High Volume Air Sampler Calibration Worksheet

Project Title: Design and Construction of Tsuen Wan Drainage Tunnel
Monitoring Location: Ho Fung College
Calibration Date: 05-Jun-09
Calibration Due Date 05-Aug-09
Time: 11:20

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

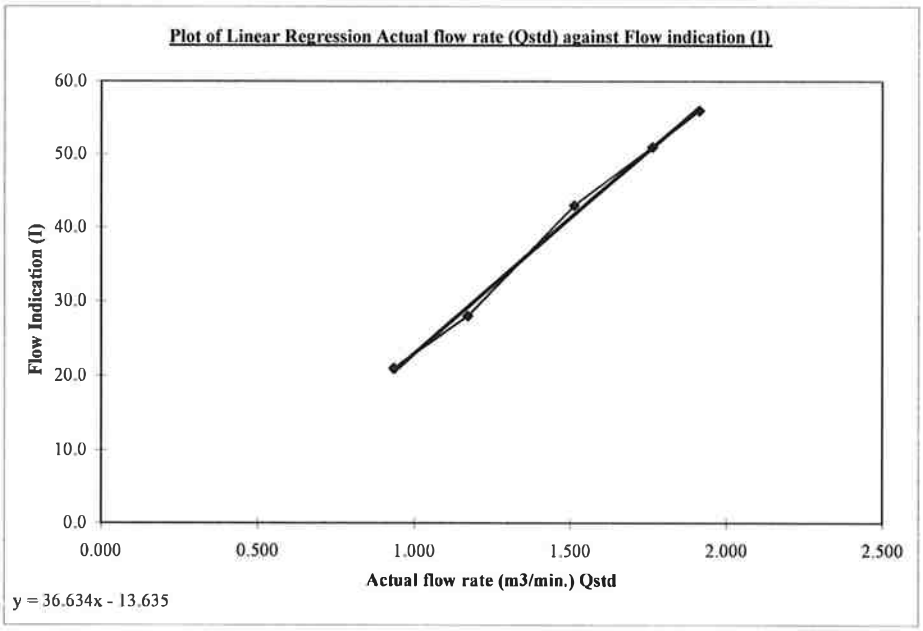
Standard pressure (mmHg) Pstd:	765.8
Standard temp. (K) Tstd:	293.00
Calibration pressure (mmHg) Pa:	752.1
Calibration temp. (K) Ta:	301.0

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

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

Sample no.	Pressure Drop (H), inch	Flow (corrcted), m^3/min	Actual flow rate (Qstd), m^3/min	Flow indication (I), arbitrary
1	14.7	3.781	1.913	56.0
2	12.5	3.486	1.764	51.0
3	9.2	2.991	1.513	43.0
4	5.5	2.313	1.170	28.0
5	3.5	1.845	0.933	21.0

Correlation Coefficient : 0.9981



Remark
1HPa = 0.750062 mmHg

Calibrated by: **Mak Kei Ho** **Date:** 8-6-09
(Ho)

Checked by: **Tang Hiu Yeung** **Date:** 8-6-09
( )

