



TISCH ENVIRONMENTAL, INC.
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ORIFICE TRANSFER STANDARD CERTIFICATION WORKSHEET TE-5025A

Date - Jan 18, 2017 Rootmeter S/N 0438320 Ta (K) - 294
 Operator Tisch Orifice I.D. - 2154 Pa (mm) - 755.65

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	1.4530	3.2	2.00
2	NA	NA	1.00	1.0420	6.4	4.00
3	NA	NA	1.00	0.9290	7.9	5.00
4	NA	NA	1.00	0.8840	8.8	5.50
5	NA	NA	1.00	0.7300	12.8	8.00

DATA TABULATION

Vstd	(x axis) Qstd	(y axis)	Va	(x axis) Qa	(y axis)
1.0035	0.6906	1.4197	0.9957	0.6853	0.8821
0.9993	0.9590	2.0078	0.9915	0.9516	1.2475
0.9972	1.0734	2.2448	0.9894	1.0651	1.3948
0.9960	1.1268	2.3543	0.9883	1.1180	1.4628
0.9907	1.3571	2.8394	0.9830	1.3466	1.7642
Qstd slope (m) = 2.12779			Qa slope (m) = 1.33238		
intercept (b) = -0.04273			intercept (b) = -0.02655		
coefficient (r) = 0.99982			coefficient (r) = 0.99982		
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}

MATERIALAB CONSULTANTS LIMITED

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TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

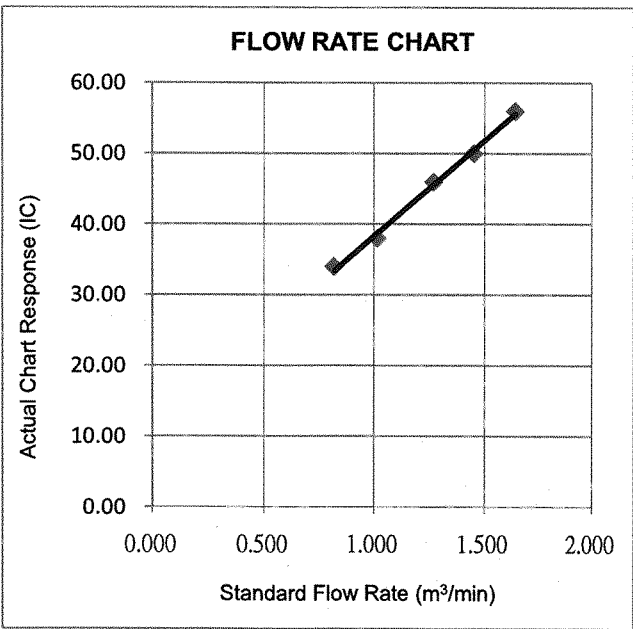
Project : Environmental Monitoring Works For Contract No. KLN/2015/07			Date of Calibration: 7-Apr-17		
Location : KER1b			Next Calibration Date: 6-Jul-17		
Brand:	Tisch		Technician: Jimmy Lui		
Model:	TE-5170	S/N:	3482		

CONDITIONS					
Sea Level Pressure (hPa):	1012.4	Corrected Pressure (mm Hg):	759		
Temperature (°C):	25	Temperature (K):	298		

CALIBRATION ORIFICE					
Make:	Tisch	Qstd Slope:	2.12779		
Model:	TE-5025A	Qstd Intercept:	-0.04273		
Calibration Date:	18-Jan-17	Expiry Date:	18-Jan-18		
S/N:	2154				

CALIBRATIONS							
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m ³ /min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	5.60	-6.30	11.900	1.640	56.00	55.96	Slope = 26.9764 Intercept = 11.3176 Corr. coeff.: 0.9977
13	4.30	-5.00	9.300	1.452	50.00	49.97	
10	3.20	-3.90	7.100	1.272	46.00	45.97	
7	1.90	-2.60	4.500	1.016	38.00	37.97	
5	1.10	-1.80	2.900	0.820	34.00	33.98	

