.990, check and recalibration again.



Location	:	MA1e	Calibration Date :	:	16-Jan-18
Equipment no.	: -	HVS007	Calibration Due Date :	: -	16-Mar-18

## CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition						
Temperature, T <sub>a</sub>	291	Kelvin	Pressure, P <sub>a</sub>	1015	mmHg	

Orifice Transfer Standard Information							
Equipment No.	Ori001	Slope, m <sub>c</sub>	2.02533	Intercept, bc	-0.03593		
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$					
Next Calibration Date	20-Mar-18	$m_c \times Q_{std} + b_c$					

Calibration of TSP									
Calibration	Manometer Reading		Q <sub>std</sub>	Continuous Flow	IC				
Point	H (inches of water)		water)	(m <sup>3</sup> / min.)	Recorder, W	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)			
	(up) (down) (difference		(difference)	X-axis	(CFM)	Y-axis			
1	1.6	1.6	3.2	0.9123	30	30.3841			
2	2.6	2.6	5.2	1.1581	38	38.4866			
3	4.2	4.2	8.4	1.4671	48	48.6146			
4	5.4	5.4	10.8	1.6611	54	54.6914			
5	6.7 6.7 13.4		13.4	1.8483 59		59.7555			
By Linear Regression of Y	on X								
Slope, m = 31.6			31.64	183 In	tercept, b =	1.7822			
Correlation Coefficient* = 0.99		95							
Calibration Accepted = Yes/N		<del>\0</del> **							

<ul> <li>if Correlation Coefficient &lt; 0.990, check and recalibration a</li> </ul>	gain.
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Remarks: As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL455 to HVS007 with respect to the update in quality management system.

 Calibrated by Date
 : Jackey MA
 Checked by Date
 : Pauline Wong

 Date
 16-Jan-18
 16-Jan-18
 16-Jan-18



Location	:	MA1w	Calibration Date	:	16-Jan-18
Equipment no.	:	HVS008	Calibration Due Date	: -	16-Mar-18

#### **CALIBRATION OF CONTINUOUS FLOW RECORDER**

Ambient Condition						
Temperature, T <sub>a</sub>	291	Kelvin	Pressure, P <sub>a</sub>	1015	mmHg	

Orifice Transfer Standard Information						
Equipment No.	Ori001	Slope, m <sub>c</sub>	2.02533	Intercept, bc	-0.03593	
Last Calibration Date	20-Mar-17	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$				
Next Calibration Date	20-Mar-18		= m <sub>c</sub>	$x Q_{std} + b_c$		

	Calibration of TSP									
Calibration	Ma	nometer Re	eading	Q <sub>std</sub>	Continuous Flow	IC				
Point	H (inches of water)		water)	(m <sup>3</sup> / min.)	Recorder, W	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)				
	(up) (down) (diffe		(difference)	X-axis	(CFM)	Y-axis				
1	1.5	1.5	3.0	0.8839	20	20.2561				
2	2.5	2.5	5.0	1.1359	30	30.3841				
3	3.9	3.9	7.8	1.4144	39	39.4994				
4	5.1	5.1	10.2	1.6148	45	45.5762				
5	6.3	6.3	12.6	1.7928	52	52.6658				
By Linear Regression of Y	on X									
	Slope, m =			424 In	tercept, b = -	10.0007				
Correlation Coefficient* =		0.99	88							
Calibration	Calibration Accepted =		Yes/P	<del>10</del> **						

* if Correlation Coefficient < 0.990, check a	ınd recalibration again.
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As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been re-assigned from EL080 to HVS008 with respect to the update in quality management system. Remarks:

Pauline Wong Calibrated by Jackey MA Checked by 16-Jan-18 Date 16-Jan-18 Date



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



# CERTIFICATE OF CALIBRATION

Certificate No.:

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Item tested

Description:

Manufacturer: Type/Model No.:

Adaptors used:

B&K

2250-L 2701778 Microphone

B&K 4950 2755097 Preamp **B&K** ZC0032 19223

Item submitted by

Serial/Equipment No.:

Customer Name:

Lam Geotechnics Limited

Sound Level Meter (Type 1)

