| 15 | 30 | Cŀ | | 7 |) | | D | ALIBRATION UE DATE: ary 11, 2020 |
|---|---|----------------|--|--------------|--|--------------------------------------|---|--|
| vir | Ce | rtifa | a I | | | 2002/02/2020 | ation | |
| - | 12 10 124 | | Contraction of the local division of the loc | | | | 0.97 | |
| Cal. Date: | January 11, | 2019 | Rootsn | neter S/N: | 438320 | | 293 | °К |
| Operator: | Jim Tisch | | | | | Pa: | 760.7 | mm Hg |
| Calibration | Model #: | TE-5025A | Calib | rator S/N: | 0005 | | | |
| | | Vol. Init | Mat. Plant | avet | ATT | 4.0 | | 1 |
| | Bun | 10.000 | Vol. Final | ΔVol. | ∆Time (min) | ΔP | ΔH (i= μ2O) | |
| | Run | (m3) | (m3) | (m3) | (min) 1.4090 | (mm Hg) | (in H2O) | |
| | 1 | 1 | 2 | 1 | the state of the s | 3.2 | 2.00 | 1 |
| | 2 | 3 | 4 | 1 | 0.9980 | 6.4 | 4.00 | 1 |
| | 3 | 5 | 6 | 1 | 0.8900 | 7.8 | 5.00 | 1 |
| | 4 | 9 | 8 | 1 | 0.8450 | 8.7 | 5.50 | 4 |
| | > | э | 10 | 1 | 0.6990 | 12.6 | 8.00 | |
| | | | D | ata Tabulat | tion | | | |
| | Vstd | Qstd | $\sqrt{\Delta H \left(\frac{Pa}{Pstd}\right)}$ | Tstd) | | Qa | √∆н(та/Ра) | |
| | (m3) | (x-axis) | (y-axis | 5) | Va | (x-axis) | (y-axis) | |
| | 1.0138 | 0.7195 | 1.426 | 9 | 0.9958 | 0.7067 | 0.8777 | |
| | 1.0095 | 1.0115 | 2.018 | 0 | 0.9916 | 0.9936 | 1.2412 | |
| | 1.0076 | 1.1321 | 2.256 | 1 | 0.9897 | 1.1121 | 1.3877 | |
| | 1,0064 | 1.1910 | 2.366 | 3 | 0.9886 | 1.1699 | 1.4555 | |
| | 1,0012 | 1.4323 | 2.853 | | 0.9834 | 1.4059 | 1.7553 | |
| | | m= | 1.998 | | | m= | 1.25149 | |
| | QSTD | b= | -0.008 | | QA | b= | -0.00543 | |
| | | r= | 0.999 | 97 | | r= | 0.99997 | |
| | | | | Calculation | 15 | | | |
| | | | /Pstd)(Tstd/Ta |) [| | ∆Vol((Pa-∆i | P)/Pa) | |
| | Qstd= | √std/∆Time | | | Qa= | Va/∆Time | | |
| | | | For subseque | ent flow rat | e calculation | ts: | | |
| | Qstd= | 1/т ((√Δн(- | $\frac{Pa}{Pstd}$ $\left(\frac{Tstd}{Ta}\right)$ |)-b) | Qa= | $1/m \left(\sqrt{\Delta F} \right)$ | (Ta/Pa))-b) | |
| | Standard | Conditions | | | | | | |
| Tstd: | and the second se | | | - E | | RECA | LIBRATION | |
| Pstd: | | mm Hg | | | | | | 1000 |
| | | еү | | | | | nnual recalibratio | |
| | | er reading (in | | | | | Regulations Part ! | The second s |
| | | ter reading (| mm Hg) | | | | , Reference Meth | |
| and a second s | osolute temp | essure ("K) | | | | | ended Particulati re, 9.2.17, page 1 | |
| las actual he | | | | | | | | |

ch Environmental, Inc.

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5 South Miami Avenue

lage of Cleves, OH 45002

www.tisch-env.com TOLL FREE: (877)263-7610 FAX: (513)467-9009



Calibration Data for High Volume Sampler (TSP Sampler)

| Location | : | CMA1b | Calbration Date | : | 16-Aug-19 |
|---------------|---|--------|---------------------|---|-----------|
| Equipment no. | : | HVS001 | Calbration Due Date | : | 16-Oct-19 |

CALIBRATION OF CONTINUOUS FLOW RECORDER

| Ambient Condition | | | | | | | | | |
|-----------------------------|---------------------------------------|-----------|-----------------|-----------------------|------------------|---------------------|---|---------------------------------|--|
| Temperature, T _a | | 303 | | Kelvin | Pressure, P | a | 1 | 1003 mmHg | |
| | Orifice Transfer Standard Information | | | | | | | | |
| Equipment No. | | 0005 | | Slope, m _c | 1.998 | 61 | Intercept, bc | -0.00882 | |
| Last Calibration Date | | 11-Jan-1 | 9 | | (H x | P _a / 10 | 13.3 x 298 / | T _a) ^{1/2} | |
| Next Calibration Date | | 11-Jan-2 | 0 | | = | m _c x | $Q_{std} + b_{c}$ | | |
| | Calibration of TSP | | | | | | | | |
| Calibration | Mar | nometer R | eading | C |) _{std} | Contin | uous Flow | IC | |
| Point | H (inches of water) | | (m ³ | / min.) | Recorder, W | | (W(P _a /1013.3x298/T _a) ^{1/2} /35.3 | | |
| | (up) | (down) | (difference) | X- | axis | (| CFM) | Y-axis | |
| 1 | 1.5 | 1.5 | 3.0 | 0. | 8595 | | 21 | 20.7199 | |
| 2 | 2.4 | 2.4 | 4.8 | 1. | 0860 | | 30 | 29.5999 | |
| 3 | 3.5 | 3.5 | 7.0 | 1. | 3106 | | 42 | 41.4398 | |
| 4 | 4.5 | 4.5 | 9.0 | 1. | 4854 | | 46 | 45.3864 | |
| 5 | 5.4 | 5.4 | 10.8 | 1. | 6268 | | 54 | 53.2797 | |
| By Linear Regression of | Y on X | | | | | | | | |
| | Slope, m | = | 41.8 | 891 | Int | ercept, b = | -18 | 5.2670 | |
| Correlation Co | pefficient* | = | 0.99 | 953 | | | | | |
| Calibration | Accepted | = | Yes/ł | No** | | | | | |
| | | | | | | | | | |

* if Correlation Coefficient < 0.990, check and recalibration again.

| Remarks : | | | | | |
|---------------|---|-----------|------------|---|-----------|
| Calibrated by | : | Henry Lau | Checked by | : | Dean Chan |
| Date | : | 16-Aug-19 | – Date | : | 16-Aug-19 |



Calibration Data for High Volume Sampler (TSP Sampler)

| Location | : | CMA1b | Calbration Date | : | 18-Oct-19 |
|---------------|---|--------|---------------------|---|-----------|
| Equipment no. | : | HVS001 | Calbration Due Date | : | 18-Dec-19 |