Calculations:
 $Qstd = 1/m[\sqrt{H2O(Pa/Pstd)}(Tstd/Ta)]-b]$
 $IC = I[\sqrt{Pa/Pstd)}(Tstd/Ta)]$
 Qstd = standard flow rate
 IC = corrected chart response
 I = actual chart response
 m = calibrator Qstd slope
 b = calibrator Qstd intercept
 Ta = actual temperature during calibration (deg K)
 Pa = actual pressure during calibration (mm Hg)
 Tstd = 298 deg K
 Pstd = 760 mm Hg
For subsequent calculation of sampler flow:
 $1/m((I)[\sqrt{298/Tav)}(Pav/760)]-b)$
 m = sampler slope
 b = sampler intercept
 I = chart response
 Tav = daily average temperature
 Pav = daily average pressure



CHOI KAM HO
 Project Consultant

Report Date: 7th April, 2017

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Environmental Monitoring Works For Contract No. KLN/2015/07				Date of Calibration: 7-Apr-17	
Location : KTD1a				Next Calibration Date: 6-Jul-17	
Brand:	Tisch			Technician: Jimmy Lui	
Model:	TE-5170	S/N:	4037		

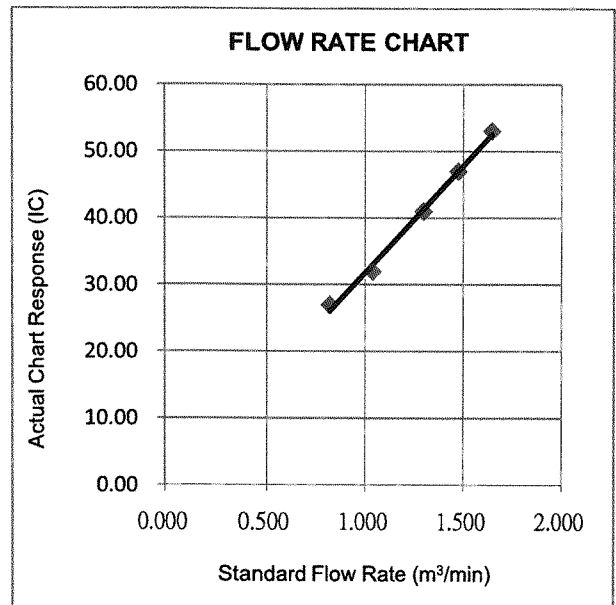
CONDITIONS					
Sea Level Pressure (hPa):	1012.4	Corrected Pressure (mm Hg):	759		
Temperature (°C):	25	Temperature (K):	298		

CALIBRATION ORIFICE					
Make:	Tisch	Qstd Slope:	2.12779		
Model:	TE-5025A	Qstd Intercept:	-0.04273		
Calibration Date:	18-Jan-17	Expiry Date:	18-Jan-18		
S/N:	2154				

CALIBRATIONS							
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m ³ /min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	5.70	-6.30	12.000	1.647	53.00	52.97	Slope = 31.9356 Intercept = -0.1259 Corr. coeff.: 0.9974
13	4.50	-5.10	9.600	1.475	47.00	46.97	
10	3.40	-4.00	7.400	1.298	41.00	40.97	
7	2.00	-2.70	4.700	1.038	32.00	31.98	
5	1.10	-1.80	2.900	0.820	27.00	26.98	

Calculations:

$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$
 $IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$
 Qstd = standard flow rate
 IC = corrected chart response
 I = actual chart response
 m = calibrator Qstd slope
 b = calibrator Qstd intercept
 Ta = actual temperature during calibration (deg K)
 Pa = actual pressure during calibration (mm Hg)
 Tstd = 298 deg K
 Pstd = 760 mm Hg
For subsequent calculation of sampler flow:
 $1/m((I)[\text{Sqrt}(298/Tav)(Pav/760)]-b)$
 m = sampler slope
 b = sampler intercept
 I = chart response
 Tav = daily average temperature
 Pav = daily average pressure



CHOI KAM HO
Project Consultant

Report Date: 7th April, 2017

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Environmental Monitoring Works For Contract No. KLN/2015/07				Date of Calibration: 7-Apr-17	
Location : KTD2a				Next Calibration Date: 6-Jul-17	
Brand:	Tisch			Technician: Jimmy Lui	
Model:	TE-5170	S/N:	3838		

