

High Volume Air Sampler Calibration Worksheet

Project Title: Design and Construction of Tsuen Wan Drainage Tunnel
Monitoring Location: Ho Fung College (ASR 1)
Calibration Date: 23-Nov-10
Calibration Due Date: 23-Jan-11
Time: 08:00

Sampler Model:	BM2000HX
Serial No.:	4994
Calibrator Orifice no.:	1785
Slope (m):	1.97702
Intercept (b):	-0.00070
Correction coeff. (r)	0.99992

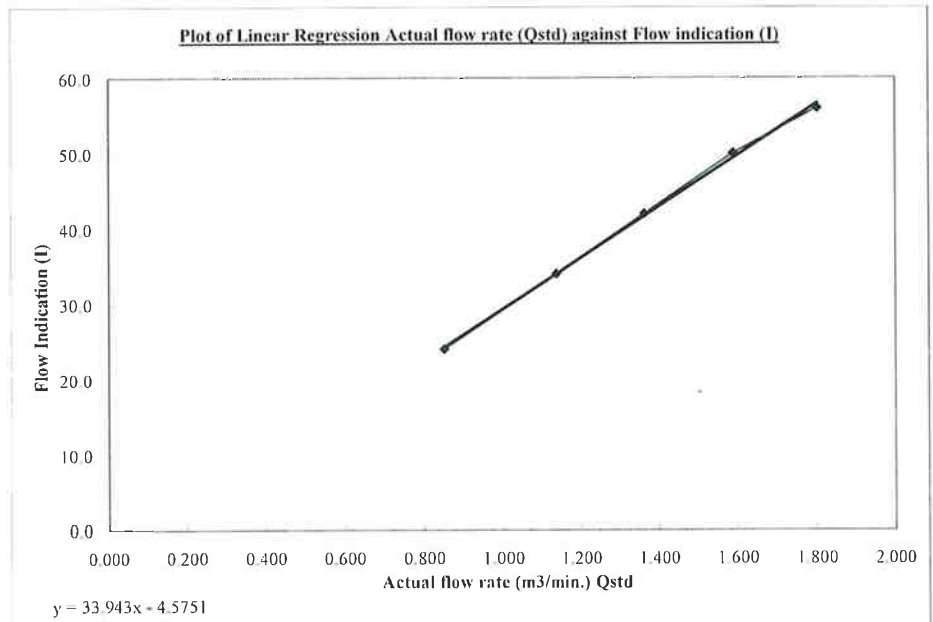
$$Flow\ (corrected) = \sqrt{H \times \frac{Pa}{Pstd} \times \frac{Tstd}{Ta}}$$

Standard pressure (mmHg) Pstd:	763.9
Standard temp. (K) Tstd:	290.8
Calibration pressure (mmHg) Pa:	760.9
Calibration temp. (K) Ta:	294.4

$$Qstd = \frac{1}{m} \times \left(\sqrt{H \times \frac{Pa}{Pstd} \times \frac{Tstd}{Ta}} - b \right)$$

Sample no.	Pressure Drop (H), inch	Flow (corrected), m ³ /min	Actual flow rate (Qstd), m ³ /min	Flow indication (I), arbitrary
1	12.6	3.564	1.803	56.0
2	9.8	3.143	1.590	50.0
3	7.2	2.694	1.363	42.0
4	5.0	2.245	1.136	34.0
5	2.8	1.680	0.850	24.0

Correlation Coefficient : 0.9993



Remark
 1HPa = 0.750062 mmHg

Calibrated by: **Arthur Chiu**
 (*Arthur Chiu*)

Date: 23/11/2010

Checked by: **F.C. Tsang**
 (*F.C. Tsang*)

Date: 23/11/2010

High Volume Air Sampler Calibration Worksheet

Project Title: Design and Construction of Tsuen Wan Drainage Tunnel
 Monitoring Location: Heng Hoi Chi Hong Ship Temple (ASR 3)
 Calibration Date: 23-Nov-10
 Calibration Due Date: 23-Jan-11
 Time: 08:15

Sampler Model:	BM2000HX
Serial No.:	5875
Calibrator Orifice no.:	1785
Slope (m):	1.97702
Intercept (b):	-0.00070
Correction coeff. (r):	0.99992

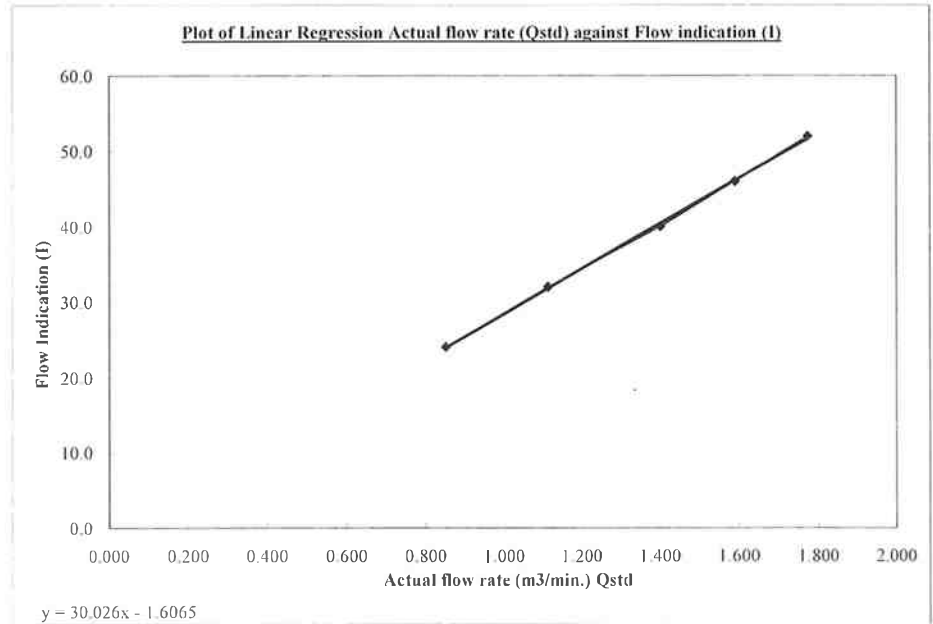
$$Flow\ (corrected) = \sqrt{H \times \frac{P_a}{P_{std}} \times \frac{T_{std}}{T_a}}$$