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

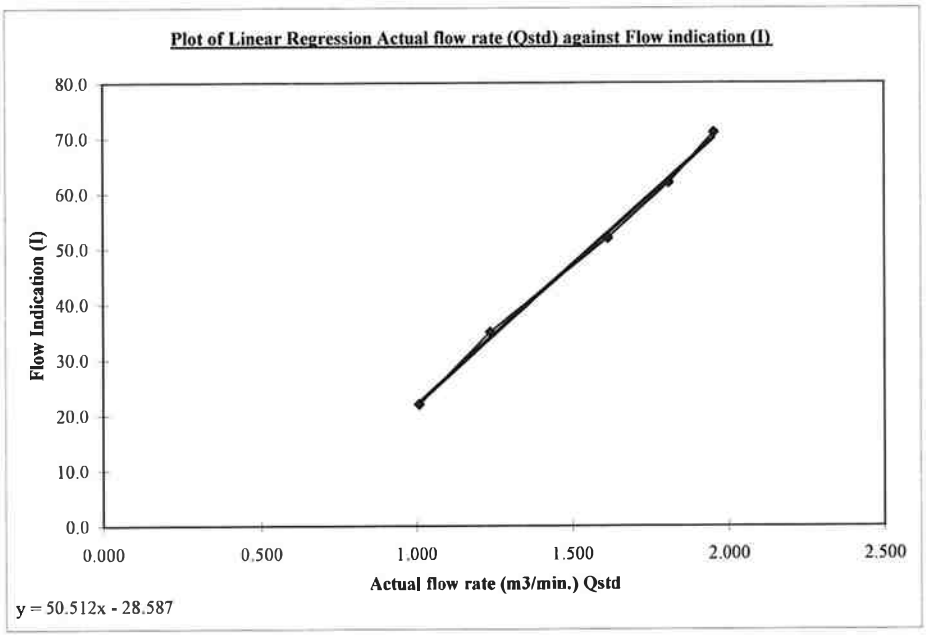
Standard pressure (mmHg) Pstd:	765.8
Standard temp. (K) Tstd:	293.00
Calibration pressure (mmHg) Pa:	748.0
Calibration temp. (K) Ta:	300.8

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

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

Sample no.	Pressure Drop (H), inch	Flow (corrcted), 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** **Date:** 5-8-09
(Ho)

Checked by: **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: 05-Jun-09
Calibration Due Date 05-Aug-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

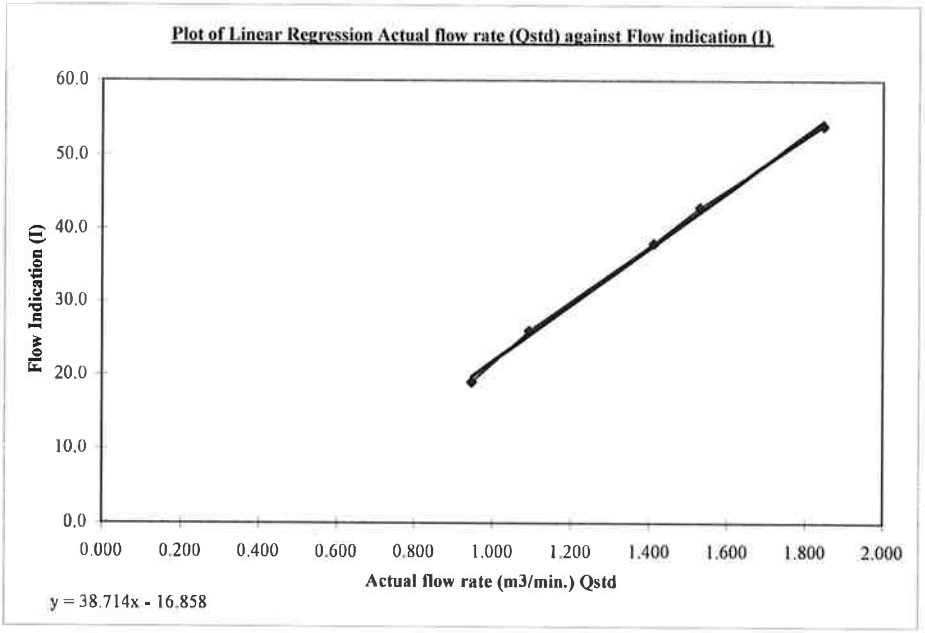
$$Flow(corrected) = \sqrt{H \times \frac{Pa}{Pstd} \times \frac{Tstd}{Ta}}$$

Standard pressure (mmHg) Pstd:	765.8
Standard temp. (K) Tstd:	293.00
Calibration pressure (mmHg) Pa:	752.1
Calibration temp. (K) Ta:	301.0

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

Sample no.	Pressure Drop (H), inch	Flow (corrcted), m^3/min	Actual flow rate (Qstd), m^3/min	Flow indication (I), arbitrary
1	13.7	3.650	1.846	54.0
2	9.4	3.023	1.530	43.0
3	8.0	2.789	1.411	38.0
4	4.8	2.160	1.093	26.0
5	3.6	1.871	0.947	19.0

