

AECOM Asia Company Limited

TSP High Volume Sampler

Field Calibration Report

Station	Tung Chung Development Pier (AMS2)	Operator:	Shum Kam Yuen
Cal. Date:	7-Sep-12	Next Due Date:	7-Nov-12
Equipment No.:	A-001-78T	Serial No.	3383

Ambient Condition			
Temperature, Ta (K)	302	Pressure, Pa (mmHg)	758.7

Orifice Transfer Standard Information					
Serial No:	843	Slope, mc	2.00834	Intercept, bc	-0.02923
Last Calibration Date:	15-Nov-11	$mc \times Qstd + bc = [DH \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	15-Nov-12	$Qstd = \{[DH \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

Calibration of TSP Sampler					
Resistance Plate No.	Orifice			HVS Flow Recorder	
	DH (orifice), in. of water	$[DH \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (m ³ /min) X-axis	Flow Recorder Reading (CFM)	Continuous Flow Recorder Reading IC (CFM) Y-axis
18	8.5	2.89	1.46	45.0	44.66
13	7.6	2.74	1.38	42.0	41.69
10	5.6	2.35	1.18	36.0	35.73
7	3.9	1.96	0.99	31.0	30.77
5	2.4	1.54	0.78	24.0	23.82

By Linear Regression of Y on X

Slope, mw = 30.1768 Intercept, bw = 0.4066

Correlation Coefficient* = 0.9979

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation	
From the TSP Field Calibration Curve, take Qstd = 1.30m ³ /min	
From the Regression Equation, the "Y" value according to	
$mw \times Qstd + bw = IC \times [(Pa/760) \times (298/Ta)]^{1/2}$	
Therefore, Set Point; IC = (mw x Qstd + bw) x [(760 / Pa) x (Ta / 298)] ^{1/2} =	<u>39.94</u>

Remarks: _____

QC Reviewer: WS CHAN Signature: [Signature] Date: 07/09/12

AECOM Asia Company Limited

TSP High Volume Sampler

Field Calibration Report

Station	Site Boundary of Site Office (WA2) (AMS3A)	Operator:	Shum Kam Yuen
Cal. Date:	7-Sep-12	Next Due Date:	7-Nov-12
Equipment No.:	A-001-79T	Serial No.	3384

Ambient Condition			
Temperature, Ta (K)	302	Pressure, Pa (mmHg)	758.7

Orifice Transfer Standard Information					
Serial No:	843	Slope, mc	2.00834	Intercept, bc	-0.02923
Last Calibration Date:	15-Nov-11	$mc \times Qstd + bc = [DH \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	15-Nov-12	$Qstd = \{[DH \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

Calibration of TSP Sampler					
Resistance Plate No.	Orifice			HVS Flow Recorder	
	DH (orifice), in. of water	$[DH \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (m ³ /min) X-axis	Flow Recorder Reading (CFM)	Continuous Flow Recorder Reading IC (CFM) Y-axis
18	8.3	2.86	1.44	46.0	45.66
13	6.8	2.59	1.30	38.0	37.72
10	5.5	2.33	1.17	32.0	31.76
7	4.0	1.99	1.00	24.0	23.82
5	2.5	1.57	0.80	15.0	14.89

By Linear Regression of Y on X

Slope, mw = 47.3617

Intercept, bw = -23.3570

Correlation Coefficient* = 0.9968

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation	
From the TSP Field Calibration Curve, take Qstd = 1.30m ³ /min	
From the Regression Equation, the "Y" value according to	
$mw \times Qstd + bw = IC \times [(Pa/760) \times (298/Ta)]^{1/2}$	
Therefore, Set Point; IC = (mw x Qstd + bw) x [(760 / Pa) x (Ta / 298)] ^{1/2} =	<u>38.50</u>

Remarks: _____

QC Reviewer: WS CHAN

Signature: RA

Date: 7/9/12

AECOM Asia Company Limited

TSP High Volume Sampler

Field Calibration Report

Station Hong Kong SkyCity Marriott Hotel (AMS7) Operator: Shum Kam Yuen
 Cal. Date: 7-Sep-12 Next Due Date: 7-Nov-12
 Equipment No.: A-001-80T Serial No. 3385