Standard pressure (mmHg) Pstd:	763.9
Standard temp. (K) Tstd:	290.8
Calibration pressure (mmHg) Pa:	760.9
Calibration temp. (K) Ta:	294.4

$$Q_{std} = \frac{1}{m} \times \left(\sqrt{H \times \frac{P_a}{P_{std}} \times \frac{T_{std}}{T_a}} - b \right)$$

Sample no.	Pressure Drop (H), inch	Flow (corrected), m ³ /min	Actual flow rate (Qstd), m ³ /min	Flow indication (I), arbitrary
1	12.2	3.507	1.774	52.0
2	9.8	3.143	1.590	46.0
3	7.6	2.768	1.401	40.0
4	4.8	2.200	1.113	32.0
5	2.8	1.680	0.850	24.0

Correlation Coefficient : 0.9996



Remark
 1HPa = 0.750062 mmHg

Calibrated by: Arthur Chiu
 (*Arthur Chiu*)

Date: 23/11/2010

Checked by: F.C. Tsang
 (*F.C. Tsang*)

Date: 23/11/2010

High Volume Air Sampler Calibration Worksheet

Project Title: Design and Construction of Tsuen Wan Drainage Tunnel
 Monitoring Location: Long Beach Gardan (ASR 8)
 Calibration Date: 23-Nov-10
 Calibration Due Date: 23-Jan-11
 Time: 08:30

Sampler Model:	TE5005X
Serial No.:	1059
Calibrator Orifice no.:	1785
Slope (m):	1.97702
Intercept (b):	-0.00070
Correction coeff. (r)	0.99992

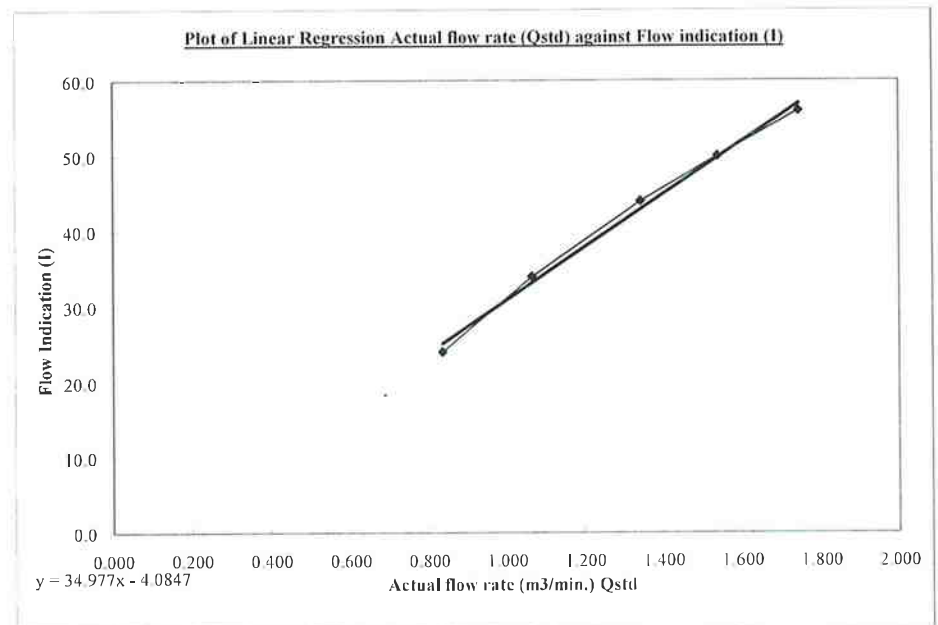
$$Flow\ (corrected) = \sqrt{H \times \frac{Pa}{Pstd} \times \frac{Tstd}{Ta}}$$

Standard pressure (mmHg) Pstd:	763.9
Standard temp. (K) Tstd:	290.8
Calibration pressure (mmHg) Pa:	760.9
Calibration temp. (K) Ta:	294.4

$$Qstd = \frac{1}{m} \times (\sqrt{H \times \frac{Pa}{Pstd} \times \frac{Tstd}{Ta}} - b)$$

Sample no.	Pressure Drop (H), inch	Flow (corrected), m ³ /min	Actual flow rate (Qstd), m ³ /min	Flow indication (I), arbitrary
1	11.8	3.449	1.745	56.0
2	9.2	3.046	1.541	50.0
3	7.0	2.657	1.344	44.0
4	4.4	2.106	1.066	34.0
5	2.7	1.650	0.835	24.0

Correlation Coefficient : 0.9969



Remark
 1HPa = 0.750062 mmHg

Calibrated by: Arthur Chiu
 (*Arthur Chiu*)

Date: 23/11/2010

Checked by: F.C. Tsang
 (*F.C. Tsang*)

Date: 23/11/2010

High Volume Air Sampler Calibration Worksheet

Project Title: Design and Construction of Tsuen Wan Drainage Tunnel
 Monitoring Location: Greenview Terrace (ASR 9)
 Calibration Date: 23-Nov-10
 Calibration Due Date: 23-Jan-11
 Time: 08:45

Sampler Model:	TE5005X
Serial No.:	1713
Calibrator Orifice no.:	1785
Slope (m):	1.97702
Intercept (b):	-0.00070
Correction coeff. (r)	0.99992