Address of Customer: Request No.:

Date of receipt:

22-Feb-2017

Date of test:

02-Mar-2017

Reference equipment used in the calibration

Multi function sound calibrator Signal generator

Signal generator

Model:

B&K 4226 DS 360 DS 360

Serial No. 2288444

33873 61227 Expiry Date:

18-Jun-2017 18-Apr-2017 18-Apr-2017 Traceable to:

CIGISMEC CEPREI CEPREI

Ambient conditions

Temperature:

Relative humidity:

20 ± 1 °C 60 ± 10 % 1010 ± 5 hPa

Air pressure:

## 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 3. between the free-field and pressure responsess of the Sound Level Meter.

#### Test results

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

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

Actual Measurement data are documented on worksheets.

Approved Signatory:

Huang Jia Min/⊭eng Jun Qi Date: 06-Mar-2017

Company Chop:

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

O Soils & Materials Engineering Co., Ltd.

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



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# CERTIFICATE OF CALIBRATION

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1, Electrical Tests

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

Test:	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor
Self-generated noise	A	Pass	0.3	
	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	Α	Pass	0.3	
	С	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

#### 2, Acoustic tests

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

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

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.

Calibrated by:

104

End

Checked by:

Lam Tze Wai

Date:

Fung Chi Yip 02-Mar-2017

Date:

06-Mar-2017

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

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



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



## CERTIFICATE OF CALIBRATION

Certificate No.:

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Item tested

Description:

Sound Level Meter (Type 1)

Microphone B&K

Preamp B & K

Manufacturer: Type/Model No.: Serial/Equipment No.: **B&K** 2250 2701778

4950 2755097 ZC0032 19223

Adaptors used:

Item submitted by

Customer Name:

Lam Geotechnics Limited

Address of Customer:

Request No. Date of receipt:

13-Feb-2018

Date of test:

21-Feb-2018

#### Reference equipment used in the calibration

Description:

Model:

Serial No.

Expiry Date:

Traceable to:

Multi function sound calibrator Signal generator

B&K 4226

2288444

08-Sep-2018 25-Apr-2018

CIGISMEC

Signal generator

DS 360 DS 360

33873 61227

01-Apr-2018

CEPREI CEPREI

## Ambient conditions

Temperature:

20 ± 1 °C

Relative humidity: Air pressure:

50 ± 10 % 1000 ± 5 hPa

## Test specifications

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

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

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

### Test results

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

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

Jun O

Actual Measurement data are documented on worksheets

Fen

Approved Signatory:

Date:

21-Feb-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.

Soils & Materials Engineering Co. Ltd.

Form No CARP152-Missue 1/Rev C/D1/D2/2007



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



## CERTIFICATE OF CALIBRATION

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#### 1, Electrical Tests

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

Test:	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor
Self-generated noise	A	Pass	0.3	
	c	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/104 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	
	Leg	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.

Subtest	Status	Expanded Uncertanity (dB)	Coverage Factor
Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 125 Hz		Subtest Status Uncertanity (dB) Weighting A at 125 Hz Pass 0.3

### 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.

Calibrated by:

Date:

Fung Chi Yip

21-Feb-2018

End

Checked by:

Date:

Lam Tze Wai 21-Feb-2018

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

Soils & Material's Engineering Co., Ltd.

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



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## CERTIFICATE OF CALIBRATION

Certificate No.:

17CA0320 02

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Item tested

Description: Manufacturer:

Adaptors used

Sound Level Meter (Type 1) B & K Microphone B & K Preamp B & K

Type/Model No.: Serial/Equipment No.: 2250-L 2722310

4950 2698702 ZC0032 13318

Item submitted by

Customer Name:

Lam Geotechnics Ltd.

Address of Customer:

Request No.: Date of receipt:

20-Mar-2017

- 0

Date of test:

23-Mar-2017

## Reference equipment used in the calibration

Description:

Multi function sound calibrator

Signal generator Signal generator Model:

B&K 4226 228 DS 360 338

2288444 33873 61227

Serial No.

