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



## CERTIFICATE OF CALIBRATION

Certificate No.:

16CA1117 01-01

Page

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 <sup>3</sup> 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.:

16CA0413 02

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Item tested

Description:

Sound Level Meter (Type 1)

Microphone

Preamp

Manufacturer: Type/Model No.:

2250-L

B & K 4950 2698702 B & K ZC0032

Serial/Equipment No.: Adaptors used:

2722310

2030102

13318

Item submitted by

Customer Name:

Lam Geotechnics Limited

Address of Customer:

100

Request No.: Date of receipt:

13-Apr-2016

Date of test:

09-May-2016

Reference equipment used in the calibration

Description:

201 O OW 2

Serial No.

Expiry Date:

Traceable to:

Multi function sound calibrator Signal generator Signal generator Model: B&K 4226 DS 360 DS 360

2288444 33873 61227 19-Jun-2016 18-Apr-2017 18-Apr-2017 CIGISMEC

CEPREI

Ambient conditions

Temperature:

Air pressure:

21 ± 1 °C

Relative humidity:

60 ± 10 % 1005 ± 5 hPa

Test specifications

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

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

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

# Test results

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

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

lin/Fena Jun Qi

Actual Measurement data are documented on worksheets.

Huand

Approved Signatory:

Date:

10-May-2016

Company Chon

**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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#### 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	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 1/10 <sup>3</sup> 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	SPĽ	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	
507 01 50 VI-46 Tologopie	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:

Date:

Fung Chi Yip 09-May-2016

Date:

J.Q. Feng 10-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.:

16CA0519 02

Page

Tel: (852) 2873 6860

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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

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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.

<del>Aiŋ</del>/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.:

16CA0519 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.

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 1/104 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.:

16CA0307 02

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Item tested

Description: Manufacturer:

Adaptors used:

Sound Level Meter (Type 1) B & K

Microphone B & K Preamp B & K ZC0032

Type/Model No.: Serial/Equipment No.: 2250-L 2701778

4950 2755097

19556

Item submitted by

Customer Name:

Lam Geotechnics Ltd.

Address of Customer:

Request No.:

\_

Date of receipt:

07-Mar-2016

Date of test:

08-Mar-2016

Reference equipment used in the calibration

Description:

Multi function sound calibrator

Model: B&K 4226 Serial No.

Expiry Date: 19-Jun-2016

Traceable to:

Signal generator Signal generator

DS 360 DS 360 2288444 33873 61227

16-Apr-2016 16-Apr-2016 CIGISMEC CEPREI CEPREI

**Ambient conditions** 

Temperature:

21 ± 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.

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.

Huang Jian Min/Feng Jun Qi

Actual Measurement data are documented on worksheets

Approved Signatory:

Date:

09-Mar-2016

Company Chop:

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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

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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	
	С	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	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 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

#### 2. Acoustic tests

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

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

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:

Lam Tze Wai

Date:

Fung Chi Yip 08-Mar-2016

Date:

09-Mar-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.



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# CERTIFICATE OF CALIBRATION

Certificate No.:

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Item tested

Description:

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

Manufacturer: Type/Model No.:

2250-L

Microphone B&K

Preamp B&K ZC0032

Serial/Equipment No.: Adaptors used:

2701778

4950 2755097

19223

Item submitted by

Customer Name:

Lam Geotechnics Limited

Address of Customer: 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

Serial No.

**Expiry Date:** 18-Jun-2017

Traceable to: CIGISMEC

Signal generator Signal generator Model: B&K 4226 DS 360 DS 360

2288444 33873

61227

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

Ambient conditions

Temperature:

20 ± 1 °C 60 ± 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 1. and the lab calibration procedure SMTP004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and 2. replaced by an equivalent capacitance within a tolerance of ±20%
- 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.

Huang Jian Min/Feng Jun Qi

Actual Measurement data are documented on worksheets.

Approved Signatory:

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 carry no implication regarding the long-term stability of the instrument.

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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
Calf assessed soins	Δ.	Dees	0.3	
Self-generated noise	A C	Pass	0.3	
		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	
3 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:

 $\sim$ 

End -

Date:

Fung Chi Yip 02-Mar-2017 Checked by:

Lam Tze Wai

-Mar-2017 V

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.

Soils & Materials Engineering Co., Ltd.



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

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# CERTIFICATE OF CALIBRATION

Certificate No.:

17CA0119 01

2250-L

3002695

Page

of

2

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:

21 ± 1 °C 40 ± 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.

