				-			REC	ALIBRATION
						2	D	UE DATE:
							Janua	ary 24, 201
	Ce	rtife	cate of	A	Cal	ibra	ntion	
			Calibration (	Certificatio	on Informat	ion		
Cal. Date:	January 24	, 2018	Rootsn	neter S/N:	438320	Ta:	293	°К
Operator:	Jim Tisch					Pa:	756.9	mm Hg
Calibration	Model #:	TE-5025A	Calib	rator S/N:	3166	1995-94		9
		Vol. Init	Vol. Final	AVol.	ATime	AP	AH	1
	Run	(m3)	(m3)	(m3)	(min)	(mm Hg)	(in H2O)	
	1	1	2	1	1.4430	3.2	2 00	
	2	3	4	1	1.0270	6.4	4.00	
	3	5	6	1	0.9220	7.9	5.00	
	4	7	8	1	0.8780	8.7	5.50	
	5	9	10	1	0.7270	12.6	8.00	
			D	ata Tabula	tion			ĺ
	Vstd	Qstd	√∆H( <u>Pa</u> Pstd	)( <u>Tstd</u> )		Qa	√∆H(Ta/Pa)	
	(m3)	(x-axis)	(y-axi	s)	Va	(x-axis)	(v-axis)	
	1.0087	0.6990	1.423	3	0.9958	0.6901	0.8799	
	1.0044	0.9780	2.012	9	0.9915	0.9655	1.2443	
	1.0024	1.0872	2.250	5	0.9896	1.0733	1.3912	
	1.0013	1.1404	2.360	3	0.9885	1.1259	1.4591	
	0.9961	1.3701	2.846	7	0.9834	1.3526	1.7598	
	OCTO	m=	2.122	31	~	m=	1.32895	
	USID	D=	-0.060	16	QA	b=	-0.03719	
			0.999	39		r=	0.99999	
	Vetdal		10-to d VIT-to d FT-	Calculation	1S		1.10.1	
	Ostd=	Vetd/ATime	/Pstu)(Tstu/Ta	,	Va=	ΔVOI((Pa-ΔP	)/Pa)	
	- quid-	v stu/ Arnine	For subseque	ent flow rat	e calculation	va/Arime		
	Qstd=	1/m (( \[ \[ \[ \[ \[ \[ \[ \[ \[ \[ \[ \[ \[	Pa (Tstd Pstd (Ta )	)-b)	Qa=	1/m ((√∆H	(Ta/Pa))-b)	
	Standard	Conditions	1	<u> </u>		<u></u>	1 /	
		and the second se		Г		RECAL	IBRATION	
Tstd:	298.15	°K						
Tstd: Pstd:	298.15 760	°K mm Hg		t				000000000000000000000000000000000000000
Tstd: Pstd:	298.15 760 K	°K mm Hg ley			US EPA reco	mmends an	nual recalibratio	n per 1998
Tstd: Pstd: ΔH: calibrate	298.15 760 K or manomet	°K mm Hg ey er reading (ii	n H2O)		US EPA reco 40 Code o	mmends an of Federal R	nual recalibratio egulations Part 5	n per 1998 50 to 51,
Tstd: Pstd: ΔH: calibrate ΔP: rootsme Ta: actual at	298.15 760 r K or manomet ter manome	°K mm Hg er reading (in eter reading ( perature (°K)	n H2O) mm Hg)		US EPA reco 40 Code o Appendix B	mmends an of Federal R to Part 50,	nual recalibratio egulations Part 5 Reference Meth	n per 1998 50 to 51, od for the
Tstd: Pstd: ΔH: calibrate ΔP: rootsme Ta: actual at Pa: actual ba	298.15 760 K or manomet ster manome psolute temp arometric pr	°K mm Hg er reading (ii eter reading berature (°K) essure (mm	n H2O) mm Hg) Hg)		US EPA reco 40 Code o Appendix B Determinat	mmends an of Federal R to Part 50, ion of Suspe	nual recalibratio egulations Part 5 Reference Meth inded Particulate	n per 1998 50 to 51, od for the Matter in
Tstd: Pstd: ΔH: calibrate ΔP: rootsme Ta: actual at Pa: actual ba b: intercept	298.15 760 K or manomet ter manome psolute temp arometric pr	°K mm Hg er reading (in eter reading ( berature (°K) essure (mm	n H2O) mm Hg) Hg)		US EPA reco 40 Code o Appendix B Determinati the	mmends an of Federal R to Part 50, on of Suspe Atmospher	nual recalibratio egulations Part 5 Reference Meth ended Particulate re, 9.2.17, page 3	on per 1998 50 to 51, od for the Matter in 80
Tstd: Pstd: ΔH: calibrate ΔP: rootsme Ta: actual al Pa: actual bi b: intercept m: slope	298.15 760 K or manomet iter manome psolute temp arometric pr	°K mm Hg er reading (ii eter reading ( berature (°K) essure (mm	n H2O) mm Hg) Hg)		US EPA reco 40 Code o Appendix B Determinati the	mmends an of Federal R to Part 50, on of Suspe Atmosphe	nual recalibratio egulations Part 5 Reference Meth ended Particulate re, 9.2.17, page 3	on per 1998 50 to 51, od for the Matter in 30

Tisch Environmental, Inc. 145 South Miami Avenue

Village of Cleves, OH 45002

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IC	26						REC/	ALIBRATION UE DATE:
		- 17					lanus	ary 11 2020
1440 t 140	-	+					Janua	ary 11, 2020
al. Date: Operator:	January 11, Jim Tisch	r <i>tifu</i>	Calibration C Rootsn	Certification	Call on Informat 438320	ion Ta: Pa:	293 760.7	°K mm Hg
Calibration	Model #:	TE-5025A	Calib	rator S/N:	0005			
	Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)	
	1	1	2	1	1.4090	3.2	2.00	
	2	3	4	1	0.9980	6.4	4.00	
	3	5	6	1	0,8900	7.8	5.00	
	4	7	8	1	0.8450	8.7	5.50	
	5	9	10	1	0.6990	12.6	8.00	
			D	ata Tabulat	tion			
	Vstd	Qstd	$\sqrt{\Delta H \left(\frac{Pa}{Pstd}\right)}$	(Tstd)		Qa	√∆H(Ta/Pa)	
	(m3)	(x-axis)	(y-axi	s)	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	8	0.9834	1.4059	1.7553	
	OCTO	m=	1.998	61	~	m=	1.25149	
	QSID	D=	-0.008	82	QA	D=	-0.00543	
		1=	0.335	57		1=	0.99997	
			10 + 11/2 + 1/2	Calculation	IS I		110.1	
	Vstd=	AVOI((Pa-AP)	/Pstd)(istd/ia	)	Va=	ΔVol((Pa-Δi	P)/Pa)	
	Qst0=	vsto/atime	Tax and comme		Qa-	varunne		
	<u> </u>	//	For subseque	ent now rat	e calculation	15:	1.5	
	Qstd=	1/m (( \/ \DH (	$\frac{Pa}{Pstd}$ $\left(\frac{Tstd}{Ta}\right)$	)-b)	Qa=	1/m((√∆F	l(Ta/Pa))-b)	
	Standard	Conditions						
Tstd	298.15	"K				RECA	LIBRATION	
Pstd:	760	mm Hg			US EPA men	mmends a	nual recalibratio	o per 1998
H: calibrat	N manomet	er reading //	14201		40 Code	of Federal I	Regulations Part 4	50 to 51
P: rootsma	eter manome	ter reading (i	mm He)		Appendix P	to Part 50	Reference Moth	od for the
a: actual al	bsolute temp	perature (*K)			Determinat	ion of Susp	ended Particulate	Matter in
a: actual b	arometric pr	essure (mm	Hg)		the	Atmosphe	re 9,7.17 nage	30
		the state of the s			23.10	mineralprice	and arecess holde :	

