



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

Date - Jan 18, 2017 Rootsmeter 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

Room 723 & 725, 7/F, Block B,
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TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Environmental Monitoring Works For Contract No. KLN/2015/07			Date of Calibration: 6-Jul-17
Location : KTD1a			Next Calibration Date: 5-Oct-17
Brand:	Tisch		Technician: Jimmy Lui
Model:	TE-5170	S/N: 4037	

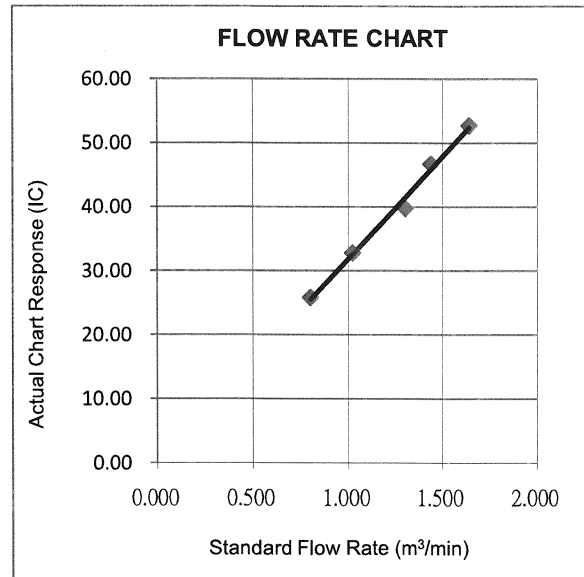
CONDITIONS			
Sea Level Pressure (hPa):	1008.1	Corrected Pressure (mm Hg):	756
Temperature (°C):	27	Temperature (K):	300

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	5.90	-6.10	12.000	1.638	53.00	52.68	Slope = 32.0779 Intercept = -0.2063 Corr. coeff.: 0.9957
13	4.30	-4.90	9.200	1.437	47.00	46.72	
10	3.50	-4.00	7.500	1.299	40.00	39.76	
7	2.10	-2.50	4.600	1.022	33.00	32.80	
5	0.90	-1.90	2.800	0.802	26.00	25.84	

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: 6th July, 2017

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TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

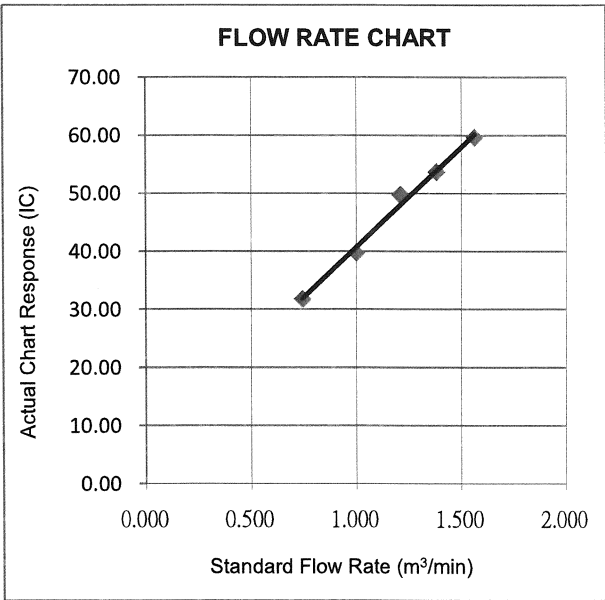
Project : Environmental Monitoring Works For Contract No. KLN/2015/07				Date of Calibration: 6-Jul-17	
Location : KTD2a				Next Calibration Date: 5-Oct-17	
Brand:	Tisch			Technician: Jimmy Lui	
Model:	TE-5170	S/N:	3838		

CONDITIONS					
Sea Level Pressure (hPa):	1008.1	Corrected Pressure (mm Hg):	756		
Temperature (°C):	27	Temperature (K):	300		

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	5.10	-5.80	10.900	1.562	60.00	59.64	Slope = 34.5666
13	4.00	-4.50	8.500	1.382	54.00	53.68	Intercept = 6.1333
10	2.90	-3.60	6.500	1.211	50.00	49.70	Corr. coeff.: 0.9959
7	1.70	-2.70	4.400	1.000	40.00	39.76	
5	0.80	-1.60	2.400	0.744	32.00	31.81	

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



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TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Environmental Monitoring Works For Contract No. KLN/2015/07			Date of Calibration: 6-Jul-17
Location : KER1b			Next Calibration Date: 5-Oct-17
Brand:	Tisch		Technician: Jimmy Lui
Model:	TE-5170	S/N: 3482	

