

High Volume Air Sampler Calibration Worksheet

Project Title: Design and Construction of Tsuen Wan Drainage Tunnel
Monitoring Location: Ho Fung College
Calibration Date: 05-Aug-09
Calibration Due Date: 05-Oct-09
Time: 12:15

Sampler Model:	BM2000HX
Serial No.:	4994
Calibrator Orifice no.:	1559
Slope (m):	1.97702
Intercept (b):	-0.00070
Correction coeff. (r)	0.99992

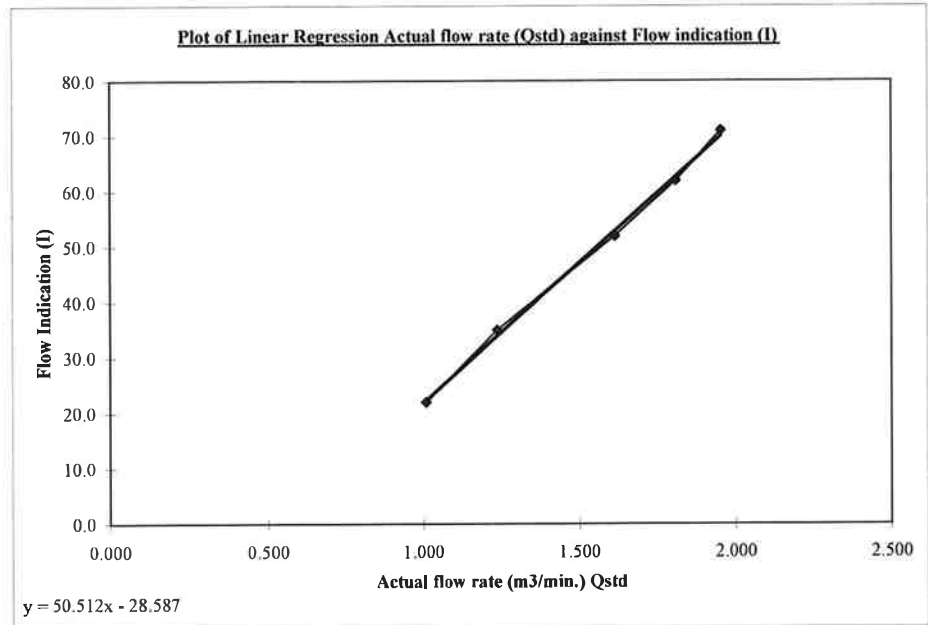
$$\text{Flow (corrected)} = \sqrt{H \times \frac{Pa}{Pstd} \times \frac{Tstd}{Ta}}$$

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

Standard pressure (mmHg) Pstd:	765.8
Standard temp. (K) Tstd:	293.00
Calibration pressure (mmHg) Pa:	748.0
Calibration temp. (K) Ta:	300.8

Sample no.	Pressure Drop (H), inch	Flow (corrected), m ³ /min	Actual flow rate (Qstd), m ³ /min	Flow indication (I), arbitrary
1	15.4	3.860	1.953	71.0
2	13.2	3.574	1.808	62.0
3	10.5	3.187	1.613	52.0
4	6.2	2.449	1.239	35.0
5	4.1	1.992	1.008	22.0

Correlation Coefficient : 0.9990



Remark
 1HPa = 0.750062 mmHg

Calibrated by: Mak Kei Ho
 (*Ho*)

Date: 5-8-09

Checked by: Tang Hiu Yeung
 (*Yeung*)

Date: 5-8-09

High Volume Air Sampler Calibration Worksheet

Project Title: Design and Construction of Tsuen Wan Drainage Tunnel
Monitoring Location: Ho Fung College
Calibration Date: 06-Oct-09
Calibration Due Date: 06-Dec-09
Time: 15:35

Sampler Model:	BM2000HX
Serial No.:	4994
Calibrator Orifice no.:	1559
Slope (m):	1.97702
Intercept (b):	-0.00070
Correction coeff. (r)	0.99992