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### Calibration Data for High Volume Sampler (TSP Sampler)

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

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition								
Temperature, T <sub>a</sub>		293 Kelvin Pre			Pressure,	Pa	1	020 mmHg
Orifice Transfer Standard Information								
Equipment No.		Ori31	66	Slope, m <sub>c</sub>	2.122	31	Intercept, bo	-0.06016
Last Calibration Date		24-Jan	-18		( H x P	<sub>a</sub> / 101:	3.3 x 298 /	T <sub>a</sub> ) <sup>1/2</sup>
Next Calibration Date		24-Jan	-19		=	m <sub>c</sub> x	Q <sub>std</sub> + b <sub>c</sub>	
Calibration of TSP								
Calibration	Manometer Reading			Q	std	Continuous Flow		IC
Point	н	H (inches of water)		(m <sup>3</sup> / min.)		Reco	order, W	W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.3 <sup>1</sup>
	(up)	(down)	(difference)	X-axis		(CFM)		Y-axis
1	1.6	1.6	3.2	0.88	312	26		26.3074
2	2.7	2.7	5.4	1.1:	362	2 34		34.4020
3	4.0	4.0	8.0	1.37	768	8 45		45.5321
4	5.2	5.2	10.4	1.56	58	58 48		48.5676
5	6.3	6.3	12.6	1.72	207		54	54.6385
By Linear Regression of Y o	on X							
s	Slope, m	=	33.7	706	Inte	rcept, b =	-3.	2329
Correlation Co	efficient*	=	0.99	933				
Calibration A	ccepted	=	Yes/	No**	-			

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

\*\* Delete as appropriate.

Date

Remarks :			
Calibrated by	:	Henry Lau	Checked by
Dete	: -	19-Dec-18	Date

Chan Ka Chun : 19-Dec-18

:



# Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA1b	Calbration Date	:	18-Feb-19
Equipment no.	:	HVS001	Calbration Due Date	:	20-Apr-19

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition									
Temperature, T <sub>a</sub>		291		Kelvin	Pressure, P	а	1	015 mmHg	
Orifice Transfer Standard Information									
Equipment No.		Ori0005	1	Slope, m <sub>c</sub>	1.998	61	Intercept, bc	-0.00882	
Last Calibration Date		11-Jan-1	9		( H x	P <sub>a</sub> / 101	3.3 x 298 /	T <sub>a</sub> ) <sup>1/2</sup>	
Next Calibration Date		11-Jan-2	0		=	m <sub>c</sub> x	Q <sub>std</sub> + b <sub>c</sub>		
Calibration of TSP									
Calibration	Manometer Reading			G	) <sub>std</sub>	Contin	uous Flow	IC	
Point	H (inches of water)		(m <sup>3</sup>	/ min.)	Reco	order, W	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)		
	(up)	(down)	(difference)	X-	X-axis (CF		CFM)	Y-axis	
1	1.4	1.4	2.8	0.8	8524		22	22.2817	
2	2.4	2.4	4.8	1.1	1147		34	34.4354	
3	3.6	3.6	7.2	1.3	3642		42	42.5378	
4	4.6	4.6	9.2	1.5	5415		47	47.6018	
5	5.9	5.9	11.8	1.1	7452		54	54.6914	
By Linear Regression of	Y on X								
	Slope, m	=	35.4	579	Inte	ercept, b =	-6	.6215	
Correlation Co	pefficient*	=	0.99	958					
Calibration	Accepted	=	Yes/ł	<del>\o</del> **					

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

** Delete as appro	priate.					
Remarks :						
Calibrated by	:	Henry Lau		Checked by	:	Chan Ka Chun
Date	:	18-Feb-19	_	Date	:	18-Feb-19



# Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA2a	Calbration Date	:	19-Dec-18
Equipment no.	:	HVS002	Calbration Due Date	: _	18-Feb-19

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition									
Temperature, T <sub>a</sub>		29	93	Kelvin <b>Pressure</b> , <b>P</b> <sub>a</sub>				1020	mmHg
Orifice Transfer Standard Information									
Equipment No.		Ori31	66	Slope, m <sub>c</sub>	2.122	31	Intercept,	bc	-0.06016
Last Calibration Date		24-Jan	-18		( H x F	P <sub>a</sub> / 10	13.3 x 298	/T <sub>a</sub> )	1/2
Next Calibration Date		24-Jan	-19		=	m <sub>c</sub>	x Q <sub>std</sub> + b	С	
Calibration of TSP									
Calibration	Manometer Reading			Q	std	Contin	nuous Flow	low IC	
Point	H (inches of water)		(m <sup>3</sup> /	(m <sup>3</sup> / min.) Rec		order, W	(W(P <sub>a</sub> /10	13.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)	
	(up)	(down)	(difference)	X-a	xis	(	CFM)		Y-axis
1	1.5	1.5	3.0	0.8	541		28		28.3311
2	2.2	2.2	4.4	1.0	284		32		32.3784
3	3.7	3.7	7.4	1.3	253		40		40.4730
4	4.5	4.5	9.0	1.4	586		44		44.5203
5	6.0	6.0	12.0	1.6	799		52		52.6149
By Linear Regression of Y o	on X								
5	Slope, m	=	29.0	948	Inte	rcept, b	= 2	2.7348	
Correlation Co	efficient*	=	0.99	963	_				
Calibration A	ccepted	=	Yes/	₩0**	_				
					_				