Ambient Condition			
Temperature, Ta (K)	302.0	Pressure, Pa (mmHg)	758.7

Orifice Transfer Standard Information					
Serial No:	843	Slope, mc	2.00834	Intercept, bc	-0.02923
Last Calibration Date:	15-Nov-11	$mc \times Qstd + bc = [DH \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	15-Nov-12	$Qstd = \{[DH \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

Calibration of TSP Sampler					
Resistance Plate No.	Orifice			HVS Flow Recorder	
	DH (orifice), in. of water	$[DH \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (m ³ /min) X-axis	Flow Recorder Reading (CFM)	Continuous Flow Recorder Reading IC (CFM) Y-axis
18	8.2	2.84	1.43	45.0	44.66
13	6.8	2.59	1.30	38.0	37.72
10	5.5	2.33	1.17	33.0	32.75
7	4.0	1.99	1.00	24.0	23.82
5	3.6	1.88	0.95	21.0	20.84

By Linear Regression of Y on X

Slope, mw = 48.8998

Intercept, bw = -25.3680

Correlation Coefficient* = 0.9971

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation	
From the TSP Field Calibration Curve, take Qstd = 1.30m ³ /min	
From the Regression Equation, the "Y" value according to	
$mw \times Qstd + bw = IC \times [(Pa/760) \times (298/Ta)]^{1/2}$	
Therefore, Set Point; IC = (mw x Qstd + bw) x [(760 / Pa) x (Ta / 298)] ^{1/2} =	<u>38.49</u>

Remarks: _____

QC Reviewer: WS CHAN

Signature: RA

Date: 7/9/12



TISCH ENVIRONMENTAL, INC.
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AIR POLLUTION MONITORING EQUIPMENT

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Nov 15, 2011 Rootmeter S/N 0438320 Ta (K) - 294
Operator Tisch Orifice I.D. - 0843 Pa (mm) - 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	NA	NA	1.00	1.3810	3.2	2.00
2	NA	NA	1.00	0.9810	6.4	4.00
3	NA	NA	1.00	0.8760	7.8	5.00
4	NA	NA	1.00	0.8370	8.8	5.50
5	NA	NA	1.00	0.6890	12.7	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
0.9934	0.7193	1.4125	0.9957	0.7210	0.8866
0.9891	1.0083	1.9976	0.9915	1.0107	1.2538
0.9871	1.1269	2.2334	0.9895	1.1295	1.4018
0.9859	1.1779	2.3424	0.9882	1.1807	1.4703
0.9807	1.4233	2.8251	0.9830	1.4267	1.7732
Qstd slope (m) = 2.00834			Qa slope (m) = 1.25759		
intercept (b) = -0.02923			intercept (b) = -0.01835		
coefficient (r) = 0.99994			coefficient (r) = 0.99994		
y axis = SQRT[H2O(Pa/760) (298/Ta)]			y axis = SQRT[H2O(Ta/Pa)]		

CALCULATIONS

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

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

For subsequent flow rate calculations:

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

EQUIPMENT CALIBRATION RECORD

Type: Laser Dust Monitor
 Manufacturer/Brand: SIBATA
 Model No.: LD-3
 Equipment No.: A.005.07a
 Sensitivity Adjustment Scale Setting: 557 CPM
 Operator: Mike Shek (MSKM)

Standard Equipment

Equipment: Rupprecht & Patashnick TEOM®
 Venue: Cyberport (Pui Ying Secondary School)
 Model No.: Series 1400AB
 Serial No: Control: 140AB219899803
 Sensor: 1200C143659803 K_o: 12500
 Last Calibration Date*: 5 May 2012

*Remarks: Recommended interval for hardware calibration is 1 year

Calibration Result

Sensitivity Adjustment Scale Setting (Before Calibration): 557 CPM
 Sensitivity Adjustment Scale Setting (After Calibration): 557 CPM

Hour	Date (dd-mm-yy)	Time	Ambient Condition		Concentration ¹ (mg/m ³) Y-axis	Total Count ²	Count/ Minute ³ X-axis
			Temp (°C)	R.H. (%)			
1	02-06-12	13:30 - 14:30	27.9	63	0.04070	1628	27.13
2	02-06-12	14:30 - 15:30	27.9	63	0.04167	1669	27.82
3	02-06-12	15:30 - 16:30	28.2	64	0.04283	1713	28.55
4	02-06-12	16:30 - 17:30	28.1	63	0.04146	1655	27.58

