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### CERTIFICATE OF CALIBRATION

Certificate No.:

15CA1203 04-01

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Item tested

Description:

Sound Level Meter (Type 1)

Microphone

**Expiry Date:** 

Manufacturer:

B&K

B&K

Type/Model No .:

2236

4188

Serial/Equipment No.:

2100736

2288941

Adaptors used:

Item submitted by

Customer Name:

Lam Geotechnics Limited

Address of Customer:

Request No.

Date of receipt:

03-Dec-2015

Date of test:

04-Dec-2015

Reference equipment used in the calibration

Description:

Signal generator

Signal generator

Multi function sound calibrator

Model: B&K 4226

DS 360

DS 360

Serial No. 2288444 33873

61227

19-Jun-2016 16-Apr-2016 16-Apr-2016

Traceable to:

CIGISMEC CEPREI CEPRE

Ambient conditions

Temperature:

Relative humidity: Air pressure:

22 ± 1 °C 50 ± 10 %

1010 ± 10 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

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:

05-Dec-2015

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.

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



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### CERTIFICATE OF CALIBRATION

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1, Electrical Tests

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

Test:	Subtest:	Status:	Expanded Uncertanity (dB)	Coverage Factor
Self-generated noise	A	Pass	0.3	
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 1/103 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:

Date:

Fung Chi Yip 04-Dec-2015 End

Checked by:

Date:

Lam Tze Wai 05-Dec-2015

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.CARP152-2/Issue 1/Rev.C/01/02/2007



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### CERTIFICATE OF CALIBRATION

Certificate No.:

16CA0413 02

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Tel: (852) 2873 6860

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Item tested

Description:
Manufacturer:
Type/Model No.:

Sound Level Meter (Type 1)

Microphone B & K 4950 Preamp B & K ZC0032

Serial/Equipment No.: Adaptors used:

2250-L 2722310

2698702

13318

Item submitted by

Customer Name:

Lam Geotechnics Limited

Address of Customer:

Request No.:

42 4-- 0040

Date of receipt:

13-Apr-2016

Date of test:

09-May-2016

### Reference equipment used in the calibration

Description:

Multi function sound calibrator

Model: B&K 4226 Serial No. 2288444 Expiry Date: 19-Jun-2016

Traceable to: CIGISMEC

Signal generator Signal generator

DS 360 DS 360 33873 61227 18-Apr-2017 18-Apr-2017 CEPREI

#### **Ambient conditions**

Temperature:

21 ± 1 °C

Relative humidity: Air pressure:

60 ± 10 % 1005 ± 5 hPa

### Test specifications

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

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

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

### Test results

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

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

in/Fena Jun Qi

Actual Measurement data are documented on worksheets.

Huand

Approved Signatory:

Date:

10-May-2016

Company Chor

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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.

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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
1000.	Gubicot.	otatus.	oniocitality (ab)	, dotor
Self-generated noise	Α	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	

#### 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.

Status	Uncertanity (dB)	Factor
Pass	0.3	
Pass	0.5	
	Pass	Pass 0.3

#### 3, Response to associated sound calibrator

N/A

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

Calibrated by:

Date:

Fung Chi Yip 09-May-2016 End

Checked by:

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

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Item tested

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

2722311

B & K 4950 2698703

Microphone

Preamp B & K ZC0032 13321

Serial/Equipment No.: Adaptors used:

Item submitted by

Lam Geotechnics Limited

Customer Name: Address of Customer:

Request No.:

Date of receipt:

19-May-2016

Date of test:

21-May-2016

### Reference equipment used in the calibration

Description:

or

Serial No.

Expiry Date: 19-Jun-2016

Traceable to: CIGISMEC CEPREI

CEPRE

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

Model:

2288444 33873 61227

73 18-Apr-2017 27 18-Apr-2017

#### Ambient conditions

Temperature: Relative humidity:

Air pressure:

21 ± 1 °C 55 ± 10 % 1005 ± 5 hPa

#### Test specifications

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

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

 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.

Ain/Feng Jun Qi

Actual Measurement data are documented on worksheets.