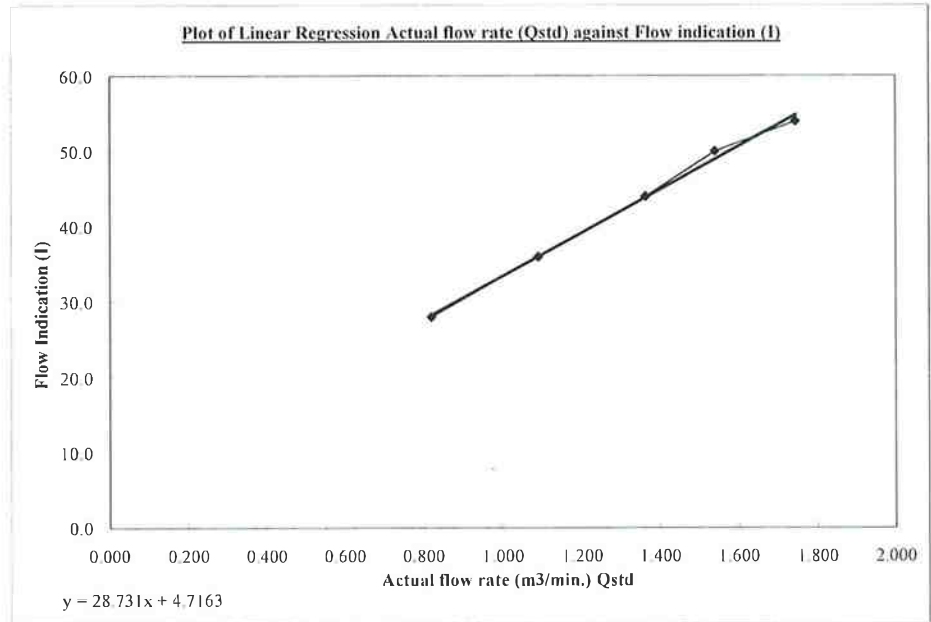
$$Flow\ (corrected) = \sqrt{H \times \frac{P_a}{P_{std}} \times \frac{T_{std}}{T_a}}$$

Standard pressure (mmHg) Pstd:	763.9
Standard temp. (K) Tstd:	290.8
Calibration pressure (mmHg) Pa:	760.9
Calibration temp. (K) Ta:	294.4

$$Q_{std} = \frac{1}{m} \times \left(\sqrt{H \times \frac{P_a}{P_{std}} \times \frac{T_{std}}{T_a}} - b \right)$$

Sample no.	Pressure Drop (H), inch	Flow (corrected), m ³ /min	Actual flow rate (Qstd), m ³ /min	Flow indication (I), arbitrary
1	11.8	3.449	1.745	54.0
2	9.2	3.046	1.541	50.0
3	7.2	2.694	1.363	44.0
4	4.6	2.154	1.090	36.0
5	2.6	1.619	0.819	28.0

Correlation Coefficient : 0.9979



Remark
 1HPa = 0.750062 mmHg

Calibrated by: Arthur Chiu
 (*Arthur Chiu*)

Date: 23/11/2010

Checked by: F.C. Tsang
 (*F.C. Tsang*)

Date: 23/11/2010

High Volume Air Sampler Calibration Worksheet

Project Title: Design and Construction of Tsuen Wan Drainage Tunnel
 Monitoring Location: Ho Fung College (ASR 1)
 Calibration Date: 21-Jan-11
 Calibration Due Date: 20-Mar-11
 Time: 08:00

Sampler Model:	BM2000HX
Serial No.:	4994
Calibrator Orifice no.:	1785
Slope (m):	1.97702
Intercept (b):	-0.00070
Correction coeff. (r)	0.99992

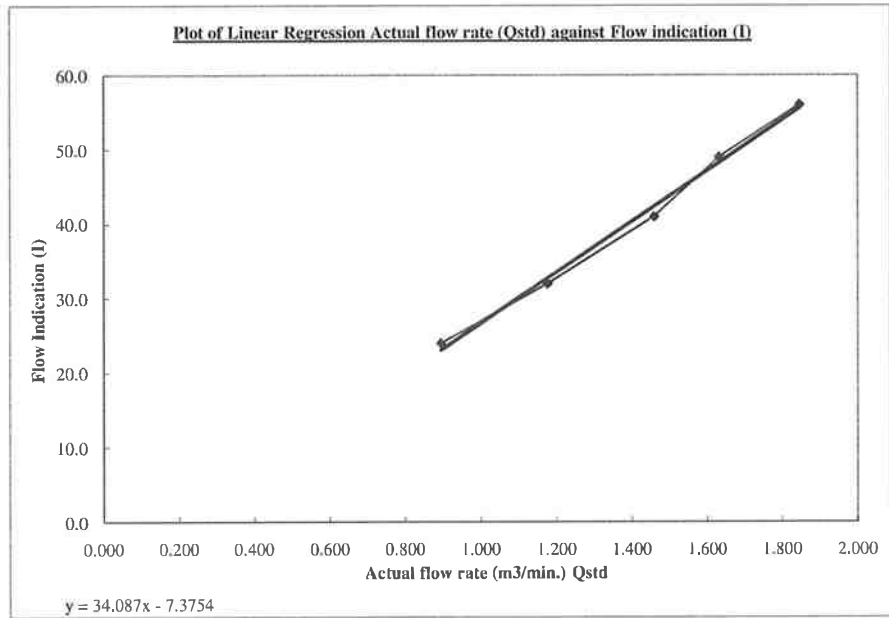
$$\text{Flow (corrected)} = \sqrt{H \times \frac{P_a}{P_{std}} \times \frac{T_{std}}{T_a}}$$

Standard pressure (mmHg) Pstd:	763.9
Standard temp. (K) Tstd:	290.8
Calibration pressure (mmHg) Pa:	764.5
Calibration temp. (K) Ta:	286.7

$$Q_{std} = \frac{1}{m} \times \left(\sqrt{H \times \frac{P_a}{P_{std}} \times \frac{T_{std}}{T_a}} - b \right)$$

Sample no.	Pressure Drop (H), inch	Flow (corrected), m ³ /min	Actual flow rate (Qstd), m ³ /min	Flow indication (I), arbitrary
1	12.8	3.649	1.846	56.0
2	10.0	3.225	1.632	49.0
3	8.0	2.885	1.459	41.0
4	5.2	2.326	1.177	32.0
5	3.0	1.767	0.894	24.0