CALIBRATION OF CONTINUOUS FLOW RECORDER

| Ambient Condition | | | | | | | | | |
|---|---------------------------------------|----------|-----------------|-----------------------------|------------------|---------------------|---|---------------------------------|--|
| Temperature, T _a | | 300 | | Kelvin Pressure, P a | | | 1 | I017 mmHg | |
| | Orifice Transfer Standard Information | | | | | | | | |
| Equipment No. | | 0005 | | Slope, m _c | 1.998 | 61 | Intercept, bc | -0.00882 | |
| Last Calibration Date | | 11-Jan-1 | 9 | | (H x | P _a / 10 | 13.3 x 298 / | T _a) ^{1/2} | |
| Next Calibration Date | | 11-Jan-2 | 0 | | = | m _c > | $Q_{std} + b_{c}$ | | |
| Calibration of TSP | | | | | | | | | |
| Calibration | Manometer Reading | | | c |) _{std} | Contin | uous Flow | IC | |
| Point | H (inches of water) | | (m ³ | / min.) | Rec | order, W | (W(P _a /1013.3x298/T _a) ^{1/2} /35.31) | | |
| | (up) | (down) | (difference) | X- | axis | (| CFM) | Y-axis | |
| 1 | 1.4 | 1.4 | 2.8 | 0.8 | 8404 | | 27 | 26.9589 | |
| 2 | 1.9 | 1.9 | 3.8 | 0.9 | 9783 | | 31 | 30.9529 | |
| 3 | 2.5 | 2.5 | 5.0 | 1.1 | 1215 | | 36 | 35.9452 | |
| 4 | 4.1 | 4.1 | 8.2 | 1.4 | 4350 | | 42 | 41.9361 | |
| 5 | 4.8 | 4.8 | 9.6 | 1.5 | 5523 | | 47 | 46.9285 | |
| By Linear Regression of | Y on X | | | | | | | | |
| | Slope, m | = | 26.6 | 137 | Int | ercept, b = | =4. | 9937 | |
| Correlation Coefficient* = 0.9936 | | | | | | | | | |
| Calibration Accepted = Yes/ No** | | | | | | | | | |
| | | | | | | | | | |

* if Correlation Coefficient < 0.990, check and recalibration again.

| ** | Delete | as | appropriate. |
|----|--------|----|--------------|
|----|--------|----|--------------|

Remarks : _____

:

:

| Calibrated | by |
|------------|----|
|------------|----|

Date

Laurance Yung 18-Oct-19 Checked by Date James Chu

:

•

18-Oct-19



Calibration Data for High Volume Sampler (TSP Sampler)

| Location | : | CMA2a | Calbration Date | : | 16-Aug-19 |
|---------------|---|--------|---------------------|---|-----------|
| Equipment no. | : | HVS002 | Calbration Due Date | : | 16-Oct-19 |

CALIBRATION OF CONTINUOUS FLOW RECORDER

| Ambient Condition | | | | | | | | | |
|-----------------------------|---------------------------------------|----------|-----------------|-----------------------------|-------------|---------------------|---|---------------|--|
| Temperature, T _a | | 303 | | Kelvin Pressure, P a | | | 1 | 1003 mmHg | |
| | Orifice Transfer Standard Information | | | | | | | | |
| Equipment No. | | 0005 | | Slope, m _c | 1.998 | 61 | Intercept, bc | -0.00882 | |
| Last Calibration Date | | 11-Jan-1 | 9 | | (H x | P _a / 10 |)13.3 x 298 / | $(T_a)^{1/2}$ | |
| Next Calibration Date | | 11-Jan-2 | 0 | | = | m _c | x Q _{std} + b _c | | |
| | Calibration of TSP | | | | | | | | |
| Calibration | Manometer Reading | | | C | t std | Conti | nuous Flow | IC | |
| Point | H (inches of water) | | (m ³ | / min.) | Recorder, W | | (W(P _a /1013.3x298/T _a) ^{1/2} /35.31) | | |
| | (up) | (down) | (difference) | X- | axis | | (CFM) | Y-axis | |
| 1 | 1.5 | 1.5 | 3.0 | 0.8 | 8595 | | 22 | 21.7066 | |
| 2 | 2.4 | 2.4 | 4.8 | 1.(| 0860 | | 34 | 33.5465 | |
| 3 | 3.4 | 3.4 | 6.8 | 1.2 | 2918 | | 41 | 40.4531 | |
| 4 | 4.0 | 4.0 | 8.0 | 1.4 | 4007 | | 48 | 47.3598 | |
| 5 | 5.2 | 5.2 | 10.4 | 1.5 | 5965 | | 56 | 55.2531 | |
| By Linear Regression of | Y on X | | | | | | | | |
| | Slope, m | = | 45.1 | 129 | Int | ercept, b | = -16 | 6.5869 | |
| Correlation Co | pefficient* | = | 0.99 | 972 | | | | | |
| Calibration | Accepted | = | Yes/ł | No** | | | | | |
| | | | | | | | | | |

* if Correlation Coefficient < 0.990, check and recalibration again.

| Remarks : | | | | | |
|---------------|---|-----------|------------|---|-----------|
| Calibrated by | : | Henry Lau | Checked by | : | Dean Chan |
| Date | : | 16-Aug-19 | – Date | : | 16-Aug-19 |



Calibration Data for High Volume Sampler (TSP Sampler)

| Location | : | CMA2a | Calbration Date | : | 18-Oct-19 |
|---------------|---|--------|---------------------|---|-----------|
| Equipment no. | : | HVS002 | Calbration Due Date | : | 18-Dec-19 |

CALIBRATION OF CONTINUOUS FLOW RECORDER

| | | | | Ambient C | Condition | | | |
|---------------------------------------|--------------------|-----------|------------------|-----------------------|-------------|---------------------|-------------------------------------|---|
| Temperature, T _a | | 300 | | Kelvin | Pressure, P | a | 1 | 017 mmHg |
| Orifice Transfer Standard Information | | | | | | | | |
| Equipment No. | | 0005 | | Slope, m _c | 1.998 | 61 | Intercept, bc | -0.00882 |
| Last Calibration Date | | 11-Jan-1 | 9 | | (H x | P _a / 10 |)13.3 x 298 / | T _a) ^{1/2} |
| Next Calibration Date | | 11-Jan-2 | 0 | | = | m _c | x Q _{std} + b _c | |
| | Calibration of TSP | | | | | | | |
| Calibration | Manometer Reading | | | C | std | Conti | nuous Flow | IC |
| Point | Н (| inches of | water) | (m ³ | / min.) | Recorder, W | | (W(P _a /1013.3x298/T _a) ^{1/2} /35.31) |
| | (up) | (down) | (difference) | X- | axis | | (CFM) | Y-axis |
| 1 | 2.1 | 2.1 | 4.2 | 1.(| 0283 | | 23 | 22.9650 |
| 2 | 2.6 | 2.6 | 5.2 | 1.1 | 1436 | | 29 | 28.9559 |
| 3 | 3.2 | 3.2 | 6.4 | 1.: | 2683 | | 36 | 35.9452 |
| 4 | 3.8 | 3.8 | 7.6 | 1.3 | 3817 | | 42 | 41.9361 |
| 5 | 4.1 | 4.1 | 8.2 | 1.4 | 4350 | | 48 | 47.9270 |
| By Linear Regression of | Y on X | | | | | | | |
| | Slope, m | = | 58.9 | 997 | Int | ercept, b | = -38 | 3.2849 |
| Correlation Coefficient* = 0.9 | | | 0.99 |)39 | | | | |
| Calibration Accepted = Yes/ | | | \o ** | | | | | |
| | | | | | | | | |

* if Correlation Coefficient < 0.990, check and recalibration again.

| Remarks : | | | | | |
|---------------|---|---------------|------------|---|-----------|
| Calibrated by | : | Laurance Yung | Checked by | : | James Chu |
| Date | : | 18-Oct-19 | Date | : | 18-Oct-19 |



Calibration Data for High Volume Sampler (TSP Sampler)

| Location | : | CMA3a | Calbration Date | : | 16-Aug-19 |
|---------------|---|--------|---------------------|-----|-----------|
| Equipment no. | : | HVS012 | Calbration Due Date | : _ | 16-Oct-19 |