Correlation Coefficient : 0.9988



Remark
1HPa = 0.750062 mmHg

Calibrated by: Mak Kei Ho ( ) **Date:** 8-6-09

Checked by: Tang Hiu Yeung ( ) **Date:** 8-6-09

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

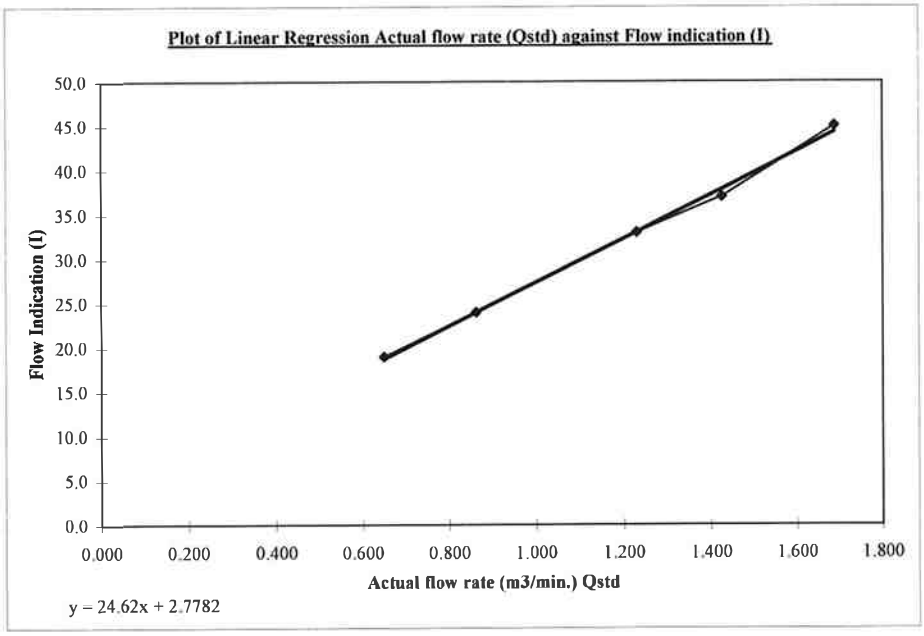
Standard pressure (mmHg) Pstd:	765.8
Standard temp. (K) Tstd:	293.00
Calibration pressure (mmHg) Pa:	748.0
Calibration temp. (K) Ta:	300.8

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

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

Sample no.	Pressure Drop (H), inch	Flow (corrcted), 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** **Date:** 5-8-09
(Ho)

Checked by: **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: Long Beach Gardan
Calibration Date: 05-Jun-09
Calibration Due Date 05-Aug-09
Time: 08:15

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

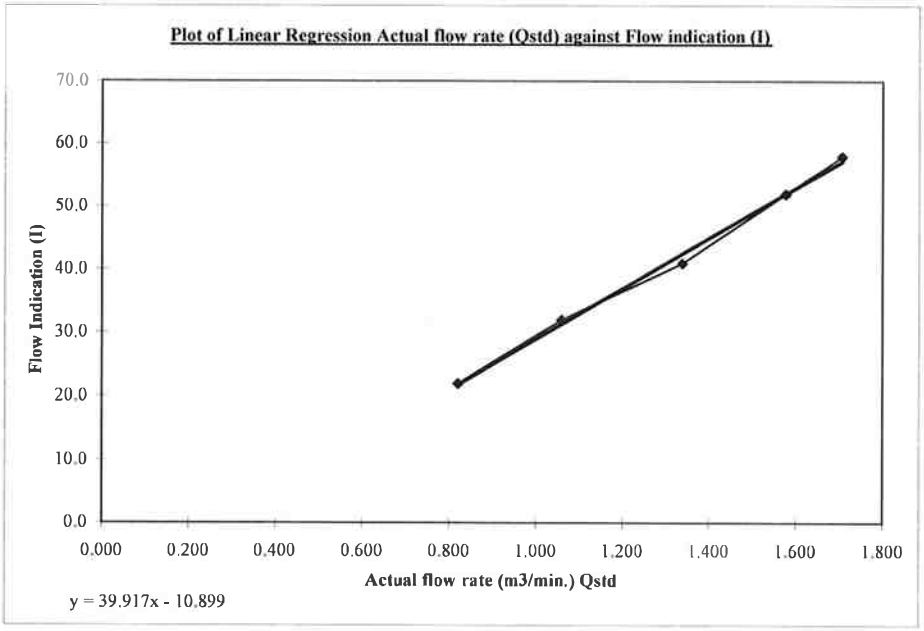
$$Flow(corrected) = \sqrt{H \times \frac{Pa}{Pstd} \times \frac{Tstd}{Ta}}$$

