

香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

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



CERTIFICATE OF CALIBRATION

Certificate No.:

17CA0209 01

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of

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Item tested

Description:

Sound Level Meter (Class 1)

Microphone

Manufacturer: Type/Model No.: Larson Davis Model 831

Serial/Equipment No.:

0003227

377B02 SNLW135892

Adaptors used:

Item submitted by

Customer Name:

Lam Geotechnics Limited

Address of Customer:

Request No.:

Date of receipt:

09-Feb-2017

Date of test:

14-Feb-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:

Signal generator Signal generator

DS 360 DS 360

33873 61227

18-Apr-2017 18-Apr-2017 CIGISMEC CEPREI CEPREI

Ambient conditions

Temperature:

Air pressure:

Relative humidity:

21 ± 1 °C 40 ± 10 %

1020 ± 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.

Huang Jian/Min/Feng Jun Qi

Actual Measurement data are documented on worksheets.

Approved Signatory:

Date:

15-Feb-2017

Company Chop:

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.

C Soils & Materials Engineering Co., Ltd



香港 黄 竹 坑 道 3 7 號 利 達 中 心 1 2 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	Α	Pass	0.3
	С	Pass	1.0 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
	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	0.4
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 1/104 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

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 14-Feb-2017 ilu -

Checked by:

Date:

/

Lam Tze Wai 15-Feb-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.:

16CA1117 01-01

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Item tested

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

B&K

2236 2100736

Microphone **B&K**

4188 2288941

Adaptors used:

Item submitted by

Serial/Equipment No.:

Customer Name:

Lam Geotechnics Limited

Address of Customer:

Request No .:

Date of receipt:

17-Nov-2016

Date of test:

18-Nov-2016

Reference equipment used in the calibration

Description:

Multi function sound calibrator

Model: B&K 4226 Serial No.

Expiry Date:

Traceable to:

Signal generator Signal generator

DS 360 DS 360

2288444 33873

61227

18-Jun-2017 18-Apr-2017 18-Apr-2017 CIGISMEC CEPREI CEPREI

Ambient conditions

Temperature:

23 ± 1 °C

Relative humidity:

50 ± 10 % 1005 ± 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 1, 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.

Huang Jian Min/Feng Jun Qi

Actual Measurement data are documented on worksheets

Approved Signatory:

Date:

21-Nov-2016

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.

O Soils & Materials Engineering Co., Ltd



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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.

			Expanded	Coverage
Test:	Subtest:	Status:	Uncertanity (dB)	Factor
Self-generated noise	Α	Pass	0.3	
3	C	Pass	1.0	2.1
	Lin	Pass	2.0	2.2
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
, ,	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 ³ at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/104 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	
	C-10 #3			

2, Acoustic tests

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

Test:	Subtest	Status	Expanded Uncertanity (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
* 99	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:

NX

Checked by:

Lam Tze Wai

Date:

Fung Chi Yip 18-Nov-2016

Date:

21-Nov-2016

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.

O Soils & Materials Engineering Co . Ltd



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CERTIFICATE OF CALIBRATION

Certificate No.:

17CA0320 02

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Item tested

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

Microphone **B&K**

Preamp B & K

Type/Model No.: Serial/Equipment No.: 2250-1 2722310

4950 2698702

18-Apr-2017

ZC0032 13318

Adaptors used:

Item submitted by Customer Name:

Lam Geotechnics Ltd.

Address of Customer:

Request No.:

20-Mar-2017

Date of receipt:

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

DS 360

DS 360

Serial No. 2288444

61227

Expiry Date: 18-Jun-2017 33873 18-Apr-2017

Traceable to:

CIGISMEC CEPREI CEPREI

Ambient conditions

Temperature:

Relative humidity:

21 ± 1 °C 60 ± 10 %

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.
- 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 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.

hin/Feng Jun Qi

Actual Measurement data are documented on worksheets.