CALIBRATION OF CONTINUOUS FLOW RECORDER

| | Ambient Condition | | | | | | | | |
|---------------------------------------|-------------------|-----------|--------------|-----------------|------------------|---------------------|-------------------|--|--|
| Temperature, T _a | | 303 | | Kelvin | Pressure, P | a | 1 | 003 mmHg | |
| Orifice Transfer Standard Information | | | | | | | | | |
| Equipment No. | | 0005 | | | 1.998 | 61 | Intercept, bc | -0.00882 | |
| Last Calibration Date | | 11-Jan-1 | 9 | | (H x | P _a / 10 | 13.3 x 298 / | T _a) ^{1/2} | |
| Next Calibration Date | | 11-Jan-2 | 0 | | = | m _c x | $Q_{std} + b_{c}$ | | |
| Calibration of TSP | | | | | | | | | |
| Calibration | Manometer Reading | | | C |) _{std} | Contin | uous Flow | IC | |
| Point | Н (| inches of | water) | (m ³ | / min.) | Recorder, W | | (W(P _a /1013.3x298/T _a) ^{1/2} /35.31 | |
| | (up) | (down) | (difference) | X- | axis | (| CFM) | Y-axis | |
| 1 | 1.3 | 1.3 | 2.6 | 0. | 8004 | | 20 | 19.7332 | |
| 2 | 2.5 | 2.5 | 5.0 | 1. | 1083 | | 30 | 29.5999 | |
| 3 | 3.5 | 3.5 | 7.0 | 1. | 3106 | | 40 | 39.4665 | |
| 4 | 4.4 | 4.4 | 8.8 | 1. | 4689 | | 48 | 47.3598 | |
| 5 | 5.5 | 5.5 | 11.0 | 1. | 6417 | | 51 | 50.3197 | |
| By Linear Regression of | Y on X | | | | | | | | |
| | Slope, m | = | 38.5 | 547 | Int | ercept, b = | -11 | 1.5139 | |
| Correlation Coefficient* = 0.9 | | | 0.99 | 921 | | | | | |
| Calibration Accepted = Yes/ | | | No** | | | | | | |
| | | | | | | | | | |

* if Correlation Coefficient < 0.990, check and recalibration again.

| Remarks : | | | | | |
|---------------|---|-----------|------------|---|-----------|
| Calibrated by | : | Henry Lau | Checked by | : | Dean Chan |
| Date | : | 16-Aug-19 | – Date | : | 16-Aug-19 |



Calibration Data for High Volume Sampler (TSP Sampler)

| Location | : | CMA3a | Calbration Date | : | 18-Oct-19 |
|---------------|---|--------|---------------------|---|-----------|
| Equipment no. | : | HVS012 | Calbration Due Date | : | 18-Dec-19 |

CALIBRATION OF CONTINUOUS FLOW RECORDER

| Ambient Condition | | | | | | | | |
|---------------------------------------|---------------------|----------|------------------|-----------------|------------------|---------------------|-----------------------------------|---|
| Temperature, T _a | | 300 | | Kelvin | Pressure, P | a | 1 | 017 mmHg |
| Orifice Transfer Standard Information | | | | | | | | |
| Equipment No. | | 0005 | | | 1.998 | 61 | Intercept, bc | -0.00882 |
| Last Calibration Date | | 11-Jan-1 | 9 | | (H x | P _a / 10 | 13.3 x 298 / | T _a) ^{1/2} |
| Next Calibration Date | | 11-Jan-2 | 0 | | = | m _c : | κQ _{std} +b _c | |
| Calibration of TSP | | | | | | | | |
| Calibration | Manometer Reading | | | c |) _{std} | Conti | nuous Flow | IC |
| Point | H (inches of water) | | | (m ³ | / min.) | Recorder, W | | (W(P _a /1013.3x298/T _a) ^{1/2} /35.31) |
| | (up) | (down) | (difference) | X- | axis | | (CFM) | Y-axis |
| 1 | 1.8 | 1.8 | 3.6 | 0.9 | 9523 | | 29 | 28.9559 |
| 2 | 2.3 | 2.3 | 4.6 | 1.0 | 0759 | | 34 | 33.9483 |
| 3 | 2.7 | 2.7 | 5.4 | 1. | 1653 | | 38 | 37.9422 |
| 4 | 3.3 | 3.3 | 6.6 | 1.: | 2879 | | 44 | 43.9331 |
| 5 | 3.7 | 3.7 | 7.4 | 1.3 | 3634 | | 49 | 48.9255 |
| By Linear Regression of | Y on X | | | | | | | |
| | Slope, m = 48.0 | | | 324 | Int | ercept, b | = -17 | 7.4077 |
| Correlation Coefficient* = 0.99 | | | 0.99 | 963 | | | | |
| Calibration Accepted = Yes/ | | | \o ** | | | | | |
| | | | | | | | | |

* if Correlation Coefficient < 0.990, check and recalibration again.

| Remarks : | | | | | |
|---------------|---|---------------|------------|---|-----------|
| Calibrated by | : | Laurance Yung | Checked by | : | James Chu |
| Date | : | 18-Oct-19 | Date | : | 18-Oct-19 |



Calibration Data for High Volume Sampler (TSP Sampler)

| Location | : | CMA4a | Calbration Date | : | 16-Aug-19 |
|---------------|-----|--------|---------------------|---|-----------|
| Equipment no. | : _ | HVS004 | Calbration Due Date | : | 16-Oct-19 |

CALIBRATION OF CONTINUOUS FLOW RECORDER

| | Ambient Condition | | | | | | | | |
|---------------------------------|---------------------|----------|------------------|-----------------------------|------------------|----------------------------------|-------------------|---|--|
| Temperature, T _a | | 303 | | Kelvin Pressure, P a | | | 1 | 003 mmHg | |
| | | | Orifice T | ransfer Sta | Indard Inform | nation | | | |
| Equipment No. | | 0005 | | Slope, m _c | 1.998 | 61 | Intercept, bc | -0.00882 | |
| Last Calibration Date | | 11-Jan-1 | 9 | | (H x | P _a / 10 ⁴ | 13.3 x 298 / | T _a) ^{1/2} | |
| Next Calibration Date | | 11-Jan-2 | 0 | | = | m _c x | $Q_{std} + b_{c}$ | | |
| Calibration of TSP | | | | | | | | | |
| Calibration | Manometer Reading | | | G |) _{std} | Contin | uous Flow | IC | |
| Point | H (inches of water) | | | (m ³ | / min.) | Recorder, W | | (W(P _a /1013.3x298/T _a) ^{1/2} /35.31) | |
| | (up) | (down) | (difference) | X- | axis | (0 | CFM) | Y-axis | |
| 1 | 1.5 | 1.5 | 3.0 | 0.8 | 8595 | | 32 | 31.5732 | |
| 2 | 2.4 | 2.4 | 4.8 | 1.0 | 0860 | | 40 | 39.4665 | |
| 3 | 3.5 | 3.5 | 7.0 | 1.3 | 3106 | | 50 | 49.3331 | |
| 4 | 4.5 | 4.5 | 9.0 | 1.4 | 4854 | | 56 | 55.2531 | |
| 5 | 5.8 | 5.8 | 11.6 | 1.0 | 6858 | | 60 | 59.1997 | |
| By Linear Regression of | Y on X | | | | | | | | |
| | Slope, m | = | 34.7 | 449 | Int | ercept, b = | 2. | 3021 | |
| Correlation Coefficient* = 0.99 | | | 927 | | | | | | |
| Calibration Accepted = Yes/ | | | \o ** | | | | | | |
| | | | | | | | | | |

* if Correlation Coefficient < 0.990, check and recalibration again.

| Remarks : | | | | | |
|---------------|---|-----------|------------|------------|-----------|
| Calibrated by | : | Henry Lau | Checked by | / : | Dean Chan |
| Date | : | 16-Aug-19 | – Date | : | 16-Aug-19 |