Huang Jian

Approved Signatory:

Date:

23-May-2016

Company Chop:

SPOS \*\*\*OIT

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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#### 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	
2 1 3 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	C	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leg	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
de la constanta de la constant	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	Α	Pass	0.3	
	С	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100µs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

### 2, Acoustic tests

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

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

Fung Chi Yip

Date: 21-May-2016

- End

Checked by:

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: Sound Level Meter (Type 1)

Microphone B & K Preamp B & K

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

4950 2755097 ZC0032 19556

Adaptors used:

Item submitted by

Lam Geotechnics Ltd.

Customer Name: Address of Customer:

Request No.: Date of receipt:

-07-Mar-2016

Date of test:

08-Mar-2016

Reference equipment used in the calibration

Description:

Model:

Serial No. 2288444 Expiry Date: 19-Jun-2016 Traceable to: CIGISMEC

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

33873 61227

16-Apr-2016 16-Apr-2016 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.

 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:

SENGINEERING COMPANY STORY OF THE STORY OF

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.

C Soils & Materials Engineering Co., Ltd.

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



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### CERTIFICATE OF CALIBRATION

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#### **Electrical Tests**

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

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

#### 2, Acoustic tests

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

Test:	Subtest	Status	Expanded Uncertanity (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz Weighting A at 8000 Hz	Pass Pass	0,3 0.5	

3, Response to associated sound calibrator

N/A

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

Calibrated by:

Fung Chi Yip Date: 08-Mar-2016

Checked by:

Date:

Lam Tze Wai 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.:

16CA0127 02

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Tel: (852) 2873 6860

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Item tested

Description:

Sound Level Meter (Type 1)

Microphone

Manufacturer:

**B&K** 

**B&K** 

Preamp B&K

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

4950 2940839 ZC0032

Adaptors used:

18582

Item submitted by

**Customer Name:** 

Lam Geoechnics Ltd

Address of Customer:

Request No.

Date of receipt:

27-Jan-2016

Date of test:

28-Jan-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

Relative humidity:

60 ± 10 %

Air pressure:

1010 ± 5 hPa

#### Test specifications

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

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

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

### Test results

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

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

Actual Measurement data are documented on worksheets.

Approved Signatory:

Date:

29-Jan-2016

Company Chop:

Huang-Jian-Nin/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.

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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	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 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:

Fung Chi Yip

28-Jan-2016

Date: 29-Jan-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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Form No CARP152-2/Issue 1/Rev C/01/02/2007



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



# CERTIFICATE OF CALIBRATION

Certificate No.:

16CA0513 01-02

Page:

117

2

Item tested

Description:

Acoustical Calibrator (Class 1)

Manufacturer: Type/Model No.: Rion Co., Ltd.

Serial/Equipment No.:

NC-73 10465798

Adaptors used:

-

Item submitted by

Curstomer:

Lam Geotechnics Ltd.

Address of Customer:

Request No.:

Date of receipt:

13-May-2016

Date of test:

17-May-2016

# Reference equipment used in the calibration

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

#### **Ambient conditions**

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

Air pressure:

1010 ± 5 hPa

### Test specifications

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

Approved Signatory:

Date:

18-May-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.

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



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# CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

16CA0513 01-02

Page

2

of

2

1, Measured Sound Pressure Level

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

Factor of the second			(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	93.96	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 = 0.001 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 = 967.3 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 = 0.8 %

Estimated expanded uncertainty

0.7 %

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

Calibrated by:

End

Date:

Fung Chi Yip \ 17-May-2016 Checked by:

Date:

