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.	Orfice			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; $IC = (mw \times Qstd + bw) \times [(760 / Pa) \times (Ta / 298)]^{1/2} =$ **39.94**

Remarks:

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

AECOM Asia Company Limited
TSP High Volume Sampler
Field Calibration Report

Station	Tung Chung Development Pier (AMS2)	Operator:	Shum Kam Yuen
Cal. Date:	2-Nov-12	Next Due Date:	2-Jan-13
Equipment No.:	A-001-78T	Serial No.	3383

Ambient Condition			
Temperature, Ta (K)	296	Pressure, Pa (mmHg)	761.9

Orifice Transfer Standard Information					
Serial No:	988	Slope, mc	1.97048	Intercept, bc	-0.00546
Last Calibration Date:	15-May-12	**mc x Qstd + bc = [DH x (Pa/760) x (298/Ta)]$^{1/2}$**			
Next Calibration Date:	15-May-13	**Qstd = {[DH x (Pa/760) x (298/Ta)]$^{1/2}$ -bc} / mc**			

Calibration of TSP Sampler

Resistance Plate No.	Orfice			HVS Flow Recorder	
	DH (orifice), in. of water	[DH x (Pa/760) x (298/Ta)]$^{1/2}$	Qstd (m^3/min) **X-axis**	Flow Recorder Reading (CFM)	Continuous Flow Recorder Reading IC (CFM) **Y-axis**
18	8.4	2.91	1.48	44.0	44.23
13	7.7	2.79	1.42	41.0	41.22
10	5.8	2.42	1.23	36.0	36.19
7	3.9	1.99	1.01	30.0	30.16
5	2.6	1.62	0.83	25.0	25.13

By Linear Regression of Y on X

Slope , mw = **28.3603** **Intercept, bw =** **1.5412**

Correlation Coefficient* = **0.9964**

*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 x Qstd + bw = IC x [(Pa/760) x (298/Ta)]$^{1/2}$

Therefore, Set Point; IC = (mw x Qstd + bw) x [(760 / Pa) x (Ta / 298)]$^{1/2}$= **38.21**

Remarks:

QC Reviewer: WS CHAN Signature: Date: 5/11/12

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 x Qstd + bc = [DH x (Pa/760) x (298/Ta)]$^{1/2}$**			
Next Calibration Date:	15-Nov-12	**Qstd = {[DH x (Pa/760) x (298/Ta)]$^{1/2}$ -bc} / mc**			

Calibration of TSP Sampler

Resistance Plate No.	Orfice			HVS Flow Recorder	
	DH (orifice), in. of water	[DH x (Pa/760) x (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 x Qstd + bw = IC x [(Pa/760) x (298/Ta)]$^{1/2}$

Therefore, Set Point; IC = (mw x Qstd + bw) x [(760 / Pa) x (Ta / 298)]$^{1/2}$= **38.50**

Remarks: _____

QC Reviewer: WS CHAN Signature: _____ Date: 7/9/12

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:	2-Nov-12	Next Due Date:	2-Jan-13
Equipment No.:	A-001-79T	Serial No.	3384

Ambient Condition			
Temperature, Ta (K)	296	Pressure, Pa (mmHg)	761.9

Orifice Transfer Standard Information					
Serial No:	988	Slope, mc	1.97048	Intercept, bc	-0.00546
Last Calibration Date:	15-May-12	**mc x Qstd + bc = [DH x (Pa/760) x (298/Ta)]$^{1/2}$**			
Next Calibration Date:	15-May-13	**Qstd = {[DH x (Pa/760) x (298/Ta)]$^{1/2}$ -bc} / mc**			