Note: 1. Monitoring data was measured by Rupprecht & Patashnick TEOM®
 2. Total Count was logged by Laser Dust Monitor
 3. Count/minute was calculated by (Total Count/60)

By Linear Regression of Y or X

Slope (K-factor): 0.0015
 Correlation coefficient: 0.9951

Validity of Calibration Record: 1 June 2013

Remarks:

QC Reviewer: YW Fung

Signature: 

Date: 4 June 2012

EQUIPMENT CALIBRATION RECORD

Type: Laser Dust Monitor
 Manufacturer/Brand: SIBATA
 Model No.: LD-3
 Equipment No.: A.005.08a
 Sensitivity Adjustment Scale Setting: 702 CPM
 Operator: Mike Shek (MSKM)

Standard Equipment

Equipment: Rupprecht & Patashnick TEOM®
 Venue: Cyberport (Pui Ying Secondary School)
 Model No.: Series 1400AB
 Serial No: Control: 140AB219899803
 Sensor: 1200C143659803 K_o: 12500
 Last Calibration Date*: 5 May 2012

*Remarks: Recommended interval for hardware calibration is 1 year

Calibration Result

Sensitivity Adjustment Scale Setting (Before Calibration): 702 CPM
 Sensitivity Adjustment Scale Setting (After Calibration): 702 CPM

Hour	Date (dd-mm-yy)	Time	Ambient Condition		Concentration ¹ (mg/m ³) Y-axis	Total Count ²	Count/ Minute ³ X-axis
			Temp (°C)	R.H. (%)			
1	02-07-12	13:30 - 14:30	28.9	73	0.04127	1545	25.75
2	02-07-12	14:30 - 15:30	29.0	73	0.04163	1566	26.10
3	02-07-12	15:30 - 16:30	29.0	73	0.04334	1630	27.17
4	02-07-12	16:30 - 17:30	29.1	74	0.04426	1665	27.74

Note: 1. Monitoring data was measured by Rupprecht & Patashnick TEOM®
 2. Total Count was logged by Laser Dust Monitor
 3. Count/minute was calculated by (Total Count/60)

By Linear Regression of Y or X

Slope (K-factor): 0.0016
 Correlation coefficient: 0.9952

Validity of Calibration Record: 1 July 2013

Remarks:

QC Reviewer: YW Fung

Signature: 

Date: 3 July 2012

EQUIPMENT CALIBRATION RECORD

Type:	<i>Laser Dust Monitor</i>
Manufacturer/Brand:	<i>SIBATA</i>
Model No.:	<i>LD-3</i>
Equipment No.:	<i>A.005.09a</i>
Sensitivity Adjustment Scale Setting:	<i>797 CPM</i>
Operator:	<i>Mike Shek (MSKM)</i>

Standard Equipment

Equipment:	<i>Rupprecht & Patashnick TEOM®</i>		
Venue:	<i>Cyberport (Pui Ying Secondary School)</i>		
Model No.:	<i>Series 1400AB</i>		
Serial No:	Control:	<i>140AB219899803</i>	
	Sensor:	<i>1200C143659803</i>	K _o : <i>12500</i>
Last Calibration Date*:	<i>5 May 2012</i>		

*Remarks: Recommended interval for hardware calibration is 1 year

Calibration Result

Sensitivity Adjustment Scale Setting (Before Calibration):	<u>797</u>	CPM
Sensitivity Adjustment Scale Setting (After Calibration):	<u>797</u>	CPM

Hour	Date (dd-mm-yy)	Time	Ambient Condition		Concentration ¹ (mg/m ³) Y-axis	Total Count ²	Count/ Minute ³ X-axis
			Temp (°C)	R.H. (%)			
1	02-06-12	13:30 - 14:30	27.9	63	0.04070	1626	27.10
2	02-06-12	14:30 - 15:30	27.9	63	0.04167	1667	27.78
3	02-06-12	15:30 - 16:30	28.2	64	0.04283	1708	28.47
4	02-06-12	16:30 - 17:30	28.1	63	0.04146	1659	27.65