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

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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
1631.	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	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	

#### 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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# 綜 合 試 驗 有 限 公 司

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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: B&K 4226

DS 360

Serial No. 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.

eng Jun Qi

Actual Measurement data are documented on worksheets.

Huang Jian

Approved Signatory:

Date:

09-Aug-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.

Soils & Materials Engineering Co., Ltd.



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2

# 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.	menter and a maketic foliable Assessment as benefit Assessment for all court for a first first for the court of the court	
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 <sup>3</sup> 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:

Fung 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:

60 ± 10 %

Air pressure:

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:

2

2

#### 1. Measured Sound Pressure Level

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

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

Date:

Lai Sheng Jie 23-Mar-2017 Checked by:

Fung Chi Yip 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 - M Operator		Rootsmeter Orifice I.I		0438320 3166	Ta (K) - Pa (mm) -	293 748.03
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	1.00 1.00 1.00 1.00	1.4270 1.0220 0.9100 0.8730 0.7180	3.2 6.4 7.9 8.8 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)
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 slo intercep coeffici y axis =	t (b) = ent (r) =	2.10714 -0.05158 0.99978 	Qa slop intercep coeffici	t (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	Calibration Date	:	16-Feb-17
Equipment no.	: _	HVS001	Calibration Due Date	: -	16-Apr-17

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition							
Temperature, T <sub>a</sub>	292	Kelvin Pressure, P <sub>a</sub> 1022 m			mmHg		
Orifice Transfer Standard Information							
Equipment No.	Ori002	Slope, m <sub>c</sub>	2.10714	Intercept, bc	-0.05158		
Last Calibration Date	te 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 of TSP								
Calibration	Manometer Reading		eading	Q <sub>std</sub>	Continuous Flow	IC		
Point	H (inches of 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	1.5	1.5	3.0	0.8584	22	22.3201		
2	2.4	2.4	4.8	1.0794	32	32.4656		
3	3.8	3.8	7.6	1.3518	41	41.5965		
4	5.2	5.2	10.4	1.5772	48	48.6984		
5	6.5	6.5	13.0	1.7605	52	52.7566		
By Linear Regression of Y	By Linear Regression of Y on X							

Slope, m = 33.6324 Intercept, b = -5.0111

Correlation Coefficient\* = 0.9938

Calibration Accepted = Yes/Ne\*\*

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

 $\underline{\text{re-assigned from EL452 to HVS001 with respect to the update in quality management system.}}$ 

Calibrated by : Jackey MA Checked by : Pauline Wong

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

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



Location	:	CMA2a	Calibration Date	:	16-Feb-17
Equipment no.	:	HVS002	Calibration Due Date	: _	16-Apr-17

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition								
Temperature, T <sub>a</sub>	292	Kelvin	Kelvin Pressure, P <sub>a</sub>		mmHg			
Orifice Transfer Standard Information								
Equipment No.	Ori002	Slope, m <sub>c</sub>	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	$= m_c \times Q_{std} + b_c$						
Calibration of TSP								

Calibration of TSP								
Calibration	Mar	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	1.7	1.7	3.4	0.9123	30	30.4365		
2	2.6	2.6	5.2	1.1224	36	36.5238		
3	4.2	4.2	8.4	1.4199	44	44.6402		
4	5.5	5.5	11.0	1.6214	50	50.7275		
5	6.9	6.9	13.8	1.8131	56	56.8148		
By Linear Regression of Y	on X							
	Slope, m	=	29.0	0457 In	ntercept, b = 3.	8086		
Correlation C	oefficient*	=	0.9	996				
Calibration	Accepted	=	Yes	'No**				

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

\*\* Delete as appropriate.

Remarks :	As per client's provided information, the equipment reference no. of the calibrated High Volume Sampler has been
	re-assigned from EL449 to HVS002 with respect to the update in quality management system.