Lam Tze Wai 18-May-2016

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



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

13-Jul-16



CMA1b

# Calibration Data for High Volume Sampler (TSP Sampler)

**Calbration Date** 

Equipment no. :		HVS001				Calbratio	n Due Date	: 13-Sep-16		
CALIBRATION OF CONTI	NUOUS FL	OW RECO	RDER							
				Ambient C	ondition					
Temperature, T <sub>a</sub>		302		Kelvin	Pressure, P	18	10	005 mmHg		
			Orifice	Transfer Sta	ndard Inform	ation				
Equipment No.		Ori002		Slope, m <sub>c</sub>	2.107	14	Intercept, bc	-0.05158		
Last Calibration Date		20-May-1	6		( H	x Pa / 10	13.3 x 298 / T	$\Gamma_{a}$ ) $^{1/2}$		
Next Calibration Date		20-May-1	7		=		$Q_{std} + b_c$			
				Calibratio	n of TSP					
Calibration	Ma	nometer Re	eading	Q	std	Contin	uous Flow	IC		
Point	н	(inches of v	vater)	(m³ / min.) Recorder, W				(W(P <sub>e</sub> /1013.3x298/T <sub>e</sub> ) <sup>1/2</sup> /35.31)		
	(up)	(down)	(difference)	X-axis (CFM)		CFM)	Y-axis			
1	5.6	5.6	11.2	1.5	957		54	53.4211		
2	4.4	4.4	8.8	1.4	172		48	47.4854		
3	3.6	3.6	7.2	1.2	842	1 2.22	42	41.5497		
4	2.5	2.5	5.0	1.0	743		34	33.6355		
5	1.6	1.6	3.2	0.8	643		28	27.6998		
By Linear Regression of Y	on X									
	Slope, m	=	36.0	0048	Int	tercept, b =	-4.1	452		
Correlation C	Coefficient*	=	0.9	976						
Calibration	Accepted	=	Yes/	No**						
* if Correlation Coefficient <	- 0 000 cha	ack and rec	alibration aga	in						
II Correlation Coefficient	. 0.990, CHE	eck and reco	alibration aga							
** Delete as appropriate.										
Remarks : As per client's	s provided i	nformation,	the equipme	nt reference r	no. of the calil	orated High Vo	olume Sampler ha	as been		
re-assigned for	rom EL452	to HVS001	with respect	to the update	in quality mar	nagement syst	em.			
Calibrated by		Kit Au				Checked I	ру	: Pauline Wong		
Date :	1	3-Jul-16	_ <del></del>			Date		: 13-Jul-16		



TESTING	Calib	ration [	Data for I	High Vol	ume San	pler (TS	P Sampler)	)		
Location :		CMA1b				Calbratio	n Date	:	12-Sep-16	
Equipment no. :		HVS001				Calbratio	n Due Date	:	13-Nov-16	
CALIBRATION OF CONTI	NIIOUS FI	OW RECO	RDER							
				Ambient C	Condition			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
Temperature, T <sub>a</sub>		302			Pressure, P		10	1010 mmHg		
			Orifice	Transfer Sta	ndard Inform	ation				
Equipment No.		Ori002		Slope, m <sub>c</sub>	2.107	14	Intercept, bc		-0.05158	
Last Calibration Date		20-May-1	6		(H x P <sub>a</sub> / 1013.3 x 298 / T <sub>a</sub> ) <sup>1/2</sup>					
Next Calibration Date		20-May-1	7		=		$Q_{std} + b_c$	*****		
				Calibration	n of TSP					
Calibration	Mai	nometer Re	eading	Q	std	Contin	uous Flow		IC	
Point	н (	inches of v	water)	(m³ / min.)		Recorder, W		(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.3		
	(up)	(down)	(difference)	X-axis		((	CFM)		Y-axis	
1	1.2	1.2	2.4	0.7536			12		11.9008	
2	2.2	2.2	4.4	1.0	117	20			19.8347	
3	3.5	3.5	7.0	1.2	697	26			25.7852	
4	4.5	4.5	9.0	1.4	364	30		29.7521		
5	5.5	5.5	11.0	1.5	855		34		33.7190	
By Linear Regression of Y	on X									
	Slope, m	=	25.7	7206	Int	ercept, b =	-6.9	594		
Correlation C	oefficient*	=	0.9	984		,				
Calibration	Accepted	=	Yes/	' <del>No</del> **						
* if Correlation Coefficient <	0.990, che	eck and reca	alibration aga	in.						
** Delete as appropriate.										
Remarks : As per client's	provided i	nformation,	the equipme	nt reference r	o. of the calib	orated High Vo	olume Sampler ha	as been		
re-assigned fr	om EL452	to HVS001	with respect	to the update	in quality mar	nagement syst	em.			
Calibrated by :	Ja	ackey MA				Checked I	ру	:	Pauline Wong	
Date :	12	2-Sep-16				Date		:	12-Sep-16	