Huang Jian

Approved Signatory:

Date:

24-Mar-2017

Company Chop:

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.

C Soils & Materials Engineering Co., Ltd



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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.

			Expanded	Coverage
Test:	Subtest:	Status:	Uncertanity (dB)	Factor
Self-generated noise	A	Pass	0.3	
con generated noise	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leg	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	
. requeriey meightings	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
·····g······go	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	
·····g······g··	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	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		100-00-00	
Dulas range	2. S. Day on Block address (see a control of the control of th	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

2, Acoustic tests

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

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

3, Response to associated sound calibrator

N/A

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

Calibrated by:

End

Checked by:

Hung Chi Yip

Date:

Lai Sheng Jie 23-Mar-2017

Date:

24-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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CERTIFICATE OF CALIBRATION

Certificate No.:

16CA0519 02

Page

Tel: (852) 2873 6860

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2

Item tested

Description:

Sound Level Meter (Type 1) **B&K**

Microphone **B&K**

Preamp **B&K**

Manufacturer: Type/Model No .:

2250-L

4950

ZC0032

Serial/Equipment No.: Adaptors used:

2722311

2698703

13321

Item submitted by

Customer Name:

Lam Geotechnics Limited

Address of Customer: Request No.:

Date of receipt:

19-May-2016

Date of test:

21-May-2016

Reference equipment used in the calibration

Description:

Multi function sound calibrator

Model: B&K 4226 Serial No.

Expiry Date:

Traceable to:

Signal generator

DS 360

2288444

19-Jun-2016 18-Apr-2017

CIGISMEC

Signal generator

DS 360

33873 61227

18-Apr-2017

CEPREI CEPREI

Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity: Air pressure:

55 ± 10 % 1005 ± 5 hPa

Test specifications

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

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

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.

Aiŋ/Feng Jun Qi

Actual Measurement data are documented on worksheets.

Huang Jian

Approved Signatory:

Date:

23-May-2016

Company Chop:

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	
	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	С	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
•	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 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	

Acoustic tests 2,

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 3,

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:

Fung Chi Yip

End

Checked by:

Date:

21-May-2016

Date:

Lam Tze Wai 23-May-2016

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.:

17CA0505 01

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Item tested

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

Microphone **B&K** 4950

Preamp **B&K** ZC0032

Type/Model No.: Serial/Equipment No.: Adaptors used:

2250-L 2722311

2698703

13321

Item submitted by

Customer Name:

Lam Geotechnics Ltd.

Address of Customer:

Request No .:

05-May-2017

Date of receipt:

Date of test:

06-May-2017

Reference equipment used in the calibration

Description:

Multi function sound calibrator

Model: B&K 4226 Serial No.

Expiry Date:

Traceable to:

Signal generator

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

/ Heng Jungi

Actual Measurement data are documented on worksheets

Approved Signatory:

Date:

09-May-2017

Company Chop:

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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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	Dane	0.0	
och-generated noise	Ĉ	Pass	0.3	
	Lin	Pass	0.8	
Linearity range for Lan		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	
3	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 ³ at 4kHz	Pass		
Time averaging	•	36 (3643)	0.3	
Dulas sassa	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 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:

Date:

Lai Sheng Jie 06-May-2017 Checked by:

Date:

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.:

17CA0221 02

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Item tested

Description: Manufacturer:

Sound Level Meter (Type 1) **B&K**

2250-L

2701778

Microphone **B&K** 4950

Preamp **B&K** ZC0032

Type/Model No.: Serial/Equipment No .: Adaptors used:

2755097

19223

Item submitted by

Customer Name: Address of Customer: Lam Geotechnics Limited

Request No.:

Date of receipt:

22-Feb-2017

Date of test:

02-Mar-2017

Reference equipment used in the calibration

Description:

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 %

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 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.

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CERTIFICATE OF CALIBRATION

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Certificate No.:

17CA0221 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.

