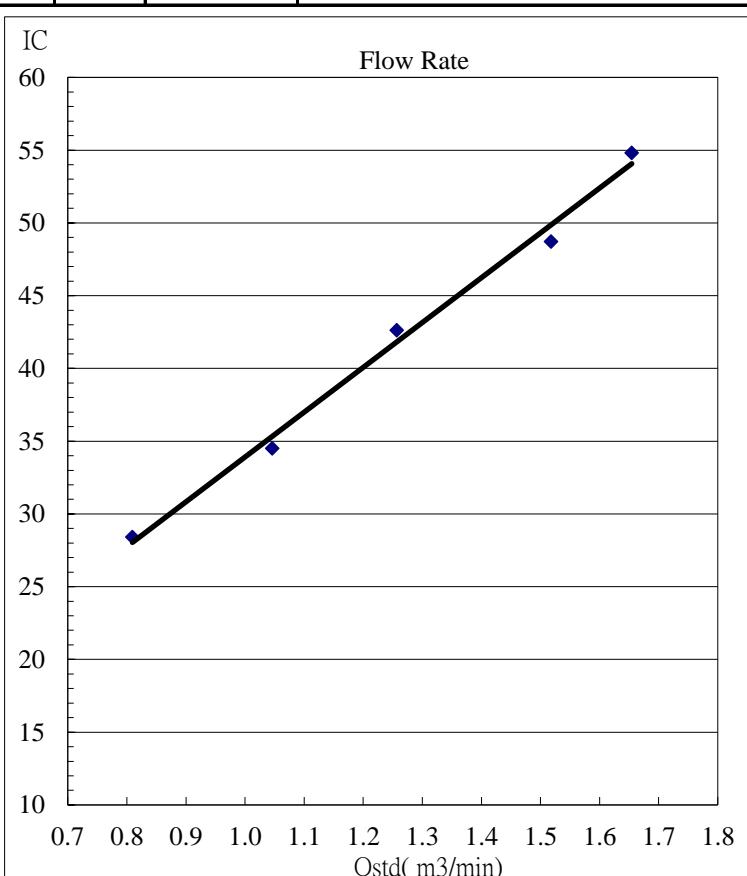




ANNEX D1

CALIBRATION CERTIFICATES FOR DUST
MONITORING EQUIPMENT

TSP SAMPLER CALIBRATION CACULATION SPREADSHEET

Location ID: AM1 Name and Model : TISCH HVS Model TE-5170	Date of Calibration: 14-Feb-25 Next Calibration Date: 14-Apr-25 Operator: P.F.Yeung																		
CONDITIONS																			
Temperature (°C)	1019 18.0	Corrected Pressure (mm Hg)	764.3 291																
CALIBRATION ORIFICE																			
Make: Model: Serial#:	TISCH TE-5025A 2454	Qstd Slope Qstd Intercept	2.08315 -0.04938																
CALIBRATION																			
Plate No.	H2O(L) (in)	H2O(R) (in)	H2O (in)	Qstd (m ³ /min)	I (chart)	IC (corrected)	LINEAR REGRESSION												
18	5.6	5.6	11.2	1.654	54	54.81	Slope= 30.803												
13	4.7	4.7	9.4	1.518	48	48.72	Intercept= 3.1088												
10	3.2	3.2	6.4	1.256	42	42.63	Corr. Coeff.= 0.9963												
7	2.2	2.2	4.4	1.046	34	34.51													
5	1.3	1.3	2.6	0.809	28	28.42													
Calulations: $Q_{std} = 1/m[\sqrt{H_2O(P_a/P_{std})(T_{std}/T_a)} - b]$ $IC = I[\sqrt{P_a/P_{std}}(T_{std}/T_a)]$ Q _{std} = standard flow rate IC = corrected chart response I = actual chart response m = calibrator Q _{std} slope b = calibrator Q _{std} intercept Ta = actual temperature during calibration (deg K) Pa = actual pressure during calibration (mm Hg)				 <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Qstd (m³/min)</th> <th>IC</th> </tr> </thead> <tbody> <tr> <td>0.809</td> <td>28.42</td> </tr> <tr> <td>1.046</td> <td>34.51</td> </tr> <tr> <td>1.256</td> <td>42.63</td> </tr> <tr> <td>1.518</td> <td>48.72</td> </tr> <tr> <td>1.654</td> <td>54.81</td> </tr> </tbody> </table>				Qstd (m ³ /min)	IC	0.809	28.42	1.046	34.51	1.256	42.63	1.518	48.72	1.654	54.81
Qstd (m ³ /min)	IC																		
0.809	28.42																		
1.046	34.51																		
1.256	42.63																		
1.518	48.72																		
1.654	54.81																		
For subsequent calculation of sampler flow: $1/m((I)[\sqrt{(298/T_{avg})(P_{avg}/760)}] - b)$ m = sampler slope b = sampler intercept I = chart response T _{avg} = daily average temperature P _{avg} = daily average pressure																			