Location :		CMA2a				Calbration Date :			13-Jul-16
Equipment no.		HVS002				Calbrati	on Due Date	:	13-Sep-16
CALIBRATION OF CONTI	NUOUS FL	OW RECO	RDER						
				Ambient C	ondition				
Temperature, T <sub>a</sub>		302		Kelvin	Pressure, P		1	005	mmHg
			Orifice	Transfer Star	ndard Inform	ation			
Equipment No.		Ori002		Slope, m <sub>c</sub>	2.107	14	Intercept, bc		-0.05158
Last Calibration Date		20-May-1	6		( H	x Pa / 10	013.3 x 298/	T <sub>a</sub> ) 1/	2
Next Calibration Date		20-May-1	7		=	m <sub>c</sub>	$x Q_{std} + b_c$		
				Calibration	n of TSP				
Calibration	Mai	nometer R	eading	Q	std	Conti	nuous 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.		
	(up)	(down)	(difference)	X-axis			(CFM)		Y-axis
1	6.8	6.8	13.6	1.7559			58		57.3782
2	5.5	5.5	11.0	1.5	816		52		51.4425
3	4.2	4.2	8.4	1.3	852		46		45.5068
4	2.9	2.9	5.8	1.1	552		38		37.5926
5	1.6	1.6	3.2	0.8	643		30		29.6784
By Linear Regression of Y	on X								
	Slope, m	=	31.2	2362	Int	tercept, b =	2.1	1999	
Correlation (		=		991					
Calibration	n Accepted	=	Yes	/ <del>No**</del>					
,							***		
* if Correlation Coefficient <	0.990, che	eck and rec	alibration aga	in.					
** Delete as appropriate.									
	a provided i	nformation	the equipme	nt reference m	o of the coli	aratad High V	Volume Sampler h	aa baa	•
Remarks :	s provided i	mormation,	trie equipmen	nt reference n	io. or the can	orated High	volume Sampler n	as bee	1
re-assigned f	rom EL449	to HVS002	with respect	to the update	in quality mar	nagement sy	stem.		
Calibrated by	-	Kit Au				Checked	l by	:	Pualine Wong
Date :	1	3-Jul-16				Date		:	13-Jul-16



TESTING	Callb	ration L	Jala 101 I	ngn von	ille Sali	ipier (13	or Sampler	)	
Location :		CMA2a				Calbratio	on Date	:	12-Sep-16
Equipment no.		HVS002				Calbratio	on Due Date	:	13-Nov-16
								-	
CALIBRATION OF CONT	NUOUS FL	OW RECO	RDER						
				Ambient Co	ondition				
Temperature, T <sub>a</sub>		302	2	Kelvin	Pressure, P	1	10	010	mmHg
			Orifice	Transfer Star	dard Inform	ation			
Equipment No.		Ori002		Slope, m <sub>c</sub>	2.107	14	Intercept, bc	T	-0.05158
Last Calibration Date		20-May-1	6	•	( H	x P <sub>a</sub> / 10	13.3 x 298 / T	r <sub>a</sub> ) 1/	2
Next Calibration Date		20-May-1	7		=	m <sub>c</sub>	$x Q_{std} + b_c$		
				Calibration	of TSP				
Calibration	Ma	nometer R	eading	Q,	std	Contir	nuous Flow		IC
Point	н	(inches of v	water)	(m <sup>3</sup> /	min.)	Rec	order, W	(W(P,	/1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)
	(up)	(down)	(difference)	X-a	COMMUNICATION OF THE PROPERTY		CFM)		Y-axis
1	1.4	1.4	2.8	0.81	0.8120 2		28		27.7686
2	2.3	2.3	4.6	1.03	339		34		33.7190
3	4.3	4.3	8.6	1.40	)47		44		43.6364
4	4.9	4.9	9.8	1.49	79		48		47.6034
5	6.0	6.0	12.0	1.65	549		56		55.5372
By Linear Regression of Y	on X								
	Slope, m	=	31.4	606	Int	ercept, b =	1.3	620	
Correlation (	Coefficient*	=	0.9	900					
Calibration	n Accepted	=	Yes/	Ne**					
* if Correlation Coefficient <	< 0.990, che	eck and reca	alibration agai	n.					,
** D. l. t									
** Delete as appropriate.  As per client's	s provided i	nformation,	the equipmer	nt reference no	o. of the calib	orated High V	olume Sampler ha	as beer	1
Remarks : re-assigned f	rom FI 440	to HVS002	with respect t	o the undato i	n quality man	agement eve	tem		
		ackey MA	respect t	o ino upuale i	quanty mai	Checked			Pualine Wong
Calibrated by		2-Sep-16				Date	~,	. —	12-Sep-16
Date		_ 00p 10				Duto		·	12-06p-10