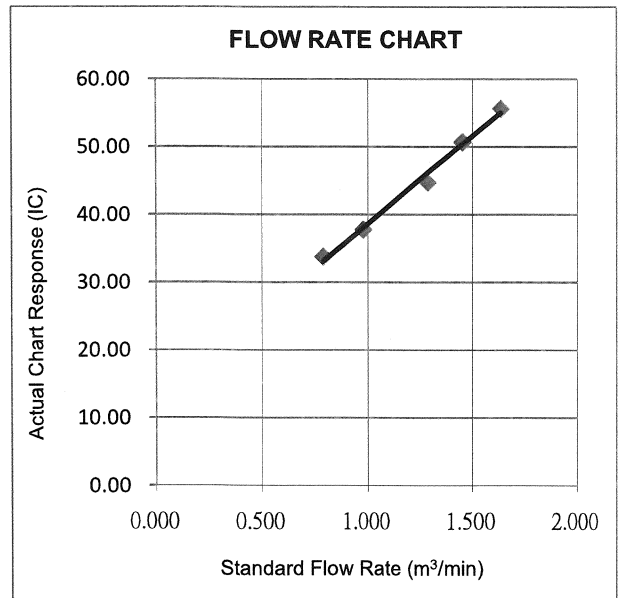
CONDITIONS			
Sea Level Pressure (hPa):	1008.1	Corrected Pressure (mm Hg):	756
Temperature (°C):	27	Temperature (K):	300

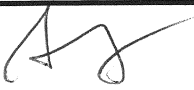
CALIBRATION ORIFICE			
Make:	Tisch	Qstd Slope:	2.12779
Model:	TE-5025A	Qstd Intercept:	-0.04273
Calibration Date:	18-Jan-17	Expiry Date:	18-Jan-18
S/N:	2154		

CALIBRATIONS							
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m ³ /min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	5.40	-6.50	11.900	1.632	56.00	55.67	Slope = 25.9776
13	4.40	-5.00	9.400	1.452	51.00	50.70	Intercept = 12.6314
10	3.30	-4.10	7.400	1.291	45.00	44.73	Corr. coeff.: 0.9951
7	1.80	-2.40	4.200	0.977	38.00	37.77	
5	1.00	-1.70	2.700	0.788	34.00	33.80	

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: 6th July, 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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MaterialLab

Report no.: 172379CA171223

Page 1 of 1

CALIBRATION CERTIFICATE OF SOUND LEVEL METER

Client Supplied Information

Client : MaterialLab Consultants Ltd.

Address : Room 723 & 725, 7F., 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
Serial No. : 3756072(meter), 01456 (microphone), 003527(Preamplifier)
Next Calibration Date : 05-Jun-2018
Specification Limit : EN 61672: 2003 Type 2

Laboratory Information


Description : B & K Acoustic Multifunction Calibrator 4226 (Traditional free field setting)
Equipment ID. : R-108-1
Date of Calibration : 06-Jun-2017 Ambient Temperature : 22 °C
Calibration Location : Calibration Laboratory of MaterialLab
Method Used : By direct comparison

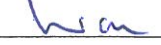
Calibration Results :

Parameters	Mean Value (dB)	Specification Limit(dB)
A-weighting frequency response	4000Hz	3.7
	2000Hz	1.8
	1000Hz	-1.0
	500Hz	-7.7
	250Hz	-18.1
	125Hz	-31.0
	63Hz	-46.4
31.5Hz	-58.2	
Differential level linearity	94dB-104dB	0.1
	104dB-114dB	0.2

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 not comply with EN 61672: 2003 Type 2 sound level meter for the above measurement.

Checked by :  Date : 7/6/2017
CA-R-297 (22/07/2009)

Certified by :  Date : 7/6/2017
Chan Chun Wai (Manager)

** End of Report **

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MaterialLab

Report no.: 161966CA162338

Page 1 of 1

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


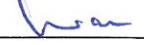
Method Used : By direct comparison

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 **

FUGRO TECHNICAL SERVICES LIMITED

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MaterialLab

Report no.: 161966CA162202

Page 1 of 1

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

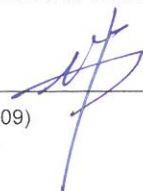

Description : B & K Acoustic Multifunction Calibrator 4226 (Traditional free field setting)
Equipment ID. : R-108-1
Date of Calibration : 01-Nov-2016 Ambient Temperature : 22 °C
Calibration Location : Calibration Laboratory of MaterialLab
Method Used : By direct comparison

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.: 172379CA171303(1)

Page 1 of 1

CALIBRATION CERTIFICATE OF SOUND CALIBRATOR

Client Supplied Information

Client : MaterialLab Consultants Ltd.

Project : Calibration Services

Details of Unit Under Test, UUT

Description : Sound Calibrator
Manufacturer : Casella (Model CEL-120/1)
Serial No. : 4358251
Equipment ID : N/A
Next Calibration Date : 05-Jun-2018
Specification Limit : EN 60942: 2003 Type 1

Laboratory Information

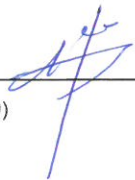

Description : Reference Sound level meter
Equipment ID. : R-119-1
Date of Calibration : 06-Jun-2017 Ambient Temperature : 22 °C
Calibration Location : Calibration Laboratory of MaterialLab
Method Used : By direct comparison

Calibration Results :

Parameters (Setting of UUT)	Mean Value (error of measurement)	Specification Limit(dB)
94dB	0.2 dB	±0.4dB
114dB	0.1 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 :  Date : 7.6.2017 Certified by :  Date : 7.6.2017
CA-R-297 (22/07/2009) Chan Chun Wai (Manager)

** End of Report **