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

Standard pressure (mmHg) Pstd:	765.8
Standard temp. (K) Tstd:	293.00
Calibration pressure (mmHg) Pa:	752.1
Calibration temp. (K) Ta:	301.0

Sample no.	Pressure Drop (H), inch	Flow (corrcted), m^3/min	Actual flow rate (Qstd), m^3/min	Flow indication (I), arbitrary
1	11.7	3.373	1.706	58.0
2	10.0	3.118	1.578	52.0
3	7.2	2.646	1.339	41.0
4	4.5	2.092	1.058	32.0
5	2.7	1.620	0.820	22.0

Correlation Coefficient : 0.9980



Remark
1HPa = 0.750062 mmHg

Calibrated by: **Mak Kei Ho** (Mo) **Date:** 8-6-09

Checked by: **Tang Hiu Yeung** ( ) **Date:** 8-6-09

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

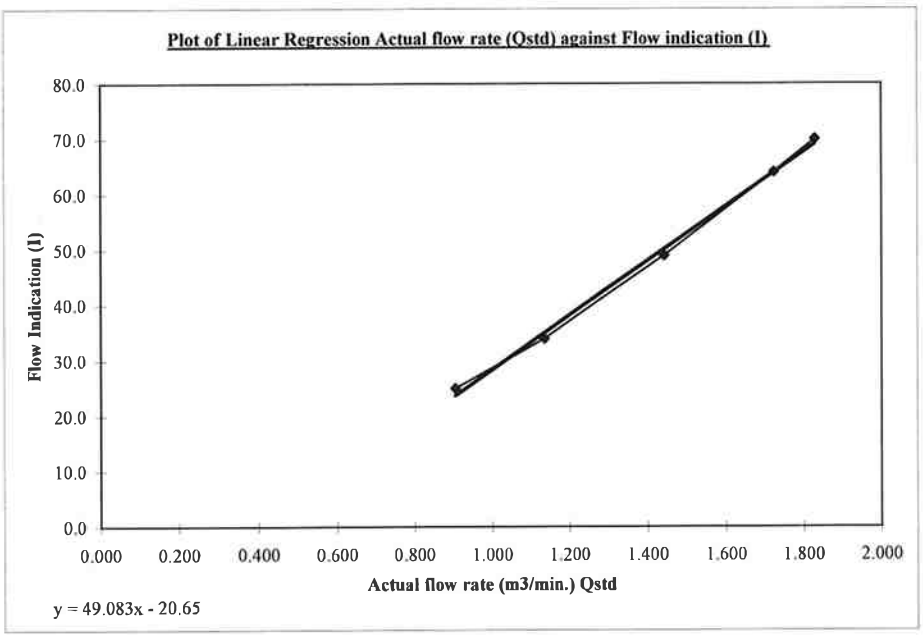
$$Flow(corrected) = \sqrt{H \times \frac{Pa}{Pstd} \times \frac{Tstd}{Ta}}$$

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

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 (corrcted), 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** **Date:** 5-8-09
(Ho)

Checked by: **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: Greenview Terrance
Calibration Date: 05-Jun-09
Calibration Due Date 05-Aug-09
Time: 09:45