IESTING				3				,	
Location	:	CMA3a				Calbrat	ion Date	:	13-Jul-16
Equipment no.	:	HVS012				Calbrat	ion Due Date	:	13-Sep-16
	,							S <del></del>	
CALIBRATION OF COM	I SHOLIKITI	EI OW BEC	OPDER						
CALIBRATION OF CON	111110003	PLOW REC	OKDEK					1000	
				Ambient Co					
Temperature, T <sub>a</sub>		302	<u> </u>	Kelvin	Pressure, P	a		1005	mmHg
per a l'investigation			Orifice To	ransfer Star	dard Informa	ation			
Equipment No.		Ori002		Slope, m <sub>c</sub>	2.107	14	Intercept, bc		-0.05158
Last Calibration Date		20-May-1	6		(Hx	(P <sub>a</sub> / 10	13.3 x 298 /	$T_a$ )	1/2
Next Calibration Date		20-May-1	7		. =		$Q_{std} + b_c$	α,	
						48888			
				Calibration					
Calibration		nometer R			std	Contin	uous Flow		IC
Point	Н (	inches of	water)	(m <sup>3</sup> / min.)		Reco	order, 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	5.4	5.4	10.8	1.5	1.5674		52		51.4425
2	4.4	4.4	8.8	1.4	172		48		47.4854
3	3.4	3.4	6.8	1.2	488		42		41.5497
4	2.4	2.4	4.8	1.0	531		38		37.5926
5	1.4	1.4	2.8	0.8	101		30		29.6784
By Linear Regression of	Y on X								
	Slope, m	=	28.4	435	Int	tercept, b =	= 6.	8685	
Correlation (	Coefficient*	=	0.99	75					
Calibratio	n Accepted	=	Yes/						
	V 900 - 30 30 30 4 <b>-</b> 30 7 <del>-</del> 30 7 - 30 7		A-4-1 Section 1	and a second					
					- n		· · · · · · · · · · · · · · · · · · ·		
* if Correlation Coefficien	t < 0.990, cl	neck and re	calibration ag	ain.					
** Delete as appropriate.									
Remarks : As per clier	nt's provided	I informatio	n, the equipm	ent referenc	e no. of the o	alibrated Hi	gh Volume Sam	ıpler h	as been
re-assigned	from EL33	3 to HVS01	2 with respec	t to the upda	te in quality n	nanagemen	t system.		
Calibrated by		Kit Au				Checked	d by	:	Pauline Wong
Date :	1	3-Jul-16				Date		:	13-Jul-16



Location :	21100-00-1-0	CMA3a			Calbration Date : 12-Sep-					
Equipment no.		HVS012				Calbra	ation Due Date	:	13-Nov-16	
CALIBRATION OF CONT	INUOUS I	FLOW REC	ORDER							
				Ambient Co	ndition					
Temperature, T <sub>a</sub>		302	2	Kelvin	Pressure, P	a		1010	mmHg	
			Orifice T	ransfer Stan	dard Informa	ation				
Equipment No.		Ori002		Slope, m <sub>c</sub>	2.107	14	Intercept, bo		-0.05158	
Last Calibration Date		20-May-1	6	$(H \times P_a / 1013.3 \times 298 / T_a)^{1/2}$						
Next Calibration Date		20-May-1	7	$= m_c \times Q_{std} + b_c$						
				Calibration	of TSP					
Calibration	Ma	nometer R	eading	Q	std	Conti	nuous Flow		IC	
Point	Н (	inches of	water)	(m <sup>3</sup> /	min.)	Re	corder, W	(W(P <sub>a</sub>	/1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)	
	(up)	(down)	(difference)	X-a	xis		(CFM)		Y-axis	
1	1.2	1.2	2.4	0.7	536		24		23.8017	
2	1.8	1.8	3.6	0.9	175		32		31.7356	
3	3.2	3.2	6.4	1.2	152		40		39.6695	
4	4.2	4.2	8.4	1.3	886		45		44.6281	
5	5.4	5.4	10.8	1.5	712		50		49.5868	
By Linear Regression of Y	on X									
	Slope, m	=	30.5	105	Int	tercept, b	= 2	.2112		
Correlation Co	=	943								
Calibration	Accepted	=	Yes/	<del>\\0</del> **						