Calibration Data for High Volume Sampler (TSP Sampler)

| Location | : | CMA4a | Calbration Date | : | 18-Oct-19 |
|---------------|---|--------|---------------------|---|-----------|
| Equipment no. | : | HVS004 | Calbration Due Date | : | 18-Dec-19 |

CALIBRATION OF CONTINUOUS FLOW RECORDER

| | | | | Ambient C | Condition | | | |
|-----------------------------|-------------|---------------------|-------------------|-----------------------|------------------|---------------------|-------------------------------------|---|
| Temperature, T _a | | 300 | 1 | Kelvin | Pressure, P | a | 1 | 1017 mmHg |
| | | | Orifice Tr | ransfer Sta | andard Inforr | nation | | |
| Equipment No. | | 0005 | | Slope, m _c | 1.9986 | 61 | Intercept, bc | -0.00882 |
| Last Calibration Date | | 11-Jan-1 | 9 | | (H x | P _a / 10 |)13.3 x 298 / | T _a) ^{1/2} |
| Next Calibration Date | | 11-Jan-20 | | | = | m _c | x Q _{std} + b _c | |
| | | | | Calibratio | on of TSP | | | |
| Calibration | Mar | Manometer Reading | | | Q _{std} | Conti | nuous Flow | IC |
| Point | Н (і | H (inches of water) | | (m ³ | / min.) | Recorder, W | | (W(P _a /1013.3x298/T _a) ^{1/2} /35.31) |
| | (up) | (down) | (difference) | X- | -axis | | (CFM) | Y-axis |
| 1 | 1.3 | 1.3 | 2.6 | 0./ | 8100 | | 26 | 25.9605 |
| 2 | 1.8 | 1.8 | 3.6 | 0.9 | 9523 | | 31 | 30.9529 |
| 3 | 2.6 | 2.6 | 5.2 | 1. | 1436 | | 36 | 35.9452 |
| 4 | 3.2 | 3.2 | 6.4 | 1.: | 2683 | | 39 | 38.9407 |
| 5 | 4.1 | 4.1 | 8.2 | 1./ | 4350 | | 42 | 41.9361 |
| By Linear Regression of ` | Y on X | | | | | _ | | |
| | Slope, m | = | 25.5 | 089 | Inte | ercept, b | =6. | 1300 |
| Correlation Co | cefficient* | = | 0.99 |) 31 | | | | |
| Calibration | Accepted | = | Yes/ I | No** | | | | |
| | | | | | | | | |

* if Correlation Coefficient < 0.990, check and recalibration again.

** Delete as appropriate.

Remarks :

Date

Calibrated by

: Laurance Yung

:

18-Oct-19

Checked by

Date

James Chu

:

•

18-Oct-19



Calibration Data for High Volume Sampler (TSP Sampler)

| Location | : | CMA5b | Calbration Date | : | 19-Aug-19 |
|---------------|---|--------|---------------------|---|-----------|
| Equipment no. | : | HVS010 | Calbration Due Date | : | 19-Oct-19 |

CALIBRATION OF CONTINUOUS FLOW RECORDER

| | | | | Ambient C | Condition | | | |
|-----------------------------|-------------------|---------------------|--------------|-----------------------|------------------|---------------------|-------------------|--|
| Temperature, T _a | | 303 | 5 | Kelvin | Pressure, P | а | 1 | 009 mmHg |
| | | | Orifice T | ransfer Sta | Indard Inform | mation | | |
| Equipment No. | | 0005 | | Slope, m _c | 1.998 | 61 | Intercept, bc | -0.00882 |
| Last Calibration Date | | 11-Jan-1 | 9 | | (H x | P _a / 10 | 13.3 x 298 / | T _a) ^{1/2} |
| Next Calibration Date | | 11-Jan-2 | 0 | | = | m _c > | $Q_{std} + b_{c}$ | |
| | | | | Calibratio | n of TSP | | | |
| Calibration | Manometer Reading | | | C | l _{std} | Contir | uous Flow | IC |
| Point | Н (| H (inches of water) | | (m ³ | / min.) | Rec | order, W | (W(P _a /1013.3x298/T _a) ^{1/2} /35. |
| | (up) | (down) | (difference) | X- | axis | (| CFM) | Y-axis |
| 1 | 1.4 | 1.4 | 2.8 | 0.8 | 3330 | | 31 | 30.6779 |
| 2 | 2.1 | 2.1 | 4.2 | 1.(| 0192 | | 37 | 36.6155 |
| 3 | 3.5 | 3.5 | 7.0 | 1.3 | 3145 | | 49 | 48.4908 |
| 4 | 4.0 | 4.0 | 8.0 | 1.4 | 4049 | | 52 | 51.4596 |
| 5 | 4.8 | 4.8 | 9.6 | 1.5 | 5386 | | 56 | 55.4181 |
| By Linear Regression of | Y on X | | | | | | | |
| | Slope, m | = | 36.0 | 750 | Int | ercept, b = | = 0. | 4484 |
| Correlation Co | pefficient* | = | 0.99 | 987 | | | | |
| Calibration | Accepted | = | Yes/ | No** | | | | |
| | | | | | | | | |

* if Correlation Coefficient < 0.990, check and recalibration again.

| Remarks : | | | | | | |
|---------------|---|-----------|---|------------|---|-----------|
| Calibrated by | : | Henry Lau | | Checked by | : | Dean Chan |
| Date | : | 19-Aug-19 | - | Date | : | 19-Aug-19 |



Calibration Data for High Volume Sampler (TSP Sampler)

| Location | : | СМА5ь | Calbration Date | : | 18-Oct-19 |
|---------------|---|--------|---------------------|---|-----------|
| Equipment no. | : | HVS010 | Calbration Due Date | : | 18-Dec-19 |

CALIBRATION OF CONTINUOUS FLOW RECORDER

| | | | | Ambient C | Condition | | | |
|-----------------------------|-------------|---------------------|-------------------|-----------------------|------------------|---------------------|-------------------------------------|---|
| Temperature, T _a | | 300 | 1 | Kelvin | Pressure, P | a | 1 | 1017 mmHg |
| | | | Orifice Tr | ransfer Sta | andard Inforr | mation | | |
| Equipment No. | | 0005 | | Slope, m _c | 1.9986 | 61 | Intercept, bc | -0.00882 |
| Last Calibration Date | | 11-Jan-1 | 9 | | (H x | P _a / 10 |)13.3 x 298 / | T _a) ^{1/2} |
| Next Calibration Date | 11-Jan-20 | | | | = | m _c | x Q _{std} + b _c | |
| | | | | Calibratio | on of TSP | | | |
| Calibration | Mar | Manometer Reading | | | Q _{std} | Conti | nuous Flow | IC |
| Point | Н (і | H (inches of water) | | (m ³ | / min.) | Recorder, W | | (W(P _a /1013.3x298/T _a) ^{1/2} /35.31) |
| | (up) | (down) | (difference) | X- | -axis | | (CFM) | Y-axis |
| 1 | 1.6 | 1.6 | 3.2 | 0./ | 8981 | | 22 | 21.9665 |
| 2 | 2.2 | 2.2 | 4.4 | 1./ | 0524 | | 26 | 25.9605 |
| 3 | 2.7 | 2.7 | 5.4 | 1. | 1653 | | 30 | 29.9544 |
| 4 | 3.4 | 3.4 | 6.8 | 1.: | 3072 | | 36 | 35.9452 |
| 5 | 4.3 | 4.3 | 8.6 | 1./ | 4695 | | 41 | 40.9376 |
| By Linear Regression of ` | Y on X | | | | | | | |
| | Slope, m | = | 34.24 | 476 | Inte | ercept, b | = | .4077 |
| Correlation Co | cefficient* | = | 0.99 |) 68 | | | | |
| Calibration | Accepted | = | Yes/ I | No** | | | | |
| | | | | | | | | |

* if Correlation Coefficient < 0.990, check and recalibration again.