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

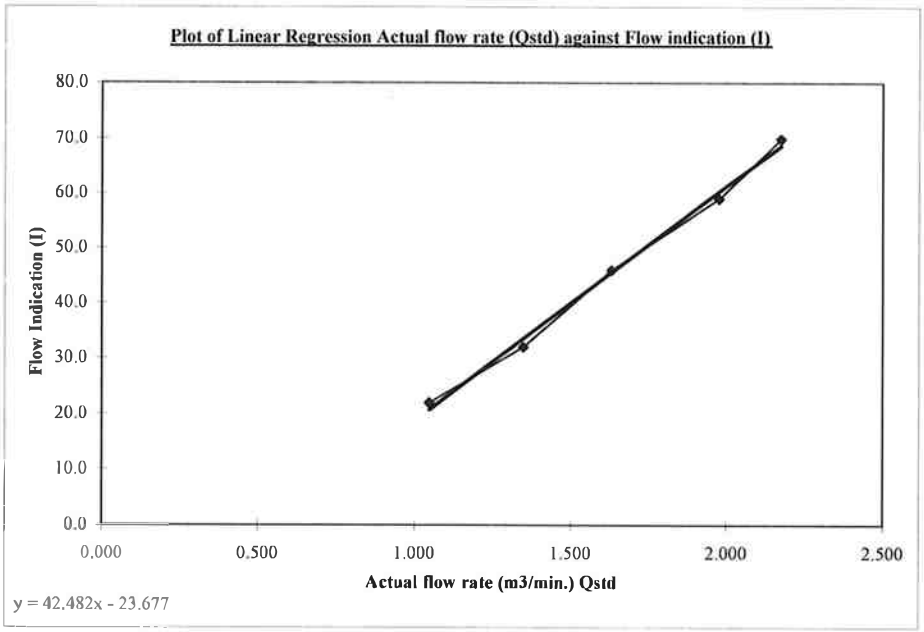
$$Flow(corrected) = \sqrt{H \times \frac{Pa}{Pstd} \times \frac{Tstd}{Ta}}$$

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

Standard pressure (mmHg) Pstd:	765.8
Standard temp. (K) Tstd:	293.00
Calibration pressure (mmHg) Pa:	752.1
Calibration temp. (K) Ta:	301.0

Sample no.	Pressure Drop (H), inch	Flow (corrcted), m^3/min	Actual flow rate (Qstd), m^3/min	Flow indication (I), arbitrary
1	19.0	4.298	2.174	70.0
2	15.7	3.907	1.977	59.0
3	10.7	3.225	1.632	46.0
4	7.3	2.664	1.348	32.0
5	4.4	2.068	1.047	22.0

Correlation Coefficient : 0.9975



Remark
1HPa = 0.750062 mmHg

Calibrated by: **Mak Kei Ho** **Date:** 8-6-09
( )

Checked by: **Tang Hiu Yeung** **Date:** 8-6-09
( )

High Volume Air Sampler Calibration Worksheet

Project Title: Design and Construction of Tsuen Wan Drainage Tunnel
Monitoring Location: Greenview Terrance
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

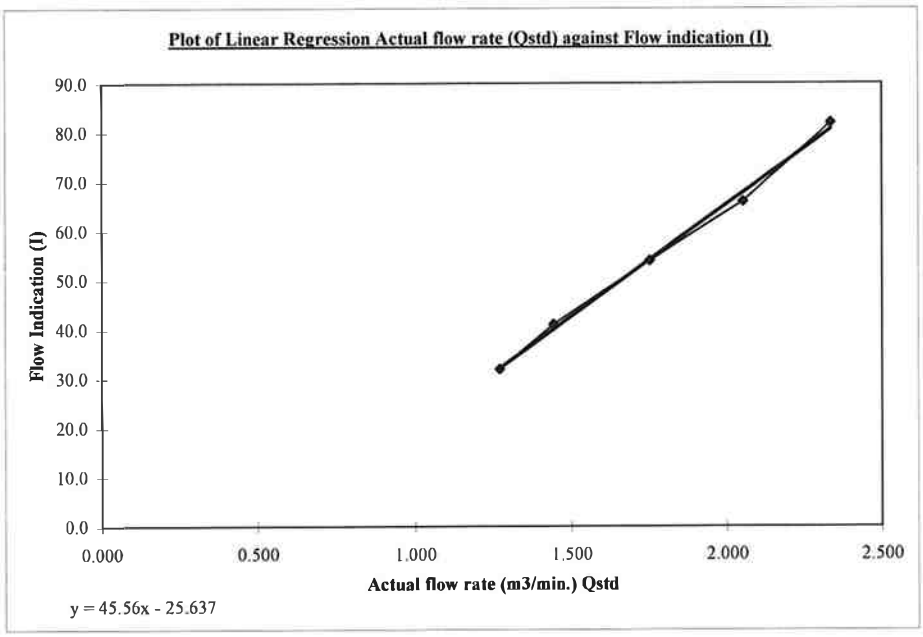
$$Flow(corrected) = \sqrt{H \times \frac{Pa}{Pstd} \times \frac{Tstd}{Ta}}$$