	1000					
Remarks :	As per clie	ent's	s provided information, the equipmen	t reference no. of the calibrated High Volume	Sample	r has been
	re-assigne	ed fr	rom EL333 to HVS012 with respect to	o the update in quality management system.	100	
Calibrated b	у	:_	Jackey MA	Checked by	:_	Pauline Wong
Date		:	12-Sep-16	Date	:	12-Sep-16

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

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



Location :		CMA4a				Calbration Date : 1			
Equipment no.		HVS004	15			Calbratio	on Due Date	: 13-Sep-16	
	(A.								
CALIBRATION OF CON	TINUOUS F	LOW REC	ORDER						
				Ambient C	Condition				
Temperature, T <sub>a</sub>		302		Kelvin	Pressure, P	a	10	005 mmHg	
			Orifice	Transfer Sta	ındard İnfori	mation			
Equipment No.		Ori002		Slope, m <sub>c</sub>	2.107	14	Intercept, bc	-0.05158	
Last Calibration Date		20-May-1	6		( H	1 x P <sub>a</sub> / 10	)13.3 x 298 / T	a) 1/2	
Next Calibration Date		20-May-1	7	$= m_c \times Q_{std} + b_c$					
				Calibratio	n of TSP				
Calibration	Mar	nometer Re	eading	Q,	std	IC			
Point	Н (	inches of v	vater)	(m <sup>3</sup> /	min.)	Red	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)		
	(up)	(down)	(difference)	X-a	xis	i)	(CFM)	Y-axis	
1	5.5	5.5	11.0	1.58	816		52	51.4425	
2	4.4	4.4	8.8	1.41	172 48		48	47.4854	
3	3.4	3.4	6.8	1.24	488		40	39.5711	
4	2.1	2.1	4.2	0.98	366		32	31.6569	
5	1.5	1.5	3.0	0.83	377		24	23.7427	
By Linear Regression of Y	on X								
	Slope, m	=	37.0	)124	In	tercept, b =	-6.1	671	
Correlation C	Coefficient*	=	0.9	947					
Calibration	n Accepted	=	Yes	'No**	e e				
* if Correlation Coefficient	< 0.990, ch	eck and re	calibration ag	ain.					
** Delete as appropriate.									
	t'a pravidad	information	the equipme	ant reference	no of the or	librated High	Volumo Samplar I	ana haan	
Remarks :	is provided	iniormation	i, trie equipmo	ent reference	no. or the ca	mbrated riigh	Volume Sampler I	Ido DECII	
re-assigned	from EL390	) to HVS00	4 with respec	to the update	e in quality m	anagement s	ystem.		
Calibrated by		Kit Au				Checked	by	: Pauline Wong	
Date :	1	3-Jul-16				Date		: 13-Jul-16	



TESTING	Callb	auon	Data 101	nigii voi	uille Sai	iihiei (	or Sample	1)	
Location :		CMA4a				Calbrat	ion Date	:	12-Sep-16
Equipment no.	And the same of th	HVS004				Calbrat	ion Due Date	:	13-Nov-16
0.44 IDD 4710 V 07 00 V		TI OW DEG							
CALIBRATION OF CON	IINUOUS	-LOW REC	ORDER						
	T			Ambient C					
Temperature, T <sub>a</sub>		302	2	Kelvin	Pressure, P	a	1	010	mmHg
			Orifice	Transfer Sta	ndard Infor	mation			
Equipment No.		Ori002		Slope, m <sub>c</sub>	2.107	14	Intercept, bc		-0.05158
Last Calibration Date		20-May-1	16	(H x P <sub>a</sub> / 1013.3 x			013.3 x 298 /	$T_a)^{1/2}$	?
Next Calibration Date		20-May-1	17		=	m c	$x Q_{std} + b_c$		
				Calibratio	n of TSP				
Calibration	Ma	nometer R	eading	Q	std	Cont	inuous Flow		IC
Point	н	inches of	water)	(m³ / min.) Recorder, W		(W(Ps	/1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)		
	(up)	(down)	(difference)	X-a	axis (CF		(CFM)		Y-axis
1	1.4	1.4	2.8	0.8	.8120 22		22		21.8182
2	2.2	2.2	4.4	1.01	117		32		31.7356
3	3.4	3.4	6.8	1.25	518		44		43.6364
4	4.4	4.4	8.8	1.42	207		48		47.6034
5	5.5	5.5	11.0	1.58	355		56		55.5372
By Linear Regression of Y	on X								
	Slope, m	=	42.7	7983	In	tercept, b =	-11.	.9911	
Correlation C	Coefficient*	=	0.9	952					
Calibration	Accepted	=	Yes	/Ne**					
* if Correlation Coefficient	< 0.990, cł	neck and re	calibration ag	ain.					
** Delete as appropriate.									
As per clien	t's provided	l informatio	n, the equipme	ent reference	no. of the ca	llibrated Hig	h Volume Sampler	has bee	ın.
Remarks :	from El 30	0 to HIVEO	)4 with respec	t to the undet	in quality m	anagement	svetem		
re-assigned		ackey MA	- with respec	t to the upuale	, in quality III	Checke			Pauline Wong
Calibrated by		2-Sep-16				Date	a by	· —	12-Sep-16
Date	1	2-06h-10				Date			12-3ep-10