		Expanded	Coverage
Subtest:	Status:	Uncertanity (dB)	Factor
۸	Dane	0.0	
9		0.3	
	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	
A	Pass	0.3	
C	Pass	0.3	
Lin	Pass	0.3	
Single Burst Fast	Pass	0.3	
Single Burst Slow	Pass	0.3	
Single 100µs rectangular pulse	Pass	0.3	
Crest factor of 3	Pass	0.3	
Single burst 5 ms at 2000 Hz	Pass		
	Pass		
1 ms burst duty factor 1/103 at 4kHz			
1 ms burst duty factor 1/10 ⁴ at 4kHz			
Single burst 10 ms at 4 kHz			
5			
		0.000	
4	1 433	0.4	
	A C Lin At reference range, Step 5 dB at 4 kHz Reference SPL on all other ranges 2 dB below upper limit of each range 2 dB above lower limit of each range At reference range, Step 5 dB at 4 kHz A C Lin Single Burst Fast Single Burst Slow Single 100µs rectangular pulse Crest factor of 3 Single burst 5 ms at 2000 Hz Repeated at frequency of 100 Hz 1 ms burst duty factor 1/10³ at 4kHz	A Pass C Pass Lin Pass At reference range , Step 5 dB at 4 kHz Pass Reference SPL on all other ranges Pass 2 dB below upper limit of each range 2 dB above lower limit of each range At reference range , Step 5 dB at 4 kHz Pass A Pass C Pass Lin Pass Single Burst Fast Pass Single Burst Slow Pass Single 100µs rectangular pulse Pass Crest factor of 3 Pass Crest factor of 3 Pass Single burst 5 ms at 2000 Hz Pass 1 ms burst duty factor 1/10³ at 4kHz Pass 1 ms burst duty factor 1/10⁴ at 4kHz Pass Single burst 10 ms at 4 kHz Pass SPL	A Pass 0.3 C Pass 0.8 Lin Pass 1.6 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 A Pass 0.3 0.3 C Pass 0.3 Lin Pass 0.3 Single Burst Fast Pass 0.3 Single Burst Slow Pass 0.3 Single 100μs rectangular pulse Pass 0.3 Crest factor of 3 Pass 0.3 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 1 ms burst duty factor 1/10 ⁴ at 4kHz Pass 0.3 Single burst 10 ms at 4 kHz 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.

THE RESIDENCE OF THE PROPERTY			Expanded	Coverage
Test:	Subtest	Status	Uncertanity (dB)	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:

 γ

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.

Fnd

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CERTIFICATE OF CALIBRATION

Certificate No.:

17CA0119 01

2250-L

3002695

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of

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Item tested

Description: Manufacturer: Type/Model No.:

Sound Level Meter (Type 1) **B&K**

Microphone **B&K** 4950 2940839

Preamp **B&K** ZC0032 18582

Serial/Equipment No.: Adaptors used:

Lam Geotechnics Limited

Customer Name: Address of Customer:

Item submitted by

Request No.:

Date of receipt:

19-Jan-2017

Date of test:

20-Jan-2017

Reference equipment used in the calibration

Description: 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: 21 ± 1 °C 40 ± 10 %

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.

Min/Feng Jun Qi

Actual Measurement data are documented on worksheets.

Huana Jia

Approved Signatory:

Date:

23-Jan-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.

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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

17CA0119 01

Page

2

1, Electrical Tests

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

Test:	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor
1031.	Subtest.	Status.	Officertainty (ub)	1 actor
Self-generated noise	Α	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	
	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:

V

End

Checked by:

Lam Tze Wai

Date:

Fung Chi Yip 20-Jan-2017

Date:

23-Jan-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.:

16CA0805 02

Page

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Item tested

Description: Manufacturer: Type/Model No.: Sound Level Meter (Type 1) B & K 2250-L 3006790

Microphone B&K 4950 2827240

B & K ZC0032 21213

Adaptors used:

Item submitted by

Serial/Equipment No.:

Customer Name:

Lam Geotechnics Ltd.