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

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 (corrcted), 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** **Date:** 5-8-09
( )

Checked by: **Tang Hiu Yeung** **Date:** 5-8-09
( )

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 18, 2009 Rootsmeter 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 = 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}

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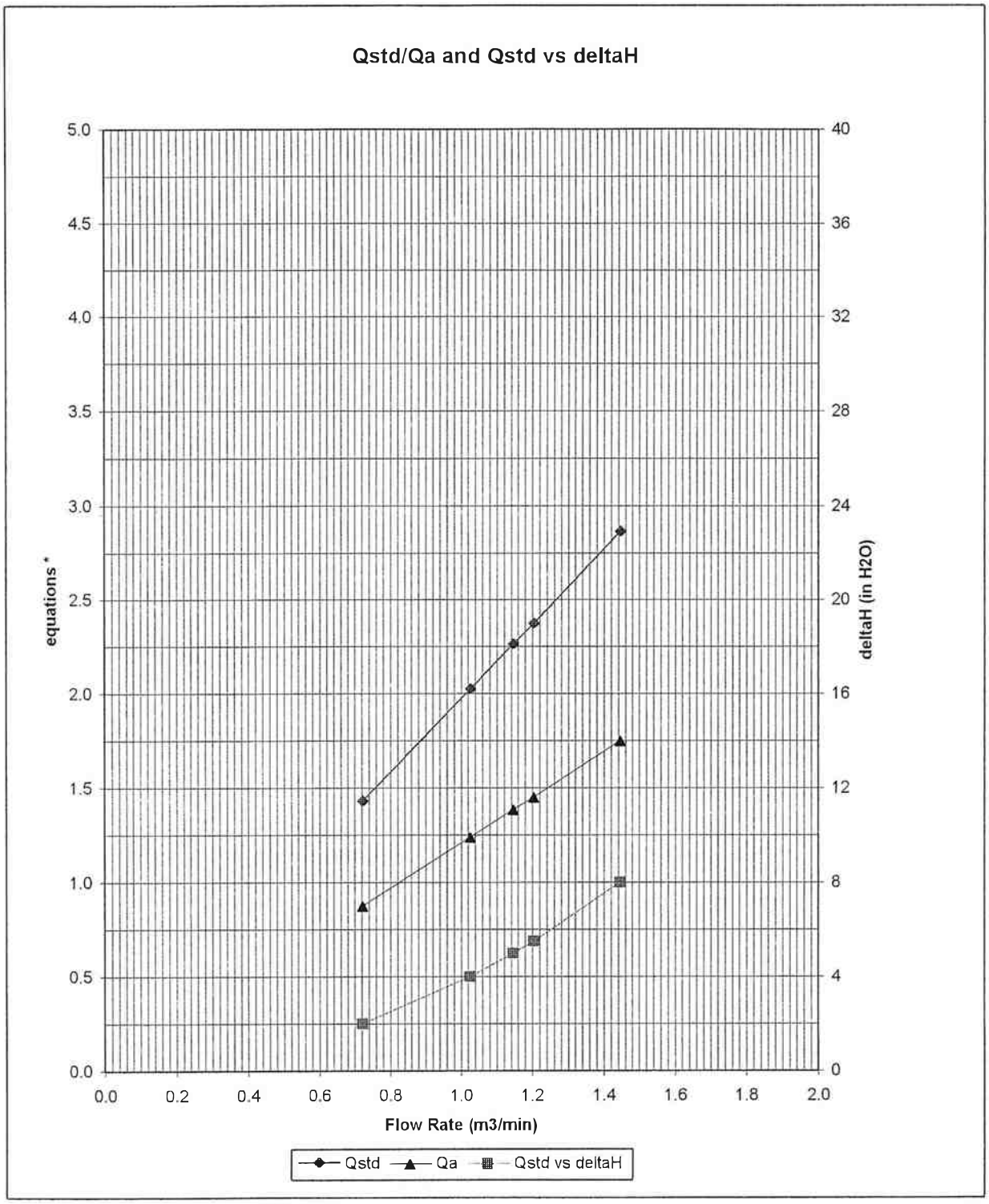
AIR POLLUTION MONITORING EQUIPMENT