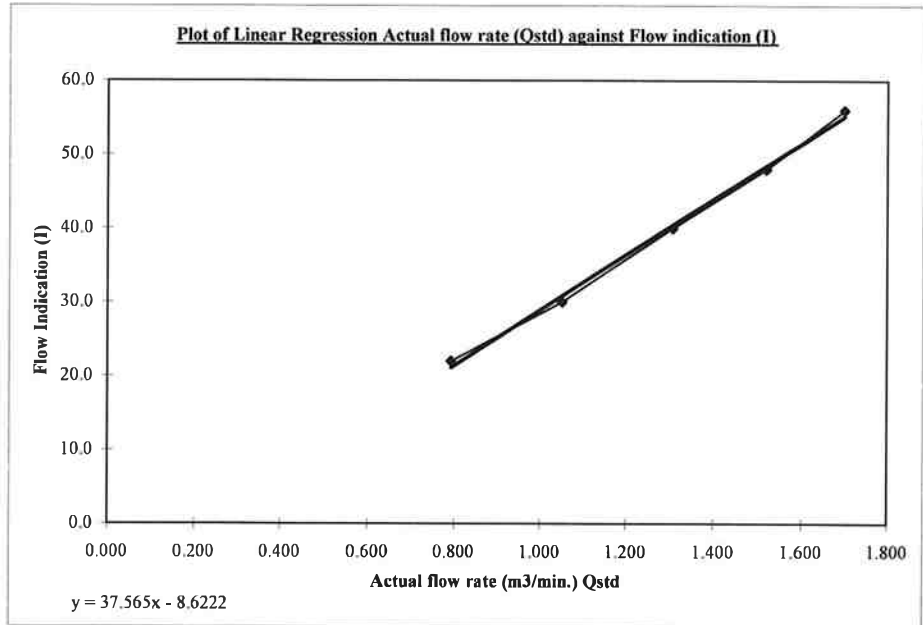
Standard pressure (mmHg) Pstd:	756.4
Standard temp. (K) Tstd:	301.80
Calibration pressure (mmHg) Pa:	748.0
Calibration temp. (K) Ta:	300.8

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

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

Sample no.	Pressure Drop (H), inch	Flow (corrected), m ³ /min	Actual flow rate (Qstd), m ³ /min	Flow indication (I), arbitrary
1	11.5	3.356	1.698	56.0
2	9.2	3.002	1.519	48.0
3	6.8	2.581	1.306	40.0
4	4.4	2.076	1.050	30.0
5	2.5	1.565	0.792	22.0

Correlation Coefficient : 0.9983



Remark
 1HPa = 0.750062 mmHg

Calibrated by: Mak Kei Ho
 (H O)

Date: 7-10-09

Checked by: Tang Hiu Yeung
 (M)

Date: 8-10-09

High Volume Air Sampler Calibration Worksheet

Project Title: Design and Construction of Tsuen Wan Drainage Tunnel
Monitoring Location: Heng Hoi Chi Hong Ship Temple
Calibration Date: 05-Aug-09
Calibration Due Date: 05-Oct-09
Time: 12:35

Sampler Model:	BM2000HX
Serial No.:	5875
Calibrator Orifice no.:	1559
Slope (m):	1.97702
Intercept (b):	-0.00070
Correction coeff. (r)	0.99992

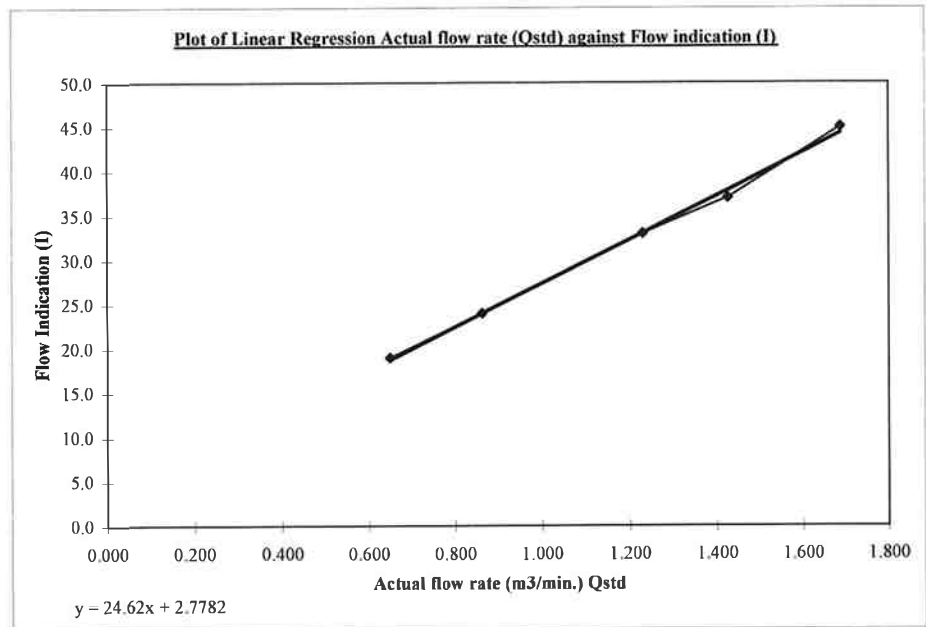
Standard pressure (mmHg) Pstd:	765.8
Standard temp. (K) Tstd:	293.00
Calibration pressure (mmHg) Pa:	748.0
Calibration temp. (K) Ta:	300.8