Calibration of TSP Sampler

Resistance Plate No.	Orfice			HVS Flow Recorder	
	DH (orifice), in. of water	[DH x (Pa/760) x (298/Ta)]$^{1/2}$	Qstd (m^3/min) **X - axis**	Flow Recorder Reading (CFM)	Continuous Flow Recorder Reading IC (CFM) **Y-axis**
18	8.1	2.86	1.45	47.0	47.25
13	6.8	2.62	1.33	39.0	39.21
10	5.6	2.38	1.21	33.0	33.18
7	4.0	2.01	1.02	23.0	23.12
5	2.6	1.62	0.83	15.0	15.08

By Linear Regression of Y on X

Slope , mw = **50.8691** **Intercept, bw =** **-27.9154**

Correlation Coefficient* = **0.9937**

*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 x Qstd + bw = IC x [(Pa/760) x (298/Ta)]$^{1/2}$

Therefore, Set Point; IC = (mw x Qstd + bw) x [(760 / Pa) x (Ta / 298)]$^{1/2}$= **38.01**

Remarks: _____

QC Reviewer: WS CHAN Signature: RM Date: 5/11/12

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 x Qstd + bc = [DH x (Pa/760) x (298/Ta)]$^{1/2}$**			
Next Calibration Date:	15-Nov-12	**Qstd = {[DH x (Pa/760) x (298/Ta)]$^{1/2}$ -bc} / mc**			

Calibration of TSP Sampler

Resistance Plate No.	Orfice			HVS Flow Recorder	
	DH (orifice), in. of water	[DH x (Pa/760) x (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 x Qstd + bw = IC x [(Pa/760) x (298/Ta)]$^{1/2}$

Therefore, Set Point; IC = (mw x Qstd + bw) x [(760 / Pa) x (Ta / 298)]$^{1/2}$= **38.49**

Remarks: _____

QC Reviewer: WS CHAN Signature: _____ 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:	2-Nov-12	Next Due Date:	2-Jan-13
Equipment No.:	A-001-80T	Serial No.	3385

Ambient Condition			
Temperature, Ta (K)	296	Pressure, Pa (mmHg)	761.9

Orifice Transfer Standard Information					
Serial No:	988	Slope, mc	1.97048	Intercept, bc	-0.00546
Last Calibration Date:	15-May-12	**mc x Qstd + bc = [DH x (Pa/760) x (298/Ta)]$^{1/2}$**			
Next Calibration Date:	15-May-13	**Qstd = {[DH x (Pa/760) x (298/Ta)]$^{1/2}$ -bc} / mc**			

Calibration of TSP Sampler

Resistance Plate No.	Orfice			HVS Flow Recorder	
	DH (orifice), in. of water	[DH x (Pa/760) x (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	2.88	1.46	45.0	45.24
13	6.8	2.62	1.33	38.0	38.20
10	5.5	2.36	1.20	33.0	33.18
7	4.0	2.01	1.02	24.0	24.13
5	3.6	1.91	0.97	21.0	21.11

By Linear Regression of Y on X

Slope , mw = **47.9780** **Intercept, bw =** **-25.1072**

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 x Qstd + bw = IC x [(Pa/760) x (298/Ta)]$^{1/2}$

Therefore, Set Point; IC = (mw x Qstd + bw) x [(760 / Pa) x (Ta / 298)]$^{1/2}$= **37.07**

Remarks: _____

QC Reviewer: WS CHAN Signature: _____ Date: 5/11/12

TISCH ENVIROMENTAL, INC.
145 SOUTH MIAMI AVE.
VILLAGE OF CLEVES, OH 45002
513.467.9000
877.263.7610 TOLL FREE
513.467.9009 FAX
WWW.TISCH-ENV.COM

AIR POLLUTION MONITORING EQUIPMENT

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Nov 15, 2011 Rootsmeter 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}

TISCH ENVIROMENTAL, INC.
145 SOUTH MIAMI AVE.
VILLAGE OF CLEVES, OH 45002
513.467.9000
877.263.7610 TOLL FREE
513.467.9009 FAX
WWW.TISCH-ENV.COM