*** y-axis equations:**

Qstd series: $\sqrt{\Delta H \left(\frac{Pa}{Pstd}\right)\left(\frac{Tstd}{Ta}\right)}$

Qa series: $\sqrt{(\Delta H\ (Ta\ /\ Pa))}$

#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

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. : 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

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. : 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.
The results are shown in the Calibration Report No. C093473.

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

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

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

CERTIFICATE OF ANALYSIS

Batch: HK0913034
Date of Issue: 30/06/2009
Client: HYDER CONSULTING LTD
Client Reference: TWDT

Calibration of Turbidity System

Item : Turbidimeter

Model No. : Eutech Instruments TN-100

Serial No. : 215619

Equipment No. : 215619

Calibration Method : This meter was calibrated in accordance with standard method APHA (19th Ed.) 2130B

Date of Calibration : 30 June, 2009

Testing Results :

Expected Reading	Recording Reading
0.00 NTU	0.00 NTU
4.00 NTU	3.86 NTU
16.0 NTU	16.3 NTU
40.0 NTU	39.8 NTU
160 NTU	173 NTU
Allowing Deviation	±10%

Ms Wong Wai Man, Alice
Laboratory Manager - Hong Kong

CERTIFICATE OF ANALYSIS

Batch: HK0913489
Date of Issue: 16/07/2009
Client: HYDER CONSULTING LTD
Client Reference:

Calibration of DO System

Item : Multi-parameter Instrument / Mehrparameter-MeBgerat

Model No. : WTW pH / Oxi 340i

Serial No. : 08101283

Equipment No.: 0901264

Calibration Method : This meter was calibrated in accordance with standard method APHA (18th Ed.) 4500-0C & G

Date of Calibration : 07 July, 2009

Testing Results :

Expected Reading	Recording Reading
5.27 mg/L 6.58 mg/L 7.73 mg/L	5.37 mg/L 6.68 mg/L 7.67 mg/L
Allowing Deviation	±0.2 mg/L

Mr Chan Kwok Fai, Godfrey
Laboratory Manager - Hong Kong

CERTIFICATE OF ANALYSIS

Batch: HK0913489
Date of Issue: 16/07/2009
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 : 07 July, 2009

Testing Results :

Expected Reading	Recording Reading
4.00	4.13
7.00	7.13
10.0	9.97
Allowing Deviation	± 0.2

Mr Chan Kwok Fai, Godfrey
Laboratory Manager - Hong Kong

CERTIFICATE OF ANALYSIS

Batch: HK0913489
Date of Issue: 16/07/2009
Client: HYDER CONSULTING LTD
Client Reference:

Calibration of Thermometer

Item : Multi-parameter Instrument / Mehrparameter-MeBgerat

Model No. : WTW pH / Oxi 340i

Serial No. : 08101283

Equipment No. : --

Calibration Method : In-house Method

Date of Calibration : 07 July, 2009

Testing Results :

Reference Temperature (^{0}C)	Recorded Temperature (^{0}C)
27.0 ^{0}C 33.5 ^{0}C	27.4 ^{0}C 33.8 ^{0}C
Allowing Deviation	±2.0^{0}C

Mr Chan Kwok Fai, Godfrey
Laboratory Manager - Hong Kong