Note: 1. Monitoring data was measured by Rupprecht & Patashnick TEOM®
2. Total Count was logged by Laser Dust Monitor
3. Count/minute was calculated by (Total Count/60)

By Linear Regression of Y or X

Slope (K-factor):	0.0015
Correlation coefficient:	0.9949

Validity of Calibration Record: 1 June 2013

Remarks:

QC Reviewer: YW Fung Signature: [Signature] Date: 4 June 2012

EQUIPMENT CALIBRATION RECORD

Type: Laser Dust Monitor
 Manufacturer/Brand: SIBATA
 Model No.: LD-3
 Equipment No.: A.005.10a
 Sensitivity Adjustment Scale Setting: 753 CPM
 Operator: Mike Shek (MSKM)

Standard Equipment

Equipment: Rupprecht & Patashnick TEOM®
 Venue: Cyberport (Pui Ying Secondary School)
 Model No.: Series 1400AB
 Serial No: Control: 140AB219899803
 Sensor: 1200C143659803 K_o: 12500
 Last Calibration Date*: 5 May 2012

*Remarks: Recommended interval for hardware calibration is 1 year

Calibration Result

Sensitivity Adjustment Scale Setting (Before Calibration): 753 CPM
 Sensitivity Adjustment Scale Setting (After Calibration): 753 CPM

Hour	Date (dd-mm-yy)	Time	Ambient Condition		Concentration ¹ (mg/m ³) Y-axis	Total Count ²	Count/ Minute ³ X-axis
			Temp (°C)	R.H. (%)			
1	02-06-12	12:45 - 13:45	27.9	63	0.04041	1613	26.88
2	02-06-12	13:45 - 14:45	27.9	63	0.04085	1631	27.18
3	02-06-12	14:45 - 15:45	27.9	63	0.04154	1663	27.72
4	02-06-12	15:45 - 16:45	28.1	64	0.04272	1711	28.52

Note: 1. Monitoring data was measured by Rupprecht & Patashnick TEOM®
 2. Total Count was logged by Laser Dust Monitor
 3. Count/minute was calculated by (Total Count/60)

By Linear Regression of Y or X

Slope (K-factor): 0.0015
 Correlation coefficient: 0.9939

Validity of Calibration Record: 1 June 2013

Remarks:

QC Reviewer: YW Fung

Signature: 

Date: 4 June 2012

EQUIPMENT CALIBRATION RECORD

Type: Laser Dust Monitor
 Manufacturer/Brand: SIBATA
 Model No.: LD-3
 Equipment No.: A.005.11a
 Sensitivity Adjustment Scale Setting: 799 CPM

Operator: Mike Shek (MSKM)

Standard Equipment

Equipment: Rupprecht & Patashnick TEOM®
 Venue: Cyberport (Pui Ying Secondary School)
 Model No.: Series 1400AB
 Serial No: Control: 140AB219899803
 Sensor: 1200C143659803 K₀: 12500
 Last Calibration Date*: 5 May 2012

*Remarks: Recommended interval for hardware calibration is 1 year

Calibration Result

Sensitivity Adjustment Scale Setting (Before Calibration): 799 CPM
 Sensitivity Adjustment Scale Setting (After Calibration): 799 CPM

Hour	Date (dd-mm-yy)	Time	Ambient Condition		Concentration ¹ (mg/m ³) Y-axis	Total Count ²	Count/ Minute ³ X-axis
			Temp (°C)	R.H. (%)			
1	02-07-12	13:45 - 14:45	29.0	73	0.04152	1659	27.65
2	02-07-12	14:45 - 15:45	29.0	73	0.04194	1670	27.83
3	02-07-12	15:45 - 16:45	29.1	74	0.04318	1725	28.75
4	02-07-12	16:45 - 17:45	29.1	74	0.04443	1780	29.67

Note: 1. Monitoring data was measured by Rupprecht & Patashnick TEOM®
 2. Total Count was logged by Laser Dust Monitor
 3. Count/minute was calculated by (Total Count/60)