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

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

Sample no.	Pressure Drop (H), inch	Flow (corrected), m ³ /min	Actual flow rate (Qstd), m ³ /min	Flow indication (I), arbitrary
1	11.5	3.336	1.688	45.0
2	8.2	2.817	1.425	37.0
3	6.1	2.429	1.229	33.0
4	3.0	1.704	0.862	24.0
5	1.7	1.283	0.649	19.0

Correlation Coefficient : 0.9985



Remark
 1HPa = 0.750062 mmHg

Calibrated by: Mak Kei Ho
 (*Mak Kei Ho*)

Date: 5-8-09

Checked by: Tang Hiu Yeung
 (*Tang Hiu Yeung*)

Date: 5-8-09

High Volume Air Sampler Calibration Worksheet

Project Title: Design and Construction of Tsuen Wan Drainage Tunnel
Monitoring Location: Heng Hoi Chi Hong Ship Temple
Calibration Date: 06-Oct-09
Calibration Due Date: 06-Dec-09
Time: 14:45

Sampler Model:	BM2000HX
Serial No.:	5875
Calibrator Orifice no.:	1559
Slope (m):	1.97702
Intercept (b):	-0.00070
Correction coeff. (r)	0.99992

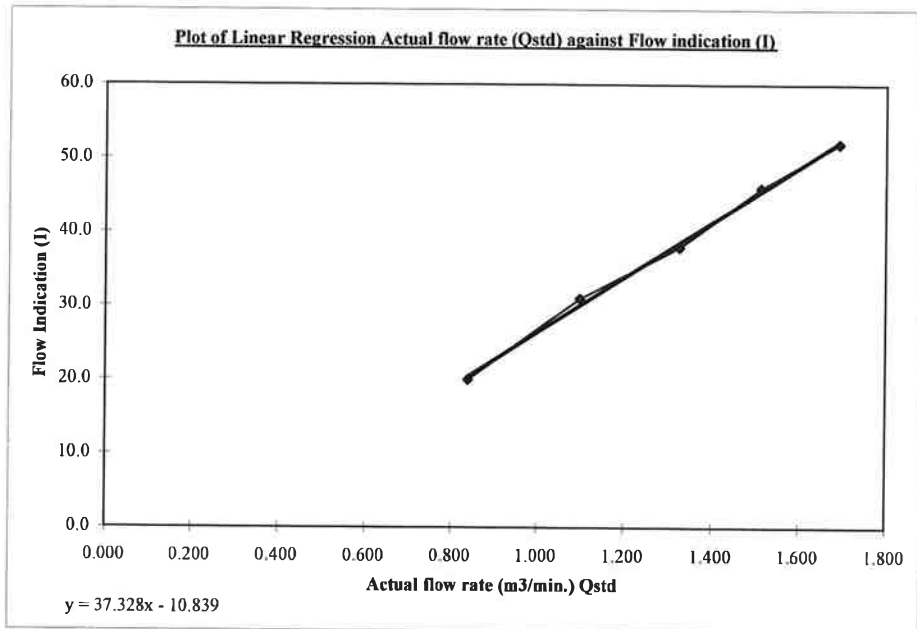
Standard pressure (mmHg) Pstd:	756.4
Standard temp. (K) Tstd:	301.80
Calibration pressure (mmHg) Pa:	748.0
Calibration temp. (K) Ta:	300.8

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

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

Sample no.	Pressure Drop (H), inch	Flow (corrected), m ³ /min	Actual flow rate (Qstd), m ³ /min	Flow indication (I), arbitrary
1	11.4	3.342	1.691	52.0
2	9.1	2.986	1.511	46.0
3	7.0	2.619	1.325	38.0
4	4.8	2.168	1.097	31.0
5	2.8	1.656	0.838	20.0

Correlation Coefficient : 0.9987



Remark
 1HPa = 0.750062 mmHg

Calibrated by: Mak Kei Ho
 (Ho)

Date: 7-10-09

Checked by: Tang Hiu Yeung
 (H.Y.)

