

Appendix C

Calibration Certificate for
Construction Dust Monitoring
Equipment



TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location : M-A3	Date of Calibration: 18-Feb-20
Location : S.K.H Tsoi Kung Po Secondary School	Next Calibration Date: 17-May-20
Make: <input type="text" value="Tisch"/>	Technician: Tony Wan
Model: <input type="text" value="TE-5170"/>	S/N: <input type="text" value="4388"/>

CONDITIONS			
Sea Level Pressure (hPa):	1026.4	Corrected Pressure (mm Hg):	770
Temperature (°C):	14.7	Temperature (K):	288

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	4.80	-7.80	12.600	1.758	57.00	58.39	Slope = 27.9500 Intercept = 7.5966 Corr. coeff.= 0.9925
13	3.90	-6.90	10.800	1.629	51.00	52.24	
10	2.80	-5.00	7.800	1.387	44.00	45.07	
7	1.20	-4.00	5.200	1.136	38.00	38.92	
5	0.20	-2.80	3.000	0.867	32.00	32.78	

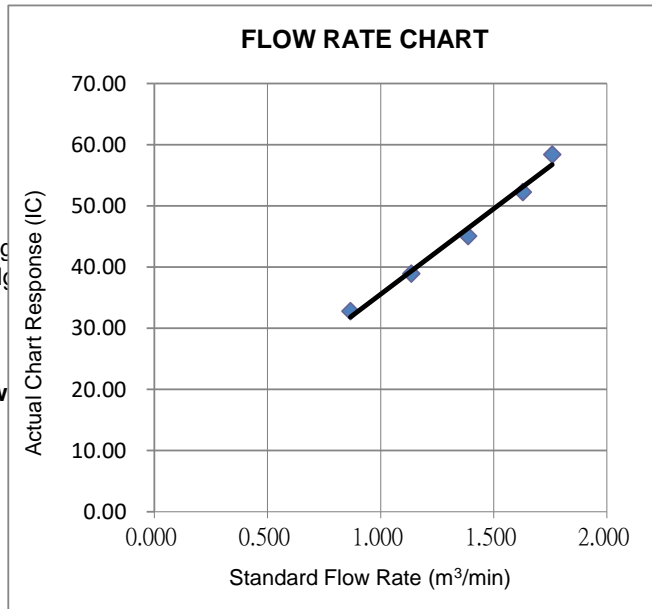
Calculations:

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





TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location : M-A3	Date of Calibration: 11-May-20
Location : S.K.H Tsoi Kung Po Secondary School	Next Calibration Date: 10-Aug-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):	1010.3	Corrected Pressure (mm Hg):	758
Temperature (°C):	28.9	Temperature (K):	292

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	4.00	-8.60	12.600	1.732	56.00	56.50	Slope = 54.4569 Intercept = -36.4615 Corr. coeff.= 0.9905
13	3.60	-7.50	11.100	1.627	52.00	52.46	
10	3.00	-6.80	9.800	1.530	48.00	48.43	
7	2.20	-6.40	8.600	1.434	42.00	42.38	
5	1.30	-5.60	6.900	1.286	32.00	32.29	

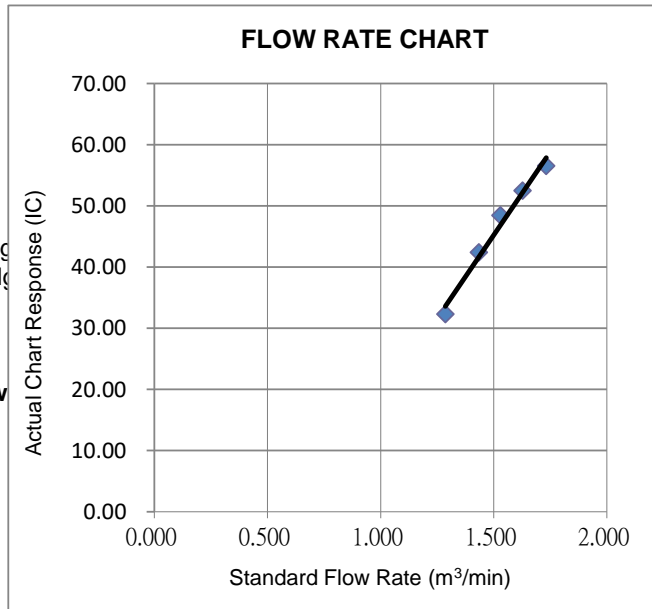
Calculations:

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

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

CALIBRATION CERTIFICATE

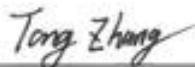
Date: May 28th, 2019

Equipment Name	:	Digital Dust Indicator, Model LD-3B
Code No.	:	080000-42
Quantity	:	1 unit
Serial No.	:	647594
Sensitivity	:	0.001 mg/m ³
Sensitivity Adjustment	:	752CPM
Scale Setting	:	May 24th, 2019

We hereby certify that the above mentioned instrment has been calibrated satisfactory.

Sincerely

SIBATA SCIENTIFIC TECHNOLOGY LTD.



Tong Zhang
Overseas & New Business Group
Overseas Sales Department



CALIBRATION CERTIFICATE

Date: August 28th, 2019

Equipment Name	:	Digital Dust Indicator, Model LD-5R
Code No.	:	080000-72
Quantity	:	1 unit
Serial No.	:	882148
Sensitivity	:	0.001 mg/m ³
Sensitivity Adjustment	:	618
Scale Setting	:	August 23rd, 2019

We hereby certify that the above mentioned instrument has been calibrated satisfactory.

Sincerely

SIBATA SCIENTIFIC TECHNOLOGY LTD.

Tong Zhang

Tong Zhang
Overseas & New Business Group
Overseas Sales Department