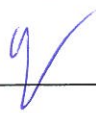
By Linear Regression of Y or X

Slope (K-factor): 0.0015
 Correlation coefficient: 0.9928

Validity of Calibration Record: 1 July 2013

Remarks:

QC Reviewer: YW Fung

Signature: 

Date: 3 July 2012

EQUIPMENT CALIBRATION RECORD

Type: Laser Dust Monitor
Manufacturer/Brand: SIBATA
Model No.: LD-3B
Equipment No.: A.005.13a
Sensitivity Adjustment Scale Setting: 643 CPM

Operator: Mike Shek (MSKM)

Standard Equipment

Equipment: Rupprecht & Patashnick TEOM®
Venue: Cyberport (Pui Ying Secondary School)
Model No.: Series 1400AB
Serial No: Control: 140AB219899803
Sensor: 1200C143659803 K₀: 12500
Last Calibration Date*: 5 May 2012

*Remarks: Recommended interval for hardware calibration is 1 year

Calibration Result

Sensitivity Adjustment Scale Setting (Before Calibration): 643 CPM
Sensitivity Adjustment Scale Setting (After Calibration): 643 CPM

Hour	Date (dd-mm-yy)	Time	Ambient Condition		Concentration ¹ (mg/m ³) Y-axis	Total Count ²	Count/ Minute ³ X-axis
			Temp (°C)	R.H. (%)			
1	02-06-12	13:30 - 14:30	27.9	63	0.04070	1623	27.05
2	02-06-12	14:30 - 15:30	27.9	63	0.04167	1663	27.72
3	02-06-12	15:30 - 16:30	28.2	64	0.04283	1771	28.52
4	02-06-12	16:30 - 17:30	28.1	63	0.04146	1656	27.60

Note: 1. Monitoring data was measured by Rupprecht & Patashnick TEOM®
2. Total Count was logged by Laser Dust Monitor
3. Count/minute was calculated by (Total Count/60)

By Linear Regression of Y or X

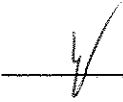
Slope (K-factor): 0.0015
Correlation coefficient: 0.9988

Validity of Calibration Record: 1 June 2013

Remarks:

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QC Reviewer: YW Fung

Signature: 

Date: 4 June 2012

EQUIPMENT CALIBRATION RECORD

Type: Laser Dust Monitor
 Manufacturer/Brand: SIBATA
 Model No.: LD-3B
 Equipment No.: A.005.14a
 Sensitivity Adjustment Scale Setting: 786 CPM
 Operator: Mike Shek (MSKM)

Standard Equipment

Equipment: Rupprecht & Patashnick TEOM®
 Venue: Cyberport (Pui Ying Secondary School)
 Model No.: Series 1400AB
 Serial No: Control: 140AB219899803
 Sensor: 1200C143659803 K_o: 12500
 Last Calibration Date*: 5 May 2012

*Remarks: Recommended interval for hardware calibration is 1 year

Calibration Result

Sensitivity Adjustment Scale Setting (Before Calibration): 786 CPM
 Sensitivity Adjustment Scale Setting (After Calibration): 786 CPM

Hour	Date (dd-mm-yy)	Time	Ambient Condition		Concentration ¹ (mg/m ³) Y-axis	Total Count ²	Count/ Minute ³ X-axis
			Temp (°C)	R.H. (%)			
1	02-06-12	13:15 - 14:15	27.9	63	0.04073	1746	29.10
2	02-06-12	14:15 - 15:15	27.9	63	0.04154	1778	29.63
3	02-06-12	15:15 - 16:15	28.1	64	0.04269	1830	30.50
4	02-06-12	16:15 - 17:15	28.1	64	0.04136	1769	29.48

Note: 1. Monitoring data was measured by Rupprecht & Patashnick TEOM®
 2. Total Count was logged by Laser Dust Monitor
 3. Count/minute was calculated by (Total Count/60)

By Linear Regression of Y or X

Slope (K-factor): 0.0014
 Correlation coefficient: 0.9963

Validity of Calibration Record: 1 June 2013

Remarks:

QC Reviewer: YW Fung Signature:  Date: 4 June 2012



綜合試驗有限公司
SOILS & MATERIALS ENGINEERING CO., LTD.

