High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

CINOTECH

Project No.	CKL 1 - Flat 121 Cha Kwo Ling Village				
Date:	6-Nov-20	Next Due Date:	6-Jan-21	Operator:	SK
Equipment No.:	A-01-18	Model No.:	TE 5170	Serial No.	0723

Ambient Condition

Temperature, Ta (K)	297.7	Pressure, Pa (mmHg)	761.9

Orifice Transfer Standard Information

Serial No.	3746	Slope, mc	0.0592	Intercept, bc	-0.0274
Last Calibration Date:	17-Jan-20	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	17-Jan-21	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

Calibration of TSP Sampler

Calibration Point	Orfice			HVS	
	ΔH (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) **X - axis**	ΔW (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ **Y-axis**
1	13.8	3.72	63.32	10.1	3.18
2	11.2	3.35	57.09	7.6	2.76
3	8.4	2.90	49.51	6.0	2.45
4	5.3	2.31	39.42	3.6	1.90
5	3.1	1.76	30.26	1.9	1.38

By Linear Regression of Y on X

 Slope , mw = **0.0533**   Intercept, bw = **-0.2162**

  Correlation coefficient* = **0.9984**

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation

From the TSP Field Calibration Curve, take Qstd = 43 CFM

From the Regression Equation, the "Y" value according to

$$mw \times Qstd + bw = [\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$$

 Therefore, Set Point; W = $(mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298)$ = **4.29**

Remarks:

Conducted by:	SK Wong	Signature:	Date:	06 November 2020
Checked by:	Henry Leung	Signature:	Date:	06 November 2020

High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

CINOTECH

Project No.	CKL 2 - Flat 103 Cha Kwo Ling Village				
Date:	6-Nov-20	Next Due Date:	6-Jan-21	Operator:	SK
Equipment No.:	A-01-55	Model No.:	TE 5170	Serial No.	1956

Ambient Condition

Temperature, Ta (K)	297.7	Pressure, Pa (mmHg)	761.9

Orifice Transfer Standard Information

Serial No.	3746	Slope, mc	0.0592	Intercept, bc	-0.0274
Last Calibration Date:	17-Jan-20	mc x Qstd + bc = [ΔH x (Pa/760) x (298/Ta)]$^{1/2}$			
Next Calibration Date:	17-Jan-21	Qstd = {[ΔH x (Pa/760) x (298/Ta)]$^{1/2}$ -bc} / mc			

$$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$$
$$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$$

Calibration of TSP Sampler

Calibration Point	Orfice			HVS	
	ΔH (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) X - axis	ΔW (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ Y-axis
1	14.5	3.81	64.90	9.6	3.10
2	11.3	3.37	57.35	7.0	2.65
3	8.4	2.90	49.51	5.6	2.37
4	5.4	2.33	39.78	3.5	1.87
5	3.1	1.76	30.26	2.2	1.49

By Linear Regression of Y on X

  Slope , mw = 0.0461   **Intercept, bw =** 0.0661

  Correlation coefficient* = 0.9977

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation

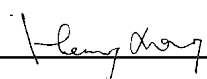From the TSP Field Calibration Curve, take Qstd = 43 CFM

From the Regression Equation, the "Y" value according to

$$mw \times Qstd + bw = [\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$$

  Therefore, Set Point; W = (mw x Qstd + bw)^2 x (760 / Pa) x (Ta / 298) =   4.19

Remarks:

Conducted by:	SK Wong	Signature:	Date: 06 November 2020
Checked by:	Henry Leung	Signature:	Date: 06 November 2020

High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

File No. MA20003/04/0003

Project No.   KER 1 - Future Residential Development at Kerry Godown

Date: 3-Dec-20   Next Due Date: 3-Feb-21   Operator: SK

Equipment No.:   A-01-04   Model No.:   TE 5170   Serial No.   10595

Ambient Condition		
Temperature, Ta (K)	290.4	Pressure, Pa (mmHg) 765.8

Orifice Transfer Standard Information				
Serial No.	3746	Slope, mc	0.0592	Intercept, bc -0.0274
Last Calibration Date:	17-Jan-20	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$		
Next Calibration Date:	17-Jan-21	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$		