| ** | Delete | as | appropriate. |
|----|--------|----|--------------|
|----|--------|----|--------------|

| Remarks : | | | | | |
|---------------|---|---------------|------------|---|-----------|
| Calibrated by | : | Laurance Yung | Checked by | : | James Chu |
| Date | : | 18-Oct-19 | Date | : | 18-Oct-19 |



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E-mail: smec@cigismec.com Website: www.cigismec.com

Tel: (852) 2873 6860 Fax: (852) 2555 7533



CERTIFICATE OF CALIBRATION

| Sound Level Mete | r (Type 1) | Microphone | Preamp | |
|-------------------|---|--|--|--|
| B & K | | B & K | B & K | |
| 2250 | | 4950 | ZC0032 | |
| 2701778 | | 2755097 | 19223 | |
| - | | - | - | |
| | | | | |
| Lam Geotechnics | Limited. | | | |
| - | | | | |
| - | | | | |
| 22-Feb-2019 | | | | |
| 25-Feb-2019 | | | | |
| used in the calib | ration | | | |
| Model: | Serial No. | Expiry Date: | Traceabl | e to: |
| B&K 4226 | 2288444 | 23-Aug-2019 | CIGISMEC |) |
| DS 360 | 33873 | 24-Apr-2019 | CEPREI | |
| DS 360 | 61227 | 26-Dec-2019 | CEPREI | |
| | | | | |
| 21 ± 1 °C | | | | |
| 55 ± 10 % | | | | |
| | | | | |
| | B & K 2250 2701778 - Lam Geotechnics - 22-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 21 ± 1 °C | 2250 2701778 - Lam Geotechnics Limited. - 22-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 21 ± 1 °C | B & K 2250 2701778 - Lam Geotechnics Limited. - 22-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25-Feb-2019 25 | B & K B & K B & K B & K 2250 4950 ZC0032 2701778 2755097 19223 - - - 22-Feb-2019 - - 25-Feb-2019 - - 21 ± 1 °C - - |

- 1, The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of <u>+</u>20%.
- 3. The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documenter on worksheets.

Approved Signatory: Fen Junqi

26-Feb-2019 Company Chop:



Comments: The results reported in his certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

Date:

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Page



2

CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No..

19CA0222 02

2 of

1, Electrical Tests

The electrical tests were perfomed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

| Test: | Subtest: | Status: | Expanded Uncertanity (dB) | Coverage Factor |
|-------------------------|--|---------|------------------------------|--------------------|
| Self-generated noise | А | Pass | 0.3 | |
| Self-generated holse | c | Pass | 0.8 | |
| | Lin | Pass | 1.6 | |
| Linearity range for Leg | At reference range, Step 5 dB at 4 kHz | Pass | 0.3 | |
| Emeanly range for Log | Reference SPL on all other ranges | Pass | 0.3 | |
| | 2 dB below upper limit of each range | Pass | 0.3 | |
| | 2 dB above lower limit of each range | Pass | 0.3 | |
| Linearity range for SPL | At reference range , Step 5 dB at 4 kHz | Pass | 0.3 | |
| Frequency weightings | A | Pass | 0.3 | |
| | С | Pass | 0.3 | |
| | Lin | Pass | 0.3 | |
| Time weightings | Single Burst Fast | Pass | 0.3 | |
| 5 5 | Single Burst Slow | Pass | 0.3 | |
| Peak response | Single 100µs rectangular pulse | Pass | 0.3 | |
| R.M.S. accuracy | Crest factor of 3 | Pass | 0.3 | |
| Time weighting I | Single burst 5 ms at 2000 Hz | Pass | 0.3 | |
| | Repeated at frequency of 100 Hz | Pass | 0.3 | |
| Time averaging | 1 ms burst duty factor 1/10 ³ at 4kHz | Pass | 0.3 | |
| 0 0 | 1 ms burst duty factor 1/10 ⁴ at 4kHz | Pass | 0.3 | |
| Pulse range | Single burst 10 ms at 4 kHz | Pass | 0.4 | |
| Sound exposure level | Single burst 10 ms at 4 kHz | Pass | 0.4 | |
| Overload indication | SPL | Pass | 0.3 | |
| | Leq | Pass | 0.4 | |

2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

| Test: | Subtest | Status | Expanded Uncertanity (dB) | Coverage Factor |
|-------------------|------------------------|--------|------------------------------|--------------------|
| Acoustic response | Weighting A at 125 Hz | Pass | 0.3 | |
| | Weighting A at 8000 Hz | Pass | 0.5 | |

3, Response to associated sound calibrator

N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

| | | - E | nd - | 1 | |
|----------------|---------------|-----|-------------|-----------------|--|
| Calibrated by: | El | | Checked by: | $1 \sim \gamma$ | |
| | Fong Chun Wai | | | Fung Chi Yip | |
| Date: | 25-Feb-2019 | | Date: | 26-Feb-2019 | |
| | | | | 1 | |

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

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CERTIFICATE OF CALIBRATION

| Certificate No.: | 19CA0329.02 | | Page | 1 of 2 |
|---------------------------------|-------------------|------------|--|---------------|
| Item tested | | | | |
| Description: | Sound Level Mete | r (Type 1) | Microphone | Preamp |
| Manufacturer: | B&K | | B&K | B & K |
| Type/Model No.: | 2250-1. | | 4950 | ZC0032 |
| Serial/Equipment No.: | 2722310 | | 2698702 | 13318 |
| Adaptors used | 1.5 | | 100 million (100 m | |
| Item submitted by | | | | |
| Customer Name: | Lam Geotechnics | Ltd. | | |
| Address of Customer: | 2 | | | |
| Request No.: | 45-000 Million | | | |
| Date of receipt: | 29-Mar-2019 | | | |
| Date of test: | 02-Apr-2019 | | | |
| Reference equipment | used in the calib | ration | | |
| Description: | Model: | Serial No. | Expiry Date: | Traceable to: |
| Multi function sound calibrator | B&K 4226 | 2288444 | 23-Aug-2019 | CIGISMEC |
| Signal generator | DS 360 | 33873 | 24-Apr-2019 | CEPREI |
| Signal generator | DS 360 | 61227 | 26-Dec-2019 | CEPREI |
| Ambient conditions | | | | |
| Temperature: | 21 ± 1 °C | | | |
| Relative humidity: | 55 ± 10 % | | | |
| Air pressure: | 1005 ± 5 hPa | | | |
| 975767972778 | ngabenner all | | | |
| Test specifications | | | | |

- The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

Test results

This is to certify that the Sound Level Meter conforms to BS 7580. Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets.

Approved Signatory: Jung

Date: 02-Apr-2019



Comments: The results reported b this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

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Company Chop:



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Page



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

19CA0329 02

2 of 2

1, Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

| Test: | Subtest: | Status: | Expanded Uncertanity (dB) | Coverage Factor |
|--------------------------|--|---------|------------------------------|--------------------|
| Self-generated noise | A | Pass | 0.3 | |
| | C | Pass | 0.8 | |
| | Lin | Pass | 1.6 | |
| Linearity range for Leg. | At reference range , Step 5 dB at 4 kHz | Pass | 0.3 | |
| | Reference SPL on all other ranges | Pass | 0.3 | |
| | 2 dB below upper limit of each range | Pass | 0.3 | |
| | 2 dB above lower limit of each range | Pass | 0.3 | |
| Linearity range for SPL | At reference range , Step 5 dB at 4 kHz | Pass | 0.3 | |
| Frequency weightings | A | Pass | 0.3 | |
| 20 M W W | C | Pass | 0.3 | |
| | Lin | Pass | 0.3 | |
| Time weightings | Single Burst Fast | Pass | 0.3 | |
| | Single Burst Slow | Pass | 0.3 | |
| Peak response | Single 100µs rectangular pulse | Pass | 0.3 | |
| R.M.S. accuracy | Crest factor of 3 | Pass | 0.3 | |
| Time weighting I | Single burst 5 ms at 2000 Hz | Pass | 0.3 | |
| | Repeated at frequency of 100 Hz | Pass | 0.3 | |
| Time averaging | 1 ms burst duty factor 1/10 ³ at 4kHz | Pass | 0.3 | |
| | 1 ms burst duty factor 1/10 ⁴ at 4kHz | Pass | 0.3 | |
| Pulse range | Single burst 10 ms at 4 kHz | Pass | 0.4 | |
| Sound exposure level | Single burst 10 ms at 4 kHz | Pass | 0.4 | |
| Overload indication | SPL | Pass | 0.3 | |
| | Log | Pass | 0.4 | |