TSP SAMPLER CALIBRATION CACULATION SPREADSHEET

Location ID: AM2 Name and Model : TISCH HVS Model TE-5170	Date of Calibration: 14-Feb-25 Next Calibration Date: 14-Apr-25 Operator: P.F.Yeung							
CONDITIONS								
Sea Level Pressure (hpa) Temperature (°C)	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>1019</td></tr> <tr><td>18.0</td></tr> </table>	1019	18.0	Corrected Pressure (mm Hg) Temperature (K)	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>764.3</td></tr> <tr><td>291</td></tr> </table>	764.3	291	
1019								
18.0								
764.3								
291								
CALIBRATION ORIFICE								
Make: Model: Serial#:	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>TISCH</td></tr> <tr><td>TE-5025A</td></tr> <tr><td>2454</td></tr> </table>	TISCH	TE-5025A	2454	Qstd Slope Qstd Intercept	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>2.08315</td></tr> <tr><td>-0.04938</td></tr> </table>	2.08315	-0.04938
TISCH								
TE-5025A								
2454								
2.08315								
-0.04938								
CALIBRATION								
Plate No.	H2O(L) (in)	H2O(R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
18	6.6	6.6	13.2	1.794	53	53.80	Slope= 28.312	
13	5.2	5.2	10.4	1.595	48	48.72	Intercept= 3.469	
10	3.8	3.8	7.6	1.367	42	42.63	Corr. Coeff.= 0.9987	
7	2.5	2.5	5.0	1.113	35	35.53		
5	1.5	1.5	3.0	0.868	27	27.41		

Calculations:

$Q_{std} = 1/m[\sqrt{H_2O(P_a/P_{std})(T_{std}/T_a)} - b]$

$IC = I[\sqrt{P_a/P_{std}}(T_{std}/T_a)]$

$Q_{std} = \text{standard flow rate}$
 $IC = \text{corrected chart response}$
 $I = \text{actual chart response}$
 $m = \text{calibrator } Q_{std} \text{ slope}$
 $b = \text{calibrator } Q_{std} \text{ intercept}$
 $T_a = \text{actual temperature during calibration (deg K)}$
 $P_a = \text{actual pressure during calibration (mm Hg)}$

For subsequent calculation of sampler flow:

$1/m((I)[\sqrt{298/T_{avg}}(\bar{P}_a/760)] - b)$

$m = \text{sampler slope}$
 $b = \text{sampler intercept}$
 $I = \text{chart response}$
 $T_{avg} = \text{daily average temperature}$
 $\bar{P}_a = \text{daily average pressure}$