Address of Customer:

Request No.:

Date of receipt:

05-Aug-2016

Date of test:

08-Aug-2016

Reference equipment used in the calibration

Description:

Multi function sound calibrator

Signal generator Signal generator Model:

DS 360

Serial No. B&K 4226 2288444 DS 360

33873 61227

Expiry Date:

18-Jun-2017 18-Apr-2017 18-Apr-2017

Traceable to:

CIGISMEC CEPRE CEPRE

Ambient conditions

Temperature:

Relative humidity: Air pressure:

21 ± 1 °C 60 + 10 %

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

Test results

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

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

Actual Measurement data are documented on worksheets.

Huang Jian

Approved Signatory:

eng Jun Qi

09-Aug-2016 Date:

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.



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CERTIFICATE OF CALIBRATION

(Continuation Page)

16CA0805 02

Page

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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
1651.	Subject.	owns.	menten menten in addition in addition in the contract of the contract in the c	
Self-generated noise	Α	Pass	0.3	
	С	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leg	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
, , ,	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	Α	Pass	0.3	
. , , ,	С	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 ³ at 4kHz	Pass	0.3	
3 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	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:

Date:

End

Checked by:

| Fung Chi Yip | Cam Tze Wai | | O8-Aug-2016 | Date: 09-Aug-2016

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.:

16CA1117 01-02

Page:

2

Item tested

Description:

Acoustical Calibrator (Class 1)

Manufacturer:

Rion Co., Ltd.

Type/Model No.: Serial/Equipment No.: NC-73 10707358

Adaptors used:

Item submitted by

Curstomer:

Lam Geotechnics Ltd

Address of Customer:

Request No.:

Date of receipt:

17-Nov-2016

Date of test:

18-Nov-2016

Reference equipment used in the calibration

Description: Lab standard microphone	Model: B&K 4180	Serial No. 2412857	Expiry Date: 14-Apr-2017	Traceable to: SCL
Preamplifier	B&K 2673	2239857	28-Apr-2017	CEPREI
Measuring amplifier	B&K 2610	2346941	26-Apr-2017	CEPREI
Signal generator	DS 360	61227	18-Apr-2017	CEPREI
Digital multi-meter	34401A	US36087050	18-Apr-2017	CEPREI
Audio analyzer	8903B	GB41300350	19-Apr-2017	CEPREI
Universal counter	53132A	MY40003662	19-Apr-2017	CEPREI

Ambient conditions

Temperature:

23 ± 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 1, 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 3, 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: 21-Nov-2016

Company Chop:

Huang Jian Min/Feng Jun Qi

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

Soils & Materials Engineering Co., Ltd

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



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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

16CA1117 01-02

Page:

Measured Sound Pressure Level 1,

> 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) Output Sound Pressure Measured Output Frequency Estimated Expanded Shown Level Setting Sound Pressure Level Uncertainty Hz dB dB dB 1000 94.00 94 12 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 = 0.002 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 = 991.6 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 = 0.6 %

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:

Funa Chi Yip

Checked by

Lam Tze Wai

Date:

18-Nov-2016

Date:

21-Nov-2016

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

Soils & Materials Engineering Co., Ltd.

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



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CERTIFICATE OF CALIBRATION

Certificate No.:

17CA0320 03

Page:

of

2

Item tested

Description:

Acoustical Calibrator (Class 1)

Manufacturer: Type/Model No.: Larson Davis CAL 200

Serial/Equipment No.:

13098

Adaptors used:

Item submitted by

Curstomer:

Lam Environmental Service Ltd.