Expiry Date:

18-Jun-2017 18-Apr-2017 18-Apr-2017 Traceable to:

CIGISMEC CEPREI CEPREI

## Ambient conditions

Temperature:

21 ± 1 °C 60 ± 10 %

DS 360

Relative humidity: Air pressure:

1010 ± 5 hPa

## Test specifications

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

#### Test results

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

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

in/Feng Jun Qi

Actual Measurement data are documented on worksheets.

Huang Jier

Approved Signatory:

Date:

24-Mar-2017

Company Chop:

SENGINE COURS SENGING COME TO THE SENGING COME A TO THE SENGING C

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

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## CERTIFICATE OF CALIBRATION

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Certificate No.:

17CA0320 02

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1. **Electrical Tests** 

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

Test:	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor
Self-generated noise	A	Pass	0.3	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A C	Pass	0.3	
5555 SESSESSE SERVED SESSES SESSES	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 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/104 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	SPĹ	Pass	0.3	
	Leq	Pass	0.4	

#### 2, Acoustic tests

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

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

3. Response to associated sound calibrator

N/A

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

Calibrated by:

Lai Sheng Jie

Checked by:

ing Chi Yip

Date:

23-Mar-2017

Date:

24-Mar-2017

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

End

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# CERTIFICATE OF CALIBRATION

Certificate No.:

17CA0505 01

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Item tested

Description: Manufacturer: Type/Model No.: Sound Level Meter (Type 1) B&K

Microphone B & K 4950

Preamp B&K ZC0032

Serial/Equipment No.: Adaptors used:

2250-L 2722311

2698703

13321

Item submitted by

Customer Name:

Lam Geotechnics Ltd.

Address of Customer:

Request No.:

Date of receipt:

05-May-2017

Date of test:

06-May-2017

Reference equipment used in the calibration

Description:

Serial No.

Expiry Date:

Traceable to:

Multi function sound calibrator Signal generator

Model: B&K 4226 DS 360

2288444 61227

18-Jun-2017 01-Apr-2018 CIGISMEC CEPREI

Ambient conditions

Temperature:

22 ± 1 °C 50 ± 10 %

Relative humidity: Air pressure:

1010 ± 5 hPa

## Test specifications

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

The electrical tests were performed using an electrical signal substituted for the microphone which was removed and 2. 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 3. between the free-field and pressure responsess of the Sound Level Meter.

## Test results

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

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

n / Fleng Jungi

Actual Measurement data are documented on worksheets

Approved Signatory:

Date:

09-May-2017

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.

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# CERTIFICATE OF CALIBRATION

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Certificate No.:

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#### **Electrical Tests**

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

Test:	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor
			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
Self-generated noise	A	Pass	0.3	
	С	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	Α	Pass	0.3	
	С	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/104 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	
900015484766170000000000000000000000000000000000	Leq	Pass	0.4	

#### 2. Acoustic tests

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

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

3, Response to associated sound calibrator

N/A

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

Calibrated by:

Checked by:

Date:

Lai Sheng Jie 06-May-2017

Date:

ung Chi Yip 09-May-2017

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

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## CERTIFICATE OF CALIBRATION

Certificate No.:

18CA0116 01

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Item tested

Description: Manufacturer: Sound Level Meter (Type 1) B & K

Microphone B&K

Preamp BAK ZC0032

Type/Model No.: Serial/Equipment No.: 2250L 3002695

4950 2940839

18582

Adaptors used:

Item submitted by

Lam Geotechnics Ltd.

Customer Name: Address of Customer: Request No.

Date of receipt:

16-Jan-2018

Date of test:

18-Jan-2018

Reference equipment used in the calibration

Description:

Multi function sound calibrator

Model: B&K 4226 Serial No.

Expiry Date: 08-Sep-2018

Traceable to:

Signal generator Signal generator

DS 360 DS 360

2288444 33873 61227

25-Apr-2018 01-Apr-2018 CIGISMEC CEPRE CEPRE

Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity: Air pressure:

50 ± 10 %

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.

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

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

## Test results

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

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

Feng Jun Qi

Actual Measurement data are documented on worksheets

Approved Signatory:

Date:

18-Jan-2018

Company Chop:

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

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## CERTIFICATE OF CALIBRATION

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18CA0116 01

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#### 1, Electrical Tests

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

Test:	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor
Self-generated noise	A	Pass	0,3	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range . Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/104 at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

#### 2, Acoustic tests

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

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

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.