Location	:	CMA5b	Calbration Date	:	13-Jul-16
Equipment no.	:	HVS010	Calbration Due Date	:	13-Sep-16

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

emperature, T <sub>a</sub>	302	Kelvin	Pressure, Pa	1005	mmHg
	Oi	rifice Transfer Sta	ndard Information	1	
Equipment No.	Ori002	Slope, m <sub>c</sub>	2.10714	Intercept, bc	-0.05158
Last Calibration Date	20-May-16		(HxF	P <sub>a</sub> / 1013.3 x 298 / T <sub>a</sub> )	1/2
Next Calibration Date	20-May-17		=	$m_c \times Q_{std} + b_c$	

**Ambient Condition** 

Calibration	Ма	Manometer Reading H (inches of water)		Q std	Continuous F	low	IC
Point	н			(m <sup>3</sup> / min.)	Recorder, V	v (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	5.5	5.5	11.0	1.5816	58		57.3782
2	4.3	4.3	8.6	1.4013	53		52.4318
3	3.4	3.4	6.8	1.2488	48		47.4854
4	2.2	2.2	4.4	1.0093	41		40.5604
5	1.4	1.4	2.8	0.8101	34		33.6355
Linear Regression of Y	on X				•		
	Slope, m	=	30.6	917	Intercept, b =	9.1551	
Correlation	Coefficient*	=	0.99	993	-		

* if	Correlation	Coefficient	< 0.990	check and	recalibration again	

Calibration Accepted

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

Yes/No\*\*

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

Calibrated by	:	Kit Au	Checked by	:	Pauline Wong
Date	:	13-Jul-16	Date	: _	13-Jul-16



Location	:	CMA5b	Calbration Date	:	12-Sep-16
Equipment no.	:	HVS010	Calbration Due Date	:	13-Nov-16

	Mark Harry			Ambient Condition				
emperature, T <sub>a</sub>		302		Kelvin Pressur	e, P <sub>a</sub>		1010	mmHg
		-	Orifice 7	Fransfer Standard Inf	ormation			
Equipment No.		Ori002		Slope, m <sub>c</sub> 2	.10714	Intercept, bo		-0.05158
Last Calibration Date		20-May-1	6		$(HxP_a/10$	13.3 x 298 /	$(T_a)^{1/2}$	
Next Calibration Date		20-May-1	7		$= m_c$	$Q_{std} + b_c$		
				Calibration of TSP				
Calibration	Ma	nometer R	eading	Q <sub>std</sub>	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> /35.3
	(up)	(down)	(difference)	X-axis		CFM)	,	Y-axis
1	1.4	1.4	2.8	0.8120		34	3	33.7190
2	2.2	2.2	4.4	1.0117		42	4	11.6529
3	3.4	3.4	6.8	1.2518		50	4	19.5868
4	4.4	4.4	8.8	1.4207		56	5	55.5372
5	5.6	5.6	11.2	1.5996		61	6	60.4959
Linear Regression of Y	on X		·					
	Slope, m	=	34.0	485	Intercept, b =	6	.6876	
Correlation C	coefficient*	=	0.99	985				
Calibration	Accepted	=	Yes/	No**				
- M. W-11		To project						
f Correlation Coefficient <	0.990, che	eck and rec	alibration agai	n.				
Controlation Committee	0.000, 0							

**	Da	lete	20	20	nro	nric	to
	DE	IELE	as	aυ	טוט	DITE	uc.

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.