2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

| Test: | Subtest | Status | Expanded Uncertanity (dB) | Coverage Factor |
|-------------------|------------------------|--------|------------------------------|--------------------|
| Acoustic response | Weighting A at 125 Hz | Pass | 0.3 | |
| | Weighting A at 8000 Hz | Pass | 0.5 | |

3, Response to associated sound calibrator

N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

| | 12 | - End - | 1 |
|----------------|------------------------------|-------------|-----------------------------|
| Calibrated by: | EL | Checked by: | 1~1 |
| Date: | Fong Chun Wai 02-Apr-2019 | Date: | Fung Chi Yib 02-Apr-2019 |

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

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CERTIFICATE OF CALIBRATION

| Certificate No.: | 19CA0425 02 | | Page | 1 of 2 |
|---|---|-------------------------|----------------------------|----------------------------------|
| Item tested | | | | |
| Description: | Sound Level Mete | r (Type 1) | Microphone | Preamp |
| Manufacturer | B&K | | B&K | B&K |
| Type/Model No.: | 2250-L | | 4950 | ZC0032 |
| Serial/Equipment No.: | 2722311 | | 2698703 | 13321 |
| Adaptors used: | 2 | | - | 10021 |
| Item submitted by | | | | |
| Customer Name: | 100000000000000000000000000000000000000 | 142 | | |
| e e e e e e e e e e e e e e e e e e e | Lam Geotechnics | 110. | | |
| Address of Customer: | 1 | | | |
| Request No. | | | | |
| Date of receipt | 25-Apr-2019 | | | |
| Date of test: | 02-May-2019 | | | |
| Reference equipment | used in the calib | ration | | |
| Description: | Model: | Serial No. | Expiry Date: | Traceable to: |
| | | | | |
| Multi function sound calibrator | B&K 4226 | 2288444 | 23-Aug-2019 | CIGISMEC |
| Signal generator | DS 360 | 61227 | 26-Dec-2019 | CEPREI |
| Ambient conditions | | | | |
| Temperature: | 22 ± 1 °C | | | |
| Relative humidity: | 55 ± 10 % | | | |
| | 1005 ± 5 hPa | | | |
| Air pressure: | 1005±5 nPa | | | |
| Test specifications | | | | |
| t, The Sound Level Me | ter has been calibrat | ed in accordance with | the requirements as spe | cified in BS 7580: Part 1: 1997 |
| and the lab calibratio | | | | |
| | | | | one which was removed and |
| | | thin a tolerance of ±20 | | |
| | | | | ons was applied for the differen |
| bahavan the free field | d and pressure respo | insess of the Sound Le | evel Meter. | |
| between the tree net | | | | |
| | | | | |
| Test results | 8 A 50 A 51 B 21 A 6 A 6 A 6 A | | | |
| Test results This is to certify that the Sou | nd Level Meter confo | erms to BS 7580: Part | 1: 1997 for the conditions | a under which the test |
| Test results This is to certify that the Sou vas performed. | | | | a under which the test |
| Test results This is to certify that the Sou was performed. Details of the performed mea Actual Measurement data an | asurements are prese | ented on page 2 of this | | s under which the test |
| Test results This is to certify that the Sou vas performed. Details of the performed mea | asurements are prese | ented on page 2 of this | | s under which the test |
| Test results This is to certify that the Sou vas performed. Details of the performed mea | asurements are prese | ented on page 2 of this | | s under which the test |

Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

Feng Junqi

E Solis & Meterials Engineering Co., Ltd.

Furm No CARP152-Manuel URev Citl U02/2007

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19CA0425 02

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2

CERTIFICATE OF CALIBRATION

(Continuation Page)

Page 2 of

1. Electrical Tests

Certificate No.:

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

| Test: | Subtest: | Status: | Expanded Uncertanity (dB) | Coverage Factor |
|-----------------------------|--|---------|------------------------------|--------------------|
| Self-generated noise | A | Pass | 0.3 | |
| odit Tourisianan using | c | Pass | 0.8 | |
| | Lin | Pass | 1.6 | |
| Linearity range for Leg | At reference range , Step 5 dB at 4 kHz | Pass | 0.3 | |
| | Reference SPL on all other ranges | Pass | 0.3 | |
| | 2 dB below upper limit of each range | Pass | 0.3 | |
| | 2 dB above lower limit of each range | Pass | 0.3 | |
| Linearity range for SPL | At reference range , Step 5 dB at 4 kHz | Pass | 0.3 | |
| Frequency weightings | A | Pass | 0.3 | |
| 1.01.71.7.697.0997.01.9799. | C | Pass | 0.3 | |
| | Lin | Pass | 0.3 | |
| Time weightings | Single Burst Fast | Pass | 0.3 | |
| 2000 - 100 E. 100 T. 10 | Single Burst Slow | Pass | 0.3 | |
| Peak response | Single 100us rectangular pulse | Pass | 0.3 | |
| R.M.S. accuracy | Crest factor of 3 | Pass | 0.3 | |
| Time weighting I | Single burst 5 ms at 2000 Hz | Pass | 0.3 | |
| NAMES SERVICE STREET | Repeated at frequency of 100 Hz | Pass | 0.3 | |
| Time averaging | 1 ms burst duty factor 1/10 ³ at 4kHz | Pass | 0.3 | |
| 2010 | 1 ms burst duty factor 1/10 ⁴ at 4kHz | Pass | 0.3 | |
| Pulse range | Single burst 10 ms at 4 kHz | Pass | 0.4 | |
| Sound exposure level | Single burst 10 ms at 4 kHz | Pass | 0.4 | |
| Overload indication | SPL | Pass | 0.3 | |
| | Leg | Pass | 0.4 | |

2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

| Test: | Subtest | Status | Expanded Uncertanity (dB) | Coverage Factor |
|-------------------|------------------------|--------|------------------------------|--------------------|
| Acoustic response | Weighting A at 125 Hz | Pass | 0.3 | |
| | Weighting A at 8000 Hz | Pass | 0.5 | |

3, Response to associated sound calibrator

N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

End Calibrated by: Checked by ung Chi Yip Shek Rwong Tal 2-May-2019 Date: Date: 03-May-2019

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to(maintain the required accuracy level.

