Certificate 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	20-Aug-2021
Next Due Date	20-Feb-2022

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
2.8	2.7	0.1
4.0	4.1	-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
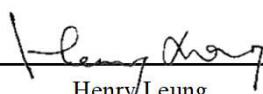**2. Performance Wind Direction Test - The wind meter was on-site calibrated against the marine compass at four direction**

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

TISCH
Environmental

Certificate of Calibration

Calibration Certification Information					
Cal. Date: January 11, 2021		**Rootsmeter S/N:** 438320		**Ta:** 297	**°K**
Operator: Jim Tisch				**Pa:** 750.1	mm Hg
Calibration Model #: TE-5025A		**Calibrator S/N: 3864**			

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4470	3.2	2.00
2	3	4	1	1.0210	6.4	4.00
3	5	6	1	0.9140	8.0	5.00
4	7	8	1	0.8670	8.8	5.50
5	9	10	1	0.7140	12.9	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)
0.9860	0.6814	1.4073	0.9957	0.6881	0.8899
0.9818	0.9616	1.9902	0.9915	0.9711	1.2585
0.9797	1.0719	2.2251	0.9893	1.0824	1.4071
0.9786	1.1288	2.3337	0.9883	1.1399	1.4757
0.9732	1.3630	2.8146	0.9828	1.3765	1.7798
QSTD	m= 2.06566		**QA**	m= 1.29348	
	b= 0.00315			b= 0.00199	
	r= 0.99996			r= 0.99996	

Calculations

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

For subsequent flow rate calculations:

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

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

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

High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

CINOTECH

File No. MA20003/44/0009

Project No.	KTD1 - Centre of Excellence in Paediatrics (Children's Hospital)		
Date:	2-Oct-21	Next Due Date: 2-Dec-21	Operator: SK
Equipment No.:	A-01-44	Model No.: TE-5170	Serial No. 1316

Ambient Condition			
Temperature, Ta (K)	303	Pressure, Pa (mmHg)	758.1

Orifice Transfer Standard Information					
Serial No.	3864	Slope, mc	0.05846	Intercept, bc	-0.00313
Last Calibration Date:	11-Jan-21	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	11-Jan-22	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

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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	13.6	3.65	62.54	9.2	3.00
2	11.2	3.31	56.75	7.2	2.66
3	8.2	2.84	48.57	5.6	2.34
4	5.6	2.34	40.15	3.3	1.80
5	3.2	1.77	30.36	1.8	1.33

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By Linear Regression of Y on X

Slope , mw = 0.0520   Intercept, bw = -0.2515

Correlation coefficient* = 0.9978

*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:	Wong Shing Kwai	Signature:		Date: 2-Oct-21
Checked by:	Henry Leung	Signature:		Date: 2-Oct-21

High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

CINOTECH

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

Date: **2-Oct-21**   Next Due Date: **2-Dec-21**   Operator: **SK**

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

Ambient Condition

Temperature, Ta (K)	303	Pressure, Pa (mmHg)	758.1

Orifice Transfer Standard Information

Serial No.	3864	Slope, mc	0.05846	Intercept, bc	-0.00313
Last Calibration Date:	11-Jan-21				
Next Calibration Date:	11-Jan-22				

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

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

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	13.4	3.63	62.07	9.1	2.99
2	10.6	3.22	55.22	7.0	2.62
3	8.4	2.87	49.16	5.6	2.34
4	5.2	2.26	38.69	3.2	1.77
5	3.0	1.72	29.40	2.1	1.44

By Linear Regression of Y on X

Slope , mw = **0.0482**   Intercept, bw = **-0.0280**

Correlation coefficient* = **0.9978**

*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; $W = (mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$ **4.26**

Remarks:

Conducted by: **Wong Shing Kwai**   Signature: Date: **2-Oct-21**

Checked by: **Henry Leung**   Signature: Date: **2-Oct-21**

High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

CINOTECH

File No. MA20003/41/0008

Project No.   KTD 2D - Next to the SOR Office of Trunk Road T2 in Kai Tak Area

Date: 25-Sep-21   Next Due Date: 25-Nov-21   Operator: SK

Equipment No.:   A-01-41   Model No.:   TE 5170   Serial No.   5280

Ambient Condition			
Temperature, Ta (K)	302.6	Pressure, Pa (mmHg)	759.5

Orifice Transfer Standard Information					
Serial No.	3864	Slope, mc	0.05846	Intercept, bc	-0.00313
Last Calibration Date:	11-Jan-21	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	11-Jan-22	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

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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	13.4	3.63	62.17	8.9	2.96
2	11.6	3.38	57.85	7.1	2.64
3	8.3	2.86	48.94	5.6	2.35
4	6.0	2.43	41.62	4.0	1.98
5	3.0	1.72	29.45	2.4	1.54

By Linear Regression of Y on X

   Slope , mw =   **0.0423**   **Intercept, bw =**   **0.2617**

   Correlation coefficient* =   **0.9954**

*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) =   **4.41**

Remarks: _____

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Conducted by: Wong Shing Kwai   Signature: _____   Date: 25-Sep-21