Correlation Coefficient : 0.9969



Remark
 1HPa = 0.750062 mmHg

Calibrated by: **Arthur Chiu**
 (*Arthur Chiu*)

Date: 21/01/2011

Checked by: **F.C. Tsang**
 (*F.C. Tsang*)

Date: 21/01/2011

High Volume Air Sampler Calibration Worksheet

Project Title: Design and Construction of Tsuen Wan Drainage Tunnel
 Monitoring Location: Heng Hoi Chi Hong Ship Temple (ASR 3)
 Calibration Date: 21-Jan-11
 Calibration Due Date: 20-Mar-11
 Time: 08:15

Sampler Model:	BM2000HX
Serial No.:	5875
Calibrator Orifice no.:	1785
Slope (m):	1.97702
Intercept (b):	-0.00070
Correction coeff. (r)	0.99992

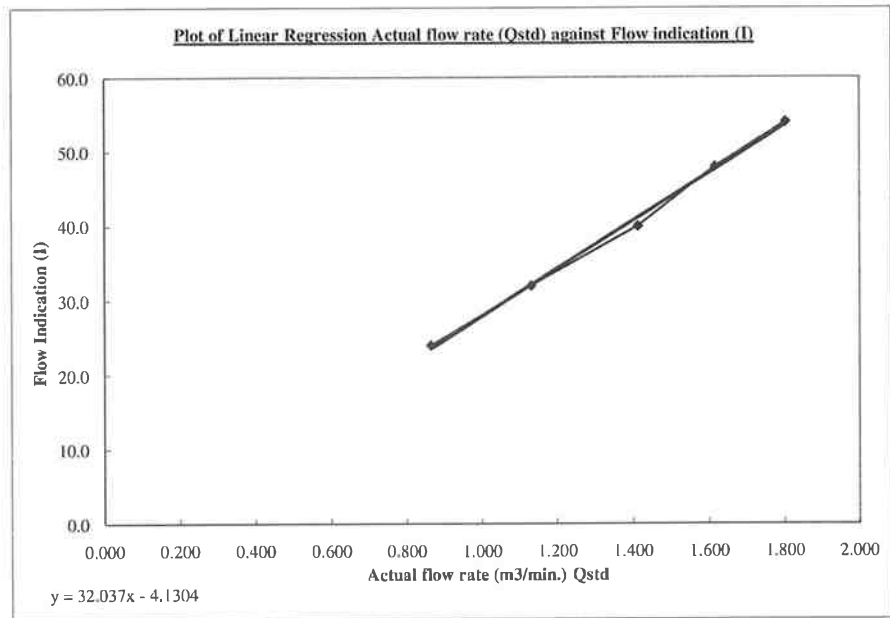
Standard pressure (mmHg) Pstd:	763.9
Standard temp. (K) Tstd:	290.8
Calibration pressure (mmHg) Pa:	764.5
Calibration temp. (K) Ta:	286.7

$$\text{Flow (corrected)} = \sqrt{H \times \frac{Pa}{Pstd} \times \frac{Tstd}{Ta}}$$

$$Qstd = \frac{1}{m} \times \left(\sqrt{H \times \frac{Pa}{Pstd} \times \frac{Tstd}{Ta}} - b \right)$$

Sample no.	Pressure Drop (H), inch	Flow (corrected), m ³ /min	Actual flow rate (Qstd), m ³ /min	Flow indication (l), arbitrary
1	12.2	3.562	1.802	54.0
2	9.8	3.193	1.615	48.0
3	7.5	2.793	1.413	40.0
4	4.8	2.235	1.131	32.0
5	2.8	1.707	0.864	24.0

Correlation Coefficient : 0.9984



Remark
 1HPa = 0.750062 mmHg

Calibrated by: Arthur Chiu
 (*Arthur Chiu*)

Date: 21/01/2011

Checked by: F.C. Tsang
 (*F.C. Tsang*)

Date: 21/01/2011

High Volume Air Sampler Calibration Worksheet

Project Title: Design and Construction of Tsuen Wan Drainage Tunnel
Monitoring Location: Long Beach Gardan (ASR 8)
Calibration Date: 21-Jan-11
Calibration Due Date: 20-Mar-11
Time: 08:30

Sampler Model:	TE5005X
Serial No.:	1059
Calibrator Orifice no.:	1785
Slope (m):	1.97702
Intercept (b):	-0.00070
Correction coeff. (r)	0.99992

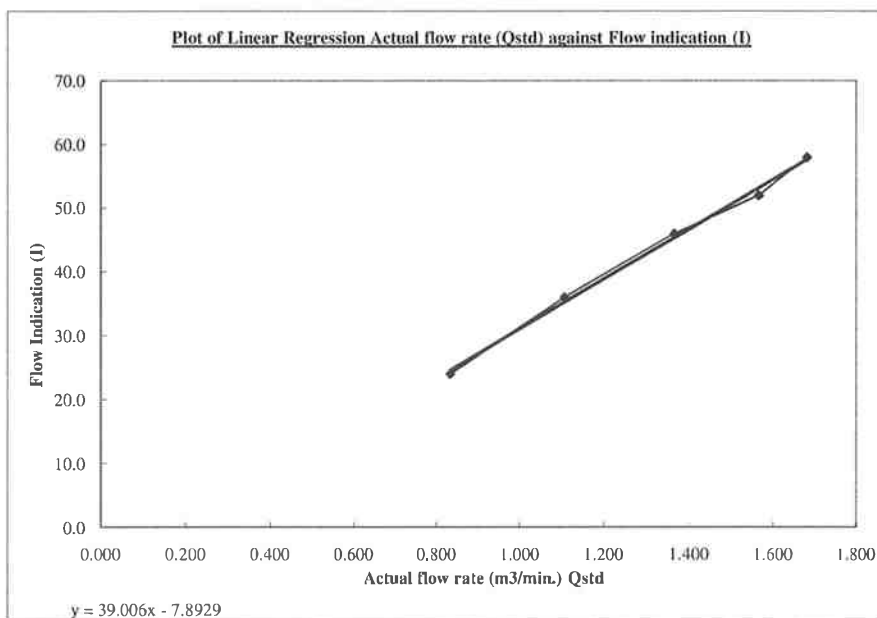
Standard pressure (mmHg) Pstd:	763.9
Standard temp. (K) Tstd:	290.8
Calibration pressure (mmHg) Pa:	764.5
Calibration temp. (K) Ta:	286.7

