

Appendix C

Calibration Certificate for
Construction Dust Monitoring
Equipment



TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location : M-A3	Date of Calibration: 4-Aug-20
Location : S.K.H Tsoi Kung Po Secondary School	Next Calibration Date: 3-Nov-20
Make: <input type="text" value="Tisch"/>	Technician: Felix Fong
Model: <input type="text" value="TE-5170"/>	S/N: <input type="text" value="4388"/>

CONDITIONS			
Sea Level Pressure (hPa):	1004	Corrected Pressure (mm Hg):	753
Temperature (°C):	27.5	Temperature (K):	301

CALIBRATION ORIFICE			
Make:	<input type="text" value="Tisch"/>	Qstd Slope:	<input type="text" value="2.08799"/>
Model:	<input type="text" value="TE-5025A"/>	Qstd Intercept:	<input type="text" value="-0.03545"/>
Calibration Date:	<input type="text" value="21-Oct-19"/>	Expiry Date:	<input type="text" value="21-Oct-20"/>
S/N:	<input type="text" value="2456"/>		

CALIBRATIONS							
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m ³ /min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	5.20	-7.90	13.100	1.735	54.00	53.53	Slope = 56.9902 Intercept = -46.6640 Corr. coeff.= 0.9954
13	4.50	-7.50	12.000	1.661	47.00	46.59	
10	3.40	-6.60	10.000	1.518	40.00	39.65	
7	2.20	-6.20	8.400	1.393	33.00	32.71	
5	1.80	-5.50	7.300	1.300	28.00	27.75	

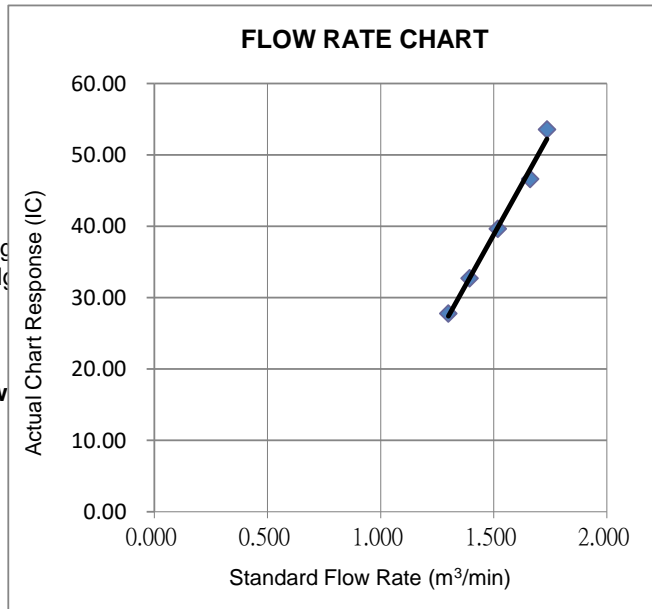
Calculations:

Qstd = 1/m[√(H2O(Pa/Pstd)(Tstd/Ta))-b]
IC = I[√(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 C)
- Pa = actual pressure during calibration (mm Hg)
- Tstd = 298 deg K
- Pstd = 760 mm Hg

For subsequent calculation of sampler flow
1/m((I)[√(298/Tav)(Pav/760)]-b)

- m = sampler slope
- b = sampler intercept
- I = chart response
- Tav = daily average temperature
- Pav = daily average pressure



Certificate of Calibration

Calibration Certification Information			
Cal. Date: October 21, 2019	Rootsmeter S/N: 438320	Ta: 295	°K
Operator: Jim Tisch		Pa: 744.2	mm Hg
Calibration Model #: TE-5025A	Calibrator S/N: 2456		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4200	3.2	2.00
2	3	4	1	1.0180	6.3	4.00
3	5	6	1	0.9030	7.9	5.00
4	7	8	1	0.8620	8.8	5.50
5	9	10	1	0.7120	12.6	8.00

Data Tabulation						
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left(Ta/Pa \right)}$ (y-axis)	
0.9849	0.6936	1.4066	0.9957	0.7012	0.8904	
0.9808	0.9635	1.9892	0.9915	0.9740	1.2592	
0.9787	1.0838	2.2240	0.9894	1.0957	1.4078	
0.9775	1.1340	2.3325	0.9882	1.1464	1.4765	
0.9724	1.3658	2.8131	0.9831	1.3807	1.7808	
QSTD	m=	2.08799	QA	m=	1.30746	
	b=	-0.03545		b=	-0.02244	
	r=	0.99989		r=	0.99989	

Calculations			
Vstd=	$\Delta Vol \left(\frac{Pa - \Delta P}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)$	Va=	$\Delta Vol \left(\frac{Pa - \Delta P}{Pa} \right)$
Qstd=	Vstd/ΔTime	Qa=	Va/ΔTime
For subsequent flow rate calculations:			
Qstd=	$1/m \left(\left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \right) \left(\frac{Tstd}{Ta} \right)} \right) - b \right)$	Qa=	$1/m \left(\left(\sqrt{\Delta H \left(Ta/Pa \right)} \right) - b \right)$

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH:	calibrator manometer reading (in H2O)
ΔP:	rootsmeter manometer reading (mm Hg)
Ta:	actual absolute temperature (°K)
Pa:	actual barometric pressure (mm Hg)
b:	intercept
m:	slope

RECALIBRATION
US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30

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CALIBRATION CERTIFICATE OF DUST METER

Client : Fugro Technical Services Limited

Project : Calibration Services

Client Supplied Information

Details of Unit Under Test, UUT

Description : Laser dust monitor
 Manufacturer : SIBATA
 Model No. : LD-5R
 Serial No. : 882149
 Specification Limit : NA
 Next Calibration Date : 05-Dec-2020

Laboratory Information

Description : Reference balance
 Equipment ID. : R-039-12
 Date of Calibration : 06-Dec-2019 Ambient Temperature : 22 °C
 Calibration Location : Calibration Laboratory of FTS
 Method Used : By direct comparison the weight of dust particle trapped in a filter paper using high volume sampler (TSP method) for a certain period, with the reading of the UUT. They should be placed at the same location and powered on and off at the same time.

Calibration Results :

Reference concentration (mg/m ³)	Total count for 1 hour	CPM (Count per minute)
0.0393	1511	25.18
0.0681	1799	29.98
0.0504	1590	26.50

Remarks:

1. The equipment being used in this calibration is traceable to recognized National Standards.
2. The interpolation equation : Concentration (mg/m³) = K x [UUT reading (CPM)], where K = 0.001932
3. Correlation coefficient (r) : 0.9927

 Checked by : Date : 17-12-2019 Certified by : K.T. Young Date : 18-12-2019

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

Leung Kwok Tai (Assistant Manager)

** End of Report **