Calibration of TSP Sampler					
Calibration Point	Orifice			HVS	
	ΔH (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) X - axis	ΔW (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ Y-axis
1	13.3	3.71	63.10	6.5	2.59
2	10.8	3.34	56.91	5.2	2.32
3	8.3	2.93	49.95	4.0	2.03
4	4.5	2.16	36.90	2.6	1.64
5	2.5	1.61	27.62	1.8	1.36

By Linear Regression of Y on X

Slope , mw =   0.0341   Intercept, bw =   0.3916

Correlation coefficient* =   0.9963

*If Correlation Coefficient < 0.990, check and recalibrate.
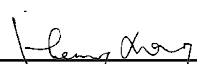
Set Point Calculation

From the TSP Field Calibration Curve, take Qstd = 43 CFM

From the Regression Equation, the "Y" value according to

$$mw \times Qstd + bw = [\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$$

Therefore, Set Point; W = (mw x Qstd + bw)^2 x (760 / Pa) x (Ta / 298) =   3.33

Remarks:

Conducted by: SK Wong   Signature: Date: 03 December 2020

Checked by: Henry Leung   Signature: Date: 03 December 2020

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High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

File No. MA20003/44/0004

Project No.   KTD1 - Centre of Excellence in Paediatrics (Children's Hospital)

Date: 3-Dec-20   Next Due Date: 3-Feb-21   Operator: SK

Equipment No.: A-01-44   Model No.: TE-5170   Serial No. 1316

Ambient Condition			
Temperature, Ta (K)	290.4	Pressure, Pa (mmHg)	765.8

Orifice Transfer Standard Information				
Serial No.	3746	Slope, mc	0.0592	Intercept, bc	-0.02740
Last Calibration Date:	17-Jan-20	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$		
Next Calibration Date:	17-Jan-21	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$		

Calibration of TSP Sampler					
Calibration Point	Orfice			HVS	
	ΔH (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) X - axis	ΔW (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ Y-axis
1	12.9	3.65	62.16	8.7	3.00
2	10.4	3.28	55.86	6.6	2.61
3	7.9	2.86	48.74	4.9	2.25
4	5.9	2.47	42.18	3.4	1.87
5	3.1	1.79	30.71	1.8	1.36

By Linear Regression of Y on X

Slope , mw = 0.0520   Intercept, bw = -0.2699

Correlation coefficient* = 0.9982

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation
From the TSP Field Calibration Curve, take Qstd = 43 CFM
From the Regression Equation, the "Y" value according to

$$mw \times Qstd + bw = [\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$$

Therefore, Set Point; W = (mw x Qstd + bw)^2 x (760 / Pa) x (Ta / 298) = 3.73

Remarks:

Conducted by: SK Wong   Signature: Date: 03 December 2020

Checked by: Henry Leung   Signature: Date: 03 December 2020

High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

File No. MA20003/41/0003

Project No. KTD 2c - G/IC Zone next to Kwun Tong Bypass (Next to the Kowloon Bay Sewage Interception Station)

Date:	3-Dec-20	Next Due Date:	3-Feb-21	Operator:	SK
Equipment No.:	A-01-41	Model No.:	TE 5170	Serial No.	5280

Ambient Condition		
Temperature, Ta (K)	290.4	Pressure, Pa (mmHg) 765.8

Orifice Transfer Standard Information					
Serial No.	3746	Slope, mc	0.0592	Intercept, bc	-0.0274
Last Calibration Date:	17-Jan-20	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	17-Jan-21	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

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Calibration of TSP Sampler					
Calibration Point	Orfice			HVS	
	ΔH (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) **X - axis**	ΔW (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ **Y-axis**
1	13.5	3.74	63.57	6.5	2.59
2	11.1	3.39	57.69	5.2	2.32
3	8.1	2.89	49.35	4.1	2.06
4	4.6	2.18	37.30	2.5	1.61
5	2.6	1.64	28.16	1.8	1.36

By Linear Regression of Y on X

Slope , mw = 0.0346   Intercept, bw = 0.3558

Correlation coefficient* = 0.9975

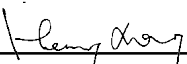*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation

From the TSP Field Calibration Curve, take Qstd = 43 CFM

From the Regression Equation, the "Y" value according to

$$mw \times Qstd + bw = [\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$$

Therefore, Set Point; $W = (mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$ 3.28

Remarks:

Conducted by:	SK Wong	Signature:	Date: 03 December 2020
Checked by:	Henry Leung	Signature:	Date: 03 December 2020

High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

Project No.   CKL 1 - Flat 121 Cha Kwo Ling Village

Date: 6-Jan-21   Next Due Date: 6-Mar-21   Operator: SK

Equipment No.: A-01-18   Model No.:   TE 5170   Serial No.   0723

Ambient Condition			
Temperature, Ta (K)	290.1	Pressure, Pa (mmHg)	764.9

Orifice Transfer Standard Information				
Serial No.	3746	Slope, mc	0.0592	Intercept, bc	-0.0274
Last Calibration Date:	17-Jan-20	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$		
Next Calibration Date:	17-Jan-21	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$		

Calibration of TSP Sampler					
Calibration Point	Orifice			HVS	
	ΔH (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) X - axis	ΔW (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ Y-axis
1	13.7	3.76	64.04	10.2	3.25
2	11.2	3.40	57.94	7.6	2.80
3	8.5	2.96	50.54	6.0	2.49
4	5.4	2.36	40.37	3.5	1.90
5	3.2	1.82	31.19	1.8	1.36

By Linear Regression of Y on X

Slope , mw =   0.0560   Intercept, bw =   -0.3720

Correlation coefficient* =   0.9983

*If Correlation Coefficient < 0.990, check and recalibrate.
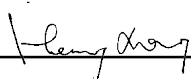
Set Point Calculation

From the TSP Field Calibration Curve, take Qstd = 43 CFM

From the Regression Equation, the "Y" value according to

$$mw \times Qstd + bw = [\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$$

Therefore, Set Point; W = $(mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298)$ =   4.01

Remarks:

Conducted by: SK Wong   Signature: Date: 6 January 2021

Checked by: Henry Leung   Signature: Date: 6 January 2021

High-Volume TSP Sampler

5-POINT CALIBRATION DATA SHEET

Project No.   CKL 2 - Flat 103 Cha Kwo Ling Village

Date:	6-Jan-21	Next Due Date:	6-Mar-21	Operator:	SK
Equipment No.:	A-01-55	Model No.:	TE 5170	Serial No.	1956

Ambient Condition			
Temperature, Ta (K)	290.1	Pressure, Pa (mmHg)	764.9

Orifice Transfer Standard Information					
Serial No.	3746	Slope, mc	0.0592	Intercept, bc	-0.0274
Last Calibration Date:	17-Jan-20	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	17-Jan-21	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

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Calibration of TSP Sampler					
Calibration Point	Orifice			HVS	
	ΔH (orifice), in. of water	$[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	Qstd (CFM) X - axis	ΔW (HVS), in. of water	$[\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$ Y-axis
1	13.9	3.79	64.50	9.5	3.13
2	11.4	3.43	58.45	7.2	2.73
3	8.5	2.96	50.54	5.7	2.43
4	5.3	2.34	40.00	3.6	1.93
5	2.9	1.73	29.71	2.1	1.47

By Linear Regression of Y on X

Slope , mw =   0.0466   Intercept, bw =   0.0736

Correlation coefficient* =   0.9976

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation

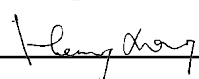From the TSP Field Calibration Curve, take Qstd = 43 CFM

From the Regression Equation, the "Y" value according to

$$mw \times Qstd + bw = [\Delta W \times (Pa/760) \times (298/Ta)]^{1/2}$$

Therefore, Set Point; $W = (mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$ 4.17

Remarks:

Conducted by:	SK Wong	Signature:		Date:	6 January 2021
Checked by:	Henry Leung	Signature:		Date:	6 January 2021

