

Annex D1

Calibration Certificates for Dust Monitoring Equipment

TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

| | |
|---|----------------------------------|
| Location ID : AM1 | Date of Calibration: 24-Nov-21 |
| Name and Model: TISCH HVS Model TE-5170 | Next Calibration Date: 24-Jan-22 |
| | Technician: Fai So |

CONDITIONS

| | | | |
|--------------------------|--------|----------------------------|---------|
| Sea Level Pressure (hPa) | 1020.3 | Corrected Pressure (mm Hg) | 765.225 |
| Temperature (°C) | 19.0 | Temperature (K) | 292 |

CALIBRATION ORIFICE

| | |
|------------------|-------------------|
| Make-> TISCH | Qstd Slope -> |
| Model-> 5025A | 2.10574 |
| Serial # -> 1941 | Qstd Intercept -> |
| | -0.00985 |

CALIBRATION

| Plate No. | H2O (L) (in) | H2O (R) (in) | H2O (in) | Qstd (m3/min) | I (chart) | IC corrected | LINEAR REGRESSION |
|-----------|--------------|--------------|----------|---------------|-----------|--------------|---|
| 18 | 6.20 | 6.20 | 12.4 | 1.700 | 59 | 60.42 | Slope = 37.2995 Intercept = -2.4242 Corr. coeff. = 0.9993 |
| 13 | 4.70 | 4.70 | 9.4 | 1.481 | 52 | 53.25 | |
| 10 | 3.70 | 3.70 | 7.4 | 1.314 | 46 | 47.11 | |
| 7 | 2.40 | 2.40 | 4.8 | 1.059 | 36 | 36.87 | |
| 5 | 1.50 | 1.50 | 3.0 | 0.838 | 28 | 28.67 | |

Calculations :

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))]-b$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart responses

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pstd = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

$$1/m((I)[\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

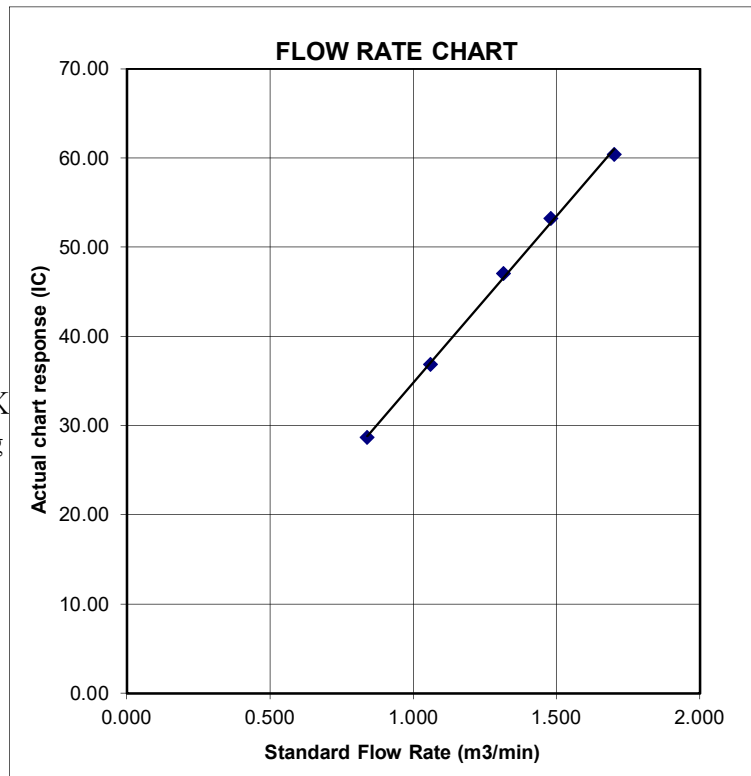
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

| | |
|---|----------------------------------|
| Location ID : AM2 | Date of Calibration: 24-Nov-21 |
| Name and Model: TISCH HVS Model TE-5170 | Next Calibration Date: 24-Jan-22 |
| | Technician: Fai So |