$$\text{Flow (corrected)} = \sqrt{H \times \frac{Pa}{Pstd} \times \frac{Tstd}{Ta}}$$

$$Qstd = \frac{1}{m} \times \left(\sqrt{H \times \frac{Pa}{Pstd} \times \frac{Tstd}{Ta}} - b \right)$$

Sample no.	Pressure Drop (H), inch	Flow (corrected), m ³ /min	Actual flow rate (Qstd), m ³ /min	Flow indication (I), arbitrary
1	10.6	3.321	1.680	58.0
2	9.2	3.094	1.565	52.0
3	7.0	2.698	1.365	46.0
4	4.6	2.187	1.107	36.0
5	2.6	1.645	0.832	24.0

Correlation Coefficient : 0.9981



Remark
 IHPa = 0.750062 mmHg

Calibrated by: Arthur Chiu
 (*Arthur Chiu*)

Date: 21/01/2011

Checked by: F.C. Tsang *Fong Cheong*
 (TSANG, FAN CHEONG)

Date: 21/01/2011

High Volume Air Sampler Calibration Worksheet

Project Title: Design and Construction of Tsuen Wan Drainage Tunnel
 Monitoring Location: Greenview Terrance (ASR 9)
 Calibration Date: 21-Jan-11
 Calibration Due Date: 20-Mar-11
 Time: 08:45

Sampler Model:	TE5005X
Serial No.:	1713
Calibrator Orifice no.:	1785
Slope (m):	1.97702
Intercept (b):	-0.00070
Correction coeff. (r)	0.99992

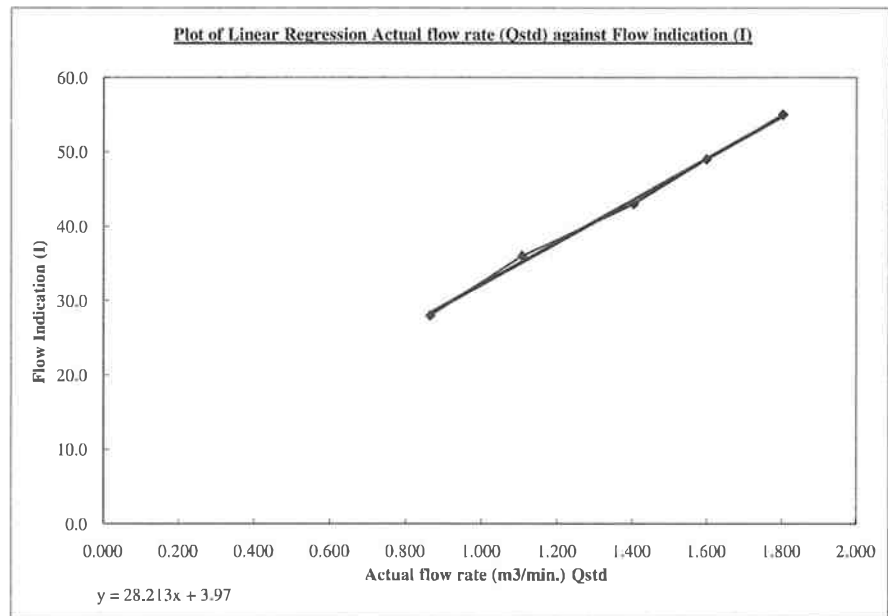
Standard pressure (mmHg) Pstd:	763.9
Standard temp. (K) Tstd:	290.8
Calibration pressure (mmHg) Pa:	764.5
Calibration temp. (K) Ta:	286.7

$$\text{Flow (corrected)} = \sqrt{H \times \frac{Pa}{Pstd} \times \frac{Tstd}{Ta}}$$

$$Qstd = \frac{1}{m} \times \left(\sqrt{H \times \frac{Pa}{Pstd} \times \frac{Tstd}{Ta}} - b \right)$$

Sample no.	Pressure Drop (H), inch	Flow (corrected), m ³ /min	Actual flow rate (Qstd), m ³ /min	Flow indication (I), arbitrary
1	12.2	3.562	1.802	55.0
2	9.6	3.160	1.599	49.0
3	7.4	2.774	1.404	43.0
4	4.6	2.187	1.107	36.0
5	2.8	1.707	0.864	28.0

Correlation Coefficient : 0.9988



Remark
 1HPa = 0.750062 mmHg

Calibrated by: Arthur Chiu
 (*Arthur Chiu*)

Date: 21/01/2011

Checked by: F.C. Tsang
 (TSANG, FAN CHEONG)

Date: 21/01/2011



TISCH ENVIRONMENTAL, INC.
 145 SOUTH MIAMI AVE.
 VILLAGE OF CLEVELAND, 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 10, 2010 Rootmeter S/N 9833620 Ta (K) - 296
 Operator Tisch Orifice I.D. - 1785 Pa (mm) - 750.57