Address of Customer:

Request No.:

Date of receipt:

20-Mar-2017

Date of test:

23-Mar-2017

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2412857	14-Apr-2017	SCL
Preamplifier	B&K 2673	2239857	28-Apr-2017	CEPREI
Measuring amplifier	B&K 2610	2346941	26-Apr-2017	CEPREI
Signal generator	DS 360	61227	18-Apr-2017	CEPREI
Digital multi-meter	34401A	US36087050	18-Apr-2017	CEPREI
Audio analyzer	8903B	GB41300350	19-Apr-2017	CEPREI
Universal counter	53132A	MY40003662	19-Apr-2017	CEPREI

Ambient conditions

Temperature:

21 ± 1 °C

Relative humidity: Air pressure:

60 ± 10 % 1010 ± 5 hPa

Test specifications

- 1, The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B and the lab calibration procedure SMTP004-CA-156.
- 2. The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
- The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

Test results

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

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

Huang Jian Min/Feng Jun Qi

Approved Signatory:

Date:

24-Mar-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

(Continuation Page)

Certificate No.:

17CA0320 03

Page:

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1. Measured Sound Pressure Level

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

			(Output level in dB re 20 μPa)
Frequency Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	Estimated Expanded Uncertainty dB
1000	94.00	93.98	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 = 0.002 dB

Estimated expanded uncertainty

0.005 dB

3, **Actual Output Frequency**

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

At 1000 Hz

Actual Frequency = 1000.2 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.

End

Calibrated by:

Checked by:

Fung Chi Yip

Date:

23-Mar-2017

24-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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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

Date - Ma Operator		Rootsmeter Orifice I.I		438320 3166	Ta (K) - Pa (mm) -	293 - 748.03
PLATE OR Run # 1 2 3 4 5	VOLUME START (m3) NA NA NA NA NA	VOLUME STOP (m3) NA NA NA NA NA	DIFF VOLUME (m3) 1.00 1.00 1.00 1.00	DIFF TIME (min) 1.4270 1.0220 0.9100 0.8730 0.7180	METER DIFF Hg (mm) 3.2 6.4 7.9 8.8 12.7	ORFICE DIFF H2O (in.) 2.00 4.00 5.00 5.50 8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)		Va	(x axis) Qa	(y axis)
0.9967 0.9925 0.9904 0.9892 0.9840	0.6985 0.9711 1.0883 1.1332 1.3705	1.4150 2.0010 2.2372 2.3464 2.8299		0.9957 0.9915 0.9893 0.9882 0.9830	0.6977 0.9701 1.0872 1.1320 1.3691	0.8851 1.2517 1.3995 1.4678 1.7702
Qstd slope (m) = 2.10714 intercept (b) = -0.05158 coefficient (r) = 0.99978 				Qa slope intercept coefficie v axis =	= (b)	1.31946 -0.03226 0.99978

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				Calibrati	on Date	:	13-Apr-17
Equipment	no. :	HVS001					Calibrati	on Due Date	:	13-Jun-17
				=						12, 46
CALIBRATIO	ON OF CONT	INUOUS FL	OW RECO	RDER						
					Ambient C	ondition				
Temperatur	re, T _a		293	3	Kelvin	Pressure, P	a	10	017	mmHg
				Orifice	Transfer Sta	ndard Inform	ation			
Equip	ment No.		Ori002		Slope, m _c	2.107	14	Intercept, bc		-0.05158
Last Calif	bration Date		20-May-1	16	200 000	(H	I x P _a / 10	13.3 x 298 / 7	$(\Gamma_a)^{1/2}$	
Next Calil	bration Date		20-May-1	7		=		$(Q_{std} + b_c)$	u,	
					Calibration	n of TSP				
Calib	bration	Ma	nometer R	eading	Q	std	Contin	Continuous Flow		IC
P	oint	н	(inches of	water)	(m ³ /	min.)	Recorder, W		(W(P _e /10	13.3x298/T _a) ^{1/2} /35.31)
		(up)	(down)	(difference)	X-a	ıxis	(CFM)			Y-axis
	1	1.6	1.6	3.2	0.8	822	30			30.3101
	2	2.9	2.9	5.8	1.1	792	38			38.3928
	3	3.8	3.8	7.6	1.3	463	46			46.4755
	4	4.8	4.8	9.6	1.5	101	52			52.5375
	5	6.4	6.4	12.8	1.7	399	58		58.5995	
By Linear Re	gression of Y	on X								
		Slope, m	=	34.2	668	Int	ercept, b =	-0.3	651	
	Correlation (Coefficient*	=	0.9	948					
	Calibration	Accepted	=	Yes/	No**					
					4.0					
* if Correlation	n Coefficient <	0.990, che	ck and reca	alibration agai	n.					
				•						
** Delete as a										
Remarks :	As per client's	s provided i	nformation,	the equipmer	nt reference n	o. of the calib	orated High V	olume Sampler ha	is been	
	re-assigned fr	om EL452	to HVS001	with respect t	o the update	in quality man	agement sys	em.		
Calibrated by	y :	Ja	ickey MA				Checked	ру	:F	Pauline Wong
Date	:	1:	3-Apr-17				Date		:	13-Apr-17