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Forn No CARP152-21anuar 1/Rev Ci01/02/2007



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CERTIFICATE OF CALIBRATION

| Certificate No.: | 19CA0116 02 | | Page | 1 | of | 2 |
|---------------------------------|--------------------|---------------|--|---|------------------|-------|
| Item tested | | | | | | |
| Description: | Sound Level Mete | r (Type 1) | Microphone | | Preamp | |
| Manufacturer: | B&K | 5. V. 47 30 F | B&K | | B&K | |
| Type/Model No.: | 2250L | | 4950 | | ZC0032 | |
| Serial/Equipment No.: | 3002695 | | 2940839 | | 18582 | |
| Adaptors used: | - 20100 States | | 50 () (() () () () () () () () | | 10,000,000 30 | |
| Item submitted by | | | | | | |
| Customer Name: | Lam Geotechnics | Ltd. | | | | |
| Address of Customer: | | 1777.34 | | | | |
| Request No.: | Same | | | | | |
| Date of receipt: | 16-Jan-2019 | | | | | |
| Date of test: | 17-Jan-2019 | | | | | |
| Reference equipment | used in the calib | ration | | | | |
| Description: | Model: | Serial No. | Expiry Date: | | Traceab | e to: |
| Multi function sound calibrator | B&K 4226 | 2288444 | 23-Aug-2019 | | CIGISME | 5 |
| Signal generator | DS 360. | 33873 | 24-Apr-2019 | | CEPREI | |
| Signal generator | DS 360 | 61227 | 26-Dec-2019 | | CEPREI | |
| Ambient conditions | | | | | | |
| Temperature: | 21 ± 1 *C | | | | | |
| Relative humidity: | 50 ± 10 % | | | | | |
| Air pressure: | 1005 ± 5 hPa | | | | | |
| Test specifications | 2 AM 000 120000000 | | | | | |

- The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of +20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed,

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets.

Æ Fend Jungi

19-Jan-2019 Company Chop:



Comments: The results reported in the certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

Date:

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Approved Signatory:

Form No. CARP152- Ulssue URay C/01/02/2007



綜合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD.

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19CA0116 02

Tel: (852) 2873 6860 Fax: (852) 2555 7533



CERTIFICATE OF CALIBRATION

(Continuation Page)

Page 2 of 2

1. Electrical Tests

Certificate No.:

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

| Test: | Subtest: | Status: | Expanded Uncertanity (dB) | Coverage Factor |
|-------------------------|--|---------|------------------------------|--------------------|
| Self-generated noise | A | Pass | 0.3 | |
| | C | Pass | 0.8 | |
| | Lin | Pass | 1.6 | |
| Linearity range for Leg | At reference range . Step 5 dB at 4 kHz | Pass | 0.3 | |
| | Reference SPL on all other ranges | Pass | 0.3 | |
| | 2 dB below upper limit of each range | Pass | 0.3 | |
| | 2 dB above lower limit of each range | Pass | 0.3 | |
| Linearity range for SPL | At reference range , Step 5 dB at 4 kHz | Pass | 0.3 | |
| Frequency weightings | A | Pass | 0.3 | |
| M. 1929 M. 12 | C | Pass | 0.3 | |
| | Lin | Pass | 0.3 | |
| Time weightings | Single Burst Fast | Pass | 0.3 | |
| | Single Burst Slow | Pass | 0.3 | |
| Peak response | Single 100µs rectangular pulse | Pass | 0.3 | |
| R.M.S. accuracy | Crest factor of 3 | Pass | 0.3 | |
| Time weighting I | Single burst 5 ms at 2000 Hz | Pass | 0.3 | |
| | Repeated at frequency of 100 Hz | Pass | 0.3 | |
| Time averaging | 1 ms burst duty factor 1/10 ³ at 4kHz | Pass | 0.3 | |
| | 1 ms burst duty factor 1/10 ⁴ at 4kHz | Pass | 0.3 | |
| Pulse range | Single burst 10 ms at 4 kHz | Pass | 0.4 | |
| Sound exposure level | Single burst 10 ms at 4 kHz | Pass | 0.4 | |
| Overload indication | SPL | Pass | 0.3 | |
| | Leg | Pass | 0.4 | |

2, Acoustic tests

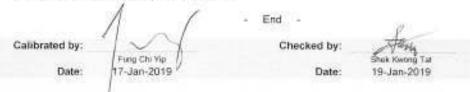
The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

| Test: | Subtest | Status | Expanded Uncertanity (dB) | Coverage Factor |
|-------------------|------------------------|--------|------------------------------|--------------------|
| Acoustic response | Weighting A at 125 Hz | Pass | 0.3 | |
| | Weighting A at 8000 Hz | Pass | 0.5 | |
| | Heighting A at 2000 Hz | P 455 | 0.0 | |

3, Response to associated sound calibrator

N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.



The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

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Form No CARP152 2/Issue 1/Rev C/01/02/2007



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Tel: (852) 2873 6860 Fax: (852) 2555 7533



CERTIFICATE OF CALIBRATION

| Certificate No.: | 19CA0314 01 | | Page | 1 | of | 2 |
|---|---|--------------------------------|--|---|------------------------------|---|
| Item tested | | | | | | |
| Description: Manufacturer: Type/Model No.: Serial/Equipment No.: Adaptors used: | Sound Level Mete Larson Davis LxT1 0003737 | | Microphone PCB 377802 171529 | | | |
| Item submitted by | | | | | | |
| Customer Name: Address of Customer: Request No.: Date of receipt: | Lam Geotechnics - 14-Mar-2019 | Ltd. | | | | |
| Date of test: | 18-Mar-2019 | | | | | |
| Reference equipment | used in the calib | ration | | | | |
| Description: Multi function sound calibrator Signal generator | Model: B&K 4226 DS 360 | Serial No. 2258444 61227 | Expiry Date: 23-Aug-2019 26-Dec-2019 | | Traceab CIGISME CEPREI | |
| Ambient conditions | | | | | | |
| Temperature: Relative humidity: Air pressure: | 21 ± 1 °C 55 ± 10 % 1005 ± 5 hPa | | | | | |

The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580; Part 1; 1997 1, and the lab calibration procedure SMTP004-CA-152.

2, The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.

3, The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets.

Approved Signatory:

Feng Jung

19-Mar-2019 Company Chop:



Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

Date:

O Soits & Materials Engineering Co., Ltd.

Form No CARP152-Masue 1/Rev C/01/02/2007



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Page



CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

1.

19CA0314 01

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Electrical Tests

The electrical tests were performed using an equivalent capacitance substituted for the microphone. The results. are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

| Test: | Subtest: | Status: | Expanded Uncertanity (dB) | Coverage Factor |
|-------------------------|--|---------|------------------------------|--------------------|
| Self-generated noise | A | Pass | 0.3 | |
| | c | Pass | 0.8 | 2.1 |
| | Lin | Pass | 1.6 | 2.2 |
| Linearity range for Leg | At reference range , Step 5 dB at 4 kHz | Pass | 0.3 | 0.22 |
| | Reference SPL on all other ranges | Pass | 0.3 | |
| | 2 dB below upper limit of each range | Pass | 0.3 | |
| | 2 dB above lower limit of each range | Pass | 0.3 | |
| Linearity range for SPL | At reference range , Step 5 dB at 4 kHz | Pass | 0.3 | |
| Frequency weightings | A | Pass | 0.3 | |
| | C | Pass | 0.3 | |
| | Lin | Pass | 0.3 | |
| Time weightings | Single Burst Fast | Pass | 0.3 | |
| | Single Burst Slow | Pass | 0.3 | |
| Peak response | Single 100µs rectangular pulse | N/A | N/A | |
| R.M.S. accuracy | Crest factor of 3 | Pass | 0.3 | |
| Time weighting I | Single burst 5 ms at 2000 Hz | Pass | 0.3 | |
| | Repeated at frequency of 100 Hz | Pass | 0.3 | |
| Time averaging | 1 ms burst duty factor 1/10 ³ at 4kHz | Pass | 0.3 | |
| | 1 ms burst duty factor 1/10 ⁴ at 4kHz | Pass | 0.3 | |
| Pulse range | Single burst 10 ms at 4 kHz | Pass | 0.4 | |
| Sound exposure level | Single burst 10 ms at 4 kHz | Pass | 0.4 | |
| Overload indication | SPL | Pass | 0.3 | |
| | Leg | Pass | 0.4 | |

2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

| Test: | Subtest | Status | Expanded Uncertanity (dB) | Coverage Factor |
|-------------------|------------------------|--------|------------------------------|--------------------|
| Acoustic response | Weighting A at 125 Hz | Pass | 0.3 | |
| | Weighting A at 8000 Hz | Pass | 0.5 | |

