

# AECOM Asia Company Limited

## TSP High Volume Sampler

### Field Calibration Report

Station: Tung Chung Development Pier (AMS2) Operator: Choi Wing Ho  
 Cal. Date: 14-Mar-12 Next Due Date: 14-May-12  
 Equipment No.: A-001-78T Serial No.: 3383

Ambient Condition			
Temperature, Ta (K)	291.3	Pressure, Pa (mmHg)	754.7

Orifice Transfer Standard Information					
Serial No:	988	Slope, mc	2.01182	Intercept, bc	-0.02516
Last Calibration Date:	17-May-11	$mc \times Qstd + bc = [DH \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	17-May-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 x (Pa/760) x (298/Ta)] <sup>1/2</sup>	Qstd (m <sup>3</sup> /min) X-axis	Flow Recorder Reading (CFM)	Continuous Flow Recorder Reading IC (CFM) Y-axis
18	8.1	2.87	1.44	45.0	45.36
13	7.4	2.74	1.38	40.0	40.32
10	5.4	2.34	1.18	34.0	34.27
7	3.7	1.94	0.98	24.0	24.19
5	2.2	1.49	0.76	15.0	15.12

By Linear Regression of Y on X  
 Slope, mw = 43.0821 Intercept, bw = -17.4550  
 Correlation Coefficient\* = 0.9931  
 \*If Correlation Coefficient < 0.990, check and recalibrate.

**Set Point Calculation**

From the TSP Field Calibration Curve, take Qstd = 1.30m<sup>3</sup>/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)]<sup>1/2</sup> = 38.25

Remarks: \_\_\_\_\_

QC Reviewer: Mike Shek Signature: Mike Date: 14 Mar 12

# AECOM Asia Company Limited

## TSP High Volume Sampler

### Field Calibration Report

Station Site Boundary of Site Office (WA2) (AMS3A) Operator: Choi Wing Ho  
 Cal. Date: 15-Mar-12 Next Due Date: 15-May-12  
 Equipment No.: A-001-79T Serial No. 3384

Ambient Condition			
Temperature, Ta (K)	293.3	Pressure, Pa (mmHg)	751.6

Orifice Transfer Standard Information					
Serial No:	988	Slope, mc	2.01182	Intercept, bc	-0.02516
Last Calibration Date:	17-May-11	$mc \times Qstd + bc = [DH \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	17-May-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 x (Pa/760) x (298/Ta)] <sup>1/2</sup>	Qstd (m <sup>3</sup> /min) X-axis	Flow Recorder Reading (CFM)	Continuous Flow Recorder Reading IC (CFM) Y-axis
18	7.9	2.82	1.41	44.0	44.11
13	6.6	2.58	1.29	40.0	40.10
10	5.4	2.33	1.17	32.0	32.08
7	3.7	1.93	0.97	24.0	24.06
5	2.3	1.52	0.77	16.0	16.04

By Linear Regression of Y on X

Slope, mw = 44.5203 Intercept, bw = -18.7205

Correlation Coefficient\* = 0.9927

\*If Correlation Coefficient < 0.990, check and recalibrate.

#### Set Point Calculation

From the TSP Field Calibration Curve, take Qstd = 1.30m<sup>3</sup>/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)]<sup>1/2</sup> = 39.06

Remarks: \_\_\_\_\_

QC Reviewer: Mike Shek Signature: Mike Date: 15-Mar-12

**AECOM Asia Company Limited**  
**TSP High Volume Sampler**  
**Field Calibration Report**

Station: Hong Kong SkyCity Marriott Hotel (AMS7) Operator: Choi Wing Ho  
 Cal. Date: 14-Mar-12 Next Due Date: 14-May-12  
 Equipment No.: A-001-80T Serial No. 3385

Ambient Condition			
Temperature, Ta (K)	291.3	Pressure, Pa (mmHg)	754.7

Orifice Transfer Standard Information					
Serial No:	988	Slope, mc	2.01182	Intercept, bc	-0.02516
Last Calibration Date:	17-May-11	$mc \times Qstd + bc = [DH \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	17-May-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 <sup>3</sup> /min) X-axis	Flow Recorder Reading (CFM)	Continuous Flow Recorder Reading IC (CFM) Y-axis
18	7.6	2.78	1.39	42.0	42.33
13	6.5	2.57	1.29	36.0	36.28
10	5.3	2.32	1.17	30.0	30.24
7	3.9	1.99	1.00	24.0	24.19
5	3.6	1.91	0.96	22.0	22.17