Date: 8-10-09

High Volume Air Sampler Calibration Worksheet

Project Title: Design and Construction of Tsuen Wan Drainage Tunnel
Monitoring Location: Long Beach Gardan
Calibration Date: 05-Aug-09
Calibration Due Date: 05-Oct-09
Time: 13:44

Sampler Model:	TE5005X
Serial No.:	0390
Calibrator Orifice no.:	1559
Slope (m):	1.97702
Intercept (b):	-0.00070
Correction coeff. (r)	0.99992

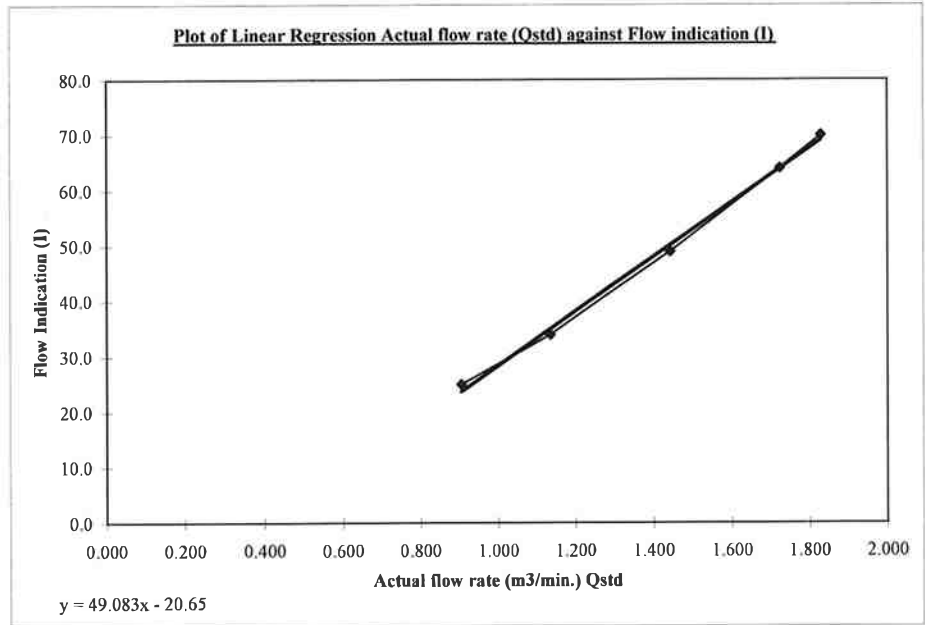
$$\text{Flow (corrected)} = \sqrt{H \times \frac{Pa}{Pstd} \times \frac{Tstd}{Ta}}$$

Standard pressure (mmHg) Pstd:	765.8
Standard temp. (K) Tstd:	293.00
Calibration pressure (mmHg) Pa:	748.0
Calibration temp. (K) Ta:	300.8

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

Sample no.	Pressure Drop (H), inch	Flow (corrected), m ³ /min	Actual flow rate (Qstd), m ³ /min	Flow indication (I), arbitrary
1	13.5	3.614	1.828	70.0
2	12.0	3.408	1.724	64.0
3	8.4	2.851	1.442	49.0
4	5.2	2.243	1.135	34.0
5	3.3	1.787	0.904	25.0

Correlation Coefficient : 0.9983



Remark
 1HPa = 0.750062 mmHg

Calibrated by: Mak Kei Ho
 (Ho)

Date: 5-8-09

Checked by: Tang Hiu Yeung
 (Yeung)

Date: 5-8-09

High Volume Air Sampler Calibration Worksheet

Project Title: Design and Construction of Tsuen Wan Drainage Tunnel
Monitoring Location: Long Beach Gardan
Calibration Date: 06-Oct-09
Calibration Due Date: 06-Dec-09
Time: 13:00

Sampler Model:	TE5005X
Serial No.:	0390
Calibrator Orifice no.:	1559
Slope (m):	1.97702
Intercept (b):	-0.00070
Correction coeff. (r)	0.99992

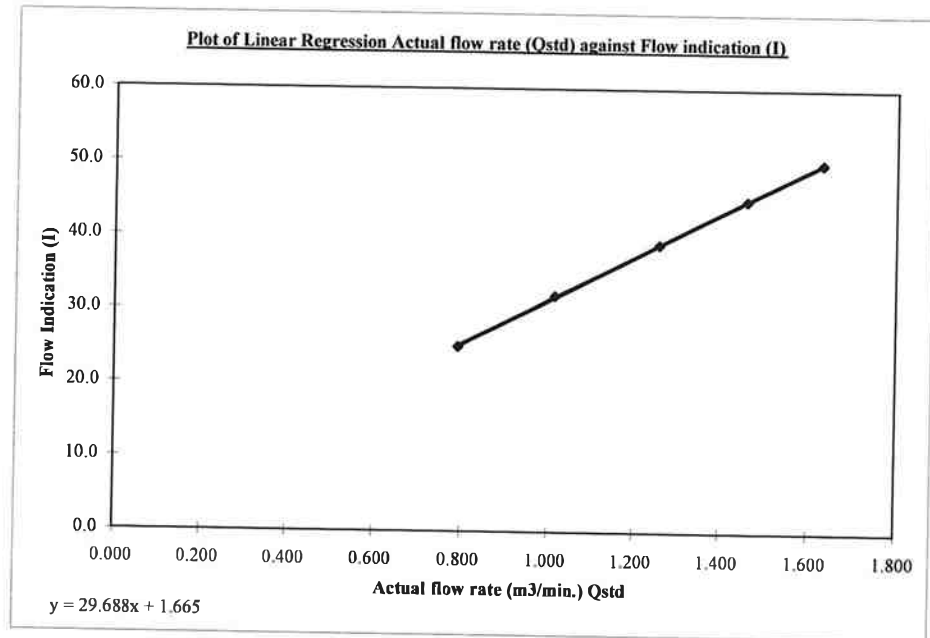
Standard pressure (mmHg) Pstd:	756.4
Standard temp. (K) Tstd:	301.80
Calibration pressure (mmHg) Pa:	748.0
Calibration temp. (K) Ta:	300.8