CONDITIONS

| | |
|--|---|
| Sea Level Pressure (hPa) 1020.3 | Corrected Pressure (mm Hg) 765.225 |
| Temperature (°C) 19.0 | Temperature (K) 292 |

CALIBRATION ORIFICE

| | |
|------------------|----------------------------|
| Make-> TISCH | Qstd Slope -> 2.10574 |
| Model-> 5025A | Qstd Intercept -> -0.00985 |
| Serial # -> 1941 | |

CALIBRATION

| Plate No. | H2O (L) (in) | H2O (R) (in) | H2O (in) | Qstd (m3/min) | I (chart) | IC corrected | LINEAR REGRESSION | | |
|-----------|--------------|--------------|----------|---------------|-----------|--------------|---|-------------|----------------|
| | | | | | | | Slope = | Intercept = | Corr. coeff. = |
| 18 | 7.20 | 7.20 | 14.4 | 1.831 | 51 | 52.23 | Slope = 30.7872 Intercept = -3.3292 Corr. coeff. = 0.9980 | | |
| 13 | 5.50 | 5.50 | 11.0 | 1.601 | 46 | 47.11 | | | |
| 10 | 4.40 | 4.40 | 8.8 | 1.433 | 40 | 40.96 | | | |
| 7 | 2.70 | 2.70 | 5.4 | 1.123 | 30 | 30.72 | | | |
| 5 | 1.50 | 1.50 | 3.0 | 0.838 | 22 | 22.53 | | | |

Calculations :

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart responses

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K

Pstd = actual pressure during calibration (mm Hg

For subsequent calculation of sampler flow:

$$1/m((I)[\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

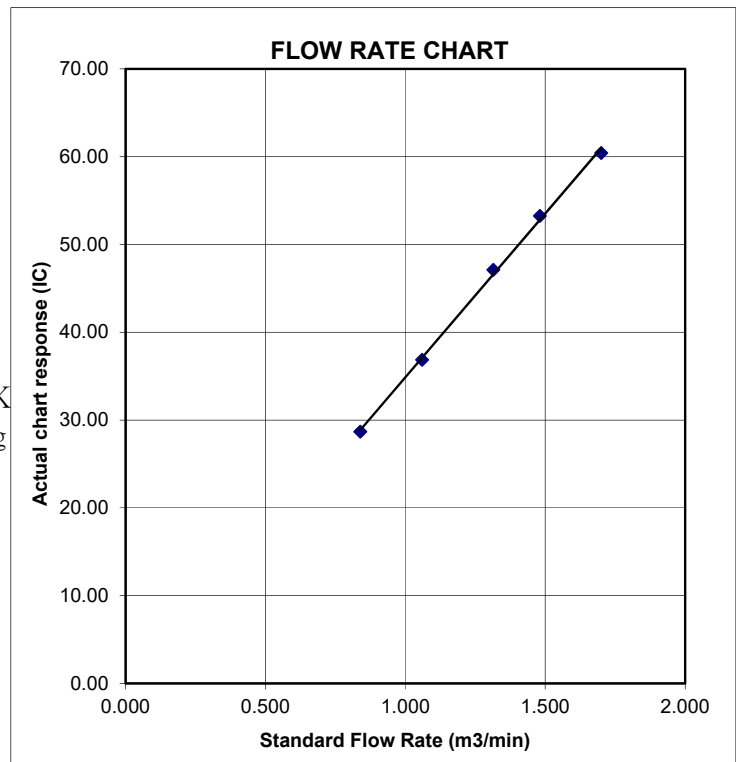
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

| | |
|---|----------------------------------|
| Location ID : AM3 | Date of Calibration: 24-Nov-21 |
| Name and Model: TISCH HVS Model TE-5170 | Next Calibration Date: 24-Jan-22 |
| | Technician: Fai So |

CONDITIONS

| | |
|---|--|
| Sea Level Pressure (hPa) 1020.3 | Corrected Pressure (mm Hg) 765.225 |
| Temperature (°C) 19.0 | Temperature (K) 292 |