By Linear Regression of Y on X

Slope, mw = 45.4356 Intercept, bw = -21.7914

Correlation Coefficient\* = 0.9927

\*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation	
From the TSP Field Calibration Curve, take Qstd = 1.30m <sup>3</sup> /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)] <sup>1/2</sup> =	<u>36.98</u>

Remarks: \_\_\_\_\_

QC Reviewer: Mike Shek Signature: Mike Date: 14 Mar 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 - May 17, 2011 Rootsmeter S/N 0438320 Ta (K) - 294  
 Operator Tisch Orifice I.D. - 0988 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	1.3900	3.2	2.00
2	NA	NA	1.00	0.9830	6.4	4.00
3	NA	NA	1.00	0.8800	7.9	5.00
4	NA	NA	1.00	0.8380	8.8	5.50
5	NA	NA	1.00	0.6920	12.7	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
0.9934	0.7146	1.4125	0.9957	0.7163	0.8866
0.9891	1.0062	1.9976	0.9915	1.0086	1.2538
0.9870	1.1216	2.2334	0.9893	1.1243	1.4018
0.9859	1.1765	2.3424	0.9882	1.1793	1.4703
0.9807	1.4172	2.8251	0.9830	1.4205	1.7732
Qstd slope (m) = 2.01182			Qa slope (m) = 1.25977		
intercept (b) = -0.02516			intercept (b) = -0.01579		
coefficient (r) = 0.99999			coefficient (r) = 0.99999		
y axis = SQRT[H2O(Pa/760) (298/Ta)]			y axis = SQRT[H2O(Ta/Pa)]		

CALCULATIONS

$$Vstd = \text{Diff. Vol} [(Pa - \text{Diff. Hg}) / 760] (298 / Ta)$$

$$Qstd = Vstd / \text{Time}$$

$$Va = \text{Diff Vol} [(Pa - \text{Diff Hg}) / Pa]$$

$$Qa = Va / \text{Time}$$

For subsequent flow rate calculations:

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

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

## 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<sub>0</sub>: 12500  
 Last Calibration Date\*: 4 June 2011

\*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 <sup>1</sup> (mg/m <sup>3</sup> ) Y-axis	Total Count <sup>2</sup>	Count/ Minute <sup>3</sup> X-axis
			Temp (°C)	R.H. (%)			
1	05-06-11	09:30 - 10:30	31.3	67	0.04118	1540	25.67
2	05-06-11	10:30 - 11:30	31.3	67	0.04354	1637	27.28
3	05-06-11	11:30 - 12:30	31.3	67	0.04633	1730	28.83
4	05-06-11	12:30 - 13:30	31.4	66	0.04271	1603	26.72

- 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: 0.9958

Validity of Calibration Record: 4 June 2012

Remarks:

QC Reviewer: YW Fung

Signature: 

Date: 8 June 2011

## 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<sub>c</sub>: 12500  
 Last Calibration Date\*: 4 June 2011

\*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 <sup>1</sup> (mg/m <sup>3</sup> ) Y-axis	Total Count <sup>2</sup>	Count/ Minute <sup>3</sup> X-axis
			Temp (°C)	R.H. (%)			
1	02-07-11	09:00 - 10:00	31.1	70	0.04313	1607	26.78
2	02-07-11	10:00 - 11:00	31.1	70	0.04137	1550	25.83
3	02-07-11	11:00 - 12:00	31.2	71	0.04552	1713	28.55
4	02-07-11	12:00 - 13:00	31.2	71	0.04736	1771	29.51

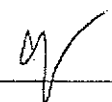
Note: 1. Monitoring data was measured by Rupprecht & Patashnick TEOM®  
 2. Total Count was logged by Laser Dust Monitor  
 3. Count/minute was calculated by (Total Count/60)

By Linear Regression of Y or X

Slope (K-factor): 0.0016  
 Correlation coefficient: 0.9949

Validity of Calibration Record: 1 July 2012

Remarks:

QC Reviewer: YW Fung Signature:  Date: 4 July 2011

## 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<sub>o</sub>: 12500  
 Last Calibration Date\*: 4 June 2011

\*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 <sup>1</sup> (mg/m <sup>3</sup> ) Y-axis	Total Count <sup>2</sup>	Count/ Minute <sup>3</sup> X-axis
			Temp (°C)	R.H. (%)			
1	05-06-11	13:30 - 14:30	31.4	66	0.04416	1758	29.30
2	05-06-11	14:30 - 15:30	31.5	66	0.04752	1889	31.48
3	05-06-11	15:30 - 16:30	31.5	66	0.04371	1748	29.13
4	05-06-11	16:30 - 17:30	31.5	67	0.04543	1808	30.13