AIR POLLUTION MONITORING EQUIPMENT

ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - May 15, 2012 Rootsmeter S/N 0438320 Ta (K) - 295
Operator Tisch Orifice I.D. - 0988 Pa (mm) - 751.84

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	1.3860	3.2	2.00
2	NA	NA	1.00	0.9700	6.4	4.00
3	NA	NA	1.00	0.8690	7.9	5.00
4	NA	NA	1.00	0.8290	8.8	5.50
5	NA	NA	1.00	0.6840	12.7	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)		Va	(x axis) Qa	(y axis)
0.9951	0.7179	1.4137		0.9957	0.7184	0.8859
0.9908	1.0215	1.9993		0.9915	1.0222	1.2528
0.9887	1.1378	2.2353		0.9894	1.1385	1.4007
0.9876	1.1913	2.3444		0.9883	1.1921	1.4690
0.9824	1.4363	2.8275		0.9831	1.4372	1.7717
Qstd slope (m) =		1.97048		Qa slope (m) =		1.23388
intercept (b) =		-0.00546		intercept (b) =		-0.00342
coefficient (r) =		0.99991		coefficient (r) =		0.99991
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:	***Laser Dust Monitor***
Manufacturer/Brand:	***SIBATA***
Model No.:	***LD-3***
Equipment No.:	***A.005.09a***
Sensitivity Adjustment Scale Setting:	***797 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): *797* CPM
Sensitivity Adjustment Scale Setting (After Calibration): *797* 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: 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*	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): *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*	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): *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:

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.
G/F., 9/F., 12/F., 13/F. & 20/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. Tel : (852) 2873 6860
香港黃竹坑道37號利達中心地下，9樓，12樓，13樓及20樓 Fax : (852) 2555 7533
E-mail: smec@cigismec.com Website: www.cigismec.com

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 responsess of the Sound Level Meter.

Test results

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

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

Actual Measurement data are documented on worksheets.

Approved Signatory: Huang Jian Min/Feng Jun Qi **Date:** 16-Jan-2012 **Company Chop:** SOILS & MATERIALS ENGINEERING COMPANY LTD 綜合試驗有限公司

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 perfomed 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	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	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.

- End -

Calibrated by: Fung Chi Yip Date: 23-Dec-2011

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.

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

HKLAS 028 CAL

CERTIFICATE OF CALIBRATION

Certificate No.: 12CA1008 02 **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-19
Serial/Equipment No.:	00320528 /N.00T.03A	,	90565	75883
Adaptors used:	-	,	-	-

Item submitted by

Customer Name:	AECOM ASIA CO., LTD.
Address of Customer:	-
Request No.:	-
Date of receipt:	08-Oct-2012

Date of test: 08-Oct-2012

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	22-Jun-2013	CIGISMEC
Signal generator	DS 360	33873	29-May-2013	CEPREI
Signal generator	DS 360	61227	29-May-2013	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 responsess of the Sound Level Meter.

Test results

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

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

Actual Measurement data are documented on worksheets.

Approved Signatory: Huang Jian Min/Feng Jun Qi **Date:** 08-Oct-2012 **Company Chop:** SOILS AND MATERIALS ENGINEERING COMPANY LTD. 綜合試驗有限公司

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. Tel : (852) 2873 6860
香港黃竹坑道37號利達中心地下，9樓，12樓，13樓及20樓 Fax : (852) 2555 7533
E-mail: smec@cigismec.com Website: www.cigismec.com

HOKLAS 028 CAL

CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 12CA1008 02 **Page** 2 **of** 2

1, Electrical Tests

The electrical tests were perfomed 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	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	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.

- End -

Calibrated by: Fung Chi Yip **Date:** 08-Oct-2012

Checked by: Chan Chun Lam **Date:** 08-Oct-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

HOKLAS 028
CAL

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

Curstomer:	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

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

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:**

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

Comments: The results reported in this certificate refer to the conditon 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

HOKLAS 028 CAL

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 μPa)

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.