CALIBRATION ORIFICE

| | |
|--|--|
| Make-> TISCH | Qstd Slope -> 2.10574 |
| Model-> 5025A | Qstd Intercept -> -0.00985 |
| Serial # -> 1941 | |

CALIBRATION

| Plate No. | H2O (L) (in) | H2O (R) (in) | H2O (in) | Qstd (m3/min) | I (chart) | IC corrected | LINEAR REGRESSION |
|-----------|--------------|--------------|----------|---------------|-----------|--------------|---|
| 18 | 6.80 | 6.80 | 13.6 | 1.780 | 54 | 55.30 | Slope = 35.7467 Intercept = -6.9119 Corr. coeff. = 0.9944 |
| 13 | 5.50 | 5.50 | 11.0 | 1.601 | 50 | 51.20 | |
| 10 | 4.10 | 4.10 | 8.2 | 1.383 | 42 | 43.01 | |
| 7 | 2.70 | 2.70 | 5.4 | 1.123 | 34 | 34.82 | |
| 5 | 1.60 | 1.60 | 3.2 | 0.866 | 22 | 22.53 | |

Calculations :

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart responses

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pstd = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

$$1/m((I)[\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

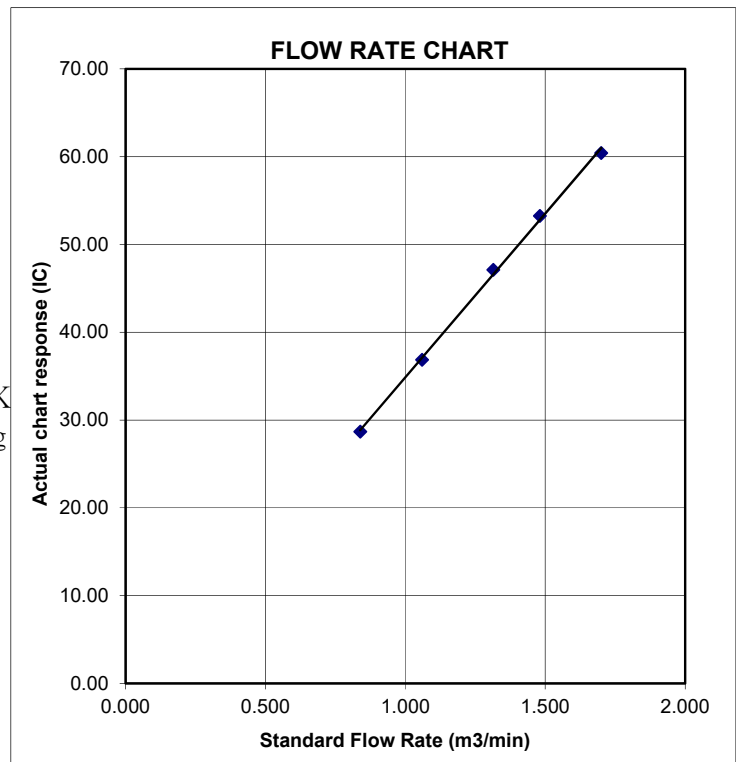
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

| | |
|---|----------------------------------|
| Location ID : AM4 | Date of Calibration: 24-Nov-21 |
| Name and Model: TISCH HVS Model TE-5170 | Next Calibration Date: 24-Jan-22 |
| | Technician: Fai So |

CONDITIONS

| | |
|--|---|
| Sea Level Pressure (hPa) 1020.3 | Corrected Pressure (mm Hg) 765.225 |
| Temperature (°C) 19.0 | Temperature (K) 292 |

CALIBRATION ORIFICE

| | |
|------------------|----------------------------|
| Make-> TISCH | Qstd Slope -> 2.10574 |
| Model-> 5025A | Qstd Intercept -> -0.00985 |
| Serial # -> 1941 | |