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: 0.9953

Validity of Calibration Record: 4 June 2012

Remarks:

QC Reviewer: YW Fung Signature:  Date: 8 June 2011

## 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<sub>c</sub>: 12500  
 Last Calibration Date\*: 4 June 2011

\*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 <sup>1</sup> (mg/m <sup>3</sup> ) Y-axis	Total Count <sup>2</sup>	Count/ Minute <sup>3</sup> X-axis
			Temp (°C)	R.H. (%)			
1	02-07-11	09:30 - 10:30	31.1	70	0.04305	1718	28.63
2	02-07-11	10:30 - 11:30	31.1	71	0.04257	1703	28.38
3	02-07-11	11:30 - 12:30	31.2	71	0.04424	1763	29.38
4	02-07-11	12:30 - 13:30	31.2	71	0.04632	1855	30.92

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: 0.9961

Validity of Calibration Record: 1 July 2012

Remarks:

QC Reviewer: YW Fung

Signature: 

Date: 4 July 2011



## EQUIPMENT CALIBRATION RECORD

Type: Laser Dust Monitor  
 Manufacturer/Brand: SIBATA  
 Model No.: LD-3B  
 Equipment No.: A.005.12a  
 Sensitivity Adjustment Scale Setting: 805 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<sub>0</sub>: 12500  
 Last Calibration Date\*: 4 June 2011

\*Remarks: Recommended interval for hardware calibration is 1 year

### Calibration Result

Sensitivity Adjustment Scale Setting (Before Calibration): 805 CPM  
 Sensitivity Adjustment Scale Setting (After Calibration): 805 CPM

Hour	Date (dd-mm-yy)	Time	Ambient Condition		Concentration <sup>1</sup> (mg/m <sup>3</sup> ) Y-axis	Total Count <sup>2</sup>	Count/ Minute <sup>3</sup> X-axis
			Temp (°C)	R.H. (%)			
1	02-07-11	09:30 - 10:30	31.1	70	0.04305	1843	30.72
2	02-07-11	10:30 - 11:30	31.1	71	0.04257	1826	30.43
3	02-07-11	11:30 - 12:30	31.2	71	0.04424	1893	31.55
4	02-07-11	12:30 - 13:30	31.2	71	0.04632	1994	33.23


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: 0.9947

Validity of Calibration Record: 1 July 2012

Remarks:

QC Reviewer: YW Fung Signature:  Date: 4 July 2011

## 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<sub>0</sub>: 12500  
 Last Calibration Date\*: 4 June 2011

\*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 <sup>1</sup> (mg/m <sup>3</sup> ) Y-axis	Total Count <sup>2</sup>	Count/ Minute <sup>3</sup> X-axis
			Temp (°C)	R.H. (%)			
1	05-06-11	11:00 - 12:00	31.4	67	0.04513	1933	32.21
2	05-06-11	12:00 - 13:00	31.4	67	0.04392	1833	31.38
3	05-06-11	13:00 - 14:00	31.5	66	0.04751	2042	34.03
4	05-06-11	14:00 - 15:00	31.5	66	0.04476	1918	31.97

- 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: 0.9978

Validity of Calibration Record: 4 June 2012

Remarks:

QC Reviewer: YW Fung

Signature: 

Date: 8 June 2011



## CERTIFICATE OF CALIBRATION

Certificate No.: 11CA0711 01-02 Page 1 of 2

### Item tested

Description:	Sound Level Meter (Type 1)	,	Microphone
Manufacturer:	B & K	,	B & K
Type/Model No.:	2238	,	4188
Serial/Equipment No.:	2255680 / N.009.01	,	2250447
Adaptors used:	-	,	-

### Item submitted by

Customer Name: AECOM ASIA CO., LTD.  
Address of Customer: -  
Request No.: -  
Date of receipt: 11-Jul-2011

Date of test: 12-Jul-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: (55 ± 5) %  
Air pressure: (995 ± 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 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.

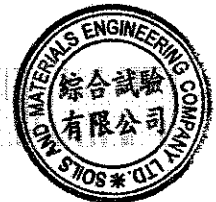
Actual Measurement data are documented on worksheets.

