

Appendix C

Calibration Certificate for
Construction Dust Monitoring
Equipment



TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location : M-A3	Date of Calibration: 5-Jan-21
Location : S.K.H Tsoi Kung Po Secondary School	Next Calibration Date: 10-Apr-21
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):	1020.1	Corrected Pressure (mm Hg):	765
Temperature (°C):	18.8	Temperature (K):	292

CALIBRATION ORIFICE			
Make:	<input type="text" value="Tisch"/>	Qstd Slope:	<input type="text" value="2.11508"/>
Model:	<input type="text" value="TE-5025A"/>	Qstd Intercept:	<input type="text" value="-0.02962"/>
Calibration Date:	<input type="text" value="11-Sep-20"/>	Expiry Date:	<input type="text" value="11-Sep-21"/>
S/N:	<input type="text" value="2154"/>		

CALIBRATIONS							
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m ³ /min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	6.60	-5.90	12.500	1.709	61.00	61.85	Slope = 45.9394 Intercept = -16.2201 Corr. coeff.= 0.9913
13	5.50	-4.90	10.400	1.560	55.00	55.77	
10	5.00	-3.00	8.000	1.370	48.00	48.67	
7	3.60	-2.40	6.000	1.188	35.00	35.49	
5	2.40	-1.40	3.800	0.949	28.00	28.39	

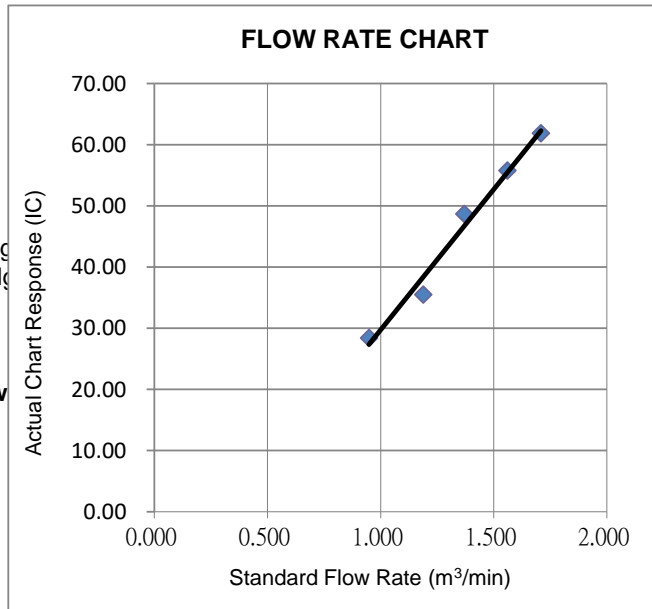
Calculations:

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 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)[Sqrt(298/Tav)(Pav/760)]-b)

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





TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location : M-A3	Date of Calibration: 7-Apr-21
Location : S.K.H Tsoi Kung Po Secondary School	Next Calibration Date: 6-Jul-21
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):	1016	Corrected Pressure (mm Hg):	765
Temperature (°C):	23.1	Temperature (K):	296

CALIBRATION ORIFICE			
Make:	<input type="text" value="Tisch"/>	Qstd Slope:	<input type="text" value="2.11508"/>
Model:	<input type="text" value="TE-5025A"/>	Qstd Intercept:	<input type="text" value="-0.02962"/>
Calibration Date:	<input type="text" value="11-Sep-20"/>	Expiry Date:	<input type="text" value="11-Sep-21"/>
S/N:	<input type="text" value="2154"/>		

CALIBRATIONS							
Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m ³ /min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	8.30	-10.00	18.300	2.050	61.00	61.40	Slope = 44.3447 Intercept = -29.1007 Corr. coeff.= 0.9981
13	6.80	-8.40	15.200	1.869	54.00	54.35	
10	5.00	-7.00	12.000	1.663	45.00	45.30	
7	4.50	-6.70	11.200	1.607	41.00	41.27	
5	3.90	-5.20	9.100	1.450	35.00	35.23	

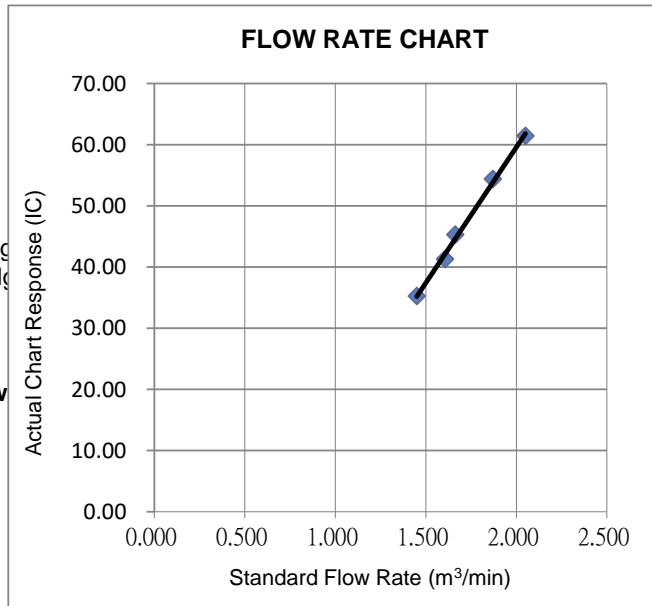
Calculations:

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 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[√(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: September 11, 2020	Rootsmer S/N: 438320	Ta: 297	°K
Operator: Jim Tisch		Pa: 755.4	mm Hg
Calibration Model #: TE-5025A	Calibrator S/N: 2154		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4510	3.3	2.00
2	3	4	1	1.0340	6.4	4.00
3	5	6	1	0.9260	8.0	5.00
4	7	8	1	0.8780	8.9	5.50
5	9	10	1	0.7250	13.0	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)	$\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)}$ (y-axis)
0.9929	0.6843	1.4123	0.9956	0.6862	0.8868
0.9888	0.9563	1.9973	0.9915	0.9589	1.2541
0.9867	1.0656	2.2330	0.9894	1.0685	1.4021
0.9855	1.1225	2.3420	0.9882	1.1255	1.4705
0.9801	1.3519	2.8246	0.9828	1.3556	1.7735
QSTD	m=	2.11508	QA	m=	1.32442
	b=	-0.02962		b=	-0.01860
	r=	0.99993		r=	0.99993

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= $Vstd / \Delta Time$	Qa= $Va / \Delta Time$
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= $1/m \left(\left(\sqrt{\Delta H \left(\frac{Ta}{Pa} \right)} \right) - b \right)$

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH:	calibrator manometer reading (in H2O)
ΔP:	rootsmer 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

Report no. : 940891CA202730(3)

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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. : 620480
 Specification Limit : NA
 Next Calibration Date : 22-Nov-2021

Laboratory Information

Description : 1. Balance 2. TSP high volume air sampler
 Equipment ID. / Serial no. : 1. C-065-9 2. 4350
 Date of Calibration : 23-Nov-2020 Ambient Temperature : 25 ± 10 °C
 Calibration Location : General Chemical Laboratory of FTS and Ma Wan A1 Site Boundary
 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)
0.0915	3211	53.52
0.0469	2732	45.53
0.1172	3659	60.98

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 = 0.001597
3. Correlation coefficient (r) : 0.9909

Checked by : Canny Date : 15-12-2020 Certified by : Leung Kwok Tai Date : 15-12-2020
 CA-R-297 (22/07/2009) Leung Kwok Tai (Assistant Manager)

** End of Report **