Qstd (m³/min)	IC
0.85	27
1.10	35
1.40	43
1.60	49
1.80	54

TSP SAMPLER CALIBRATION CACULATION SPREADSHEET

Location ID: AM3 Name and Model : TISCH HVS Model TE-5170	Date of Calibration: 14-Feb-25 Next Calibration Date: 14-Apr-25 Operator: P.F.Yeung							
CONDITIONS								
Sea Level Pressure (hpa) Temperature (°C)	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>1019</td></tr> <tr><td>18.0</td></tr> </table>	1019	18.0	Corrected Pressure (mm Hg) Temperature (K)	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>764.3</td></tr> <tr><td>291</td></tr> </table>	764.3	291	
1019								
18.0								
764.3								
291								
CALIBRATION ORIFICE								
Make: Model: Serial#:	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>TISCH</td></tr> <tr><td>TE-5025A</td></tr> <tr><td>2454</td></tr> </table>	TISCH	TE-5025A	2454	Qstd Slope Qstd Intercept	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>2.08315</td></tr> <tr><td>-0.04938</td></tr> </table>	2.08315	-0.04938
TISCH								
TE-5025A								
2454								
2.08315								
-0.04938								
CALIBRATION								
Plate No.	H2O(L) (in)	H2O(R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
18	5.9	5.9	11.8	1.698	58	58.87	Slope= 26.234	
13	4.6	4.6	9.2	1.502	53	53.80	Intercept= 14.767	
10	3.2	3.2	6.4	1.256	48	48.72	Corr. Coeff.= 0.9941	
7	2.1	2.1	4.2	1.022	42	42.63		
5	1.4	1.4	2.8	0.839	35	35.53		

Calculations:

$Q_{std} = 1/m[\sqrt{H_2O(P_a/P_{std})(T_{std}/T_a)} - b]$

$IC = I[\sqrt{P_a/P_{std}}(T_{std}/T_a)]$

Q_{std} = standard flow rate
 IC = corrected chart response
 I = actual chart response
 m = calibrator Q_{std} slope
 b = calibrator Q_{std} intercept
 T_a = actual temperature during calibration (deg K)
 P_a = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

$1/m((I)[\sqrt{298/T_{avg}}(P_{avg}/760)] - b)$

m = sampler slope
 b = sampler intercept
 I = chart response
 T_{avg} = daily average temperature
 P_{avg} = daily average pressure

Qstd (m3/min)	IC
0.85	36
1.05	43
1.30	49
1.50	54

TSP SAMPLER CALIBRATION CACULATION SPREADSHEET

Location ID: AM4 Name and Model : TISCH HVS Model TE-5170	Date of Calibration: 14-Feb-25 Next Calibration Date: 14-Apr-25 Operator: P.F.Yeung							
CONDITIONS								
Sea Level Pressure (hpa) Temperature (°C)	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>1019</td></tr> <tr><td>18.0</td></tr> </table>	1019	18.0	Corrected Pressure (mm Hg) Temperature (K)	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>764.3</td></tr> <tr><td>291</td></tr> </table>	764.3	291	
1019								
18.0								
764.3								
291								
CALIBRATION ORIFICE								
Make: Model: Serial#:	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>TISCH</td></tr> <tr><td>TE-5025A</td></tr> <tr><td>2454</td></tr> </table>	TISCH	TE-5025A	2454	Qstd Slope Qstd Intercept	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>2.08315</td></tr> <tr><td>-0.04938</td></tr> </table>	2.08315	-0.04938
TISCH								
TE-5025A								
2454								
2.08315								
-0.04938								
CALIBRATION								
Plate No.	H2O(L) (in)	H2O(R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
18	6.5	6.5	13.0	1.781	57	57.86	Slope= 30.302	
13	5.2	5.2	10.4	1.595	51	51.77	Intercept= 3.414	
10	3.7	3.7	7.4	1.349	43	43.65	Corr. Coeff.= 0.9984	
7	2.5	2.5	5.0	1.113	36	36.54		
5	1.5	1.5	3.0	0.868	30	30.45		

Calculations:

$Q_{std} = 1/m[\sqrt{H_2O(P_a/P_{std})(T_{std}/T_a)} - b]$

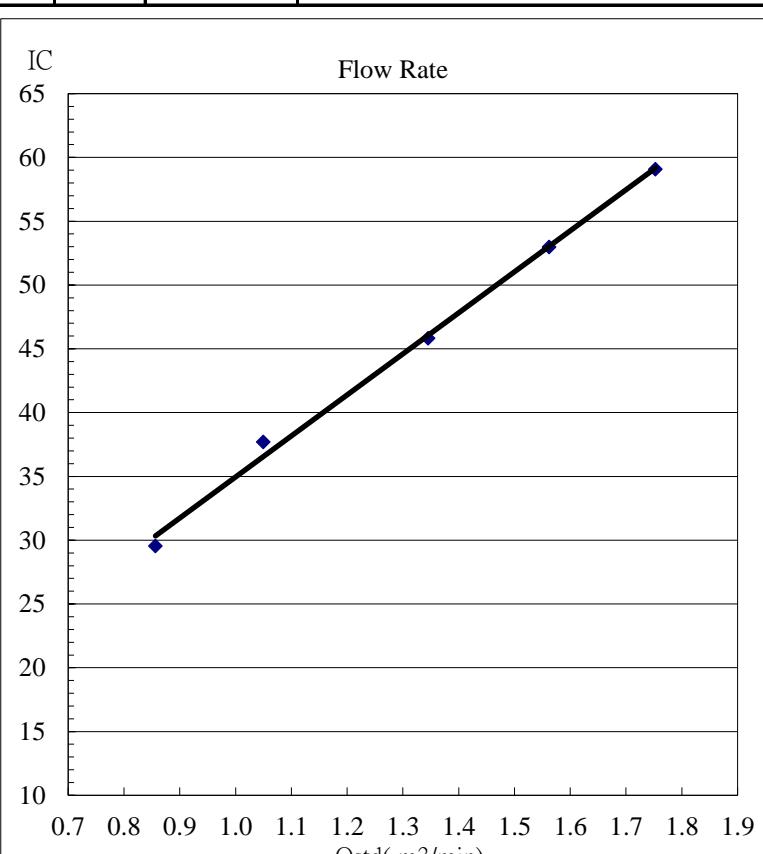
$IC = I[\sqrt{P_a/P_{std}}(T_{std}/T_a)]$

Q_{std} = standard flow rate
 IC = corrected chart response
 I = actual chart response
 m = calibrator Q_{std} slope
 b = calibrator Q_{std} intercept
 T_a = actual temperature during calibration (deg K)
 P_a = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

$1/m((I)[\sqrt{298/T_{avg}}(P_{avg}/760)] - b)$

m = sampler slope
 b = sampler intercept
 I = chart response
 T_{avg} = daily average temperature
 P_{avg} = daily average pressure



TSP SAMPLER CALIBRATION CACULATION SPREADSHEET

Location ID: AM1 Name and Model : TISCH HVS Model TE-5170	Date of Calibration: 9-Apr-25 Next Calibration Date: 9-Jun-25 Operator: P.F.Yeung						
CONDITIONS							
Temperature (°C)	1013 25.0	Corrected Pressure (mm Hg)	759.8 298				
CALIBRATION ORIFICE							
Make: Model: Serial#:	TISCH TE-5025A 2454	Qstd Slope Qstd Intercept	2.08315 -0.04938				
CALIBRATION							
Plate No.	H2O(L) (in)	H2O(R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	5.0	5.0	10.0	1.542	52	52.01	Slope= 32.896
13	4.0	4.0	8.0	1.382	45	45.01	Intercept= 0.2523
10	2.9	2.9	5.8	1.180	38	38.00	Corr. Coeff.= 0.9960
7	1.9	1.9	3.8	0.960	32	32.00	
5	1.4	1.4	2.8	0.827	28	28.00	

Calulations:

$Q_{std} = 1/m[\sqrt{H_2O(P_a/P_{std})(T_{std}/T_a)} - b]$

$IC = I[\sqrt{P_a/P_{std}}(T_{std}/T_a)]$

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)

For subsequent calculation of sampler flow:

$1/m((I)[\sqrt{(298/T_{avg})(P_{avg}/760)}] - b)$

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

Qstd (m ³ /min)	Flow Rate (IC)
0.82	28
1.18	38
1.42	45
1.55	52

TSP SAMPLER CALIBRATION CACULATION SPREADSHEET

Location ID: AM2	Date of Calibration:	9-Apr-25
Name and Model : TISCH HVS Model TE-5170	Next Calibration Date:	9-Jun-25
	Operator:	P.F.Yeung