PLATE OR Run #	VOLUME START (m3)	VOLUME STOP (m3)	DIFF VOLUME (m3)	DIFF TIME (min)	METER	ORFICE
					DIFF Hg (mm)	DIFF H2O (in.)
1	NA	NA	1.00	1.3960	3.2	2.00
2	NA	NA	1.00	0.9840	6.4	4.00
3	NA	NA	1.00	0.8790	7.9	5.00
4	NA	NA	1.00	0.8390	8.7	5.50
5	NA	NA	1.00	0.6940	12.7	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
0.9900	0.7092	1.4102	0.9957	0.7133	0.8881
0.9858	1.0018	1.9943	0.9915	1.0076	1.2560
0.9837	1.1191	2.2296	0.9894	1.1256	1.4042
0.9827	1.1713	2.3385	0.9884	1.1781	1.4728
0.9774	1.4084	2.8203	0.9830	1.4165	1.7762
Qstd slope (m) = 2.01637			Qa slope (m) = 1.26262		
intercept (b) = -0.02316			intercept (b) = -0.01458		
coefficient (r) = 0.99996			coefficient (r) = 0.99996		
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:

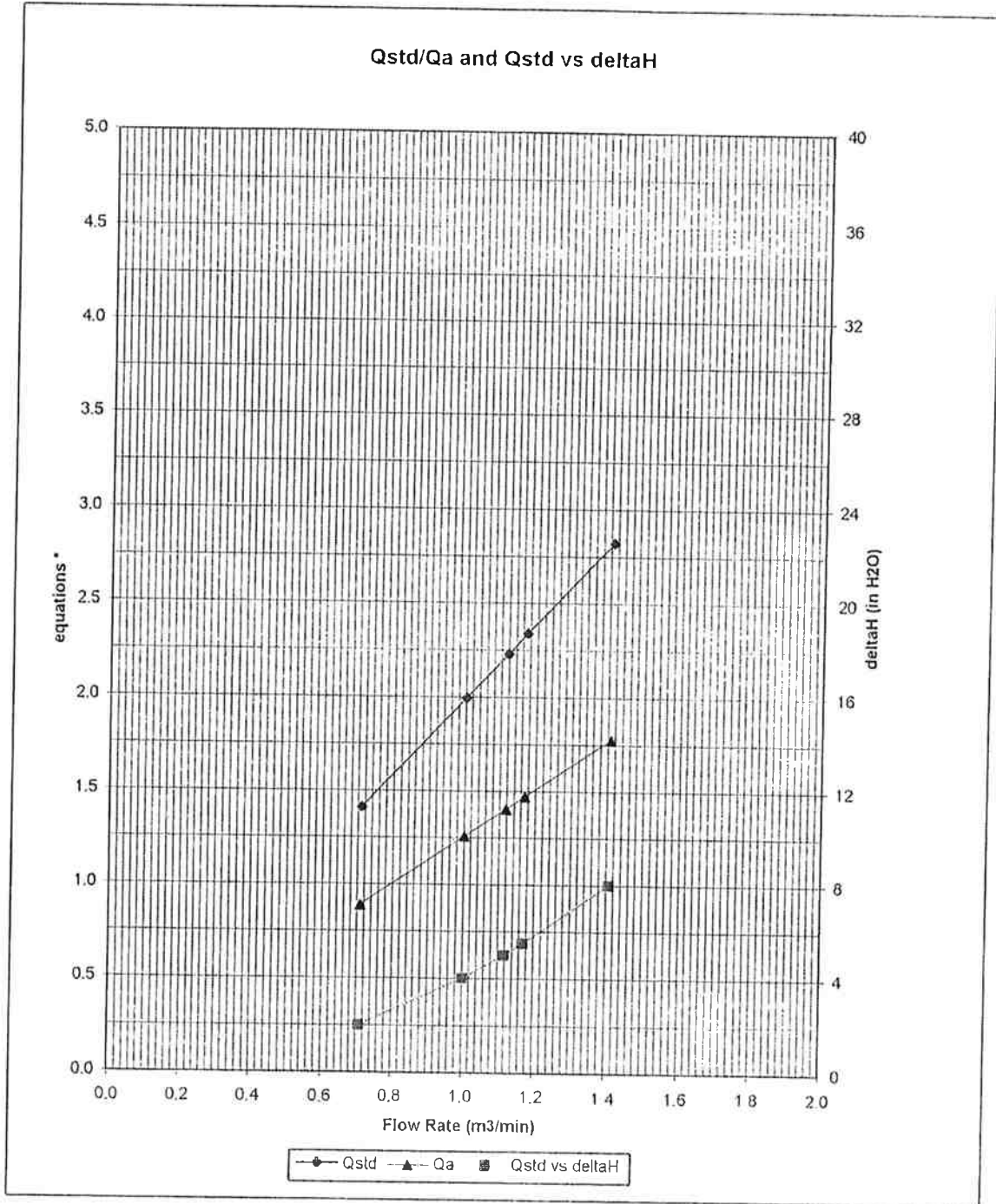
$$Qstd = 1/m \{ [\text{SQRT}(\text{H2O}(\text{Pa}/760)(298/\text{Ta}))] - b \}$$

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



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AIR POLLUTION MONITORING EQUIPMENT



* y-axis equations:

Qstd series:
$$\sqrt{\Delta H \left(\frac{P_a}{P_{std}} \right) \left(\frac{T_{std}}{T_a} \right)}$$

Qa series:
$$\sqrt{\Delta H (T_a / P_a)}$$

#1785



輝創工程有限公司

Sun Creation Engineering Limited Calibration and Testing Laboratory

Certificate No. : C102904

Certificate of Calibration

This is to certify that the equipment

Description : Sound Level Meter

Manufacturer : Rion

Model No. : NL-31

Serial No. : 00410224

*has been calibrated for the specific items and ranges.
The results are shown in the Calibration Report No. C102904.*

The equipment is supplied by

Co. Name : Envirotech Services Co.

*Address : Shop 6, G/F., Casio Mansion, 209 Shaukeiwan Road,
Hong Kong*

Date of Issue : 31 May 2010

Certified by :

K C Lee

The test equipment used for calibration are traceable to the National Standards as specified in this report.
This report shall not be reproduced except in full and with prior written approval from this laboratory.