Calibrated by:

Date:

Fung Chi Yip 18-Jan-2018 Checked by

onou by.

Date:

Lam Tze Wai 18-Jan-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.

End

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## CERTIFICATE OF CALIBRATION

Certificate No.:

17CA0904 02

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Item tested

Description:

Sound Level Meter (Type 1)

Microphone

Preamp

of

Manufacturer: Type/Model No.: B & K 2250-L B & K 4950 2827240 B & K ZC0032 21213

Serial/Equipment No.: Adaptors used: 3006790

40

Item submitted by

Customer Name:

Lam Geotechnics Limited

Address of Customer:

Request No.:

04 Can 2017

Date of receipt:

04-Sep-2017

Date of test:

09-Sep-2017

## Reference equipment used in the calibration

Description:

Model:

DS 360

Serial No.

Expiry Date:

Traceable to:

Multi function sound calibrator Signal generator B&K 4226 DS 360 2288444 33873

61227

08-Sep-2018 25-Apr-2018 01-Apr-2018 CIGISMEC

CEPREI

Signal generator

Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity: Air pressure: 50 ± 10 % 1015 ± 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 responsess of the Sound Level Meter.

# Test results

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

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

Min/Feng Jun Qi

Actual Measurement data are documented on worksheets.

Approved Signatory:

Date:

09-Sep-2017

Company Chop:

SNOS \*\*OLY

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

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## CERTIFICATE OF CALIBRATION

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Certificate No.:

17CA0904 02

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**Electrical Tests** 

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

			Expanded	Coverage
Test:	Subtest:	Status:	Uncertanity (dB)	Factor
Self-generated noise	A	Pass	0.3	
I - Control ( Production of the Control	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	A 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 1/103 at 4kHz	Pass	0.3	
150.55	1 ms burst duty factor 1/104 at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

#### 2. Acoustic tests

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

Test:	Subtest	Status	Expanded Uncertanity (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
- All and the state of the stat	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

Calibrated by:

Lai Sheng Jie

Checked by:

Fung Chi Yip

Date:

09-Sep-2017

Date:

09-Sep-2017

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

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



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



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# CERTIFICATE OF CALIBRATION

Certificate No.:

17CA0426 01-02

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Item tested

Description:

Sound Level Meter (Type 1)

Larson Davis

Microphone PCB

Manufacturer: Type/Model No .:

LxT1

377B02 171529

Serial/Equipment No.: Adaptors used:

0003737

Item submitted by

Customer Name: Address of Customer: Lam Environmental Service Ltd.

Request No .: Date of receipt:

26-Apr-2017

Date of test:

28-Apr-2017

Reference equipment used in the calibration

Description:

Multi function sound calibrator

Model: B&K 4226

Serial No. 2288444

Expiry Date: 18-Jun-2017

Traceable to: CIGISMEC

Signal generator

DS 360

61227

01-Apr-2018

CEPREI

Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity: Air pressure:

50 ± 10 % 1010 ± 5 hPa

Test specifications

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

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

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

## Test results

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

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

Min/Feng Jun Qi

Actual Measurement data are documented on worksheets.

Approved Signatory:

Date:

04-May-2017

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.

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



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# CERTIFICATE OF CALIBRATION

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17CA0426 01-02

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#### 1, Electrical Tests

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

Test:	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor	
Self-generated noise	Α	Pass	0.3		
	C	Pass	0.8	2.1	
	Lin	Pass	1.6	2.2	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3		
	Reference SPL on all other ranges	Pass	0.3		
	2 dB below upper limit of each range	Pass	0.3		
	2 dB above lower limit of each range	Pass	0.3		
Linearity range for SPL	At reference range , Step 5 dB at 4 kHz	Pass	0.3		
Frequency weightings	Α	Pass	0.3		
	C	Pass	0.3		
	Lin	Pass	0.3		
Time weightings	Single Burst Fast	Pass	0.3		
service allow more many	Single Burst Slow	Pass	0.3		
Peak response	Single 100µs rectangular pulse	N/A	N/A		
R.M.S. accuracy	Crest factor of 3	Pass	0.3		
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3		
A MARION OF STREET A CONTRACTOR	Repeated at frequency of 100 Hz	Pass	0.3		
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3		
2 2	1 ms burst duty factor 1/104 at 4kHz	Pass	0.3		
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4		
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4		
Overload indication	SPL	Pass	0.3		
	Leq	Pass	0.4		