Checked by Pauline Wong Calibrated by Jackey MA 12-Sep-16 Date 12-Sep-16 Date



Location	:	MA1w	Calbration Date	:	13-Jul-16
Equipment no.	:	HVS008	Calbration Due Date	: [	13-Sep-16

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition		HK1610369		
Temperature, T <sub>a</sub>	302	Kelvin Pressure, P <sub>a</sub>	1005	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	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	6.6	6.6	13.2	1.7302	58	57.3782			
2	5.4	5.4	10.8	1.5674	52	51.4425			
3	4.2	4.2	8.4	1.3852	44	43.5283			
4	2.5	2.5	5.0	1.0743	32	31.6569			
5	1.6	1.6	3.2	0.8643	22	21.7641			
By Linear Regression of `	Y on X								
	Slope, m	=	40.9	142 In	tercept, b = -	13.0277			
Correlation (	Coefficient*	=	0.99	93					
Calibratio	n Accepted	=	Yes/4	<del>10**</del>					

* i	f Correlation	Coefficient	< 0.990,	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.

 Calibrated by Date
 :
 Kit Au
 Checked by Date
 :
 Pauline Wong

 13-Jul-16
 Date
 :
 13-Jul-16



MA1w HVS008 Calbration Due Date : Equipment no.

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition		A STATE OF THE STATE OF	HK1610369		
Temperature, T <sub>a</sub>	302	Kelvin	Pressure, P <sub>a</sub>	1010	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>	$a_c \times Q_{std} + b_c$					

				_		
Calibration	Mai	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	1.8	1.8	3.6	0.9175	24	23.8017
2	2.6	2.6	5.2	1.0977	32	31.7356
3	4.2	4.2	8.4	1.3886	44	43.6364
4	5.4	5.4	10.8	1.5712	52	51.5703
5	6.6	6.6	13.2	1.7345	58	57.5207
Linear Regression of Y	on X					
	Slope, m	=	41.44	75 I	ntercept, b =	13.9650
Correlation C	oefficient*	=	0.999	97	-	
Calibration	Accepted	=	Yes/N	<del>0</del> **		

if Correlation Coefficient < 0	.990, 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.

Pauline Wong Calibrated by Jackey MA Checked by Date Date 12-Sep-16 12-Sep-16



Location	:	MA1e	Calbration Date	:	13-Jul-16	
Equipment no.	:	HVS007	Calbration Due Date	: -	13-Sep-16	

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition									
Temperature, T <sub>a</sub>	302	Kelvin Pressure, Pa	1005	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 Manometer Reading 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	6.6	6.6	13.2	1.7302	63	62.3246				
2	5.4	5.4	10.8	1.5674	56	55.3996				
3	4.3	4.3	8.6	1.4013	44	43.5283				
4	2.4	2.4	4.8	1.0531	32	31.6569				
5	1.6	1.6	3.2	0.8643	20	19.7856				

By Linear	Regression	of	Y	on X	
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Slope, m = 47.8740 Intercept, b = -20.8106

Correlation Coefficient\* = 0.9942

Calibration Accepted = Yes/Ne\*\*

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
 :
 Kit Au
 Checked by
 :
 Pauline Wong

 Date
 :
 13-Jul-16
 Date
 :
 13-Jul-16

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



Location	:	MA1e	Calbration Date	:	12-Sep-16
Equipment no.	:	HVS007	Calbration Due Date	: [	13-Nov-16

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition									
Temperature, T <sub>a</sub>	302	Kelvin Pressure, Pa	1010	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		= <i>m</i>	$c \times Q_{std} + b_c$				

Calibration of TSP								
Calibration	Ma	Manometer Reading		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	1.4	1.4	2.8	0.8120	19	18.8430		
2	2.6	2.6	5.2	1.0977	31	30.7438		
3	4.2	4.2	8.4	1.3886	44	43.6364		
4	5.4	5.4	10.8	1.5712	54	53.5538		
5	6.7	6.7	13.4	1.7474	62	61.4877		

Correlation Coefficient\* 0.9991 Yes/No\*\* Calibration Accepted

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.

Pauline Wong Calibrated by Checked by Jackey MA 12-Sep-16 Date Date 12-Sep-16

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