з, Response to associated sound calibrator

N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

| | | - End - | 1 1 |
|----------------|------------------------------|-------------|---------------------------|
| Calibrated by: | Ela | Checked by: | 1~1 |
| Date: | Fong Chun Wai 18-Mar-2019 | Date: | Fung CN Ya 19-Mar-2019 |

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

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Form No CARP152-2/Islue 1/Rev C/01/02/2007

Calibration Certificate

Certificate Number 2018010851

1

Customer: LAM Environmental Services Ltd 11/F Centre Point 181-185 Gloucester Road Wanchai, , Hong Kong

| Model Number Serial Number Test Results | CAL200 13098 Pass |) | Procedure Number Technician Calibration Date Calibration Due | Scott | 1.8386 Montgo t 2018 | mery |
|---|--------------------------------|---|---|-------------------|----------------------------|--------------------------------|
| Initial Condition Description | Inoperal Larson I | ble Davis CAL200 Acoustic Calibrator | Cambration Due Temperature Humidity Static Pressure | 23 34 101.2 | °C %RH kPa | ± 0.3 °C ± 3 %RH ± 1 kPa |
| Evaluation Metho | od | The data is aquired by the insert voltage circuit sensitivity. Data reported in dB re 2 | | ne refere | nce mic | crophone's open |
| Compliance Stan | dards | Compliant to Manufacturer Specifications | s per D0001.8190 and the | following | g standa | ards: |

ANSI S1.40-2006

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2005. Test points marked with a **‡** in the uncertainties column do not fall within this laboratory's scope of accreditation.

IEC 60942:2017

The quality system is registered to ISO 9001:2008.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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| Standards Used | | | | | | |
|--|------------|------------|--------------|--|--|--|
| Description | Cal Date | Cal Due | Cal Standard | | | |
| Agilent 34401A DMM | 09/06/2018 | 09/06/2019 | 001021 | | | |
| Larson Davis Model 2900 Real Time Analyzer | 04/10/2018 | 04/10/2019 | 001051 | | | |
| Microphone Calibration System | 03/07/2018 | 03/07/2019 | 005446 | | | |
| 1/2" Preamplifier | 09/20/2018 | 09/20/2019 | 006506 | | | |
| Larson Davis 1/2" Preamplifier 7-pin LEMO | 08/07/2018 | 08/07/2019 | 006507 | | | |
| 1/2 inch Microphone - RI - 200V | 05/10/2018 | 05/10/2019 | 006510 | | | |
| Pressure Transducer | 07/18/2018 | 07/18/2019 | 007368 | | | |

Larson Davis, a division of PCB Piezotronics, Inc 1681 West 820 North Provo, UT 84601, United States 716-684-0001





Certificate Number 2018010851

Output Level

| Nominal Level [dB] | Pressure [kPa] | Test Result [dB] | Lower limit [dB] | Upper limit [dB] | Expanded Uncertainty [dB] | Result |
|-----------------------|-------------------|---------------------|---------------------|---------------------|------------------------------|--------|
| 114 | 101.2 | 114.01 | 113.80 | 114.20 | 0.14 | Pass |
| 94 | 101.2 | 94.01 | 93.80 | 94.20 | 0.15 | Pass |

-- End of measurement results--

Frequency

| Nominal Level | Pressure | Test Result | Lower limit | Upper limit | Expanded Uncertainty | Result |
|---------------|----------|-------------|-------------|-------------|----------------------|--------|
| (dB) | [kPa] | [Hz] | [Hz] | [Hz] | [Hz] | Result |
| 114 | 101.2 | 1,000.09 | 990.00 | 1,010.00 | 0.20 | Pass |
| 94 | 101.2 | 1,000.09 | 990.00 | 1,010.00 | 0.20 | Pass |

-- End of measurement results--

Total Harmonic Distortion + Noise (THD+N)

| Nominal Level [dB] | Pressure [kPa] | Test Result | Lower limit [%] | Upper limit [%] | Expanded Uncertainty [%] | Result |
|-----------------------|-------------------|-------------|--------------------|--------------------|-----------------------------|--------|
| 114 | 101.2 | 0.31 | 0.00 | 2.00 | 0.25 | Pass |
| 94 | 101.2 | 0.35 | 0.00 | 2.00 | 0.25 | Pass |

-- End of measurement results--

Level Change Over Pressure

Tested at: 114 dB, 24 °C, 34 %RH

| Nominal Pressure | Pressure | Test Result | Lower limit | Upper limit | Expanded Uncertainty | Damit |
|------------------|----------|-------------|-------------|-------------|----------------------|--------|
| [kPa] | [kPa] | [dB] | [dB] | [dB] | [dB] | Result |
| 108.0 | 108.0 | -0.05 | -0.30 | 0.30 | 0.04 ‡ | Pass |
| 101.3 | 101.3 | 0.00 | -0.30 | 0.30 | 0.04 ‡ | Pass |
| 92.0 | 92.0 | 0.06 | -0.30 | 0.30 | 0.04 ‡ | Pass |
| 83.0 | 82.9 | 0.09 | -0.30 | 0.30 | 0.04 ‡ | Pass |
| 74.0 | 74.1 | 0.06 | -0.30 | 0.30 | 0.04 ‡ | Pass |
| 65.0 | 65.1 | -0.04 | -0.30 | 0.30 | 0.04 ± | Pass |

-- End of measurement results--

Frequency Change Over Pressure

| Nominal Pressure | Pressure | Test Result | Lower limit | Upper limit | Expanded Uncertainty | Result |
|------------------|----------|-------------|-------------|-------------|-----------------------------|--------|
| kPaj | [kPa] | [Mz] | [117] | [11z] | [112] | Result |
| 08.0 | 108.0 | 0.02 | -10.00 | 10.00 | 0.20 ‡ | Pass |
| 01.3 | 101.3 | 0.00 | -10.00 | 10.00 | 0.20 ‡ | Pass |
| 02.0 | 92.0 | 0.00 | -10.00 | 10.00 | 0.20 ‡ | Pass |
| 3.0 | 82.9 | 0.01 | -10.00 | 10.00 | 0.20 ‡ | Pass |
| 74.0 | 74.1 | 0.01 | -10.00 | 10.00 | 0.20‡ | Pass |
| 5.0 | 65.1 | 0.01 | -10.00 | 10.00 | 0.20 ± | Pass |

-- End of measurement results--

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10/29/2018 1:43:01PM

Certificate Number 2018010851 Total Harmonic Distortion + Noise (THD+N) Over Pressure

Tested at: 114 dB, 24 °C, 34 %RH

| Nominal Pressure | Pressure | Test Result | Lower limit | Upper limit | Expanded Uncertainty | Basult |
|------------------|----------|-------------|-------------------|-------------|-----------------------------|--------|
| [kPa] | [kPa] | [%] | [%] | 1% | [%] | Result |
| 08.0 | 108.0 | 0.30 | 0.00 | 2.00 | 0.25 ‡ | Pass |
| 01.3 | 101.3 | 0.31 | 0.00 | 2.00 | 0.25 ‡ | Pass |
| 92.0 | 92.0 | 0.33 | 0.00 | 2.00 | 0.25 ‡ | Pass |
| 3.0 | 82.9 | 0.35 | 0.00 | 2.00 | 0.25 ‡ | Pass |
| 4.0 | 74.1 | 0.37 | 0.00 | 2.00 | 0.25 ‡ | Pass |
| 5.0 | 65.1 | 0.40 | 0.00 | 2.00 | 0.25 ‡ | Pass |
| | | | End of measuremen | nt results | | |

Signatory: _Scott Montgomery

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10/29/2018 1:43:01PM

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