Calibrated by : Jackey MA Checked by : Pualine Wong

Date Date Date : 16-Feb-17



TESTING	Calibr	ation D	ata for H	ligh Vol	ume San	npler (T	SP Sampl	er)	
Location :		CMA3a				Calibra	ation Date	:	23-Feb-17
Equipment no.		HVS012			Calibration Due Date				23-Apr-17
CALIBRATION OF CON	TINUOUS	FLOW REC	CORDER						
				Ambient C	ondition				
Temperature, T <sub>a</sub>		29		Kelvin	Pressure, P	a		1017	mmHg
			Orifice T	ransfer Star	ndard Inform	ation			
Equipment No.		Ori002		Slope, m <sub>c</sub>	2.107	14	Intercept, bo	:	-0.05158
Last Calibration Date		20-May-1	6		(Hx	(P <sub>a</sub> / 10	13.3 x 298 /	'T <sub>a</sub> )	1/2
Next Calibration Date		20-May-1	7		=	m <sub>c</sub> >	$Q_{std} + b_c$	100	
				Calibration	of TSP				
Calibration	Ma	nometer R	eading	Q	std	Contin	uous Flow		IC
Point	н	(inches of	water)	(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	1.3	1.3	2.6	0.8	003	30			30.4141
2	2.2	2.2	4.4	1.0337		36		36.4969	
3	3.5	3.5	7.0	1.2	974		43		43.5935
4	4.5	4.5	9.0	1.4	679		48		48.6625
5	5.6	5.6	11.2	1.6	346		52		52.7177
By Linear Regression of Y	on X								
	Slope, m	=	26.9	932	Int	ercept, b =	=8	.7224	
Correlation Co	oefficient*	=	0.99	997					
Calibration	Accepted	=	Yes/ł	<del>Vo</del> **					
* if Correlation Coefficient	< 0.990, ch	neck and re	calibration ag	ain.					
** Delete as appropriate.									
Remarks : As per client	s provided	I information	n, the equipm	ent reference	e no. of the c	alibrated Hi	gh Volume San	npler ha	s been
re-assigned f	from EL33	3 to HVS01	2 with respec	t to the upda	te in quality n	nanagemen	t system.		
Calibrated by	Ja	ickey MA				Checked	l by	:	Pauline Wong
Date :	23	3-Feb-17				Date		:	23-Feb-17



TESTING				5				,	
Location	:	CMA4a				Calibration	on Date	:	23-Feb-17
Equipment no.	:	HVS004		Calibration Due Date :			23-Apr-17		
CALIBRATION OF CO	NTINUOUS F	LOW REC	ORDER						
				Ambient (	Condition				
Temperature, T <sub>a</sub>		291		Kelvin	Pressure, P	a	10	)17	mmHg
			Orifice	Transfer Sta	andard Infor	mation		N. S.	
Equipment No.		Ori002		Slope, m <sub>c</sub>	2.107	14	Intercept, bc		-0.05158
Last Calibration Date	е	20-May-1	6		(H	XP <sub>a</sub> / 10	13.3 x 298 / 7	a) 1/2	
Next Calibration Date	е	20-May-1	7		=	$m_c$	$(Q_{std} + b_c)$		
				Calibratio	on of TSP				
Calibration	Ma	nometer R	eading	Q	std	Contin	uous Flow		IC
Point	н	inches of	water)	(m <sup>3</sup> /	(m³ / min.)		order, W	(W(P <sub>a</sub> /10	013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)
	(up)	(down)	(difference)	X-a	ixis	(	CFM)		Y-axis
1	1.3	1.3	2.6	0.8	003		20		20.2760
2	2.2	2.2	4.4	1.03	337		32		32.4417
3	3.4	3.4	6.8	1.2	791		40		40.5521
4	4.4	4.4	8.8	1.4	517		48		48.6625
5	5.6	5.6	11.2	1.6	346		53		53.7315
By Linear Regression of	f Y on X								
:	Slope, m	=	39.9	9678	Int	tercept, b =	-10.4	4229	
Correlation	Coefficient*	=	0.9	953					
Calibrati	on Accepted	=	Yes	'Ne**					
* if Correlation Coefficie	nt < 0.990 ck	neck and re	calibration an	ain					
ii Gorrolduori Goomolo	111 - 0.000, 01	iook and ro	ound and a ag	a					
** Delete as appropriate	-								
Remarks : As per clie	ent's provided	l information	n, the equipme	ent reference	no. of the ca	llibrated High	Volume Sampler h	nas been	
re-assigne	ed from EL39	0 to HVS00	4 with respec	to the update	e in quality m	anagement sy	stem.		
Calibrated by	: Ja	ackey MA				Checked	by	:	Pauline Wong
Date	: 2	3-Feb-17				Date		:	23-Feb-17



Location	
Equipment	no

:	CMA5b	
:	HVS010	-200

**Calibration Date** Calibration Due Date 23-Feb-17

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

		Ambient Condition		
Temperature, T <sub>a</sub>	291	Kelvin Pressure, Pa	1017	mmHg