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E-mail: smec@cigismec.com Website: www.cigismec.com

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



CERTIFICATE OF CALIBRATION

Certificate No.: 11CA1221 01-01

Page 1 of 2

Item tested

Description:	Sound Level Meter (Type 1)	Microphone	Preamp
Manufacturer:	Rion Co., Ltd.	Rion Co., Ltd.	Rion Co., Ltd.
Type/Model No.:	NL 31	UC-53A	NH-21
Serial/Equipment No.:	00320534 / N.007.02A	90526	03581
Adaptors used:	-	-	-

Item submitted by

Customer Name: AECOM ASIA CO., LTD.
Address of Customer: -
Request No.: -
Date of receipt: 21-Dec-2011

Date of test: 23-Dec-2011

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	09-May-2012	CIGISMEC
Signal generator	DS 360	33873	30-May-2012	CEPREI
Signal generator	DS 360	61227	30-May-2012	CEPREI

Ambient conditions

Temperature: (22 ± 1) °C
Relative humidity: (60 ± 10) %
Air pressure: (1000 ± 5) hPa

Test specifications

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

Test results

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

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

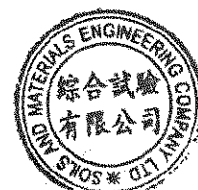
Actual Measurement data are documented on worksheets.

Approved Signatory:

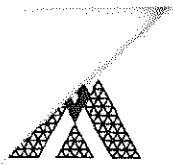
Huang Jian Min / Feng Jun Qi

Date: 16-Jan-2012

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.



綜合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD.

G/F, 9/F, 12/F, 13/F. & 20/F., Leader Centre 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.
香港黃竹坑道37號利達中心地下・9樓・12樓・13樓及20樓
E-mail: smec@cigismec.com Website: www.cigismec.com

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



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 11CA1221 01-01

Page 2 of 2

1, Electrical Tests

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

Test:	Subtest:	Status:	Uncertainty (dB) / Coverage Factor	
Self-generated noise	A	Pass	0.3	
	C	Pass	0.8	2.1
	Lin	Pass	1.6	2.2
Linearity range for Leq	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL Frequency weightings	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	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	N/A	N/A	
	Repeated at frequency of 100 Hz	N/A	N/A	
Time averaging	1 ms burst duty factor 1/10 ³ at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 ⁴ at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

2, Acoustic tests

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

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

3, Response to associated sound calibrator

N/A

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

Calibrated by:

Fung Chi Yip

Date: 23-Dec-2011

- End -

Checked by:

Chan Chun Lam

Date: 16-Jan-2012

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



CERTIFICATE OF CALIBRATION

Certificate No.: 11CA1221 01-02

Page: 1 of 2

Item tested

Description: Acoustical Calibrator (Class 1)
Manufacturer: Rion Co., Ltd.
Type/Model No.: NC-73
Serial/Equipment No.: 10307216 / N.004.06
Adaptors used: -

Item submitted by

Customer: AECOM ASIA CO., LTD.
Address of Customer: -
Request No.: -
Date of receipt: 21-Dec-2011

Date of test: 16-Jan-2012

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2341427	18-May-2012	SCL
Preamplifier	B&K 2673	2239857	14-Dec-2011	CEPREI
Measuring amplifier	B&K 2610	2346941	15-Dec-2011	CEPREI
Signal generator	DS 360	61227	30-May-2012	CEPREI
Digital multi-meter	34401A	US36087050	09-Dec-2011	CEPREI
Audio analyzer	8903B	GB41300350	27-May-2012	CEPREI
Universal counter	53132A	MY40003662	30-May-2012	CEPREI

Ambient conditions

Temperature: 22 ± 1 °C
Relative humidity: 65 ± 5 %
Air pressure: 1005 ± 5 hPa

Test specifications

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

Test results

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

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

Approved Signatory:

Huang Jian Min / Feng Jun Qi

Date: 16-Jan-2012

Company Chop:



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



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 11CA1221 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.

