Appendix C

Calibration Certificate for

Construction Dust Monitoring

Equipment

FUGRO TECHNICAL SERVICES LIMITED
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Profit Industrial Building,
1-15 Kwai Fung Crescent, Kwai Fong,
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Tel : (852)-24508238
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Email : mcl@fugro.com.hk

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Location : M-A3
Location : S.K.H Tsoi Kung Po Secondary School
Make: Tisch
Model: TE-5170 S/N: 4388

Date of Calibration: 23-Sep-23
Next Calibration Date: 22-Dec-23
Technician: Eve Ma

CONDITIONS

Sea Level Pressure (hPa):	1012	Corrected Pressure (mm Hg):	759
Temperature (℃):	30	Temperature (K):	303

CALIBRATION ORIFICE

Make:	Tisch	Qstd Slope:	2.08482
Model:	TE-5025A	Qstd Intercept:	-0.02977
Calibration Date:	1-Jun-23	Expiry Date:	1-Jun-24
S/N:	2456		

CALIBRATIONS

Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m^3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
18	7.90	-4.20	12.100	1.667	60.00	59.45	Slope =	28.9784
13	6.80	-3.00	9.800	1.502	55.00	54.49	Intercept =	11.2062
10	5.60	-1.80	7.400	1.307	50.00	49.54	Corr. coeff.=	0.9955
7	3.40	-0.40	3.800	0.941	40.00	39.63		
5	3.16	-0.50	3.660	0.923	37.00	36.66		

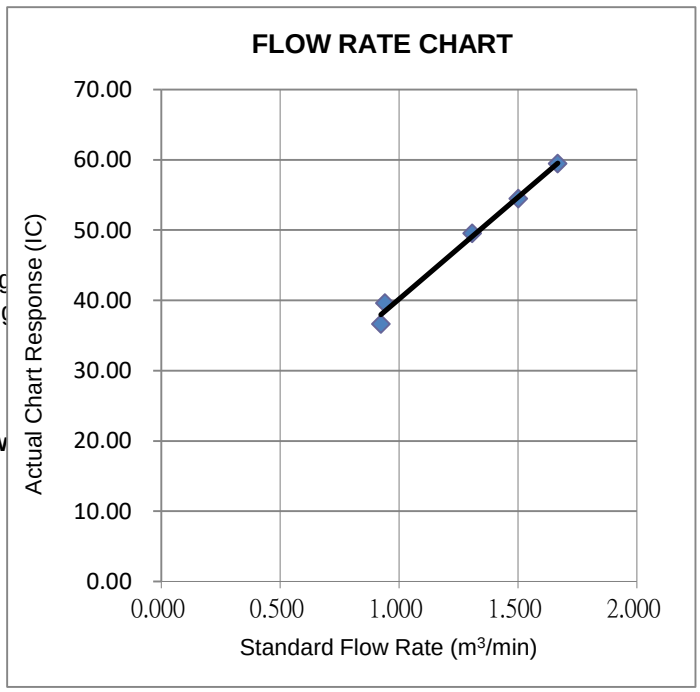
Calculations:

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
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



FUGRO TECHNICAL SERVICES LIMITED
Fugro Development Centre
5 Lok Yi Street, Tai Lam
Tuen Mun, NT
Hong Kong

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

Model:	Tisch TE-5170	Date of Calibration:	23-Dec-23
Serial No.:	4388	Next Calibration Date:	22-Mar-24
		Technician:	Eve Ma

CONDITIONS

Sea Level Pressure (hPa):	1029.90	Corrected Pressure (mm Hg):	772
Temperature (°C):	11	Temperature (K):	284

CALIBRATION ORIFICE

Model:	Tisch TE-5025A	Qstd Slope:	2.08482
Serial No.:	2456	Qstd Intercept:	-0.02977
Calibration Date:	1-Jun-23	Expiry Date:	1-Jun-24