CONDITIONS

Sea Level Pressure (hpa)	1013	Corrected Pressure (mm Hg)	759.8
Temperature (°C)	25.0	Temperature (K)	298

CALIBRATION ORIFICE

Make:	TISCH	Qstd Slope	2.08315
Model:	TE-5025A	Qstd Intercept	-0.04938
Serial#:	2454		

CALIBRATION

Plate No.	H2O(L) (in)	H2O(R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	5.9	6.0	11.9	1.680	55	55.01	Slope= 28.738
13	5.0	5.0	10.0	1.542	50	50.01	Intercept= 6.645
10	3.6	3.5	7.1	1.303	45	45.01	Corr. Coeff.= 0.9961
7	2.4	2.3	4.7	1.065	38	38.00	
5	1.5	1.4	2.9	0.841	30	30.00	

Calulations:

$$Q_{std} = 1/m[\sqrt{H_2O(P_a/P_{std})(T_{std}/T_a)} - b]$$

$$IC = I[\sqrt{P_a/P_{std}}(T_{std}/T_a)]$$

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)

For subsequent calculation of sampler flow:

$$1/m((I)[\sqrt{(298/T_{avg})(P_{avg}/760)}] - b)$$

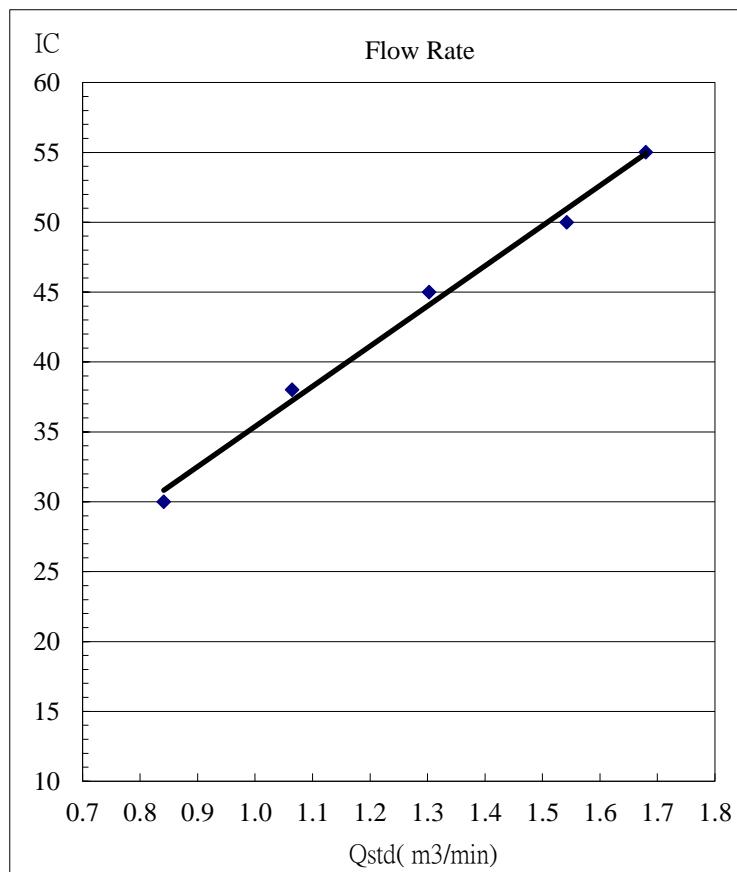
m = sampler slope

b = sampler intercept

I = chart response

Tavg = daily average temperature

Pavg = daily average pressure



TSP SAMPLER CALIBRATION CACULATION SPREADSHEET

Location ID: AM3 Name and Model : TISCH HVS Model TE-5170	Date of Calibration: 9-Apr-25 Next Calibration Date: 9-Jun-25 Operator: P.F.Yeung							
CONDITIONS								
Sea Level Pressure (hpa) Temperature (°C)	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>1013</td></tr> <tr><td>25.0</td></tr> </table>	1013	25.0	Corrected Pressure (mm Hg) Temperature (K)	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>759.8</td></tr> <tr><td>298</td></tr> </table>	759.8	298	
1013								
25.0								
759.8								
298								
CALIBRATION ORIFICE								
Make: Model: Serial#:	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>TISCH</td></tr> <tr><td>TE-5025A</td></tr> <tr><td>2454</td></tr> </table>	TISCH	TE-5025A	2454	Qstd Slope Qstd Intercept	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>2.08315</td></tr> <tr><td>-0.04938</td></tr> </table>	2.08315	-0.04938
TISCH								
TE-5025A								
2454								
2.08315								
-0.04938								
CALIBRATION								
Plate No.	H2O(L) (in)	H2O(R) (in)	H2O (in)	Qstd (m ³ /min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
18	5.8	5.8	11.6	1.659	57	57.01	Slope= 31.353	
13	4.4	4.4	8.8	1.448	51	51.01	Intercept= 5.3438	
10	3.5	3.5	7.0	1.294	46	46.01	Corr. Coeff.= 0.9995	