CONDITIONS					
Sea Level Pressure (hPa):	1012.4	Corrected Pressure (mm Hg):	759		
Temperature (°C):	25	Temperature (K):	298		

CALIBRATION ORIFICE					
Make:	Tisch	Qstd Slope:	2.12779		
Model:	TE-5025A	Qstd Intercept:	-0.04273		
Calibration Date:	18-Jan-17	Expiry Date:	18-Jan-18		
S/N:	2154				

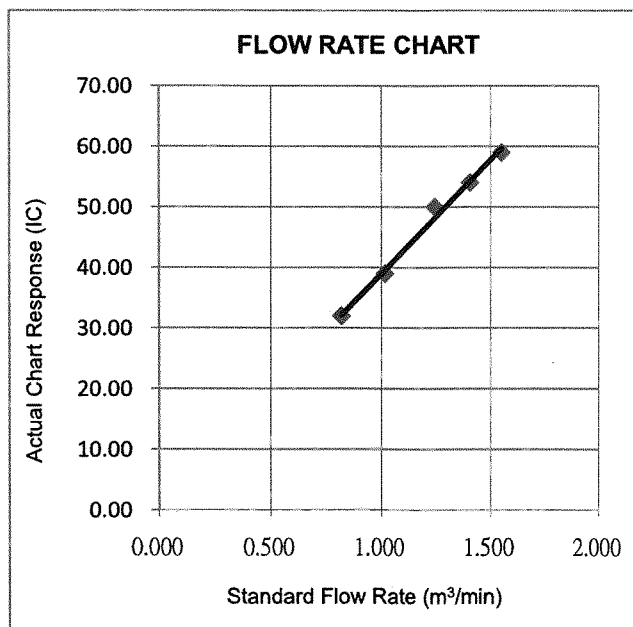
CALIBRATIONS							
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m ³ /min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	4.90	-5.70	10.600	1.549	59.00	58.96	Slope = 37.5842 Intercept = 1.4001 Corr. coeff.: 0.9958
13	4.00	-4.70	8.700	1.405	54.00	53.96	
10	3.00	-3.80	6.800	1.245	50.00	49.97	
7	1.90	-2.60	4.500	1.016	39.00	38.97	
5	1.10	-1.80	2.900	0.820	32.00	31.98	

Calculations:

$Qstd = 1/m[\sqrt{H2O(Pa/Pstd)(Tstd/Ta)}-b]$
 $IC = I[\sqrt{Pa/Pstd}(Tstd/Ta)]$
 Qstd = standard flow rate
 IC = corrected chart response
 I = actual chart response
 m = calibrator Qstd slope
 b = calibrator Qstd intercept
 Ta = actual temperature during calibration (deg K)
 Pa = actual pressure during calibration (mm Hg)
 Tstd = 298 deg K
 Pstd = 760 mm Hg

For subsequent calculation of sampler flow:

$1/m((I)[\sqrt{298/Tav}(Pav/760)]-b)$
 m = sampler slope
 b = sampler intercept
 I = chart response
 Tav = daily average temperature
 Pav = daily average pressure



CHOI KAM HO
Project Consultant

Report Date: 7th April, 2017

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MaterialLab

Report No. : 161966CA171055

Page 1 of 1

CALIBRATION CERTIFICATE OF ANEMOMETER

Client Supplied Information

Client : MaterialLab Consultants Ltd.

Project : Calibration Services

Details of Unit Under Test, UUT

Description : Anemometer

Manufacturer : Benetech

Model No. : GM816

Serial No. : 13372555

Equipment ID. : N/A

Next Calibration Date : 09-May-2018

Laboratory Information

Details of Reference Equipment –

Description : Reference Anemometer

Equipment ID. : R-101-4

Date of Calibration : 10-May-2017 Ambient Temperature : 22 °C

Calibration Location : Calibration Laboratory of MaterialLab



Method Used : By direct Comparison

Calibration Results :

Reference Reading (m/s)	UUT Reading (m/s)	Error (m/s)
2.00	2.0	0.0
3.98	3.9	-0.1
5.98	5.4	-0.6
8.01	7.0	-1.0
10.01	8.8	-1.2

Remark :

1. The equipment being used in this calibration is traceable to recognized National Standards.

Checked by :  Date : 12-5-2017 Certified by :  Date : 12-5-2017
CA-R-297 (22/07/2009) Chan Chun Wai (Manager)

** End of Report **

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Materialab

Report no.: 161966CA161737

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CALIBRATION CERTIFICATE OF SOUND LEVEL METER

Client : Materialab Consultants Ltd.