CALIBRATION

| Plate No. | H2O (L) (in) | H2O (R) (in) | H2O (in) | Qstd (m3/min) | I (chart) | IC corrected | LINEAR REGRESSION | | |
|-----------|--------------|--------------|----------|---------------|-----------|--------------|---|-------------|----------------|
| | | | | | | | Slope = | Intercept = | Corr. coeff. = |
| 18 | 6.30 | 6.30 | 12.6 | 1.713 | 49 | 50.18 | Slope = 30.9360 Intercept = -2.2579 Corr. coeff. = 0.9984 | | |
| 13 | 5.20 | 5.20 | 10.4 | 1.557 | 45 | 46.08 | | | |
| 10 | 3.80 | 3.80 | 7.6 | 1.332 | 39 | 39.94 | | | |
| 7 | 2.50 | 2.50 | 5.0 | 1.081 | 30 | 30.72 | | | |
| 5 | 1.50 | 1.50 | 3.0 | 0.838 | 23 | 23.55 | | | |

Calculations :

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart responses

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pstd = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

$$1/m((I)[\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

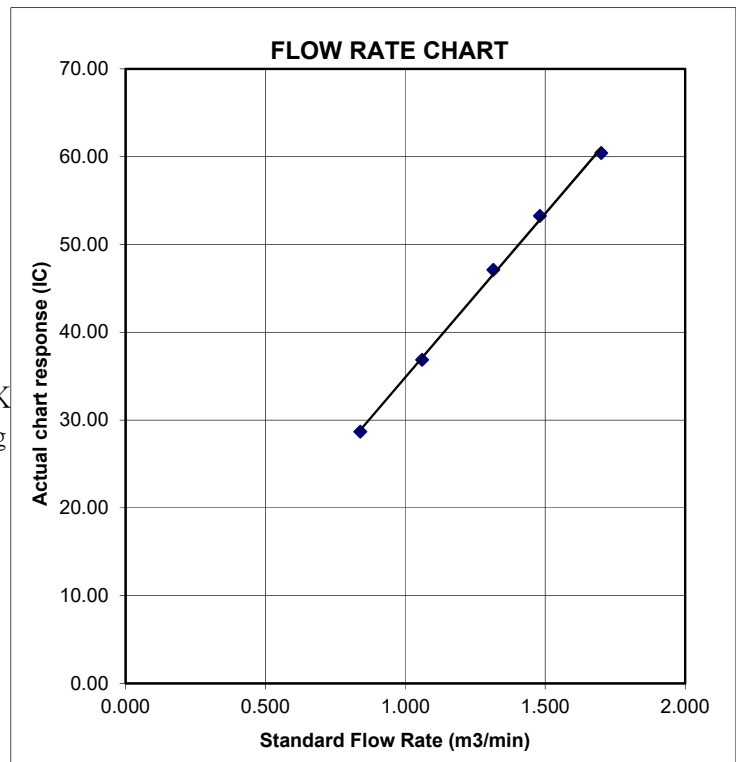
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

| | |
|---|----------------------------------|
| Location ID : AM1 | Date of Calibration: 21-Jan-22 |
| Name and Model: TISCH HVS Model TE-5170 | Next Calibration Date: 21-Mar-22 |
| | Operator: Martin |

CONDITIONS

| | | | |
|--------------------------|--------|----------------------------|-------|
| Sea Level Pressure (hPa) | 1017.6 | Corrected Pressure (mm Hg) | 763.2 |
| Temperature (°C) | 17.9 | Temperature (K) | 291 |

CALIBRATION ORIFICE

| | |
|------------------|----------------------------|
| Make-> TISCH | Qstd Slope -> 1.99838 |
| Model-> 5025A | Qstd Intercept -> -0.00903 |
| Serial # -> 1612 | |