Calibration and Testing Laboratory of Sun Creation Engineering Limited

c/o T.F. Tsing Shan Wan Exchange Building, 1 Hing On Lane, Tuen Mun, New Territories, Hong Kong
Tel: 2927 2606 Fax: 2744 8986 E-mail: call@suncreation.com Website: www.suncreation.com



輝創工程有限公司

Sun Creation Engineering Limited Calibration and Testing Laboratory

Certificate No. : C106297

Certificate of Calibration

This is to certify that the equipment

Description : Integrating Sound Level Meter

Manufacturer : Bruel & Kjaer

Model No. : 2238

Serial No. : 2448529

*has been calibrated for the specific items and ranges.
The results are shown in the Calibration Report No. C106297.*

The equipment is supplied by

Co. Name : Hyder Consulting Limited

*Address : 47/F., Hopewell Centre, 183 Queen's Road East,
Wanchai, Hong Kong*

Date of Issue : 16 November 2010

Certified by :

K/C Lee

The test equipment used for calibration are traceable to the National Standards as specified in this report.
This report shall not be reproduced except in full and with prior written approval from this laboratory.

Calibration and Testing Laboratory of Sun Creation Engineering Limited

c/o 4/F, Tsing Shan Wan Exchange Building, 1 Hing On Lane, Tuen Mun, New Territories, Hong Kong
Tel: 2927 2606 Fax: 2744 8986 E-mail: callab@suncreation.com Website: www.suncreation.com



Calibration Certificate

Certificate No. **07436**

Page 1 of 3 Pages

Customer : Hyder Consulting Limited

Address : 47/F., Hopewell Centre, 183 Queens Road East, Wanchai, Hong Kong

Order No. : Q02884

Date of receipt : 28-Dec-10

Item Tested

Description : Sound Level Meter

Manufacturer : B&K

Model : 2238

Serial No. : 2562782

Test Conditions

Date of Test : 29-Dec-10

Supply Voltage : --

Ambient Temperature : (23 ± 3)°C

Relative Humidity : (50 ± 25) %

Test Specifications

Calibration check.

Ref. Document/Procedure: Z01.

Test Results

All results were within the IEC 651 Type 1 & IEC 804 Type 1 specification.

The results are shown in the attached page(s).

Main Test equipment used:

<u>Equipment No.</u>	<u>Description</u>	<u>Cert. No.</u>	<u>Traceable to</u>
S017A	Multi-Function Generator	07279	SCL-HKSAR
S024	Sound Level Calibrator	04062	NIM-PRC & SCL-HKSAR

The values given in this Calibration Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Hong Kong Calibration Ltd. shall not be liable for any loss or damage resulting from the use of the equipment.

The test equipment used for calibration are traceable to International System of Units (SI).

The test results apply to the above Unit-Under-Test only

Calibrated by : 

P. F. Wong

Approved by : 

Dorothy Cheuk

Date: 30-Dec-10

This Certificate is issued by:

Hong Kong Calibration Ltd.

Unit 8B, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street, Kwai Chung, NT, Hong Kong.

Tel: 2425 8801 Fax: 2425 8646

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Calibration Certificate

Certificate No. **07436**

Page 2 of 3 Pages

Results :

1. SPL Accuracy

UUT Setting				Applied Value (dB)	UUT Reading (dB)
Range	Freq. Wgt.	Bandwith	Center Freq.		
20 ~ 100	A	BB/F	--	94.0	94.1
	A	BB/S	--		94.1
	C	BB/F	--		94.0
40 ~ 120	A	BB/F	--	94.0	94.1
	A	BB/F	--	114.0	113.9

IEC 651 Type 1 Spec. : ± 0.7 dB

Uncertainty : ± 0.1 dB

2. Level Stability : 0.0 dB

IEC 651 Type 1 Spec. : ± 0.3 dB

Uncertainty : ± 0.01 dB

3. Linearity

3.1 Level Linearity

UUT Range (dB)	Applied Value (dB)	UUT Reading (dB)	Variation (dB)	IEC 651 Type 1 Spec. (Primary Indicator Range)
140	114.0	114.3	+0.2	± 0.7 dB
130	104.0	104.3	+0.2	
120	94.0	94.1 (Ref.)	--	
110	84.0	83.9	-0.2	
100	74.0	73.9	-0.2	
90	64.0	63.9	-0.2	
80	54.0	54.2	+0.1	

Uncertainty : ± 0.1 dB



Calibration Certificate

Certificate No. **07436**

Page 3 of 3 Pages

3.2 Differential level linearity

UUT Range (dB)	Applied Value (dB)	UUT Reading (dB)	Variation (dB)	IEC 651 Type 1 Spec.
120	84.0	83.9	-0.2	± 0.4 dB
	94.0	94.1 (Ref.)	--	
	95.0	95.1	0.0	± 0.2 dB

Uncertainty : ± 0.1 dB

4. Frequency Weighting

A weighting

Frequency	Attenuation (dB)	IEC 651 Type 1 Spec.
31.5 Hz	-40.0	- 39.4 dB, ± 1.5 dB
63 Hz	-26.7	- 26.2 dB, ± 1.5 dB
125 Hz	-16.6	- 16.1 dB, ± 1 dB
250 Hz	-9.1	- 8.6 dB, ± 1 dB
500 Hz	-3.5	- 3.2 dB, ± 1 dB
1 kHz	0.0 (Ref)	0 dB, ± 1 dB
2 kHz	+1.5	+ 1.2 dB, ± 1 dB
4 kHz	+1.3	+ 1.0 dB, ± 1 dB
8 kHz	-0.7	- 1.1 dB, + 1.5 dB ~ -3 dB
16 kHz	-6.3	- 6.6 dB, + 3 dB ~ - ∞

Uncertainty : ± 0.1 dB

5. Time Averaging

Applied Burst duty Factor	Applied Leq Value (dB)	UUT Reading (dB)	IEC 804 Type 1 Spec.
continuous	40.0	40.0	--
1/10	40.0	39.9	± 0.5 dB
1/10 ²	40.0	40.0	
1/10 ³	40.0	40.5	± 1.0 dB
1/10 ⁴	40.0	41.0	