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

Remarks	
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Calibrated by	:	Henry Lau	Checked by	Chan Ka Chun
Date	:	19-Dec-18	Date	19-Dec-18



# Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA2a	Calbration Date	:	18-Feb-19
Equipment no.	:	HVS002	Calbration Due Date	:	20-Apr-19

### CALIBRATION OF CONTINUOUS FLOW RECORDER

	Ambient Condition								
Temperature, T <sub>a</sub>		291		Kelvin <b>Pressure, P</b> a			1	015 mmHg	
Orifice Transfer Standard Information									
Equipment No.		Ori0005	5	Slope, m <sub>c</sub>	1.998	61	Intercept, bc	-0.00882	
Last Calibration Date		11-Jan-1	9		( H x	P <sub>a</sub> / 10	13.3 x 298 /	T <sub>a</sub> ) <sup>1/2</sup>	
Next Calibration Date		11-Jan-2	0		=	m <sub>c</sub> :	xQ <sub>std</sub> +b <sub>c</sub>		
Calibration of TSP									
Calibration	Manometer Reading			c	Q <sub>std</sub>	Conti	nuous Flow	IC	
Point	H (inches of water)		(m <sup>3</sup>	/ min.)	Recorder, W		$(W(P_a/1013.3x298/T_a)^{1/2}/35.31)$		
	(up)	(down)	(difference)	X-	axis	(CFM)		Y-axis	
1	1.7	1.7	3.4	0.	9388		24	24.3073	
2	2.4	2.4	4.8	1.	1147		33	33.4225	
3	4.0	4.0	8.0	1.4	4377		42	42.5378	
4	5.1	5.1	10.2	1.	6229		50	50.6402	
5	6.2	6.2	12.4	1.	7889		58	58.7427	
By Linear Regression of	Y on X								
	Slope, m	=	38.5	348	Inte	ercept, b	= -11	.2706	
Correlation Coefficient* = 0.9			0.99	949					
Calibration	Accepted	=	- Yes/No**						

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

Remarks :					
Calibrated by	:	Henry Lau	Checked by	:	Chan Ka Chun
Date	:	18-Feb-19	Date	: _	18-Feb-19



# Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA3a	Calbration Date	:	19-Dec-18
Equipment no.	: _	HVS012	Calbration Due Date	:	18-Feb-19

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition									
Temperature, T <sub>a</sub>			293	Kelvin	Pressure, F	<b>)</b> _a		1020	mmHg
Orifice Transfer Standard Information									
Equipment No.		Ori31	66	Slope, m <sub>c</sub>	2.1223	31	Intercept, k	oc ·	-0.06016
Last Calibration Date		24-Jar	า-18		(HxPa	/ 1013.	3 x 298 / 7	Γ <sub>a</sub> ) <sup>1/2</sup>	
Next Calibration Date		24-Jar	ו-19		=	m <sub>c</sub> x	(Q <sub>std</sub> + b	с	
Calibration of TSP									
Calibration	Manometer Reading			Q <sub>std</sub>		Continu	ious Flow		IC
Point	H (inches of water)		(m <sup>3</sup> / min.)		Reco	rder, W	(W(P <sub>a</sub> /1013.3)	(298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)	
	(up)	(down)	(difference)	X-axis	;	(C	FM)	Y-	axis
1	1.2	1.2	2.4	0.7669	)	:	20	20	.2365
2	2.0	2.0	4.0	0.9819	)	:	28	28	.3311
3	3.5	3.5	7.0	1.2897	7	:	37	37.	.4375
4	4.5	4.5	9.0	1.4586	3	i	41	41	.4848
5	5.5	5.5	11.0	1.6096	3		50	50	.5912
By Linear Regression of Y of	on X								
\$	Slope, m	=	33	3.7811	Inter	cept, b =		5.6420	
Correlation Cor	efficient*	=	0	.9918	_				
Calibration Accepted = Ye		Ye	≥s/No**	-					
					-				

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

Remarks :					
Calibrated by	:	Henry Lau	Checked by	:	Chan Ka Chun
Date	: _	19-Dec-18	Date	:	19-Dec-18



# Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	СМАЗа	Calbration Date	:	18-Feb-19
Equipment no.	:	HVS012	Calbration Due Date	:	20-Apr-19

### CALIBRATION OF CONTINUOUS FLOW RECORDER

	Ambient Condition								
Temperature, T <sub>a</sub>		291		Kelvin <b>Pressure, P</b> a			1	015 mmHg	
Orifice Transfer Standard Information									
Equipment No.		Ori0005		Slope, m <sub>c</sub>	1.998	61	Intercept, bc	-0.00882	
Last Calibration Date		11-Jan-1	9		( H x	P <sub>a</sub> / 10	)13.3 x 298 /	T <sub>a</sub> ) <sup>1/2</sup>	
Next Calibration Date		$= m_c x Q_{std} + b_c$							
Calibration of TSP									
Calibration	Manometer Reading			c	) <sub>std</sub>	Conti	nuous Flow	IC	
Point	H (inches of water)		(m <sup>3</sup>	/ min.)	Recorder, W		$(W(P_a/1013.3x298/T_a)^{1/2}/35.31)$		
	(up)	(down)	(difference)	Х-	C-axis (CFM)		(CFM)	Y-axis	
1	1.3	1.3	2.6	0.	8215		30	30.3841	
2	2.0	2.0	4.0	1.	0179		38	38.4866	
3	3.1	3.1	6.2	1.:	2662		44	44.5634	
4	4.0	4.0	8.0	1.	4377		49	49.6274	
5	5.0	5.0	10.0	1.	6069		54	54.6914	
By Linear Regression of	Y on X								
Slope, m = 29.9			29.9	992	Inte	ercept, b	=6.	6497	
Correlation Coefficient* = 0.9			0.99	964					
Calibration	Accepted	=	Yes/ł	<del>\o</del> **					

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

\*\* Delete as appropriate.