Project : Calibration Services

Client Supplied Information

Details of Unit Under Test, UUT

Description : Sound Level Meter
Manufacturer : Casella (Model no. CEL-63X(meter), CEL-251(microphone), CEL-495(Preamplifier))
Serial No. : 2451083 (meter), 01361(microphone), 002845 (Preamplifier))
Next Calibration Date : 23-Aug-2017
Specification Limit : EN 61672: 2003 Type 1

Laboratory Information

Description : B & K Acoustic Multifunction Calibrator 4226 (Traditional free field setting)
Equipment ID. : R-108-1
Date of Calibration : 24-Aug-2016 Ambient Temperature : 21 °C
Calibration Location : Calibration Laboratory of Materialab
Method Used : By direct comparison

Calibration Results :

Parameters		Mean Value (dB)	Specification Limit(dB)
A-weighting frequency response	4000Hz	0.6	2.6 to -0.6
	2000Hz	0.5	2.8 to -0.4
	1000Hz	0.0	1.1 to -1.1
	500Hz	-3.0	-1.8 to -4.6
	250Hz	-8.3	-7.2 to -10.0
	125Hz	-15.7	-14.6 to -17.6
	63Hz	-25.7	-24.7 to -27.7
	31.5Hz	-37.4	-37.4 to -41.4
Differential level linearity	94dB-104dB	0.0	± 0.6
	104dB-114dB	0.0	± 0.6

Remarks :

1. The equipment used in this calibration is traceable to recognized National Standards.
2. The mean value is the average of four measurements.
3. For calibration: Reference SPL are 94, 104 & 114dB, range setting is 20-140dB & time weighing is fast
4. The equipment does comply with EN 61672: 2003 Type 1 sound level meter for the above measurement.

Checked by :  Date : 24.8.2016 Certified by :  Date : 26.8.2016

CA-R-297 (22/07/2009)

Chan Chun Wai (Manager) /

Kwok Chi Wa (Assistant Manager)

** End of Report **

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MaterialLab

Report no.: 161966CA162338

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CALIBRATION CERTIFICATE OF SOUND LEVEL METER

Client Supplied Information

Client : MaterialLab Consultants Ltd.

Address : Room 723 & 725, 7/F., Block B Profit Industrial Building, 1-15 Kwai Fung Crescent, Kwai Chung, N.T.

Project : Calibration Services

Details of Unit Under Test, UUT

Description : Sound Level Meter
Manufacturer : Casella
Model No. : Casella (Model no. CEL-63X(meter), CEL-251(microphone), CEL-495(Preamplifier))
Serial No. : 2451028 (meter), 01231(microphone), 002850 (Preamplifier)
Next Calibration Date : 16-Nov-2017
Specification Limit : EN 61672: 2003 Type 1

Laboratory Information

Description : B & K Acoustic Multifunction Calibrator 4226 (Traditional free field setting)

Equipment ID. : R-108-1

Date of Calibration : 17-Nov-2016 Ambient Temperature : 22 °C

Calibration Location : Calibration Laboratory of MaterialLab


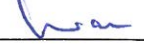
Method Used : By direct comparison

Calibration Results :

Parameters	Mean Value (dB)	Specification Limit(dB)
A-weighting frequency response	4000Hz	2.6 to -0.6
	2000Hz	0.8 to -0.4
	1000Hz	-1.0 to -1.1
	500Hz	-4.5 to -4.6
	250Hz	-9.9 to -10.0
	125Hz	-17.3 to -17.6
	63Hz	-27.3 to -27.7
	31.5Hz	-39.5 to -41.4
Differential level linearity	94dB-104dB	± 0.6
	104dB-114dB	± 0.6

Remarks :

1. The equipment used in this calibration is traceable to recognized National Standards.
2. The mean value is the average of four measurements.
3. For calibration: Reference SPL are 94, 104 & 114dB, range setting is 20-140dB & time weighing is fast
4. The equipment does comply with EN 61672: 2003 Type 1 sound level meter for the above measurement.