(Output level in dB re 20 μ Pa)			
Frequency Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	Estimated Uncertainty dB
1000	94.00	93.92	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 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 = 990.6 Hz

Estimated uncertainty 0.2 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 = 0.7%

Estimated uncertainty 0.7%

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

Calibrated by:

Date:

Fung Chi Yip
16-Jan-2012

- End -

Checked by:

Date:

Chan Chun Lam
16-Jan-2012

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.



綜合試驗有限公司
SOILS & MATERIALS ENGINEERING CO., LTD.

G/F, 9/F, 12/F, 13/F & 20/F, Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.
香港黃竹坑道37號利達中心地下, 9樓, 12樓, 13樓及20樓
E-mail: smec@cigismec.com Website: www.cigismec.com

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



CERTIFICATE OF CALIBRATION

Certificate No.: 12CA0321 01-04

Page: 1 of 2

Item tested

Description: Acoustical Calibrator (Class 1)
Manufacturer: Rion Co., Ltd.
Type/Model No.: NC-73
Serial/Equipment No.: 10185482 / N.004.09
Adaptors used: -

Item submitted by

Customer: AECOM ASIA CO., LTD.
Address of Customer: -
Request No.: -
Date of receipt: 21-Mar-2012

Date of test: 21-Mar-2012

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2412857	18-May-2012	SCL
Preamplifier	B&K 2673	2239857	05-Jan-2013	CEPREI
Measuring amplifier	B&K 2610	2346941	29-Dec-2012	CEPREI
Signal generator	DS 360	61227	30-May-2012	CEPREI
Digital multi-meter	34401A	US36087050	16-Dec-2012	CEPREI
Audio analyzer	8903B	GB41300350	27-May-2012	CEPREI
Universal counter	53132A	MY40003662	30-May-2012	CEPREI

Ambient conditions

Temperature: 21 ± 1 °C
Relative humidity: 60 ± 10 %
Air pressure: 1005 ± 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.
3. 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

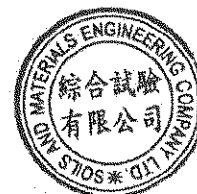
Details of the performed measurements are presented on page 2 of this certificate.

Approved Signatory:

Huang Jun Min/Feng Jun Qi

Date: 23-Mar-2012

Company Chop:



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

CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 12CA0321 01-04

Page: 2 of 2

1, Measured Sound Pressure Level

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

Frequency Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	Estimated Uncertainty dB
1000	94.00	93.59	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 uncertainty	0.005 dB
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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 = 990.9 Hz

Estimated uncertainty	0.7 Hz	Coverage factor $k = 2.2$
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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 = 0.6%

Estimated uncertainty	0.7%
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The uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95 %. A coverage factor of 2 is assumed unless explicitly stated.

Calibrated by:

Date:

Fung Chi Yip
21-Mar-2015

Checked by:

Date:

Chan Chun Lam
23-Mar-2012

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.

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: HK1218922
Amendment: 1
Date of Issue: 13/08/2012
Client: AECOM ASIA COMPANY LIMITED



Description: YSI Sonde
Brand Name: YSI
Model No.: YSI 6820-C-M
Serial No.: W.026.09
Equipment No.: W.026.09
Date of Calibration: 17 July, 2012

Date of next Calibration: 17 October, 2012

Parameters:

Conductivity

Method Ref: APHA (21st edition), 2510B

Expected Reading (uS/cm)	Displayed Reading (uS/cm)	Tolerance (%)
142.6	136.8	-4.1
6667	6747	1.2
12890	12470	-3.3
58670	57330	-2.3
Tolerance Limit (%)		10.0

Dissolved Oxygen

Method Ref: APHA (21st edition), 4500O: G

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
3.91	4.06	0.15
5.01	5.15	0.14
6.97	6.88	-0.09
Tolerance Limit ($\pm$ mg/L)		0.20

Salinity

Method Ref: APHA (21st edition), 2520B

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
0	0.03	--
10	10.22	2.2
20	19.06	-4.7
30	29.76	-0.8
Tolerance Limit ($\pm$ %)		10.0

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



Work Order: HK1218922
Amendment: 1
Date of Issue: 13/08/2012
Client: AECOM ASIA COMPANY LIMITED

Description: YSI Sonde
Brand Name: YSI
Model No.: YSI 6820-C-M
Serial No.: W.026.09
Equipment No.: W.026.09
Date of Calibration: 17 July, 2012

