



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

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Profit Industrial Building,  
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## TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Project : Environmental Monitoring Works For Contract No. KLN/2015/07				Date of Calibration: 5-Oct-17	
Location : KTD1a				Next Calibration Date: 4-Jan-18	
Brand:	Tisch		Technician: Toby Wan		
Model:	TE-5170	S/N:	4037		

CONDITIONS					
Sea Level Pressure (hPa):	1013.3	Corrected Pressure (mm Hg):	760		
Temperature (°C):	29	Temperature (K):	302		

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				

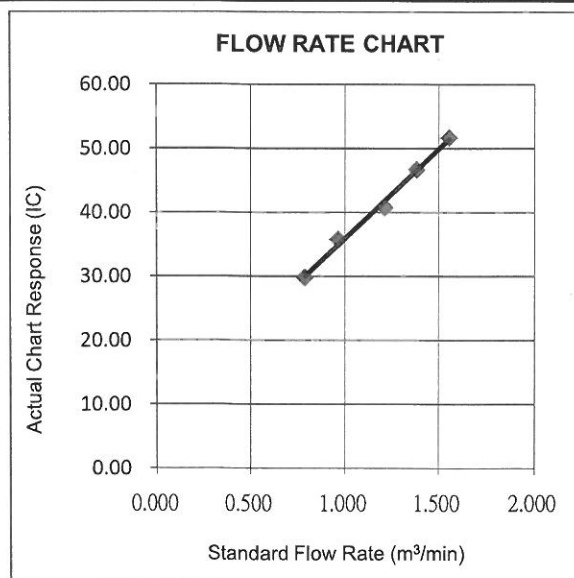
CALIBRATIONS							
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m <sup>3</sup> /min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	5.00	-5.80	10.800	1.554	52.00	51.65	Slope = 27.8838 Intercept = 8.0325 Corr. coeff.: 0.9968
13	3.90	-4.60	8.500	1.381	47.00	46.69	
10	2.90	-3.60	6.500	1.210	41.00	40.73	
7	1.70	-2.40	4.100	0.965	36.00	35.76	
5	1.00	-1.70	2.700	0.787	30.00	29.80	

### 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: 5<sup>th</sup> October, 2017

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**TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET**

Project : Environmental Monitoring Works For Contract No. KLN/2015/07			Date of Calibration: 5-Oct-17		
Location : KTD2a			Next Calibration Date: 4-Jan-18		
Brand:	Tisch		Technician: Toby Wan		
Model:	TE-5170	S/N:	3838		

CONDITIONS			
Sea Level Pressure (hPa):	1013.3	Corrected Pressure (mm Hg):	760
Temperature (°C):	29	Temperature (K):	302

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		

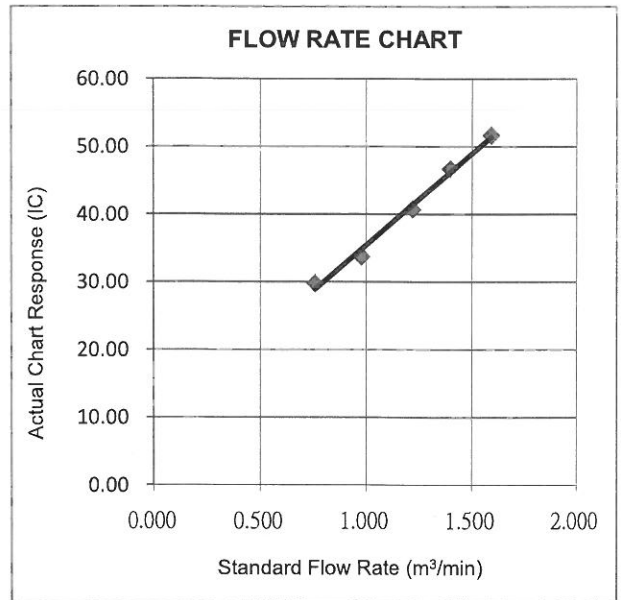
CALIBRATIONS							
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m³/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	6.70	-4.60	11.300	1.589	52.00	51.65	Slope = 27.1114 Intercept = 8.3150 Corr. coeff.: 0.9959
13	5.60	-3.10	8.700	1.397	47.00	46.69	
10	4.40	-2.20	6.600	1.219	41.00	40.73	
7	3.10	-1.10	4.200	0.977	34.00	33.77	
5	2.30	-0.20	2.500	0.758	30.00	29.80	