Approved Signatory:

  
Huang Jian Ming/Feng Jun Qi

Date: 13-Jul-2011

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.: 11CA0711 01-02

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	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	Frequency weightings			
Time weightings	A	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
Peak response	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
R.M.S. accuracy	Single 100µs rectangular pulse	Pass	0.3	
Time weighting I	Crest factor of 3	Pass	0.3	
	Single burst 5 ms at 2000 Hz	Pass	0.3	
Time averaging	Repeated at frequency of 100 Hz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3	
Pulse range	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
	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:

Date:

Fung Chi Yip  
12-Jul-2011

Checked by:

Date:

Chan Chun Lam  
13-Jul-2011

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.: 11CA0830 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.007.03A	90565	75883
Adaptors used:	-	-	-

### Item submitted by

Customer Name: AECOM ASIA CO., LTD.  
Address of Customer: -  
Request No.: -  
Date of receipt: 30-Aug-2011

Date of test: 31-Aug-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: (23 ± 1) °C  
Relative humidity: (60 ± 5) %  
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 responsiveness 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.

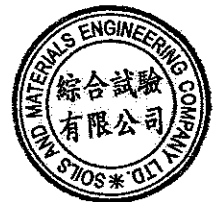
Actual Measurement data are documented on worksheets.

Approved Signatory:

  
Huang Jian Aia/Feng Jun Qi

Date: 31-Aug-2011

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.: 11CA0830 02 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	At reference range, Step 5 dB at 4 kHz	Pass	0.3	
	A	Pass	0.3	
	C	Pass	0.3	
Frequency weightings	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 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

### 2, Acoustic tests

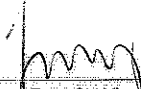
The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

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

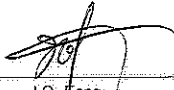
### 3, Response to associated sound calibrator

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:   
Date: 31-Aug-2011

- End -

Checked by:   
Date: 31-Aug-2011

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.: 11CA0711 01-05

Page: 1 of 2

### Item tested

Description: Acoustical Calibrator (Class 1)  
Manufacturer: Rion Co., Ltd.  
Type/Model No.: NC-73  
Serial/Equipment No.: 10307223 / N.004.08  
Adaptors used: -

### Item submitted by

Customer: AECOM ASIA CO. LTD.  
Address of Customer: -  
Request No.: -  
Date of receipt: 11-Jul-2011

Date of test: 13-Jul-2011

### 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	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:  $22 \pm 1$  °C  
Relative humidity:  $55 \pm 5$  %  
Air pressure:  $990 \pm 5$  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.

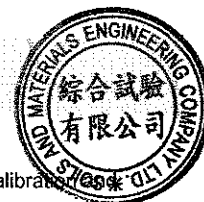
Details of the performed measurements are presented on page 2 of this certificate.

Approved Signatory:

Huang Jian Min / Feng Jun Qi

Date: 13-Jul-2011

Company Chop:



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



## CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 11CA0711 01-05

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	(Output level in dB re 20 $\mu$ Pa)
			Estimated Uncertainty dB
1000	94.00	93.70	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 = 989.2 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:

Fung Chi Yip  
Date: 13-Jul-2011

- End -

Checked by:

Chan Chun Lam  
Date: 13-Jul-2011

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.





# ALS Technichem (HK) Pty Ltd

## REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

**CONTACT:** MR MIKE SHEK  
**CLIENT:** AECOM ASIA COMPANY LIMITED  
**ADDRESS:** 11/F, TOWER 2, GRAND CENTRAL PLAZA,  
138 SHATIN RURAL COMMITTEE ROAD,  
SHATIN, N.T.,  
HONG KONG.

**WORK ORDER:** HK1204978  
**LABORATORY:** HONG KONG  
**DATE RECEIVED:** 21/02/2012  
**DATE OF ISSUE:** 23/02/2012

**PROJECT:** --

### COMMENTS

It is certified that the item under calibration/checking has been calibrated/checked by corresponding calibrated equipment in the laboratory.  
Maximum Tolerance and calibration frequency stated in the report, unless otherwise stated, the internal acceptance criteria of ALS will be followed.