Remarks :					
Calibrated by	:	Henry Lau	Checked b	by :	Chan Ka Chun
Date	:	18-Feb-19	Date	:	18-Feb-19



### Calibration Data for High Volume Sampler (TSP Sampler)

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

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition									
Temperature, T <sub>a</sub>		29	93	Kelvin	Pressure,	Pa		1020	
Orifice Transfer Standard Information									
Equipment No.		Ori31	66	Slope, m <sub>c</sub>	2.122	31	Intercept,	bc	-0.06016
Last Calibration Date		24-Jan	-18		( H x F	P <sub>a</sub> / 101	3.3 x 298	/T <sub>a</sub> )	1/2
Next Calibration Date	24-Jan-19				=	m <sub>c</sub> >	k Q <sub>std</sub> + b	С	
Calibration of TSP									
Calibration	Manometer Reading			Q	std	Continu	uous Flow	IC	
Point	н	(inches c	of water)	<b>r)</b> (m <sup>3</sup> / min.)		Reco	order, W	(W(P <sub>a</sub> /10	13.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)
	(up)	(down)	(difference)	X-a	xis	(0	CFM)		Y-axis
1	1.5	1.5	3.0	0.8	541		24		24.2838
2	2.0	2.0	4.0	0.98	319		31	31.366	
3	3.6	3.6	7.2	1.30	)76		40		40.4730
4	4.2	4.2	8.4	1.4	101		47		47.5558
5	5.7	5.7	11.4	1.63	381		56		56.6622
By Linear Regression of Y	′ on X								
s	Slope, m	=	39.8	624	Inte	rcept, b =	-	9.2955	
Correlation Coe	efficient*	=	0.99	932	_				
Calibration A	ccepted	=	Yes/I	<del>\o</del> **	_				

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

\*\* Delete as appropriate.

Remarks : \_\_\_\_\_

Calibrated by	:	Henry Lau	Checked by	Chan Ka Chun
Date	:	19-Dec-18	Date :	19-Dec-18



# Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA4a	Calbration Date	:	18-Feb-19
Equipment no.	:	HVS004	Calbration Due Date	:	20-Apr-19

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition										
Temperature, T <sub>a</sub>		291		Kelvin	Pressure, P	a	1	015 mmHg		
			Orifice Tr	ansfer Sta	Indard Inform	nation				
Equipment No.		Ori0005 S			1.998	61	Intercept, bc	-0.00882		
Last Calibration Date		11-Jan-1	9		( H x	P <sub>a</sub> / 10	13.3 x 298 /	T <sub>a</sub> ) <sup>1/2</sup>		
Next Calibration Date	ration Date 11-Jan-20				=	m <sub>c</sub> >	κQ <sub>std</sub> +b <sub>c</sub>			
				Calibratio	n of TSP					
Calibration	Manometer Reading			G	l <sub>std</sub>	Contir	nuous Flow	IC		
Point	H (inches of water)		(m <sup>3</sup>	/ min.)	Rec	order, W	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31			
	(up)	(down)	(difference)	X-	axis	(CFM)		Y-axis		
1	1.4	1.4	2.8	0.8	3524		22	22.2817		
2	2.2	2.2	4.4	1.0	0674		33	33.4225		
3	2.9	2.9	5.8	1.:	2248		40	40.5122		
4	4.1	4.1	8.2	1.4	4555		47	47.6018		
5	5.8	5.8	11.6	1.	7304		58	58.7427		
By Linear Regression of	Y on X									
	Slope, m = 40.4			458	Inte	ercept, b	= -10	0.6963		
Correlation Coefficient* = 0.9			0.99	957						
Calibration Accepted = Yes				<del>\0</del> **						

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

Remarks :					
Calibrated by	:	Henry Lau	Checked by	:	Chan Ka Chun
Date	:	18-Feb-19	Date	: _	18-Feb-19



### Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA5b	Calbration Date	:	19-Dec-18
Equipment no.	:	HVS010	Calbration Due Date	:	18-Feb-19

#### CALIBRATION OF CONTINUOUS FLOW RECORDER

				Ambient Co	ondition				
Temperature, T <sub>a</sub>		293		Kelvin	Pressure,	Pa		1020	mmHg
			Orifice Tr	ansfer Stan	dard Inform	nation			
Equipment No.		Ori316	6	Slope, m <sub>c</sub>	2.122	31	Intercept, I	oc	-0.06016
Last Calibration Date	24-Jan-18				( H x F	P <sub>a</sub> / 101	3.3 x 298	/T <sub>a</sub> ) <sup>1</sup>	/2
Next Calibration Date		24-Jan-1	9		=	m <sub>c</sub> x	x Q <sub>std</sub> + b	с	
Calibration of TSP									
Calibration	Manometer Reading			Q	std	Continu	ious Flow		IC
Point	H (inches of water)		(m <sup>3</sup> /	min.)	Reco	rder, W	(W(P <sub>a</sub> /10	13.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)	
	(up)	(down)	difference	X-a	xis	(C	FM)		Y-axis
1	1.5	1.5	3.0	0.85	541	:	25		25.2956
2	2.8	2.8	5.6	1.15	566	:	34		34.4020
3	3.6	3.6	7.2	1.30	)76	:	38		38.4493
4	4.8	4.8	9.6	1.50	)55		46		46.5439
5	6.0	6.0	12.0	1.67	799		54		54.6385
By Linear Regression of Y	′ on X								
5	Slope, m	=	35	.1088	Inte	rcept, b =		5.8015	
Correlation Coe	efficient*	=	0.	9935					
Calibration A	ccepted	=	Yes	s/No**	-				
					-				

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

\*\* Delete as appropriate.

Remarks : \_\_\_\_\_

Calibrated by	:	Henry Lau	Checked by	:	Chan Ka Chun
Date	:	19-Dec-18	Date	:	19-Dec-18



# Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	CMA5b	Calbration Date	:	18-Feb-19
Equipment no.	:	HVS010	Calbration Due Date	:	20-Apr-19

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition									
Temperature, T <sub>a</sub>		291		Kelvin	Pressure, P	a	1	015 mmHg	
			Orifice Tr	ansfer Sta	andard Inform	mation			
Equipment No.		Ori0005		Slope, m <sub>c</sub>	1.998	61	Intercept, bc	-0.00882	
Last Calibration Date	11-Jan-19				( H x	P <sub>a</sub> / 10	13.3 x 298 /	T <sub>a</sub> ) <sup>1/2</sup>	
Next Calibration Date		11-Jan-2	0		=	m <sub>c</sub> :	$x Q_{std} + b_{c}$		
				Calibratio	on of TSP				
Calibration	Manometer Reading			c	) <sub>std</sub>	Conti	nuous Flow	IC	
Point	H (inches of water)		(m <sup>3</sup>	/ min.)	Recorder, W		$(W(P_a/1013.3x298/T_a)^{1/2}/35.31)$		
	(up)	(down)	(difference)	X-	axis (CFM)		(CFM)	Y-axis	
1	1.2	1.2	2.4	0.	7895	37		37.4738	
2	2.0	2.0	4.0	1.	0179		42	42.5378	
3	3.1	3.1	6.2	1.:	2662		50	50.6402	
4	4.0	4.0	8.0	1.	4377		56	56.7171	
5	5.0	5.0	10.0	1.	6069		61	61.7811	
By Linear Regression of	Y on X								
Slope, m = 30.4			30.4	544	Inte	ercept, b	= 12	.5644	
Correlation Coefficient* = 0.9			0.99	972					
Calibration	Yes/	<del>\o</del> **							