- End -

Calibrated by: Fung Chi Yip **Date:** 16-Jan-2012

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.

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. Tel : (852) 2873 6860
香港黃竹坑道37號利達中心地下，9樓，12樓，13樓及20樓 Fax : (852) 2555 7533
E-mail: smec@cigismec.com Website: www.cigismec.com

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.:	10186482 / N.004.09
Adaptors used:	-

Item submitted by

Curstomer:	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 Jian Min/Feng Jun Qi **Date:** 23-Mar-2012 **Company Chop:** SOILS AND MATERIALS ENGINEERING COMPANY LTD 綜合試驗有限公司

Comments: The results reported in this certificate refer to the conditon 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. Tel : (852) 2873 6860
香港黃竹坑道37號利達中心地下、9樓、12樓、13樓及20樓 Fax : (852) 2555 7533
E-mail: smec@cigismec.com Website: www.cigismec.com

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.

(Output level in dB re 20 μPa)

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

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 0.2 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 = 0.6%**

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.

- End -

Calibrated by: Fung Chi Yip Date: 21-Mar-2012

Checked by: Chan Chun Lam Date: 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 (±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 (±%)	10.0

Mr Chan Kwok Fai, Godfrey
Laboratory Manager - Hong Kong

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

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

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: HK1227690
Amendment: 1
Date of Issue: 17/10/2012
Client: AECOM ASIA COMPANY LIMITED

Description: YSI Sonde
Brand Name: YSI
Model No.: 6820-V1
Serial No.: W.026.09
Equipment No.: W.026.09
Date of Calibration: 16 October, 2012 Date of next Calibration: 16 January, 2013

Parameters:

Conductivity

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

Expected Reading (uS/cm)	Displayed Reading (uS/cm)	Tolerance (%)
146.9	155	5.5
6667	7086	6.3
12890	13010	0.9
58670	56680	-3.4
	Tolerance Limit (%)	10.0

Dissolved Oxygen

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

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
5.78	5.74	-0.04
6.32	6.42	0.10
7.59	7.49	-0.10
	Tolerance Limit (±mg/L)	0.20

Salinity

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

Expected Reading (ppt)	Displayed Reading (ppt)	Tolerance (%)
0	0.00	--
10	10.59	5.9
20	20.62	3.1
30	30.42	1.4
	Tolerance Limit (±%)	10.0

Mr Chan Kwok Fai, Godfrey
Laboratory Manager - Hong Kong

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: HK1227690
Date of Issue: 17/10/2012
Client: AECOM ASIA COMPANY LIMITED

Description: YSI Sonde
Brand Name: YSI
Model No.: 6820-V1
Serial No.: W.026.09
Equipment No.: W.026.09
Date of Calibration: 16 October, 2012 Date of next Calibration: 16 January, 2013

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)
18.5	18.81	0.3
23.0	22.75	-0.3
31.0	30.65	-0.4
	Tolerance Limit (°C)	2.0

Turbidity

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

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
0	0.0	--
4	4.3	7.5
10	9.3	-7.0
20	21.3	6.5
50	54.3	8.6
100	106.5	6.5
	Tolerance Limit (±%)	10.0

Mr Chan Kwok Fai, Godfrey
Laboratory Manager - Hong Kong

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: HK1221702
Amendment no.: 1
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: 16 November, 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

Mr Chan Kwok Pai, Godfrey
Laboratory Manager - Hong Kong

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: HK1221702
Amendment no.: 1
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: 16 November, 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: HK1230161
Date of Issue: 13/11/2012
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: 13 November, 2012 Date of next Calibration: 13 February, 2013

Parameters:

Conductivity

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

Expected Reading (uS/cm)	Displayed Reading (uS/cm)	Tolerance (%)
146.9	147.5	0.4
6667	6344	-4.8
12890	12490	-3.1
58670	55720	-5.0
	Tolerance Limit (%)	10.0