Checked by :  Date : 2016/11/17 Certified by :  Date : 2016/11/17
CA-R-297 (22/07/2009) Chan Chun Wai (Manager)

** End of Report **

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MaterialLab

Report no.: 161966CA162202

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CALIBRATION CERTIFICATE OF SOUND LEVEL METER

Client Supplied Information

Client : MaterialLab Consultants Ltd.

Address : Room 723 & 725, 7/F., Block B Profit Industrial Building, 1-15 Kwai Fung Crescent, Kwai Chung, N.T.

Project : Calibration Services

Details of Unit Under Test, UUT

Description : Sound Level Meter
Manufacturer : Casella
Model No. : Casella (Model no. CEL-63X(meter), CEL-251(microphone), CEL-495(Preamplifier))
Serial No. : 2451091 (meter), 01308(microphone), 002752 (Preamplifier))
Next Calibration Date : 31-Oct-2017
Specification Limit : EN 61672: 2003 Type 1

Laboratory Information

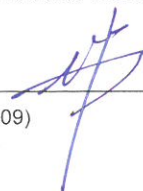

Description : B & K Acoustic Multifunction Calibrator 4226 (Traditional free field setting)
Equipment ID. : R-108-1
Date of Calibration : 01-Nov-2016 Ambient Temperature : 22 °C
Calibration Location : Calibration Laboratory of MaterialLab
Method Used : By direct comparison

Calibration Results :

Parameters		Mean Value (dB)	Specification Limit(dB)
A-weighting frequency response	2000Hz	1.9	2.8 to -0.4
	1000Hz	0.1	1.1 to -1.1
	500Hz	-3.5	-1.8 to -4.6
	250Hz	-8.9	-7.2 to -10.0
	125Hz	-16.4	-14.6 to -17.6
	63Hz	-26.4	-24.7 to -27.7
	31.5Hz	-39.3	-37.4 to -41.4
Differential level linearity	94dB-104dB	0.0	± 0.6
	104dB-114dB	0.0	± 0.6

Remarks :

1. The equipment used in this calibration is traceable to recognized National Standards.
2. The mean value is the average of four measurements.
3. For calibration: Reference SPL are 94, 104 & 114dB, range setting is 20-140dB & time weighing is fast
4. The equipment does comply with EN 61672: 2003 Type 1 sound level meter for the above measurement.

Checked by :  Date : 3-11-2016 Certified by :  Date : 4-11-2016
CA-R-297 (22/07/2009) Chan Chun Wai (Manager)

** End of Report **

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MaterialLab

Report no.: 161966CA162202(1)

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CALIBRATION CERTIFICATE OF SOUND CALIBRATOR

Client Supplied Information

Client : Materialab Consultants Ltd.

Address : Room 723 & 725, 7/F., Block B Profit Industrial Building, 1-15 Kwai Fung Crescent, Kwai Chung, N.T.

Project : Calibration Services

Details of Unit Under Test, UUT

Description : Sound Calibrator
Manufacturer : Casella (Model no. CEL-120/1)
Serial No. : 3321858
Next Calibration Date : 31-Oct-2017
Specification Limit : ± 0.5 dB

Laboratory Information

Description : Reference Sound level meter
Equipment ID. : R-119-1
Date of Calibration : 01-Nov-2016 Ambient Temperature : 22 °C
Calibration Location : Calibration Laboratory of MaterialLab
Method Used : By direct comparison

Calibration Results :

Parameters (Setting of UUT)	Mean Value (error of measurement)	Specification Limit(dB)
94dB	-0.3 dB	± 0.5 dB
114dB	-0.2 dB	

Remarks :

1. The equipment used in this calibration is traceable to recognized National Standards.
2. The mean value is the average of four measurements.
3. The equipment does comply with the specification limit.

Checked by : 
CA-R-297 (22/07/2009)

Date : 3-11-2016

Certified by :


Chan Chun Wai (Manager)

Date : 4/11/2016

** End of Report **