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

** Delete as appro	priate.				
Remarks :					
Calibrated by	:	Henry Lau	Checked by	:	Chan Ka Chun
Date	:	18-Feb-19	Date	:	18-Feb-19



# Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	MA1e	Calbration Date	:	19-Dec-18
Equipment no.	:	HVS007	Calbration Due Date	:	18-Feb-19

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition									
Temperature, T <sub>a</sub>		293		Kelvin	Pressure, P	а	1	020 mmHg	
			Orifice Tr	ansfer Sta	andard Inform	mation			
Equipment No.		Ori3166		Slope, m <sub>c</sub>	2.122	31	Intercept, bc	-0.06016	
Last Calibration Date		24-Jan-1	8		( H x	P <sub>a</sub> / 10	)13.3 x 298 /	T <sub>a</sub> ) <sup>1/2</sup>	
Next Calibration Date		24-Jan-1	9		=	m <sub>c</sub>	x Q <sub>std</sub> + b <sub>c</sub>		
Calibration of TSP									
Calibration Manometer Reading			c	) <sub>std</sub>	Conti	nuous Flow	IC		
Point	H (inches of water)		(m <sup>3</sup>	/ min.)	Red	corder, W	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)		
	(up)	(down)	(difference)	X-	X-axis (C		(CFM)	Y-axis	
1	1.8	1.8	3.6	0.9	.9329 2		24	24.2838	
2	2.5	2.5	5.0	1.0	0944		33	33.3902	
3	4.0	4.0	8.0	1.3	3768		43	43.5085	
4	5.2	5.2	10.4	1.	5658		50	50.5912	
5	6.5	6.5	13.0	1.1	7473		57	57.6740	
By Linear Regression of	Y on X								
Slope, m = 39.8			39.8	628	Inte	ercept, b	= -11	.6647	
Correlation Coefficient* = 0.9			0.99	973					
Calibration	Accepted	=	Yes/ł	<del>\o</del> **					

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

Remarks :					
Calibrated by	:	Henry Lau	Checked by	:	Chan Ka Chun
Date	:	19-Dec-18	Date	:	19-Dec-18



# Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	MA1e	Calbration Date	:	18-Feb-19
Equipment no.	:	HVS007	Calbration Due Date	:	20-Apr-19

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition								
Temperature, T <sub>a</sub>		291		Kelvin	Pressure, P	а	1	015 mmHg
			Orifice Tr	ansfer Sta	andard Inform	mation		
Equipment No.		Ori0005		Slope, m <sub>c</sub>	1.998	61	Intercept, bc	-0.00882
Last Calibration Date	11-Jan-19				( H x	P <sub>a</sub> / 10	13.3 x 298 /	T <sub>a</sub> ) <sup>1/2</sup>
Next Calibration Date		11-Jan-2	0		=	m <sub>c</sub> :	xQ <sub>std</sub> +b <sub>c</sub>	
				Calibratio	on of TSP			
Calibration	Manometer Reading			c	) <sub>std</sub>	Conti	nuous Flow	IC
Point	H (inches of water)		(m <sup>3</sup>	/ 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.	9659		22	22.2817
2	2.4	2.4	4.8	1.	1147		31	31.3969
3	3.8	3.8	7.6	1.4	4014		41	41.5250
4	5.0	5.0	10.0	1.	6069		50	50.6402
5	6.1	6.1	12.2	1.	7744		56	56.7171
By Linear Regression of	Y on X							
	Slope, m	=	41.5	898	Inte	ercept, b	= -16	6.5769
Correlation Coefficient* = 0.				969				
Calibration	Accepted	=	Yes/ł	<del>Vo</del> **				

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

Remarks :						
Calibrated by	:	Henry Lau		Checked by	:	Chan Ka Chun
Date	:	18-Feb-19	_	Date	:	18-Feb-19



# Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	MA1w	Calbration Date	:	19-Dec-18
Equipment no.	:	HVS008	Calbration Due Date	:	18-Feb-19

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition									
Temperature, T <sub>a</sub>		293		Kelvin	Pressure, P	а	1	020 mmHg	
Orifice Transfer Standard Information									
Equipment No.		Ori3166		Slope, m <sub>c</sub>	2.122	31	Intercept, bc	-0.06016	
Last Calibration Date		24-Jan-18			( H x	P <sub>a</sub> / 10	13.3 x 298 /	T <sub>a</sub> ) <sup>1/2</sup>	
Next Calibration Date		24-Jan-1	9		=	m <sub>c</sub> :	xQ <sub>std</sub> +b <sub>c</sub>		
Calibration of TSP									
Calibration	Manometer Reading			G	) <sub>std</sub>	Conti	nuous Flow	IC	
Point	H (inches of water)		(m <sup>3</sup>	/ min.) Recor		order, W	(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)		
	(up)	(down)	(difference)	X-	axis		(CFM)	Y-axis	
1	1.7	1.7	3.4	0.9	9074		24	24.2838	
2	2.6	2.6	5.2	1.1	1155		33	33.3902	
3	4.2	4.2	8.4	1.4	4101	43		43.5085	
4	5.3	5.3	10.6	1.	5806		50	50.5912	
5	6.6	6.6	13.2	1.1	7605		57	57.6740	
By Linear Regression of	Y on X								
	Slope, m	=	38.5	875	Inte	ercept, b	= -10	.3897	
Correlation Coefficient* = 0.9993									
Calibration	Accepted	=	Yes/ł	<del>\o</del> **					

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

\*\* Delete as appropriate.

Remarks :						
Calibrated by	:	Henry Lau		Checked by	:	Chan Ka Chun
Date	:	19-Dec-18	_	Date	:	19-Dec-18

\_



# Calibration Data for High Volume Sampler (TSP Sampler)

Location	:	MA1w	Calbration Date	:	18-Feb-19
Equipment no.	:	HVS008	Calbration Due Date	:	20-Apr-19