CALIBRATION

| Plate No. | H2O (L) (in) | H2O (R) (in) | H2O (in) | Qstd (m3/min) | I (chart) | IC corrected | LINEAR REGRESSION |
|-----------|--------------|--------------|----------|---------------|-----------|--------------|--|
| 18 | 5.80 | 5.80 | 11.6 | 1.733 | 60 | 61.59 | Slope = 35.3011 Intercept = 1.4692 Corr. coeff. = 0.9935 |
| 13 | 4.50 | 4.50 | 9.0 | 1.527 | 54 | 55.43 | |
| 10 | 3.40 | 3.40 | 6.8 | 1.328 | 48 | 49.27 | |
| 7 | 2.20 | 2.20 | 4.4 | 1.069 | 40 | 41.06 | |
| 5 | 1.30 | 1.30 | 2.6 | 0.823 | 28 | 28.74 | |

Calculations :

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta)) - b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart responses

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pstd = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

$$1/m((I)[\text{Sqrt}(298/Tav)(Pav/760)] - b)$$

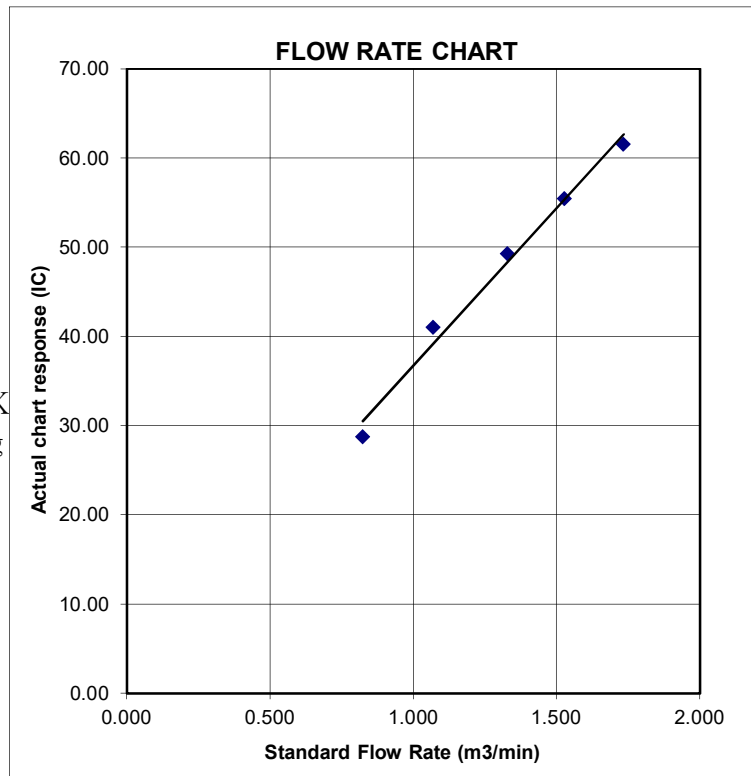
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

| | |
|---|----------------------------------|
| Location ID : AM2 | Date of Calibration: 21-Jan-22 |
| Name and Model: TISCH HVS Model TE-5170 | Next Calibration Date: 21-Mar-22 |
| | Operator: Martin |

CONDITIONS

| | |
|--|---|
| Sea Level Pressure (hPa) 1017.6 | Corrected Pressure (mm Hg) 763.2 |
| Temperature (°C) 17.9 | Temperature (K) 291 |

CALIBRATION ORIFICE

| | |
|------------------|----------------------------|
| Make-> TISCH | Qstd Slope -> 1.99838 |
| Model-> 5025A | Qstd Intercept -> -0.00903 |
| Serial # -> 1612 | |

CALIBRATION

| Plate No. | H2O (L) (in) | H2O (R) (in) | H2O (in) | Qstd (m3/min) | I (chart) | IC corrected | LINEAR REGRESSION |
|-----------|--------------|--------------|----------|---------------|-----------|--------------|---|
| 18 | 6.20 | 6.20 | 12.4 | 1.792 | 52 | 53.38 | Slope = 31.7057 Intercept = -4.2210 Corr. coeff. = 0.9909 |
| 13 | 5.10 | 5.10 | 10.2 | 1.625 | 44 | 45.17 | |
| 10 | 3.70 | 3.70 | 7.4 | 1.385 | 40 | 41.06 | |
| 7 | 2.50 | 2.50 | 5.0 | 1.139 | 32 | 32.85 | |
| 5 | 1.70 | 1.70 | 3.4 | 0.940 | 24 | 24.64 | |