**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:** 5<sup>th</sup> October, 2017

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**TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET**

Project : Environmental Monitoring Works For Contract No. KLN/2015/07			Date of Calibration: 5-Oct-17		
Location : KER1b			Next Calibration Date: 4-Jan-18		
Brand:	Tisch		Technician: Toby Wan		
Model:	TE-5170	S/N:	3482		

CONDITIONS			
Sea Level Pressure (hPa):	1013.3	Corrected Pressure (mm Hg):	760
Temperature (°C):	29	Temperature (K):	302

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		

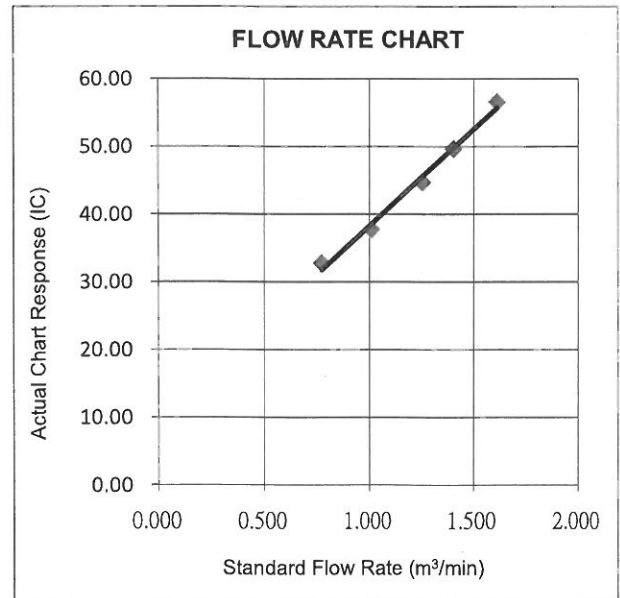
CALIBRATIONS							
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m³/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	7.50	-4.10	11.600	1.610	57.00	56.62	Slope = 28.6210 Intercept = 9.6516 Corr. coeff.: 0.9954
13	6.00	-2.80	8.800	1.405	50.00	49.67	
10	5.30	-1.70	7.000	1.255	45.00	44.70	
7	4.00	-0.50	4.500	1.010	38.00	37.75	
5	3.10	0.50	2.600	0.773	33.00	32.78	

**Calculations:**

Qstd = 1/m[ $\sqrt{\text{H2O}(\text{Pa}/\text{Pstd})(\text{Tstd}/\text{Ta})}$ ]-b]  
 IC = I[ $\sqrt{\text{Pa}/\text{Pstd})(\text{Tstd}/\text{Ta})}$ ]  
 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)[ $\sqrt{298/\text{Tav}}(\text{Pav}/760)$ ]-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:** 5<sup>th</sup> October, 2017

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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


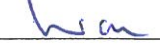
Description : B & K Acoustic Multifunction Calibrator 4226 (Traditional free field setting)  
Equipment ID. : R-108-1  
Date of Calibration : 06-Jun-2017 Ambient Temperature : 22 °C  
Calibration Location : Calibration Laboratory of MaterialLab  
Method Used : By direct comparison

### 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 Certified by :  Date : 7/6/2017  
CA-R-297 (22/07/2009) Chan Chun Wai (Manager)

\*\* End of Report \*\*

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# MaterialLab

Report no.: 161966CA170482

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. : 3756127 (meter), 00937 (microphone), 002712 (Preamplifier))  
Next Calibration Date : 28-Feb-2018  
Specification Limit : EN 61672: 2003 Type 1