Dissolved Oxygen

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

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
4.40	4.23	-0.17
6.44	6.33	-0.11
8.20	8.21	0.01
	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	3.89	-0.11
7.0	7.01	0.01
10.0	10.13	0.13
	Tolerance Limit (±unit)	0.2

Salinity

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

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
0	0.00	--
10	9.82	-1.8
20	20.04	0.2
30	29.73	-0.9
	Tolerance Limit (±%)	10.0

Mr Chan Kwok Fai, Godfrey
Laboratory Manager - Hong Kong

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: HK1230161
Date of Issue: 13/11/2012
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: 13 November, 2012 Date of next Calibration: 13 February, 2013

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)
22.6	22.25	-0.4
30.0	29.70	-0.3
38.5	38.90	0.4
	Tolerance Limit (°C)	2.0

Turbidity

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

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
0	0.0	--
4	3.8	-5.0
10	9.6	-4.0
20	19.5	-2.5
50	48.8	-2.4
100	96.3	-3.7
	Tolerance Limit (±%)	10.0

Mr Chan Kwok Fai, Godfrey
Laboratory Manager - Hong Kong

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: HK1226911
Date of Issue: 09/10/2012
Client: AECOM ASIA COMPANY LIMITED

Description: YSI Sonde
Brand Name: YSI
Model No.: 6820 V2
Serial No.: 12D 100972
Equipment No.: W.026.36
Date of Calibration: 09 October, 2012 Date of next Calibration: 09 January, 2013

Parameters:

Conductivity

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

Expected Reading (uS/cm)	Displayed Reading (uS/cm)	Tolerance (%)
142.6	142.0	-0.4
6667	6537	-1.9
12890	12260	-4.9
58670	56930	-3.0
	Tolerance Limit (%)	10.0

Dissolved Oxygen

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

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
5.17	5.26	0.09
6.58	6.64	0.06
7.30	7.39	0.09
	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	4.11	0.11
7.0	7.08	0.08
10.0	9.94	-0.06
	Tolerance Limit (±unit)	0.2

Salinity

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

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
0	0.00	--
10	10.26	2.6
20	20.46	2.3
30	30.39	1.3
	Tolerance Limit (±%)	10.0

Mr Chan Kwok Fai, Godfrey
Laboratory Manager - Hong Kong

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: HK1226911
Date of Issue: 09/10/2012
Client: AECOM ASIA COMPANY LIMITED

Description: YSI Sonde
Brand Name: YSI
Model No.: 6820 V2
Serial No.: 12D 100972
Equipment No.: W.026.36
Date of Calibration: 09 October, 2012 Date of next Calibration: 09 January, 2013

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)
20.5	20.38	-0.1
24.5	24.04	-0.5
29.5	28.96	-0.5
	Tolerance Limit (°C)	2.0

Turbidity

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

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
0	0.0	--
4	4.4	10.0
10	10.2	2.0
20	20.7	3.5
50	49.4	-1.2
100	99.9	-0.1
	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 (±unit)	0.2

Mr Chan Kwok Fai, Godfrey
Laboratory Manager - Hong Kong

REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

Work Order: HK1228018
Date of Issue: 20/10/2012
Client: AECOM ASIA COMPANY LIMITED

Description: pH Meter
Brand Name: Orion
Model No.: 230A+
Serial No.: 020365
Equipment No.: W.039.04
Date of Calibration: 18 October, 2012 Date of next Calibration: 18 January, 2013

Parameters:

pH Value

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

Expected Reading (pH Unit)	Displayed Reading (pH Unit)	Tolerance (pH unit)
4.0	3.94	-0.06
7.0	6.96	-0.04
10.0	9.85	-0.15
	Tolerance Limit (±unit)	0.2

Mr Chan Kwok Fai, Godfrey
Laboratory Manager - Hong Kong