Calculations :

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart responses

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pstd = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

$$1/m((I)[\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

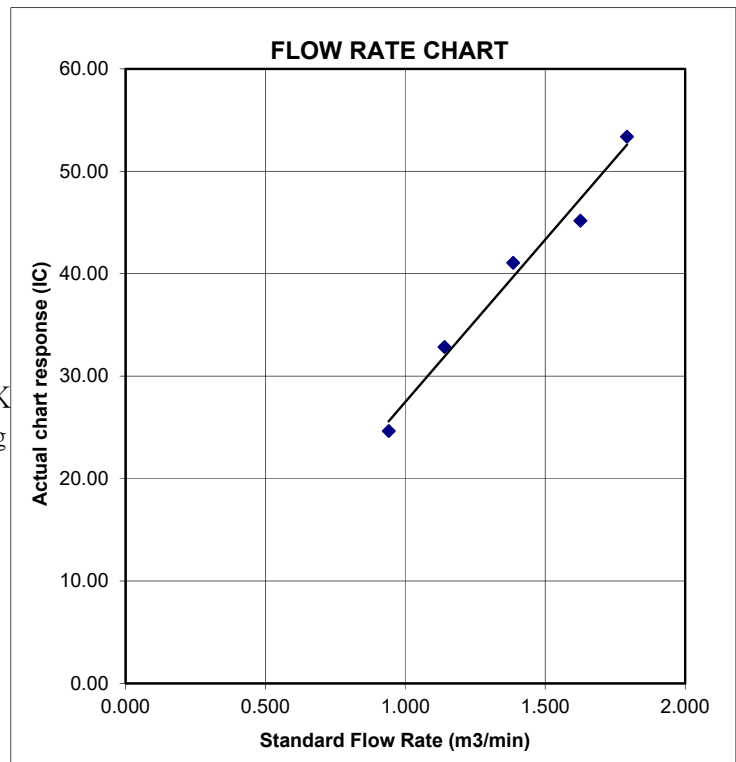
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

| | |
|---|----------------------------------|
| Location ID : AM3 | Date of Calibration: 21-Jan-22 |
| Name and Model: TISCH HVS Model TE-5170 | Next Calibration Date: 21-Mar-22 |
| | Operator: Martin |

CONDITIONS

| | |
|---|--|
| Sea Level Pressure (hPa) 1017.6 | Corrected Pressure (mm Hg) 763.2 |
| Temperature (°C) 17.9 | Temperature (K) 291 |

CALIBRATION ORIFICE

| | |
|--|--|
| Make-> TISCH | Qstd Slope -> 1.99838 |
| Model-> 5025A | Qstd Intercept -> -0.00903 |
| Serial # -> 1612 | |

CALIBRATION

| Plate No. | H2O (L) (in) | H2O (R) (in) | H2O (in) | Qstd (m3/min) | I (chart) | IC corrected | LINEAR REGRESSION |
|-----------|--------------|--------------|----------|---------------|-----------|--------------|---|
| 18 | 6.00 | 6.00 | 12.0 | 1.763 | 56 | 57.49 | Slope = 35.1532 Intercept = -4.1234 Corr. coeff. = 0.9968 |
| 13 | 4.70 | 4.70 | 9.4 | 1.561 | 49 | 50.30 | |
| 10 | 3.70 | 3.70 | 7.4 | 1.385 | 44 | 45.17 | |
| 7 | 2.20 | 2.20 | 4.4 | 1.069 | 34 | 34.90 | |
| 5 | 1.40 | 1.40 | 2.8 | 0.854 | 24 | 24.64 | |

Calculations :