Checked by: Henry Leung   Signature: _____   Date: 25-Sep-21

High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

CINOTECH

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

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

Ambient Condition			
Temperature, Ta (K)	302.7	Pressure, Pa (mmHg)	757.8

Orifice Transfer Standard Information					
Serial No.	3864	Slope, mc	0.05846	Intercept, bc	-0.00313
Last Calibration Date:	11-Jan-21	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$	
Next Calibration Date:	11-Jan-22	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$	

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

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

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	12.8	3.54	60.69	9.8	3.10
2	10.8	3.26	55.75	7.6	2.73
3	8.4	2.87	49.17	6.0	2.43
4	5.6	2.34	40.16	3.6	1.88
5	3.0	1.72	29.41	1.9	1.37

By Linear Regression of Y on X

Slope , mw =   0.0549   **Intercept, bw =**   -0.2831

Correlation coefficient* =   0.9979

*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) =   **4.40**

Remarks: _____

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Conducted by:	Wong Shing Kwai	Signature:		Date:	6-Sep-21
Checked by:	Henry Leung	Signature:		Date:	6-Sep-21

High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

CINOTECH

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

Ambient Condition			
Temperature, Ta (K)	302.7	Pressure, Pa (mmHg)	757.8

Orifice Transfer Standard Information					
Serial No.	3864	Slope, mc	0.05846	Intercept, bc	-0.00313
Last Calibration Date:	11-Jan-21	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	11-Jan-22	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

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	12.8	3.54	60.69	9.8	3.10
2	10.2	3.16	54.18	8.0	2.80
3	8.4	2.87	49.17	5.9	2.41
4	6.2	2.47	42.25	4.0	1.98
5	3.4	1.83	31.30	1.9	1.37

By Linear Regression of Y on X

Slope , mw = **0.0605**   Intercept, bw = **-0.5414**

Correlation coefficient* = **0.9981**

*If Correlation Coefficient < 0.990, check and recalibrate.

Set Point Calculation

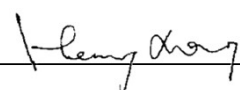From the TSP Field Calibration Curve, take Qstd = 43 CFM

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 = $(mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298)$ =   **4.32**

Remarks: _____

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Conducted by:	Wong Shing Kwai	Signature:		Date: 6-Sep-21
Checked by:	Henry Leung	Signature:		Date: 6-Sep-21

High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

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

Date: 2-Aug-21   Next Due Date: 2-Oct-21   Operator: SK

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

Ambient Condition			
Temperature, Ta (K)	302.7	Pressure, Pa (mmHg)	750

Orifice Transfer Standard Information					
Serial No.	3864	Slope, mc	0.05846	Intercept, bc	-0.00313
Last Calibration Date:	11-Jan-21	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	11-Jan-22	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

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	3.66	62.69	9.2	2.99
2	11.2	3.30	56.48	7.0	2.61
3	8.3	2.84	48.63	5.4	2.29
4	6.2	2.45	42.04	3.4	1.82
5	3.2	1.76	30.21	1.8	1.32

By Linear Regression of Y on X

Slope , mw =   0.0516   Intercept, bw =   -0.2704

Correlation coefficient* =   0.9964

*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 = $(mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298)$ =   3.90

Remarks:

Conducted by: Wong Shing Kwai   Signature: Date: 2-Aug-21

Checked by: Henry Leung   Signature: Date: 2-Aug-21

High-Volume TSP Sampler
5-POINT CALIBRATION DATA SHEET

CINOTECH

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

Date: 2-Aug-21   Next Due Date: 2-Oct-21   Operator: SK

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

Ambient Condition			
Temperature, Ta (K)	302.7	Pressure, Pa (mmHg)	750

Orifice Transfer Standard Information					
Serial No.	3864	Slope, mc	0.05846	Intercept, bc	-0.00313
Last Calibration Date:	11-Jan-21	$mc \times Qstd + bc = [\Delta H \times (Pa/760) \times (298/Ta)]^{1/2}$			
Next Calibration Date:	11-Jan-22	$Qstd = \{[\Delta H \times (Pa/760) \times (298/Ta)]^{1/2} - bc\} / mc$			

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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	13.7	3.65	62.46	9.0	2.96
2	11.4	3.33	56.98	7.0	2.61
3	8.6	2.89	49.50	5.4	2.29
4	5.2	2.25	38.50	3.2	1.76
5	3.0	1.71	29.26	2.1	1.43

By Linear Regression of Y on X

Slope , mw =   0.0457   Intercept, bw =   0.0483

Correlation coefficient* =   0.9970

*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; $W = (mw \times Qstd + bw)^2 \times (760 / Pa) \times (Ta / 298) =$ 4.16

Remarks:

Conducted by: Wong Shing Kwai   Signature: Date: 2-Aug-21

Checked by: Henry Leung   Signature: Date: 2-Aug-21