### CALIBRATION OF CONTINUOUS FLOW RECORDER

Ambient Condition								
Temperature, T <sub>a</sub>		291		Kelvin	Pressure, P	a	1	015 mmHg
			Orifice Tr	ansfer Sta	andard Inform	nation		
Equipment No.		Ori0005		Slope, m <sub>c</sub>	1.998	61	Intercept, bc	-0.00882
Last Calibration Date		11-Jan-19			( H x	P <sub>a</sub> / 10	)13.3 x 298 /	T <sub>a</sub> ) <sup>1/2</sup>
Next Calibration Date		11-Jan-2	0		=	m <sub>c</sub>	xQ <sub>std</sub> +b <sub>c</sub>	
				Calibratio	on of TSP			
Calibration	Manometer Reading			c	Q <sub>std</sub>	Conti	nuous Flow	IC
Point	H (inches of water)		(m <sup>3</sup>	/ min.)	Recorder, W		(W(P <sub>a</sub> /1013.3x298/T <sub>a</sub> ) <sup>1/2</sup> /35.31)	
	(up)	(down)	(difference)	X-	axis		(CFM)	Y-axis
1	1.8	1.8	3.6	0.	9659		24	24.3073
2	2.6	2.6	5.2	1.	1600	34		34.4354
3	4.0	4.0	8.0	1.4	4377		42	42.5378
4	5.2	5.2	10.4	1.	6386		50	50.6402
5	6.4	6.4	12.8	1.3	8174		54	54.6914
By Linear Regression of	Y on X							
	Slope, m	=	35.2	899	Inte	ercept, b	= -8	.2225
Correlation Coefficient* = 0.5				934				
Calibration Accepted = Yes/No**								

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

Remarks :					
Calibrated by	:	Henry Lau	Checked by	:	Chan Ka Chun
Date	:	18-Feb-19	Date	: _	18-Feb-19



#### 综合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港美行就道 37號利達中心12樓

12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



# CERTIFICATE OF CALIBRATION

Certificate No.:	18CA1114 02			Page	1	of	2
Item tested							
Description:	Sound Level Mete	(Type 1)	20 O	Microphone			
Manufacturer:	B&K			B&K			
Type/Model No.:	2236		2 3	4188			
Serial/Equipment No.:	2100736		8) - E	2288941			
Adaptors used:			Ş :	-			
Item submitted by							
Customer Name:	Lam Environment	al Service Ltd.					
Address of Customer:	The second second						
Request No .:	-						
Date of receipt:	14-Nov-2018						
Date of test:	15-Nov-2018						
Reference equipment	used in the calib	ration					
Description:	Model:	Serial No.		Expiry Date:		Traceal	ale to:
Multi function sound calibrator	B&K 4228	2288444		23-Aug-2019		CIGISME	C
Sional generator	DS 360	33873		24-Apr-2019		CEPREI	
Signal generator	DS 360	61227		23-Apr-2019		CEPREI	
Ambient conditions		Control -					
Temperature:	20 ± 1 °C						
Relative humidity:	50 ± 10 %						
Air pressure:	1000 ± 5 hPa						
Test enecifications							

- 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
- 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: Date: 15-Nov-2018 Company Chop:

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Form No.CARP152-18 num 1/Rev.C/01/02/2007



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香 憲 黄 竹 坑 道 3 7 號 利 嶠 中 心 1 2 樓 12F., Laader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

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



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### CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA1114 02

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of

#### **Electrical Tests** 1.

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	
Series and the series of	c	Pass	1.0	2.1
	Lin	Pass	20	22
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	
	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	
Control of the Market of Market	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/10 <sup>3</sup> at 4kHz	Pass	0.3	
100010-00000000000	1 ms burst duty factor 1/10 <sup>4</sup> 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	

#### Response to associated sound calibrator 3.

#### 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.

	1	- End -	Amin	
Calibrated by:	~ 7	Checked by:	2 hours	
Date:	Fung Chi Yip 15-Nov-2018	Date:	Shek Kwong Tat 15-Nov-2018	

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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12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

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



### CERTIFICATE OF CALIBRATION

Certificate No.:	18CA0213 02		Page	1	of	2
Item tested						
Description: Manufacturer: Type/Model No.: Serial/Equipment No.: Adaptors used:	Sound Level Me B & K 2250 2701778 -	ter (Type 1)	Microphone B & K 4950 2755097		Preamp B & K ZC0032 19223 -	
Item submitted by						
Customer Name: Address of Customer: Request No.: Date of receipt:	Lam Geotechnic - 13-Feb-2018	s Limited.				
Date of test:	21-Feb-2018					
Reference equipment	used in the cali	bration				
Description: Multi function sound calibrator	Model: B&K 4225	Serial No. 2288444	Expiry Date: 08-Sep-2018		Traceab	le to: C

Multi function sound calibrator	B&K 4226	2288444	08-Sep-2018	CIGISME
Signal generator	DS 360	33873	25-Apr-2018	CEPREI
Signal generator	DS 360	61227	01-Apr-2018	CEPREI
Ambient conditions				

Temperature:	20 ± 1 °C
Relative humidity:	50 ± 10 %
Air pressure:	1000 ± 5 hPa

#### Test specifications

- 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.
- 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%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference 3. 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: Fen Jun O

21-Feb-2018 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:

C Soils & Materials Engineering Co. Ltd

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



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12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website; www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



### CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA0213 02

Page 2

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#### 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.

			Expanded	Coverage
Test:	Subtest:	Status:	Uncertanity (dB)	Factor
Self-generated noise	А	Pass	0.3	
	с	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	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	
	С	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 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> 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.



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.

C Soils & Material's Engineering Co. Ltd

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



#### 综合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong.

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

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



### **CERTIFICATE OF CALIBRATION**

19CA0222 02		Page	1 of 2
Sound Level Meter B & K 2250 2701778 -	r (Type 1)	Microphone B & K 4950 2755097 -	Preamp B & K ZC0032 19223 -
Lam Geotechnics - - 22-Feb-2019	Limited.		
25-Feb-2019			
used in the calib	ration		
Model: B&K 4226 DS 360 DS 360	Serial No. 2288444 33873 61227	Expiry Date: 23-Aug-2019 24-Apr-2019 26-Dec-2019	Traceable to: CIGISMEC CEPREI CEPREI
21 ± 1 °C 55 ± 10 % 1005 ± 5 hPa			
	19CA0222 02 Sound Level Meter B & K 2250 2701778 - Lam Geotechnics I - 22-Feb-2019 25-Feb-2019 15ed in the calibut Model: B&K 4226 DS 360 DS 360 21 ± 1 °C 55 ± 10 % 1005 ± 5 hPa	19CA0222 02   Sound Level Meter (Type 1)   B & K   2250   2701778   -   Lam Geotechnics Limited.   -   22-Feb-2019   25-Feb-2019   seed in the calibration   Model: Serial No.   B&K 4226 2288444   DS 360 33873   DS 360 61227   21 ± 1 °C 55 ± 10 %   1005 ± 5 hPa	19CA0222 02 Page   Sound Level Meter (Type 1) Microphone   B & K B & K   2250 4950   2701778 2755097   - -   Lam Geotechnics Limited. -   - -   22-Feb-2019 -   25-Feb-2019 -   seed in the calibration Expiry Date:   B&K 4226 2288444 23-Aug-2019   DS 360 33873 24-Apr-2019   DS 360 61227 26-Dec-2019   21 ± 1 °C 55 ± 10 % 1005 ± 5 hPa

- 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.
- 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 <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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香港寅竹坑狙37號利莲中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533

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### CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No..