Location :		CMA2a					on Date	: 13-Apr-17	
Equipment no.		HVS002				Calibrati	on Due Date	: 13-Jun-17	
		300 A						9 1	
CALIBRATION OF CONTIN	UOUS FL	OW RECO	RDER						
				Ambient C	ondition				
Temperature, T _a		293		Kelvin	Pressure, P		10	017 mmHg	
			Orifice 1	Transfer Sta	ndard Inform	ation		The Assessment of the State of	
Equipment No.		Ori002		Slope, m _c	2.107	14	Intercept, bc	-0.05158	
Last Calibration Date		20-May-1	6		(H	x P _a / 10)13.3 x 298 / 7	Γ_a) $^{1/2}$	
Next Calibration Date		20-May-1	7		=	m _c :	$x Q_{std} + b_c$		
				Calibration	n of TSP				
Calibration	Ma	nometer R	eading	Q	std	Continuous Flow		IC	
Point	н	(inches of	water)	(m ³ /	min.)	Recorder, W		(W(P _a /1013.3x298/T _a) ^{1/2} /35.3	31)
	(up)	(down)	(difference)	X-a	axis	(CFM)		Y-axis	
1	1.5	1.5	3.0	0.8	550	32		32.3307	
2	2.3	2.3	4.6	1.0	529	40		40.4134	
3	3.8	3.8	7.6	1.3	463	46		46.4755	
4	5.1	5.1	10.2	1.5	558	52		52.5375	
5	6.5	6.5	13.0	1.7	533	56		56.5788	
By Linear Regression of Y o	n X								
	Slope, m	=	26.2	984	Int	ercept, b =	11.1	1467	
Correlation C	oefficient*	=	0.9	934					
Calibration	Accepted	=	Yes/	Ne**					
* if Correlation Coefficient <	0.990, che	eck and rec	alibration agai	n.					
** Delete as appropriate.									
	provided i	nformation	the equipmer	nt reference r	o of the calil	orated High V	olume Sampler h	as heen	
Remarks :			***************************************			1530	W		
re-assigned fro			with respect t	o the update	in quality mar				
Calibrated by		ackey MA				Checked	by	: Pualine Wong	_
Date :	1	3-Apr-17				Date		: 13-Apr-17	



Location	:	CMA3a	Calibration Date	:	20-Apr-17
Equipment no.	:	HVS012	Calibration Due Date	:	20-Jun-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition									
Temperature, T _a	299	Kelvin	Pressure, P _a	101	0 mmHg				
	Orifice Transfer Standard Information								
Equipment No.	Ori002	Slope, m _c	Slope, m _c 2.10714 Intercept, bc -0.05158						
Last Calibration Date	20-May-16		$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$						
Next Calibration Date	20-May-17		$= m_c \times Q_{std} + b_c$						