TISCH Environmental

Certificate of Calibration

Calibration Certification Information

Cal. Date: January 17, 2020	**Rootsmeter S/N:** 438320	**Ta:** 295 °K
Operator: Jim Tisch		**Pa:** 744.2 mm Hg
Calibration Model #: TE-5025A	**Calibrator S/N:** 3746	

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4340	3.2	2.00
2	3	4	1	1.0180	6.4	4.00
3	5	6	1	0.9080	7.9	5.00
4	7	8	1	0.8700	8.7	5.50
5	9	10	1	0.7150	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	0.6868	1.4066	0.9957	0.6944	0.8904
0.9807	0.9633	1.9892	0.9914	0.9739	1.2592
0.9787	1.0779	2.2240	0.9894	1.0896	1.4078
0.9776	1.1237	2.3325	0.9883	1.1360	1.4765
0.9724	1.3601	2.8131	0.9831	1.3749	1.7808
QSTD m=	2.09221		**QA** m=	1.31010	
b=	-0.02779		b=	-0.01759	
r=	0.99994		r=	0.99994	

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

Cerificate of Calibration - Wind Monitoring Station

Description:	Yau Lai Estate, Bik Lai House
Manufacturer:	Davis Instruments
Model No.:	Davis7440
Serial No.:	MC01010A44
Equipment No.:	SA-03-04
Date of Calibration	21-Aug-2020
Next Due Date	21-Feb-2021

1. Performance check of Wind Speed

Wind Speed, m/s		Difference D (m/s)
Wind Speed Reading (V1)	Anemometer Value (V2)	D = V1 – V2
0.0	0.0	0.0
1.5	1.5	0.0
2.2	2.3	-0.1
3.5	3.4	0.1
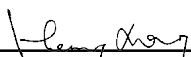
2. Performance check of Wind Direction

Wind Direction (^{o})		Difference D (^{o})
Wind Direction Reading (W1)	Marine Compass Value (W2)	D = W1 - W2
0	0	0.0
90	90	0.0
180	180	0.0
270	270	0.0

Test Specification:

1. Performance Wind Speed Test - The wind meter was on-site calibrated against the anemometer

2. Performance Wind Direction Test - The wind meter was on-site calibrated against the marine compass at four direction

Calibrated by: _____   Approved by: _____

　　　　　　　　　Wong Shing Kwai　　　　　　　　　　　　　　　　　Henry Leung

Certificate of Calibration

It is certified that the item under calibration has been calibrated by corresponding calibrated High Volume Sampler

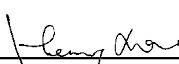|			
Description:	Digital Dust Indicator	Date of Calibration	5-Dec-20
Manufacturer:	Sibata Scientific Technology LTD.	Validity of Calibration Record	5-Feb-21
Model No.:	LD-5R		
Serial No.:	972778		
Equipment No.:	SA-01-07	Sensitivity	0.001 mg/m3
High Volume Sampler No.:	A-01-01A	Before Sensitivity Adjustment	735 CPM
Tisch Calibration Orifice No.:	3607	After Sensitivity Adjustment	735 CPM

Calibration of 1 hr TSP		
Calibration Point	**Laser Dust Monitor** Mass Concentration (µg/m3) **X-axis**	**HVS** Mass concentration (µg/m^3) **Y-axis**
1	48.0	88.4
2	43.0	84.2
3	38.0	79.3
Average	**43.0**	**84.0**

By Linear Regression of Y on X

Slope , mw = 0.9100   Intercept, bw = 44.8367

Correlation coefficient* = 0.9990

Set Correlation Factor	
Particaulate Concentration by High Volume Sampler (µg/m^3)	84.0
Particaulate Concentration by Dust Meter (µg/m^3)	43.0
Measureing time, (min)	60.0
Set Correlation Factor , SCF	
SCF = [K=High Volume Sampler / Dust Meter, (µg/m3)]	**2.0**

In-house method in according to the instruction manual:

The Dust Monitor was compared with a calibrated High Volume Sampler and The result was used to generate the Correlation Factor (CF) between the Dust Monitor and High Volume Sampler.

Those filter papers are weighted by HOKLAS laboratory (HPCT Litimed)

Calibrated by: _____   Approved by: _____
Wong Shing Kwai   Henry Leung