19CA0222 02

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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.

			Expanded	Coverage
Test:	Subtest:	Status:	Uncertanity (dB)	Factor
Self-generated noise	А	Pass	0.3	
<b>3</b>	С	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	
	С	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 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> 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.

Uncertanity (dB)	Factor
0.3	
0.5	
	0.3 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.

	0	- End -		1	
Calibrated by:	El	Checked by	y:	$1 \sim \chi$	
	Fong Chun Wai			Fung Chi Yip (\	
Date:	25-Feb-2019	Date	e:	26-Feb-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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Tel: (852) 2873 6860 Fax: (852) 2555 7533



### CERTIFICATE OF CALIBRATION

Certificate No.:	18CA0309 01		Page	1	of	2
Item tested						
Description: Manufacturer: Type/Model No.: Serial/Equipment No.: Adaptors used:	Sound Level Mete B & K 2250-L 2722310	r (Type 1)	Microphone B & K 4950 2698702		Preamp B & K ZC0032 13318	
Item submitted by						
Customer Name: Address of Customer: Request No.: Date of receipt:	Lam Geotechnics - - 09-Mar-2018	Ltd.				
Date of test:	10-Mar-2018					
Reference equipment	used in the calib	ration				
Description: Multi function sound calibrator Signal generator Signal generator	Model: B&K 4226 DS 360 DS 360	Serial No. 2288444 33873 61227	Expiry Date: 08-Sep-2018 25-Apr-2018 01-Apr-2018		Traceat CIGISME CEPREI CEPREI	ble to: C
Ambient conditions						
Temperature: Relative humidity: Air pressure:	21 ± 1 °C 50 ± 10 % 1000 ± 5 hPa					
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: Date: 12-Mar-2018 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.

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香港黄竹坑道37號利達中心12樓

12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



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### CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA0309 01

Page

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#### 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.

			Expanded	coverage
Test:	Subtest:	Status:	Uncertanity (dB)	Factor
Self-generated noise	A	Pass	0.3	
	С	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	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	
	С	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 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> 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.



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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E-mail: smec@cigismec.com

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



### CERTIFICATE OF CALIBRATION

Website: www.cigismec.com

Certificate No.:	18CA0413 02		Page	1	of	2
Item tested						
Description: Manufacturer: Type/Model No.: Serial/Equipment No.: Adaptors used:	Sound Level Met B & K 2250-L 2722311	er (Type 1)	Microphone B & K 4950 2698703		Preamp B & K ZC0032 13321	
Item submitted by						
Customer Name: Address of Customer: Request No.: Date of receipt:	Lam Geotechnics - - 13-Apr-2018	s Ltd.				
Date of test:	18-Apr-2018					
Reference equipment	used in the calil	bration				
Description: Multi function sound calibrator Signal generator	Model: 8&K 4226 DS 360	Serial No. 2288444 33873	Expiry Date: 08-Sep-2018 25-Apr-2018		Traceab CIGISME CEPREI	le to: C

#### Ambient conditions

Temperature:	20 ± 1 °C
Relative humidity:	50 ± 10 %
Air pressure:	1000 ± 5 hPa

#### 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.



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.

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12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong, E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



### CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA0413 02

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#### 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:	Uncertanity (dB)	Coverage Factor
Self-generated noise	А	Pass	0.3	
	С	Pass	0.8	
	Lin	Pass	1.6	
Linearity range for Leq	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	
	С	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 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/104 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.



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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#### 综合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港貴竹筑道37號利進中心12葉 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong,

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



### CERTIFICATE OF CALIBRATION

Certificate No.:	19CA0116 02		Page	1	of	2
Item tested						
Description: Manufacturer: Type/Model No.:	Sound Level Mete B & K 2250L	er (Type 1)	Microphone B & K 4950	Microphone B & K		
Serial/Equipment No.: Adaptors used:	3002695		2940839		18582	
Item submitted by						
Customer Name:	Lam Geotechnics	Ltd.				
Address of Customer:	-					
Request No.:	Beaucannes					
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	le to:
Multi function sound calibrator	B&K 4226	2288444	23-Aug-2019		CIGISME	C
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 encelfications				_		

#### 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.

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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:

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Approved Signatory:

Form No.CARP152-Mesue MRev C/01/02/2007



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香 挹 黃 竹 坑 道 3 7 號 利 嶐 中 心 1 2 條 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

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 122 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 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> 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.



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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12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong, E-mail: smec@clgismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533



### CERTIFICATE OF CALIBRATION

Certificate No.:	18CA0907 02		Page	1	of	2
Item tested						
Description	Sound Level Mete	er (Type 1)	Microphone		Preamp	
Manufacturer:	B&K		B&K		B&K	
Type/Model No.:	2250-L		4950		ZC0032	
Serial/Equipment No.:	3006790		2827240		21213	
Adaptors used:	-					
Item submitted by						
Customer Name:	Lam Geotechnics	Limited				
Address of Customer:						
Request No.:						
Date of receipt:	07-Sep-2018					
Date of test:	10-Sep-2018					
Reference equipment	used in the calib	ration				
Description:	Model:	Serial No.	Expiry Date:		Traceab	le to:
Multi function sound calibrator	B&K 4226	2288444	23-Aug-2019		CIGISME	C
Sional generator	DS 360	33873	24-Apr-2019		CEPRE!	3
Signal generator	DS 360	61227	23-Apr-2019		CEPREI	
Ambient conditions						
Temperature	21 * 1 °C					
Relative humidity:	50 ± 10 %					
Air pressure:	1005 ± 5 hPa					
Test enecifications						
rest specifications						
1 The Sound Level Me	ter has been calibrat	ed in accordance with	the requirements as see	cifie	d in BS 79	80. Part 1
and the lab calibratio	n procedure SMTPO	M.CA.152	ine requirements so spe		0.0000	and the second second

- 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:

Feng

10-Sep-2018 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:

@ Sold & Materials Engineering Cir. Ltd.

Form No. CARP 152-Literuar 1/Rev. CK01002/2007



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Page



### CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA0907 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.B	
	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	
	С	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
and a second second second	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 1	Single burst 5 ms at 2000 Hz	Pass	0.3	
Contractory and the contractory	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor 1/103 at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> 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	
	Lea	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: Fung Chi Yip sk Kwong Tat 10-Sep-2018 Date: 10-Sep-2018 Date:

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.