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart responses

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K

Pstd = actual pressure during calibration (mm Hg

For subsequent calculation of sampler flow:

$$1/m((I)[\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

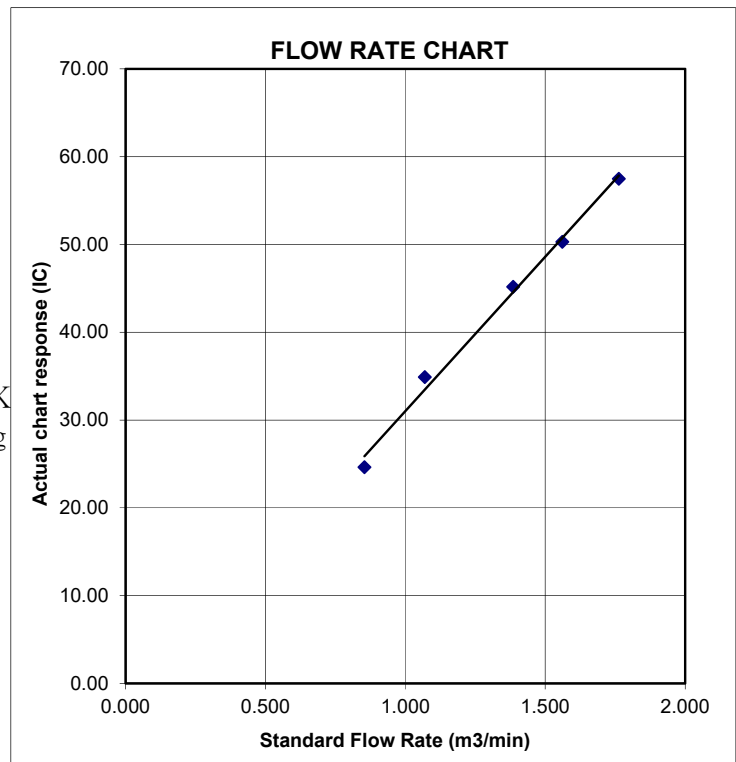
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



TSP SAMPLER CALIBRATION CALCULATION SPREADSHEET

| | |
|---|----------------------------------|
| Location ID : AM4 | Date of Calibration: 21-Jan-22 |
| Name and Model: TISCH HVS Model TE-5170 | Next Calibration Date: 21-Mar-22 |
| | Operator: Martin |

CONDITIONS

| | |
|--|---|
| Sea Level Pressure (hPa) 1017.6 | Corrected Pressure (mm Hg) 763.2 |
| Temperature (°C) 17.9 | Temperature (K) 291 |

CALIBRATION ORIFICE

| | |
|------------------|----------------------------|
| Make-> TISCH | Qstd Slope -> 1.99838 |
| Model-> 5025A | Qstd Intercept -> -0.00903 |
| Serial # -> 1612 | |

CALIBRATION

| Plate No. | H2O (L) (in) | H2O (R) (in) | H2O (in) | Qstd (m3/min) | I (chart) | IC corrected | LINEAR REGRESSION |
|-----------|--------------|--------------|----------|---------------|-----------|--------------|--|
| 18 | 5.80 | 5.80 | 11.6 | 1.733 | 54 | 55.43 | Slope = 28.9709 Intercept = 4.6281 Corr. coeff. = 0.9988 |
| 13 | 4.70 | 4.70 | 9.4 | 1.561 | 48 | 49.27 | |
| 10 | 3.60 | 3.60 | 7.2 | 1.366 | 43 | 44.14 | |
| 7 | 2.30 | 2.30 | 4.6 | 1.093 | 35 | 35.93 | |
| 5 | 1.40 | 1.40 | 2.8 | 0.854 | 29 | 29.77 | |

Calculations :

$$Qstd = 1/m[\text{Sqrt}(H2O(Pa/Pstd)(Tstd/Ta))-b]$$

$$IC = I[\text{Sqrt}(Pa/Pstd)(Tstd/Ta)]$$

Qstd = standard flow rate

IC = corrected chart responses

I = actual chart response

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pstd = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

$$1/m((I)[\text{Sqrt}(298/Tav)(Pav/760)]-b)$$

m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure