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

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

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	3.222	1.630	50.0
2	8.5	2.886	1.460	45.0
3	6.3	2.484	1.257	39.0
4	4.1	2.004	1.014	32.0
5	2.5	1.565	0.792	25.0

Correlation Coefficient : 0.9999



Remark
 1HPa = 0.750062 mmHg

Calibrated by: Mak Kei Ho
 (*Mak Kei Ho*)

Date: 7-10-09

Checked by: Tang Hiu Yeung
 (*Tang Hiu Yeung*)

Date: 8-10-09

High Volume Air Sampler Calibration Worksheet

Project Title: Design and Construction of Tsuen Wan Drainage Tunnel
Monitoring Location: Greenview Terrace
Calibration Date: 05-Aug-09
Calibration Due Date: 05-Oct-09
Time: 13:20

Sampler Model:	TE5005X
Serial No.:	0646
Calibrator Orifice no.:	1559
Slope (m):	1.97702
Intercept (b):	-0.00070
Correction coeff. (r)	0.99992

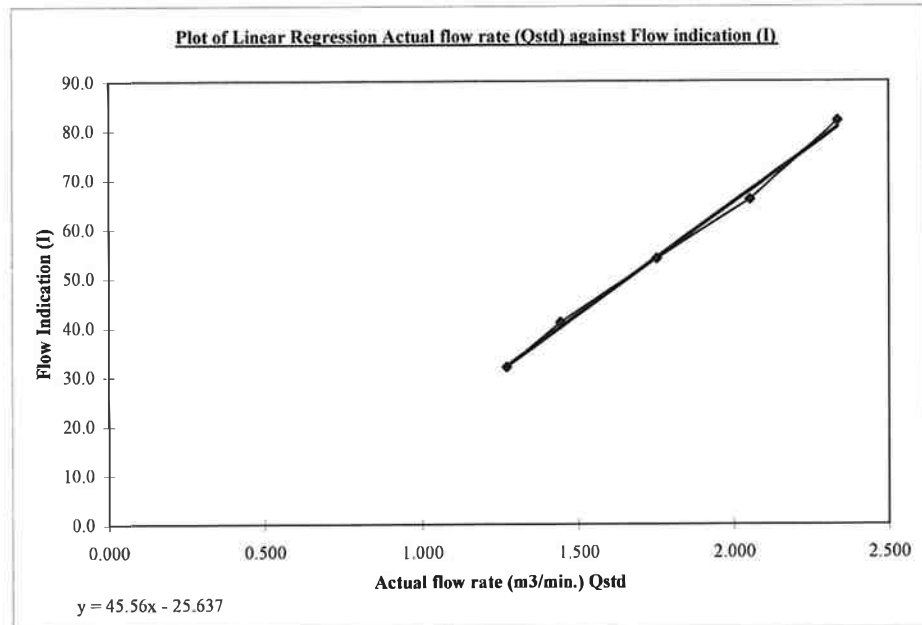
$$\text{Flow (corrected)} = \sqrt{H \times \frac{Pa}{Pstd} \times \frac{Tstd}{Ta}}$$

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

Standard pressure (mmHg) Pstd:	765.8
Standard temp. (K) Tstd:	293.00
Calibration pressure (mmHg) Pa:	748.0
Calibration temp. (K) Ta:	300.8

Sample no.	Pressure Drop (H), inch	Flow (corrected), m ³ /min	Actual flow rate (Qstd), m ³ /min	Flow indication (I), arbitrary
1	22.0	4.614	2.334	82.0
2	17.0	4.056	2.052	66.0
3	12.4	3.464	1.752	54.0
4	8.4	2.851	1.442	41.0
5	6.5	2.508	1.269	32.0

Correlation Coefficient : 0.9981



Remark
 1HPa = 0.750062 mmHg

Calibrated by: Mak Kei Ho
 (*Mk*)

Date: 5-8-09

Checked by: Tang Hiu Yeung
 (*Hy*)

Date: 5-8-09

High Volume Air Sampler Calibration Worksheet

Project Title: Design and Construction of Tsuen Wan Drainage Tunnel
Monitoring Location: Greenview Terrace
Calibration Date: 06-Oct-09
Calibration Due Date: 06-Dec-09
Time: 11:42

Sampler Model:	TE5005X
Serial No.:	0646
Calibrator Orifice no.:	1559
Slope (m):	1.97702
Intercept (b):	-0.00070
Correction coeff. (r)	0.99992

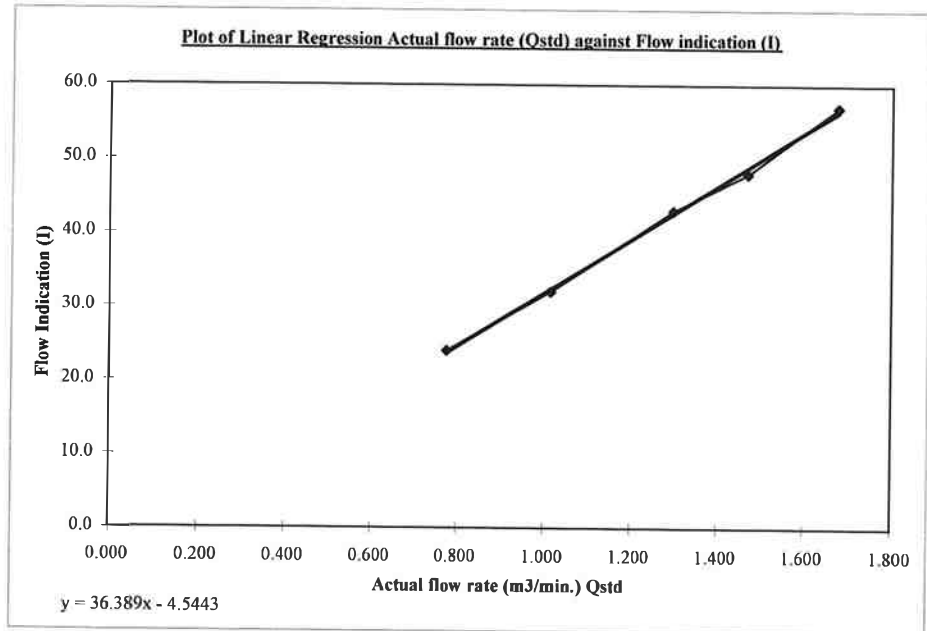
Standard pressure (mmHg) Pstd:	756.4
Standard temp. (K) Tstd:	301.80
Calibration pressure (mmHg) Pa:	748.0
Calibration temp. (K) Ta:	300.8

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

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

Sample no.	Pressure Drop (H), inch	Flow (corrected), m ³ /min	Actual flow rate (Qstd), m ³ /min	Flow indication (I), arbitrary
1	11.2	3.312	1.676	57.0
2	8.6	2.903	1.469	48.0
3	6.7	2.562	1.296	43.0
4	4.1	2.004	1.014	32.0
5	2.4	1.533	0.776	24.0

Correlation Coefficient : 0.9989



Remark
 1HPa = 0.750062 mmHg

Calibrated by: Mak Kei Ho
 (*Mak Kei Ho*)

Date: 7-10-09

Checked by: Tang Hiu Yeung
 (*Tang Hiu Yeung*)

Date: 8-10-09



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 18, 2009 Rootsometer S/N 9833620 Ta (K) - 293
 Operator Tisch Orifice I.D. - 1559 Pa (mm) - 765.81

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	1.4130	3.2	2.00
2	NA	NA	1.00	0.9900	6.4	4.00
3	NA	NA	1.00	0.8850	7.9	5.00
4	NA	NA	1.00	0.8420	8.7	5.50
5	NA	NA	1.00	0.6970	12.7	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
1.0205	0.7222	1.4317	0.9958	0.7047	0.8748
1.0163	1.0266	2.0247	0.9917	1.0017	1.2371
1.0142	1.1460	2.2637	0.9896	1.1182	1.3831
1.0132	1.2033	2.3742	0.9886	1.1741	1.4506
1.0078	1.4459	2.8633	0.9834	1.4109	1.7495
Qstd slope (m) =		1.97702	Qa slope (m) =		1.23797
intercept (b) =		-0.00070	intercept (b) =		-0.00043
coefficient (r) =		0.99992	coefficient (r) =		0.99992
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:

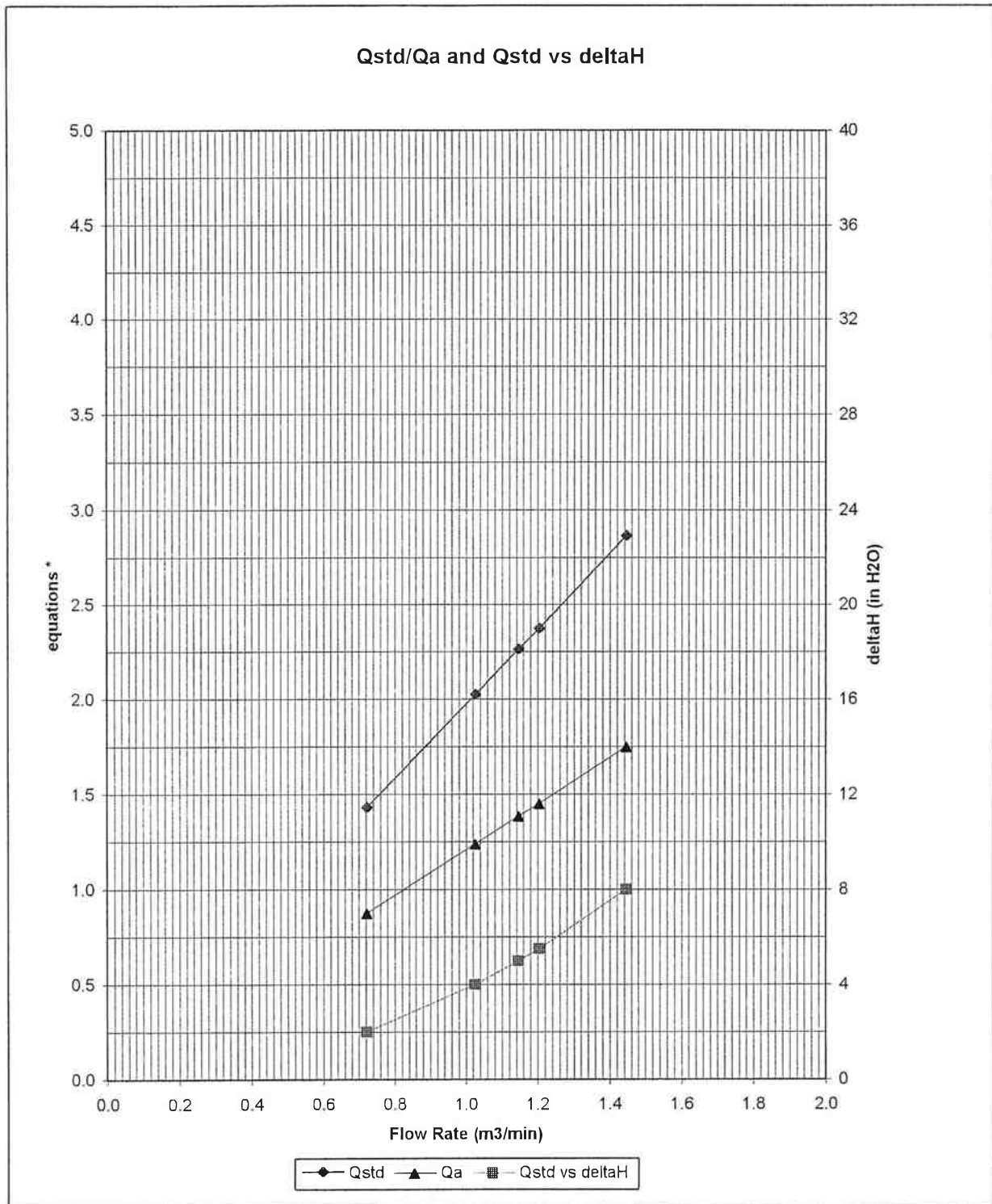
$$Qstd = 1/m \{ [\text{SQRT}(\text{H2O}(\text{Pa}/760) (298/\text{Ta}))] - b \}$$

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



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AIR POLLUTION MONITORING EQUIPMENT

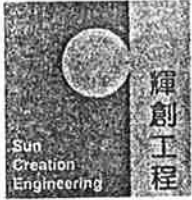


* y-axis equations:

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

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

1559



輝創工程有限公司

Sun Creation Engineering Limited Calibration and Testing Laboratory

Certificate No. : C093599

Certificate of Calibration

This is to certify that the equipment

Description : Precision Sound Level Meter

Manufacturer : Rion

Model No. : NA-27

Serial No. : 00201194

*has been calibrated for the specific items and ranges.
The results are shown in the Calibration Report No. C093599.*