**Scope of Test:** Conductivity, Dissolved Oxygen, pH, Salinity, Temperature and Turbidity  
**Description:** YSI Sonde  
**Brand Name:** YSI  
**Model No.:** YSI 6820 V2  
**Serial No.:** 12A010544  
**Equipment No.:** W.026.34  
**Date of Calibration:** 21 February, 2012

### NOTES

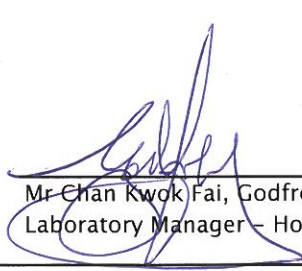
This is the Final Report and supersedes any preliminary report with this batch number.  
Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

### ISSUING LABORATORY: HONG KONG

#### Address

ALS Technichem (HK) Pty Ltd  
11/F Chung Shun Knitting Centre  
1-3 Wing Yip Street  
Kwai Chung  
HONG KONG

**Phone:** 852-2610 1044  
**Fax:** 852-2610 2021  
**Email:** [hongkong@alsglobal.com](mailto:hongkong@alsglobal.com)

  
Mr Chan Kwok Fai, Godfrey  
Laboratory Manager - Hong Kong

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Page 1 of 3

ADDRESS 11/F, Chung Shun Knitting Centre, 1-3 Wing Yip Street, Kwai Chung, N.T., Hong Kong PHONE +852 2610 1044 FAX +852 2610 2021  
ALS TECHNICHEM (HK) PTY LTD Part of the ALS Laboratory Group A Campbell Brothers Limited Company

# REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

**Work Order:** HK1204978  
**Date of Issue:** 23/02/2012  
**Client:** AECOM ASIA COMPANY LIMITED



**Description:** YSI Sonde  
**Brand Name:** YSI  
**Model No.:** YSI 6820 V2  
**Serial No.:** 12A010544  
**Equipment No.:** W.026.34  
**Date of Calibration:** 21 February, 2012

**Date of next Calibration:** 21 May, 2012

**Parameters:**

**Conductivity**

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

Expected Reading (uS/cm)	Displayed Reading (uS/cm )	Tolerance (%)
146.9	146	-0.6
6667	6514	-2.3
12890	12890	0.0
58670	57840	-1.4
Tolerance Limit (%)		10.0

**Dissolved Oxygen**

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

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
6.32	6.44	0.12
7.16	7.12	-0.04
8.13	8.12	-0.01
Tolerance Limit (±mg/L)		0.20

**pH Value**

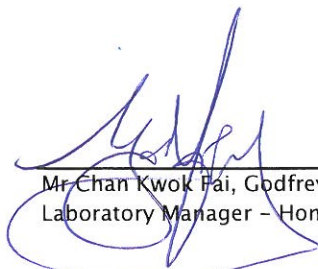
**Method Ref: APHA 21st Ed. 4500H:B**

Expected Reading (pH Unit)	Displayed Reading (pH Unit)	Tolerance (pH unit)
4.0	4.02	0.02
7.0	6.99	-0.01
10.0	9.93	-0.07
Tolerance Limit (±unit)		0.2

**Salinity**

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

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
0	0.08	--
10	10.32	3.2
20	20.44	2.2
30	30.93	3.1
Tolerance Limit (±%)		10.0

  
 Mr Chan Kwok Fai, Godfrey  
 Laboratory Manager - Hong Kong

# REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

**Work Order:** HK1204978  
**Date of Issue:** 23/02/2012  
**Client:** AECOM ASIA COMPANY LIMITED



**Description:** YSI Sonde  
**Brand Name:** YSI  
**Model No.:** YSI 6820 V2  
**Serial No.:** 12A010544  
**Equipment No.:** W.026.34  
**Date of Calibration:** 21 February, 2012      **Date of next Calibration:** 21 May, 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)
14.6	14.33	-0.3
26.5	26.44	-0.1
32.0	31.46	-0.5
	Tolerance Limit (°C)	2.0

**Turbidity**

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

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
0	-0.2	--
4	3.8	-5.0
10	9.6	-4.0
20	19.9	-0.5
50	54.8	9.6
100	109.2	9.2
	Tolerance Limit (±%)	10.0

  
 Mr Chan Kwok Fai, Godfrey  
 Laboratory Manager - Hong Kong



## ALS Technichem (HK) Pty Ltd

### REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION

**CONTACT:** MR MIKE SHEK  
**CLIENT:** AECOM ASIA COMPANY LIMITED  
**ADDRESS:** 11/F, TOWER 2, GRAND CENTRAL PLAZA,  
138 SHATIN RURAL COMMITTEE ROAD,  
SHATIN, N.T.,  
HONG KONG.