### Laboratory Information

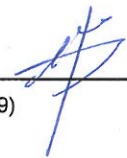

Description : B & K Acoustic Multifunction Calibrator 4226 (Traditional free field setting)  
Equipment ID. : R-108-1  
Date of Calibration : 01-Mar-2017 Ambient Temperature : 22 °C  
Calibration Location : Calibration Laboratory of MaterialLab  
Method Used : By direct comparison

### Calibration Results :

Parameters	Mean Value (dB)	Specification Limit(dB)
A-weighting frequency response	4000Hz	-0.2
	2000Hz	0.8
	1000Hz	0.1
	500Hz	-3.0
	250Hz	-8.4
	125Hz	-15.8
	63Hz	-25.9
	31.5Hz	-38.3
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 : 3-3-2017 Certified by :  Date : 3.3.2017  
CA-R-297 (22/07/2009) Chan Chun Wai (Manager)

\*\* End of Report \*\*

# FUGRO TECHNICAL SERVICES LIMITED

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# MaterialLab

Report no.: 161966CA170279

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 (N-29)  
Manufacturer : Casella  
Model No. : Casella (Model no. CEL-63X(meter), CEL-251(microphone), CEL-495(Preamplifier))  
Serial No. : 3756036 (meter), 01308 (microphone), 003048(Preamplifier)  
Next Calibration Date : 06-Feb-2018  
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 : 07-Feb-2017 Ambient Temperature : 22 °C

Calibration Location : Calibration Laboratory of MaterialLab

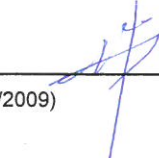

Method Used : By direct comparison

### Calibration Results :

Parameters	Mean Value (dB)	Specification Limit(dB)
A-weighting frequency response	4000Hz	1.5 to -0.6
	2000Hz	0.9 to -0.4
	1000Hz	-0.5 to -1.1
	500Hz	-3.9 to -4.6
	250Hz	-9.3 to -10.0
	125Hz	-16.7 to -17.6
	63Hz	-26.8 to -27.7
	31.5Hz	-39.3 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 : 9-2-2017 Certified by :  Date : 9-2-2017  
CA-R-297 (22/07/2009) Chan Chun Wai (Manager)

\*\* End of Report \*\*

# FUGRO TECHNICAL SERVICES LIMITED

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# MaterialLab

Report no.: 172379CA171674(1)

Page 1 of 1

## CALIBRATION CERTIFICATE OF SOUND CALIBRATOR

### 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 Calibrator  
Manufacturer : Caselia (Model no. CEL-120/1)  
Serial No. : 0255083  
Next Calibration Date : 30-Jul-2018  
Specification Limit :  $\pm 0.5$ dB

### Laboratory Information



Description : Reference Sound Level Meter  
Equipment ID. : R-119-1  
Date of Calibration : 31-Jul-2017 Ambient Temperature : 21 °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	0.1 dB	$\pm 0.5$ dB
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 : 28-2017 Certified by :  Date : 4-8-2017  
CA-R-297 (22/07/2009) Kwok Chi Wa (Assistant Manager)

\*\* End of Report \*\*

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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 \*\*

Certificate of  
Conformance and Calibration for

**CEL-120 Acoustic Calibrator**

Applicable Standards :-IEC 60942: 2003 & ANSI S1.40: 2006

CEL-120/1 Class 1

CEL-120/2 Class 2

Serial No: 1677438

Firmware: 04

Temperature: 22.9 °C Pressure: 1010.8 mb %RH 51.7

Frequency = 1.00kHz ± 2Hz T.H.D. = < 1%	Calibration Level
SPL @ 114.0dB Setting	<u>114.01</u> dB
SPL @ 94.0dB Setting (CEL-120/1 only)	<u>93.97</u> dB/N.A

Engineer :- [Signature] Date :- 14 JUN 2017

Company test equipment and acoustic working standards, used for conformance testing, are subject to periodic calibration, traceable to UK national standards, in accordance with the company's ISO9001 Quality System.

**DECLARATION OF CONFORMITY**

This certificate confirms that the instrument specified above has been produced and tested to comply with the manufacturer's published specifications and the relevant European Community CE directives.

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