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 : 10 July 2009

Certified by :


H C Chan

The test equipment used for calibration are traceable to the National Standards as specified in this report.
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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: callaba@suncreation.com Website: www.suncreation.com



輝創工程有限公司

Sun Creation Engineering Limited Calibration and Testing Laboratory

Certificate No. : C093598

Certificate of Calibration

This is to certify that the equipment

Description : Sound Level Calibrator

Manufacturer : Rion

Model No. : NC-73

Serial No. : 10786708

*has been calibrated for the specific items and ranges.
The results are shown in the Calibration Report No. C093598.*

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 : 10 July 2009

Certified by : 
H C Chan

The test equipment used for calibration are traceable to the National Standards as specified in this report.
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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



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Sun Creation Engineering Limited Calibration and Testing Laboratory

Certificate No. : C093473

Certificate of Calibration

This is to certify that the equipment

Description : Precision Integrating Sound Level Meter

Manufacturer : Rion

Model No. : NL-18

Serial No. : 00360030

*has been calibrated for the specific items and ranges.
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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 : 6 July 2009

Certified by :

Chan H C Chan
H C Chan

The test equipment used for calibration are traceable to the National Standards as specified in this report.
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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



輝創工程有限公司

Sun Creation Engineering Limited Calibration and Testing Laboratory

Certificate No. : C093472

Certificate of Calibration

This is to certify that the equipment

Description : Sound Level Calibrator

Manufacturer : Rion

Model No. : NC-73

Serial No. : 10997142

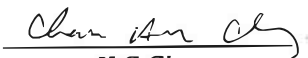
*has been calibrated for the specific items and ranges.
The results are shown in the Calibration Report No. C093472.*

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 : 6 July 2009

Certified by : 
H C Chan

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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

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E-mail: callab@suncreation.com

Website: www.suncreation.com

CERTIFICATE OF ANALYSIS



Batch: HK0919972
Date of Issue: 25/09/2009
Client: HYDER CONSULTING LTD
Client Reference: TWDT

Calibration of Turbidity System

Item : Turbidimeter
Model No. : Eutech Instruments TN-100
Serial No. : 215619
Equipment No. : --
Calibration Method : This meter was calibrated in accordance with standard method APHA (19th Ed.) 2130B
Date of Calibration : 25 September, 2009

Testing Results :

Expected Reading	Recording Reading
0.00 NTU	0.00 NTU
4.00 NTU	3.95 NTU
16.0 NTU	15.7 NTU
40.0 NTU	42.3 NTU
160 NTU	168 NTU
Allowing Deviation	±10%


Mr Chan Kwok Fai, Godfrey
Laboratory Manager - Hong Kong

CERTIFICATE OF ANALYSIS



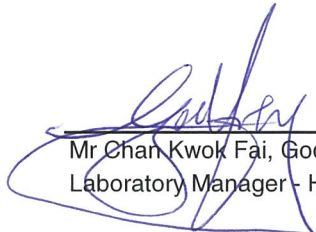
Batch: HK0919989
Date of Issue: 07/10/2009
Client: HYDER CONSULTING LTD
Client Reference:

Calibration of pH System

Item : Multi-parameter Instrument / Mehrparameter-MeBgerat
Model No. : WTW pH / Oxi 340i
Serial No. : 08101283
Equipment No. : --
Calibration Method : This meter was calibrated in accordance with standard method APHA (19th Ed.) 4500-H⁺B
Date of Calibration : 25 September, 2009

Testing Results :

Expected Reading	Recording Reading
4.00	3.99
7.00	7.03
10.0	9.83
Allowing Deviation	± 0.2


Mr Chan Kwok Fai, Godfrey
Laboratory Manager - Hong Kong

CERTIFICATE OF ANALYSIS




Date of Issue: 06/10/2009
Client: HYDER CONSULTING LTD

Calibration of DO System

Item : DO meter
Model No. : YSI 58
Serial No. : O6G2357 AF
Calibration Method : This meter was calibrated in accordance with standard method APHA (18th Ed.) 4500-0C & G
Date of Calibration : 04 September, 2009

Testing Results :

Expected Reading	Recording Reading
3.83 mg/L	3.65 mg/L
5.62 mg/L	5.48 mg/L
6.37 mg/L	6.18 mg/L
8.14 mg/L	8.01 mg/L
Allowing Deviation	±0.2 mg/L


Mr Chan Kwok Fai, Godfrey
Laboratory Manager - Hong Kong