CALIBRATIONS

Plate No.	H2O (L) (in)	H2O (R) (in)	H2O (in)	Qstd (m^3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
18	4.60	-4.70	9.300	1.525	54.00	55.77	Slope =	22.4052
13	3.80	-3.90	7.700	1.389	51.00	52.67	Intercept =	21.0926
10	3.30	-3.40	6.700	1.296	48.00	49.57	Corr. coeff.=	0.9931
7	2.50	-2.60	5.100	1.133	44.00	45.44		
5	1.10	-1.30	2.400	0.782	38.00	39.24		

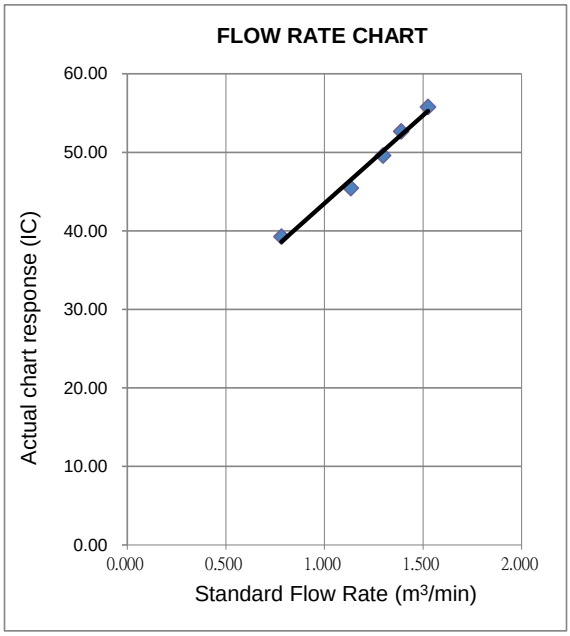
Calculations:

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



TISCH Environmental

RECALIBRATION DUE DATE:
June 1, 2024

Certificate of Calibration

Calibration Certification Information					
Cal. Date:	June 1, 2023	**Rootsmeter S/N:** 438320	**Ta:** 295	°K	
Operator:	Jim Tisch		**Pa:** 751.8	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	1.4360	3.2	2.00
2	3	4	1	1.0210	6.4	4.00
3	5	6	1	0.9080	8.0	5.00
4	7	8	1	0.8670	8.8	5.50
5	9	10	1	0.7170	12.8	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)
0.9951	0.6929	1.4137	0.9957	0.6934	0.8859
0.9908	0.9704	1.9993	0.9915	0.9711	1.2528
0.9887	1.0889	2.2353	0.9894	1.0896	1.4007
0.9876	1.1391	2.3444	0.9883	1.1399	1.4690
0.9823	1.3700	2.8275	0.9830	1.3710	1.7717
QSTD	**m=**	**2.08482**	**QA**	**m=**	**1.30548**
	b=	**-0.02977**		**b=**	**-0.01866**
	r=	**0.99997**		**r=**	**0.99997**

Calculations

Vstd=	ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	**Va=**	ΔVol((Pa-ΔP)/Pa)
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

Tisch Environmental, Inc.
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FUGRO TECHNICAL SERVICES LIMITED
Fugro Development Centre
5 Lok Yi Street, Tai Lam
Tuen Mun, NT
Hong Kong

Report no. : 940891CA230848(6)

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. : 882147

Next Calibration Date : 8-Feb-2024

Laboratory Information

Details of Reference Equipment -

Description : Reference balance

Equipment ID. : C-065-5

Date of Calibration : 9-Feb-2023 Ambient Temperature : 24 °C

Calibration Location : Calibration Lab. 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)
0.0545	1588	26.47
0.0587	1603	26.72
0.0775	1674	27.90

Remarks:

1. The equipment being used in this calibration is traceable to recognized National Standards.
2. The interpolation equation : Concentration (mg/m^3) = K x UUT reading (CPM) where K = 0.002352
3. Correlation coefficient (r) : 1.0000

Checked by : _____ Date : 26-4-2023 Certified by : _____ Date : 26-4-2023

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

Leung Kwok Tai (Assistant Manager)

** End of Report **