Calibration of TSP								
Calibration	Mai	nometer Re	eading	Q _{std}	Continuous Flow	IC		
Point	Н (inches of v	vater)	(m ³ / min.)	Recorder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)		
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis		
1	1.3	1.3	2.6	0.7872	31	30.8977		
2	2.2	2.2	4.4	1.0167	36	35.8812		
3	3.5	3.5	7.0	1.2759	43	42.8581		
4	4.5	4.5	9.0	1.4435	48	47.8416		
5	5.3	5.3	10.6	1.5645	54	53.8218		
By Linear Regression of Y	By Linear Regression of Y on X							
	Slope, m	=	28.6	680 In	tercept, b =	7.3550		

Correlation Coefficient*

Calibration Accepted

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

 $\underline{\text{re-assigned from EL333 to HVS012 with respect to the update in quality management system.}}$

0.9911

Yes/No**

Calibrated by : Jackey MA Checked by : Pauline Wong

Date Date Checked by : 20-Apr-17

^{*} if Correlation Coefficient < 0.990, check and recalibration again.

^{**} Delete as appropriate.



Location	:	CMA4a	Calibration Date	:	20-Apr-17
Equipment no.	:	HVS004	Calibration Due Date	:	20-Jun-17
				•	_

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition						
Temperature, T _a	299	Kelvin	Pressure, P _a	1010	mmHg	

Orifice Transfer Standard Information								
Equipment No.	Ori002	Slope, m _c	2.10714	Intercept, bc	-0.05158			
Last Calibration Date	20-May-16		$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$					
Next Calibration Date	20-May-17	$= m_c \times Q_{std} + b_c$						

	Calibration of TSP								
Calibration	Ма	nometer Ro	eading	Q _{std}	Continuous Flow	IC			
Point	H (inches of water)		(m ³ / min.)	Recorder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)				
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis			
1	1.2	1.2	2.4	0.7573	35	34.8845			
2	1.8	1.8	3.6	0.9220	41	40.8647			
3	2.9	2.9	5.8	1.1636	48	47.8416			
4	3.8	3.8	7.6	1.3285	53	52.8251			
5	5.0	5.0	10.0	1.5203	57	56.8119			
By Linear Pagrassion of N		3.0	10.0	1.0203	31	30.8119			

Slope, m = 28.8782 Intercept, b = 13.7729

Correlation Coefficient* = 0.9965

Calibration Accepted = Yes/No**

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

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

Calibrated by : Jackey MA Checked by : Pauline Wong

 Date
 :
 20-Apr-17
 Date
 :
 20-Apr-17

^{*} if Correlation Coefficient < 0.990, check and recalibration again.

^{**} Delete as appropriate.



Location	:	CMA5b	Calibration Date	:	21-Apr-17
Equipment no.	:	HVS010	Calibration Due Date	: -	21-Jun-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition							
Temperature, T _a	299	Kelvin	Pressure, P _a	1008	mmHg		

Orifice Transfer Standard Information								
Equipment No.	Ori002	Slope, m _c	2.10714	Intercept, bc	-0.05158			
Last Calibration Date	20-May-16	$(HxP_a/1013.3x298/T_a)^{1/2}$						
Next Calibration Date	20-May-17		= <i>m</i>	$a_c \times Q_{std} + b_c$				

				Calibration of TSP				
Calibration	Mar	nometer Re	eading	Q _{std}	Continuous Flow	IC		
Point	н (inches of v	water)	(m ³ / min.)	Recorder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)		
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis		
1	1.4	1.4	2.8	0.8152	38	37.8371		
2	2.1	2.1	4.2	0.9929	44	43.8113		
3	3.3	3.3	6.6	1.2385	52	51.7770		
4	4.3	4.3	8.6	1.4102	57	56.7556		
5	5.5	5.5	11.0	1.5917	62	61.7341		
y Linear Regression of \	Linear Regression of Y on X							
	Slope, m	=	30.8	3725 Ir	ntercept, b = 1	3.0364		

Slope, m = 30.8725 Intercept, b = 13.0364

Correlation Coefficient* = 0.9991

Calibration Accepted = Yes/No**

**	Delete	as	ар	pro	priate.
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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 EL222 to HVS010 with respect to the update in quality management system.