**WORK ORDER:** HK1204979  
**LABORATORY:** HONG KONG  
**DATE RECEIVED:** 21/02/2012  
**DATE OF ISSUE:** 22/02/2012

**PROJECT:** --

#### COMMENTS

It is certified that the item under calibration/checking has been calibrated/checked by corresponding calibrated equipment in the laboratory.

Maximum Tolerance and calibration frequency stated in the report, unless otherwise stated, the internal acceptance criteria of ALS will be followed.

**Scope of Test:** Conductivity, Dissolved Oxygen, pH, Salinity, Temperature and Turbidity  
**Description:** YSI Sonde  
**Brand Name:** YSI  
**Model No.:** YSI 6820 V2  
**Serial No.:** 12A010545  
**Equipment No.:** --  
**Date of Calibration:** 21 February, 2012

#### NOTES

This is the Final Report and supersedes any preliminary report with this batch number.

Results apply to sample(s) as submitted. All pages of this report have been checked and approved for release.

#### ISSUING LABORATORY: HONG KONG

##### **Address**

ALS Technichem (HK) Pty Ltd  
11/F Chung Shun Knitting Centre  
1-3 Wing Yip Street  
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**Phone:** 852-2610 1044  
**Fax:** 852-2610 2021  
**Email:** [hongkong@alsglobal.com](mailto:hongkong@alsglobal.com)

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

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Page 1 of 3

ADDRESS 11/F, Chung Shun Knitting Centre, 1-3 Wing Yip Street, Kwai Chung, N.T., Hong Kong PHONE +852 2610 1044 FAX +852 2610 2021  
ALS TECHNICHEM (HK) PTY LTD Part of the ALS Laboratory Group A Campbell Brothers Limited Company

# REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



**Work Order:** HK1204979  
**Date of Issue:** 22/02/2012  
**Client:** AECOM ASIA COMPANY LIMITED

**Description:** YSI Sonde  
**Brand Name:** YSI  
**Model No.:** YSI 6820 V2  
**Serial No.:** 12A010545  
**Equipment No.:** --  
**Date of Calibration:** 21 February, 2012

**Date of next Calibration:** 21 May, 2012

**Parameters:**

**Conductivity**

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

Expected Reading (uS/cm)	Displayed Reading (uS/cm )	Tolerance (%)
146.9	153	4.2
6667	6308	-5.4
12890	12570	-2.5
58670	56410	-3.9
Tolerance Limit (%)		10.0

**Dissolved Oxygen**

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

Expected Reading (mg/L)	Displayed Reading (mg/L)	Tolerance (mg/L)
6.32	6.47	0.15
7.16	7.06	-0.10
8.13	8.13	0.00
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	3.98	-0.02
7.0	6.97	-0.03
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	10.08	0.8
20	20.13	0.6
30	30.52	1.7
Tolerance Limit (±%)		10.0

  
 \_\_\_\_\_  
 Mr Chan Kwok Fai, Godfrey  
 Laboratory Manager - Hong Kong

# REPORT OF EQUIPMENT PERFORMANCE CHECK/CALIBRATION



**Work Order:** HK1204979  
**Date of Issue:** 22/02/2012  
**Client:** AECOM ASIA COMPANY LIMITED

**Description:** YSI Sonde  
**Brand Name:** YSI  
**Model No.:** YSI 6820 V2  
**Serial No.:** 12A010545  
**Equipment No.:** --

**Date of Calibration:** 21 February, 2012                      **Date of next Calibration:** 21 May, 2012

**Parameters:**

**Temperature**

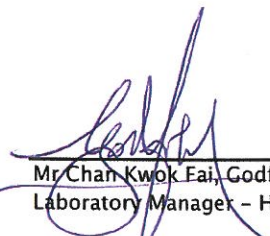
**Method Ref: Section 6 of International Accreditation New Zealand Technical Guide No. 3 Second edition March 2008: Working Thermometer Calibration Procedure.**

Expected Reading (°C)	Displayed Reading (°C)	Tolerance (°C)
14.6	15.01	0.4
26.2	26.28	0.1
31.0	30.52	-0.5
Tolerance Limit (°C)		2.0

**Turbidity**

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

Expected Reading (NTU)	Displayed Reading (NTU)	Tolerance (%)
0	0.2	--
4	3.6	-10.0
10	9.6	-4.0
20	18.7	-6.5
50	50.1	0.2
100	96.9	-3.1
Tolerance Limit (±%)		10.0

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