Uncertainty : ± 0.1 dB

Remarks : 1. UUT : Unit-Under-Test

2. The uncertainty claimed is for a confidence probability of not less than 95%.

3. Atmospheric pressure : 1 012 hPa.

----- END -----



Calibration Certificate

Certificate No. **07437**

Page 1 of 2 Pages

Customer : Hyder Consulting Limited

Address : 47/F., Hopewell Centre, 183 Queens Road East, Wanchai, Hong Kong

Order No. : Q02884

Date of receipt : 28-Dec-10

Item Tested

Description : Sound Level Calibrator

Manufacturer : B&K

Model : Type 4231

Serial No. : 2699361

Test Conditions

Date of Test : 29-Dec-10

Supply Voltage : --

Ambient Temperature : (23 ± 3)°C

Relative Humidity : (50 ± 25) %

Test Specifications

Calibration check.

Ref. Document/Procedure : F21, Z02.

Test Results

All results were within the IEC 942 Class 1 specification.

The results are shown in the attached page(s).

Main Test equipment used:

<u>Equipment No.</u>	<u>Description</u>	<u>Cert. No.</u>	<u>Traceable to</u>
S014	Spectrum Analyzer	03926	NIM-PRC & SCL-HKSAR
S024	Sound Level Calibrator	04062	NIM-PRC & SCL-HKSAR
S041	Universal Counter	04461	SCL-HKSAR
S206	Sound Level Meter	04462	SCL-HKSAR

The values given in this Calibration Certificate only relate to the values measured at the time of the test and any uncertainties quoted will not include allowance for the equipment long term drift, variations with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement. Hong Kong Calibration Ltd. shall not be liable for any loss or damage resulting from the use of the equipment.

The test equipment used for calibration are traceable to International System of Units (SI).

The test results apply to the above Unit-Under-Test only

Calibrated by : 
P. F. Wong

Approved by : 
Dorothy Cheuk

Date: 30-Dec-10

This Certificate is issued by:

Hong Kong Calibration Ltd.

Unit 8B, 24/F., Well Fung Industrial Centre, No. 58-76, Ta Chuen Ping Street, Kwai Chung, NT, Hong Kong.

Tel: 2425 8801 Fax: 2425 8646

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Calibration Certificate

Certificate No. 07437

Page 2 of 2 Pages

Results :

1. Level Accuracy

UUT Nominal Value (dB)	Measured Value (dB)	IEC 942 Class 1 Spec.
94	94.02	± 0.3 dB
114	114.10	

Uncertainty : ± 0.1 dB

2. Frequency

UUT Nominal Value	Measured Value	IEC 942 Class 1 Spec.
1 kHz	1.000 kHz	± 2 %

Uncertainty : ± 3.6 x 10⁻⁶

3. Level Stability : 0.0 dB

IEC 942 Class 1 Spec. : ± 0.1 dB

Uncertainty : ± 0.01 dB

4. Total Harmonic Distortion : < 0.5 %

IEC 942 Class 1 Spec. : < 3 %

Uncertainty : ± 2.3 % of reading

Remark : 1. UUT : Unit-Under-Test

2. The above measured values are the mean of 3 measurement.

3. The uncertainty claimed is for a confidence probability of not less than 95%.

4. Atmospheric Pressure : 1012 hPa.

----- END -----

CERTIFICATE OF ANALYSIS



Work Order: HK1030685
Date of Issue: 31/12/2010
Client: HYDER CONSULTING LIMITED
Client Reference: DC2007/12 DESIGN AND CONSTRUCTION OF
TSUEN WAN DRAINAGE TUNNEL

Calibration of Turbidity System

Item : Turbidimeter Model No.: Eutech Instruments TN-100
ALS Lab ID: HK1030685 -001 Equipment No.: --
Date of Calibration: 28 December, 2010 Serial No.: 215619

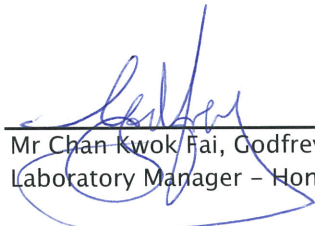
Testing Results :

Turbidity

Expected Reading	Recording Reading
0.00 NTU	0.29 NTU
4.00 NTU	3.97 NTU
40.0 NTU	39.7 NTU
80.0 NTU	74.2 NTU
400 NTU	433 NTU
800 NTU	783 NTU
Allowing Deviation	± 10%

Testing Method:

APHA (19th edition), 2130B


Mr Chan Kwok Fai, Godfrey
Laboratory Manager - Hong Kong

CERTIFICATE OF ANALYSIS



Work Order: HK1028665
Date of Issue: 03/12/2010
Client: HYDER CONSULTING LIMITED
Client Reference:

Calibration of Multimeter

Item : Multimeter
ALS Lab ID: HK102866 -001
Date of Calibration: 03 December 2010

Model No.: WTW pH/Oxi 340i
Serial No.: 08101283

Testing Results :

pH	Expected Reading	Recording Reading	Testing Method: APHA (20th edition), 4500-H ⁺ B
	4.00	4.03	
7.00	7.18		
10.0	10.1		
Allowing Deviation	± 0.2 unit		

Temperature	Expected Reading	Recording Reading	Testing Method: In-House Method
	12.5 °C	12.6 °C	
20.5 °C	20.8 °C		
37.0 °C	37.1 °C		
Allowing Deviation	±2.0°C		

Dissolved Oxygen	Expected Reading	Recording Reading	Testing Method: APHA (20th edition), 4500-OC & G
	4.67 mg/L	4.75 mg/L	
5.97 mg/L	5.89 mg/L		
8.01 mg/L	8.02 mg/L		
Allowing Deviation	± 0.2 mg/L		


Mr Chan Kwok Fai, Godfrey
Laboratory Manager - Hong Kong