## 2, Acoustic tests

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

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

Response to associated sound calibrator

N/A

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

Calibrated by:

Lai Sheng Jie

Checked by:

Fung Chi Yip

Date:

28-Apr-2017

Date:

04-May-2017

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

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# CERTIFICATE OF CALIBRATION

Certificate No.:

17CA1124 02

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Item tested

Description:

Acoustical Calibrator (Class 1)

Manufacturer: Type/Model No.: Larson Davis CAL200

Serial/Equipment No.: Adaptors used: 13128

Item submitted by

Curstomer:

Lam Environmental Service Ltd.

Address of Customer:

Request No.:

200

Date of receipt:

24-Nov-2017

Date of test:

30-Nov-2017

## 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	2239857	05-May-2018	CEPREI
Measuring amplifier	B&K 2610	2346941	03-May-2018	CEPREI
Signal generator	DS 360	61227	01-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:

22 ± 1 °C

Relative humidity: Air pressure: 50 ± 10 % 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.
- 2. The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
- The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

## Test results

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

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

Feng

Approved Signatory:

Date: 30-Nov-2017

Company Chop:

SENGINESS STOS H OLL

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

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## CERTIFICATE OF CALIBRATION

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1, Measured Sound Pressure Level

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

Frequency	Output Sound Pressure	Measured Output	(Output level in dB re 20 µPa) Estimated Expanded Uncertainty dB
Shown	Level Setting	Sound Pressure Level	
Hz	dB	dB	
1000	94.0	94.01	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 = 0.010 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 = 999.5 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 = 0.5 %

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.

Calibrated by:

End

salibrated by.

Checked by:

Lam Tze War

Date:

Fung Chi Yip 30-Nov-2017

Date:

30-Nov-2017

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

C Soils & Materials Engineering Co., Ltd.

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



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# CERTIFICATE OF CALIBRATION

Certificate No.:

17CA1110 02

to:

Item tested

Description: Manufacturer: Acoustical Calibrator (Class 1)

Type/Model No.: Serial/Equipment No.: Rion Co., Ltd. NC-73

Adaptors used:

10707358

Item submitted by

Curstomer.

Lam Geotechnics Ltd.

Address of Customer Request No.

Date of receipt:

10-Nov-2017

Date of test:

14-Nov-2017

# Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable (
Lab standard microphone	B&K 4180	2341427	11-Apr-2018	SCL
Preamplifier	B&K 2673	2239857	05-May-2018	CEPREI
Measuring amplifier	B&K 2610	2346941	03-May-2018	CEPREI
Signal generator	DS 360	61227	01-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:

1010 ± 5 hPa

## Test specifications

- The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B 1. 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. 2.
- 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.

-Min/Feng Jun Qi

Huang Jia

Approved Signatory:

Date:

15-Nov-2017

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.

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# CERTIFICATE OF CALIBRATION

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Certificate No.:

17CA1110 02

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1, Measured Sound Pressure Level

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

			(Output level in dB re 20 µPa)
Frequency Shown	Output Sound Pressure Level Setting	Measured Output Sound Pressure Level	Estimated Expanded Uncertainty
		Sound Flessure Level	SAME TO SAME
Hz	dВ	db	dB
1000	94.00	93.93	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 = 0.008 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 = 991.5 Hz

Estimated expanded uncertainty

0.1 Hz

Coverage factor k = 2.2

#### Total Noise and Distortion 4.

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

At 1000 Hz

TND = 0.3 %

Estimated expanded uncertainty

0.7 %

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

End

Calibrated by:

Checked by:

Date:

14-Nov-2017

Date:

Fung Chi Yip 5-Nov-2017

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

Form No CARP156-2/Issue 1/Rev C/01/05/2000