7	2.2	2.2	4.4	1.031	38	38.00		
5	1.3	1.3	2.6	0.798	30	30.00		

Calulations:

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)

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

Flow Rate	IC
60	57.01
55	51.01
50	46.01
45	38.00
40	30.00
35	31.353
30	5.3438
25	0.9995
20	Corr. Coeff.
15	Slope
10	Intercept

TSP SAMPLER CALIBRATION CACULATION SPREADSHEET

Location ID: AM4 Name and Model : TISCH HVS Model TE-5170	Date of Calibration: 9-Apr-25 Next Calibration Date: 9-Jun-25 Operator: P.F.Yeung							
CONDITIONS								
Sea Level Pressure (hpa) Temperature (°C)	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>1013</td></tr> <tr><td>25.0</td></tr> </table>	1013	25.0	Corrected Pressure (mm Hg) Temperature (K)	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>759.8</td></tr> <tr><td>298</td></tr> </table>	759.8	298	
1013								
25.0								
759.8								
298								
CALIBRATION ORIFICE								
Make: Model: Serial#:	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>TISCH</td></tr> <tr><td>TE-5025A</td></tr> <tr><td>2454</td></tr> </table>	TISCH	TE-5025A	2454	Qstd Slope Qstd Intercept	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>2.08315</td></tr> <tr><td>-0.04938</td></tr> </table>	2.08315	-0.04938
TISCH								
TE-5025A								
2454								
2.08315								
-0.04938								
CALIBRATION								
Plate No.	H2O(L) (in)	H2O(R) (in)	H2O (in)	Qstd (m ³ /min)	I (chart)	IC (corrected)	LINEAR REGRESSION	
18	5.9	6.0	11.9	1.680	57	57.01	Slope= 31.260	
13	4.9	4.9	9.8	1.527	51	51.01	Intercept= 4.1528	
10	3.5	3.5	7	1.294	45	45.01	Corr. Coeff.= 0.9983	
7	2.4	2.3	4.7	1.065	38	38.00		
5	1.4	1.5	2.9	0.841	30	30.00		

Calculations:

$Q_{std} = 1/m[\sqrt{H_2O(P_a/P_{std})(T_{std}/T_a)} - b]$

$IC = I[\sqrt{P_a/P_{std}}(T_{std}/T_a)]$

Q_{std} = standard flow rate
 IC = corrected chart response
 I = actual chart response
 m = calibrator Q_{std} slope
 b = calibrator Q_{std} intercept
 T_a = actual temperature during calibration (deg K)
 P_a = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

$1/m((I)[\sqrt{(298/T_{avg})(P_{avg}/760)}] - b)$

m = sampler slope
 b = sampler intercept
 I = chart response
 T_{avg} = daily average temperature
 P_{avg} = daily average pressure