 Calibrated by
 :
 Jackey MA
 Checked by
 :
 Pauline Wong

 Date
 :
 21-Apr-17
 Date
 :
 21-Apr-17

 $[\]ensuremath{^*}$ if Correlation Coefficient < 0.990, check and recalibration again.



Location	:	MA1e	Calibration Date	:	21-Apr-17
Equipment no.	:	HVS007	Calibration Due Date	: -	21-Jun-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition						
Temperature, T _a	299	Kelvin	Pressure, P _a	1008	mmHg	

Orifice Transfer Standard Information							
Equipment No.	Ori002	Slope, m _c	2.10714	Intercept, bc	-0.05158		
Last Calibration Date	20-May-16	$(HxP_a/1013.3x298/T_a)^{1/2}$) 1/2		
Next Calibration Date	20-May-17		= <i>m</i>	$_{c}$ \times Q_{std} + b_{c}			

Calibration of TSP							
Calibration	Manometer Reading		Q _{std}	Continuous Flow	IC		
Point	H (inches of water)		(m ³ / min.)	Recorder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)		
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis	
1	1.5	1.5	3.0	0.8429	29	28.8757	
2	2.3	2.3	4.6	1.0380	38	37.8371	
3	3.6	3.6	7.2	1.2924	48	47.7942	
4	4.5	4.5	9.0	1.4421	56	55.7599	
5	5.1	5.1	10.2	1.5337	64	63.7256	
By Linear Regression of Y	on X						
	Slope, m	=	48.08	836 In	tercept, b = -1:	2.3359	
Correlation C	oefficient*	=	0.99	25			
Calibration	Accepted	=	Yes/	\o **			

 if Correlation Coefficient < 0.990, check and recalibration a 	gain.
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As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been Remarks:

re-assigned from EL455 to HVS007 with respect to the update in quality management system.

Pauline Wong Calibrated by Checked by Jackey MA 21-Apr-17 21-Apr-17 Date Date



Location	:	MA1w	Calibration Date	:	21-Apr-17
Equipment no.	:	HVS008	Calibration Due Date	:	21-Jun-17

CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition						
Temperature, T _a	299	Kelvin	Pressure, P _a	1008	mmHg	

Orifice Transfer Standard Information						
Equipment No.	Ori002	Slope, m _c	2.10714	Intercept, bc	-0.05158	
Last Calibration Date	20-May-16		(HxP _a /1	013.3 x 298 / T	a) 1/2	
Next Calibration Date	20-May-17		= <i>m</i> _c	$x Q_{std} + b_c$		

Calibration of TSP							
Calibration	Mai	nometer Ro	eading	Q _{std}	Continuous Flow	IC	
Point	Н (inches of	water)	(m ³ / min.)	Recorder, W	(W(P _a /1013.3x298/T _a) ^{1/2} /35.31)	
	(up)	(down)	(difference)	X-axis	(CFM)	Y-axis	
1	1.5	1.5	3.0	0.8429	20	19.9142	
2	2.4	2.4	4.8	1.0598	28	27.8799	
3	3.8	3.8	7.6	1.3272	38	37.8371	
4	5.0	5.0	10.0	1.5188	44	43.8113	
5	6.4	6.4	12.8	1.7151	50	49.7856	
By Linear Regression of Y	on X						
	Slope, m	=	34.43	344 In	tercept, b =	8.6696	
Correlation C	oefficient*	=	0.99	89			
Calibration	Calibration Accepted =		Yes/P	10 **			

* if Correlation Coefficient < 0.990, check a	and 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 21-Apr-17 Date 21-Apr-17 Date