Orifice Transfer Standard Information								
Equipment No.	Ori002	Slope, m <sub>c</sub>	2.10714	Intercept, bc	-0.05158			
Last Calibration Date	20-May-16		$(HxP_a)$	/1013.3 x 298 / T <sub>a</sub> )	1/2			
Next Calibration Date	20-May-17	$= m_c \times Q_{std} + b_c$						

				Calibration of TSP		
Calibration	Ма	nometer R	eading	Q <sub>std</sub>	Continuous Flow	IC
Point	н	inches of	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	0.8296	36	36.4969
2	2.2	2.2	4.4	1.0337	42	42.5797
3	3.6	3.6	7.2	1.3155	52	52.7177
4	4.6	4.6	9.2	1.4838	57	57.7867
5	5.8	5.8	11.6	1.6631	63	63.8695
Linear Regression of Yo	n X					
	Slope, m	=	33.0	908	Intercept, b =	8.8257
Correlation C	oefficient*	=	0.99	996		20
Calibration	Accepted	=	Yes/l	No**		

* if Correlation Coefficient	< 0.990,	check and	recalibration	again.
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**	Delete	as	appro	priate.
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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 EL222 to HVS010 with respect to the update in quality management system.

Calibrated by

Date

Jackey MA 23-Feb-17

Checked by

Date

Pauline Wong 23-Feb-17



Location	:	MA1e	Calibration Date	:	23-Feb-17
Equipment no.	:	HVS007	Calibration Due Date	:	23-Apr-17

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition						
Temperature, T <sub>a</sub>	291	Kelvin Pressure, Pa	1017	mmHg		

Orifice Transfer Standard Information						
Equipment No.	Ori002	Slope, m <sub>c</sub>	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	Ma	nometer R	eading	Q std	Continuous Flow	IC
Point	н	inches of	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	1.5	1.5	3.0	0.8578	28	28.3865
2	2.5	2.5	5.0	1.1003	38	38.5245
3	4.0	4.0	8.0	1.3853	44	44.6073
4	5.2	5.2	10.4	1.5761	52	52.7177
5	6.6	6.6	13.2	1.7725	60	60.8281
By Linear Regression of Y	on X					•
	Slope, m	=	34.05	568 In	tercept, b =	0.5688
Correlation C	oefficient*	=	0.99	37		
Calibration	Accepted	=	Yes/A	l <del>o</del> **		

*	if	Correlation	Coefficient	< 0 990	check and	recalibration	anain
	ш	Correlation	COGINCIENT	~ U.33U.	CHECK and	recampianon	auaiii.

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
 : 23-Feb-17
 23-Feb-17



Location	:	MA1w	Calibration Date	:	23-Feb-17
Equipment no.	:	HVS008	Calibration Due Date	: _	23-Apr-17

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition							
Temperature, T <sub>a</sub>	291	Kelvin Pressure, Pa	1017	mmHg			

Orifice Transfer Standard Information						
Equipment No.	Ori002	Slope, m <sub>c</sub>	2.10714	Intercept, bc	-0.05158	
Last Calibration Date	20-May-16		$(HxP_a/$	1013.3 x 298 / T <sub>a</sub> )	1/2	
Next Calibration Date	20-May-17		= <i>m</i>	$_{c}$ $\times$ $Q$ $_{std}$ + $b$ $_{c}$		

Calibration of TSP							
Calibration	Mai	nometer R	eading	Q <sub>std</sub>	Continuous Flow	IC	
Point	н	inches of	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	1.5	1.5	3.0	0.8578	20	20.2760	
2	2.5	2.5	5.0	1.1003	28	28.3865	
3	3.9	3.9	7.8	1.3682	37	37.5107	
4	5.1	5.1	10.2	1.5611	43	43.5935	
5	6.3	6.3	12.6	1.7323	50	50.6901	
By Linear Regression of Y	By Linear Regression of Y on X						
	Slope, m	=	34.32	297 In	tercept, b =	9.3592	
Correlation C	oefficient*	=	0.99	93	-		
Calibration	Accepted	=	Yes/A	<del>lo</del> **			

* if Correlation C	oefficient < 0.99	), check and	recalibration again.
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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 EL080 to HVS008 with respect to the update in quality management system.

Checked by Pauline Wong Calibrated by Jackey MA Date 23-Feb-17 Date 23-Feb-17