Date of next Calibration: 17 October, 2012

Parameters:

Temperature

Method Ref: Section 6 of International Accreditation New Zealand Technical
Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

Expected Reading (°C)	Displayed Reading (°C)	Tolerance (°C)
21.0	21.14	0.1
27.5	26.60	-0.9
33.0	32.05	-1.0
Tolerance Limit (°C)		2.0

Turbidity

Method Ref: APHA (21st edition), 2130B

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
0	0.1	--
4	4.1	2.5
10	10.0	0.0
20	20.0	0.0
50	49.7	-0.6
100	98.7	-1.3
Tolerance Limit (±%)		10.0

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



Work Order: HK1221702
Date of Issue: 16/08/2012
Client: AECOM ASIA COMPANY LIMITED

Description: YSI Sonde V2
Brand Name: YSI
Model No.: YSI 6820 V2
Serial No.: 12A101545
Equipment No.: W.026.35
Date of Calibration: 16 August, 2012

Date of next Calibration: 17 October, 2012

Parameters:

Conductivity

Method Ref: APHA (21st edition), 2510B

Expected Reading (uS/cm)	Displayed Reading (uS/cm)	Tolerance (%)
146.9	152.9	4.1
6667	6342	-4.9
12890	12110	-6.1
58670	56140	-4.3
Tolerance Limit (%)		10.0

Dissolved Oxygen

Method Ref: APHA (21st edition), 4500O: G

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
5.65	5.65	0.00
6.50	6.66	0.16
6.84	7.00	0.16
Tolerance Limit (±mg/L)		0.20

pH Value

Method Ref: APHA 21st Ed. 4500H:B

Expected Reading (pH Unit)	Displayed Reading (pH Unit)	Tolerance (pH unit)
4.0	3.97	-0.03
7.0	6.92	-0.08
10.0	9.92	-0.08
Tolerance Limit (±unit)		0.2

Salinity

Method Ref: APHA (21st edition), 2520B

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
0	0.08	--
10	9.85	-1.5
20	19.27	-3.7
30	29.22	-2.6
Tolerance Limit (±%)		10.0

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



Work Order: HK1221702
Date of Issue: 16/08/2012
Client: AECOM ASIA COMPANY LIMITED

Description: YSI Sonde V2
Brand Name: YSI
Model No.: YSI 6820 V2
Serial No.: 12A101545
Equipment No.: W.026.35
Date of Calibration: 16 August, 2012

Date of next Calibration: 17 October, 2012

Parameters:

Temperature

Method Ref: Section 6 of International Accreditation New Zealand Technical

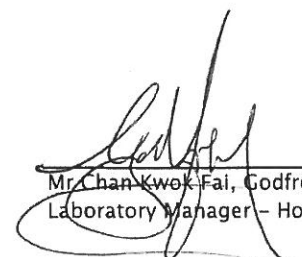
Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure.

Expected Reading (°C)	Displayed Reading (°C)	Tolerance (°C)
22.5	22.2	-0.3
25.5	25.0	-0.5
30.0	31.1	1.1
Tolerance Limit (°C)		2.0

Turbidity

Method Ref: APHA (21st edition), 2130B

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
0	0.0	--
4	3.9	-2.5
10	9.8	-2.0
20	20.1	0.5
50	50.2	0.4
100	98.9	-1.1
Tolerance Limit (±%)		10.0


Mr. Chan Kwok Fai, Godfrey
Laboratory Manager - Hong Kong

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



Work Order: HK1219200
Date of Issue: 25/07/2012
Client: AECOM ASIA COMPANY LIMITED

Description: pH Meter
Brand Name: Thermo
Model No.: Orion 230A+
Serial No.: 020365
Equipment No.: W.039.04
Date of Calibration: 24 July, 2012

Date of next Calibration: 24 October, 2012

Parameters:

pH Value

Method Ref: APHA 21st Ed. 4500H:B

Expected Reading (pH Unit)	Displayed Reading (pH Unit)	Tolerance (pH unit)
4.0	3.96	-0.04
7.0	6.94	-0.06
10.0	9.82	-0.18
Tolerance Limit ($\pm$ unit)		0.2