O Sale & Materials Ergenütring Cit. Ltd.

Form No CARP 152 24ssue 1/Rev C/01/02/2007





### CERTIFICATE OF CALIBRATION

Certificate No.:	18CA0510 04		Page	1	of	2
Item tested						
Description: Manufacturer: Type/Model No.: Serial/Equipment No.: Adaptors used:	Sound Level Mete Larson Davis LxT1 0004796 -	er (Type 1)	Microphone PCB 377B02 155507		Preamp PCB PRMLx 042621	) T1L
Item submitted by						
Customer Name: Address of Customer: Request No.: Date of receipt:	Lam Geotechnics - - 10-May-2018	Ltd				
Date of test:	11-May-2018					
Reference equipment	used in the calib	ration				
Description: Multi function sound calibrator Signal generator	Model: B&K 4226 DS 360	Serial No. 2288444 61227	Expiry Date: 08-Sep-2018 23-Apr-2019		Traceat CIGISME CEPREI	ole to: C
Ambient conditions						
Temperature: Relative humidity; Air pressure:	21 ± 1 °C 50 ± 10 % 1005 ± 5 hPa					

#### 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.
- 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%.
- 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

Fend Juna

Approved Signatory:





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:

C Soils & Materials Engineering Co., Ltd.

Form No CARP152-186506 1/Rev C/01/02/2007



#### 綜合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香港黄竹坑道37號利達中心12樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com

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



### CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA0510 04

Website: www.clgismec.com

Page

2 nf

#### 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	
	С	Pass	0.8	2.1
	Lin	Pass	16	22
Linearity range for Leq	At reference range , Step 5 dB at 4 kHz	Pass	0.3	4
	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	
	Single Burst Slow	Pass	03	
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 <sup>3</sup> at 4kHz	Pass	0.3	
	1 ms burst duty factor 1/10 <sup>4</sup> at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.5	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.4	
	Lea	Pace	0.3	
		1 0 3 3	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



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

C Sols & Materials Engineering Co. Ltd

Form No CARP152-24ssue 1/Rev C/01/02/2007

# Calibration Certificate

Certificate Number 2018010851

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

Model Number	iber CAL200 ber 13098 Is <b>Pass</b>		Procedure Number	D0001.8385			
Serial Number			Technician	Scott Montgomery			
Test Results			Calibration Date	29 Oct 2018			
Initial Condition	Incore	bla.	Calibration Due				
	Inoperable		Temperature	23	*C	± 0.3 °C	
Description	Larson Davis CAL200 Acoustic Calibrator		Humidity	34	%RH	± 3 %RH	
			Static Pressure	101.2	kPa	±1kPa	
Evaluation Method		The data is aquired by the insert voltage circuit sensitivity. Data reported in dB	ge calibration method using the 20 µPa.	ne refere	nce mi	crophone's open	
Compliance Standards		Compliant to Manufacturer Specifications per D0001.8190 and the following standards: IEC 60942:2017 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.

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	4	
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 Piczotronics, Inc 1681 West 820 North Provo, UT 84601, United States 716-684-0001





10/29/2018 1-43-01PM



### 綜合試驗有限公司 SOILS & MATERIALS ENGINEERING CO., LTD. 香 徳 黄 竹 坑 砲 3 7 號 利 達 中 心 1 2 樓 12F., Loader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong,

E-mail: smec@cigismec.com Website: www.cigismec.com Tel: (852) 2873 6860 Fax: (852) 2555 7533

24-Apr-2019



### CERTIFICATE OF CALIBRATION

Certificate No.:	18CA1220 02		Page:	1	of	2
Item tested						
Description:	Acoustical Calib	rator (Class 1)				
Manufacturer:	Larson Davis	8889 B. C.				
Type/Model No.:	CAL200					
Serial/Equipment No.:	13128					
Adaptors used:	00,225975-00 875					
Item submitted by						
Curstomer:	Lam Environme	ntal Service Ltd.				
Address of Customer:						
Request No.:						
Date of receipt:	20-Dec-2018					
Date of test:	28-Dec-2018					
Reference equipment	used in the cal	ibration				
Description:	Model:	Serial No.	Expiry Date:	13	Traceable	to:
Lab standard microphone	B&K 4180	2412857	20-Apr-2019		SCL	
Preamplifier	B&K 2673	2239857	27-Apr-2019		CEPREI	
Measuring amplifier	B&K 2610	2346941	08-May-2019		CEPREI	
Signal generator	DS 360	33873	24-Apr-2019	- 83	CEPREI	
Digital multi-meter	34401A	US36087050	23-Apr-2019	- 19	CEPREI	
Audio analyzer	80030	CP41200250	23 Apr 2019		CEDOEI	

#### Ambient conditions

Universal counter

Temperature:	20±1°C
Relative humidity:	50 ± 10 %
Air pressure:	1000 ± 5 hPa

53132A

#### Test specifications

1. The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B and the lab calibration procedure SMTP004-CA-156.

MY40003662

- 2. The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.
- З, The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference. pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

#### Test results

This is to certify that the sound calibrator conforms to the requirements of annex B of IEC 60942, 1997 for the conditions under which the test was performed. This does not imply that the sound calibrator meets IEC 60942 under any other conditions.

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

at

Fend



Jungi

29-Dec-2018 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:

© Soits & Material's Engineering Coll Ltd.

Farm No. CARP106-54ssue 1/Rev. Dt01/03/2007

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

香 進 黄 竹 坑 道 3 7 號 利 達 中 心 1 2 樓 12/F., Leader Centre, 37 Wong Chuk Hang Road, Aberdeen, Hong Kong. E-mail: smec@cigismec.com Website: www.cigismec.com

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



### CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.:

18CA1220 02

2 Page:

#### Measured Sound Pressure Level 1.

The output Sound Pressure Level in the calibrator head was measured at the setting and frequency shown using a calibrated laboratory standard microphone and insert voltage technique. The results are given in below with the estimated uncertainties.

Fr	Requency	Output Sound Pressure	Measured Output	Estimated Expanded
	Shown	Level Setting	Sound Pressure Level	Uncertainty
	Hz	dB	dB	dB
	1000	94.00	93.84	0.10

#### 2, Sound Pressure Level Stability - Short Term Fluctuations

The Short Term Fluctuations was determined by measuring the maximum and minimum of the fast weighted DC output of the B&K 2610 measuring amplifier over a 20 second time interval as required in the standard. The Short Term Fluctuation was found to be:

At 1000 Hz	STF = 0.006 dB

Estimated expanded uncertainty

#### 3, Actual Output Frequency

The determination of actual output frequency was made using a B&K 4180 microphone together with a B&K 2673 preamplifier connected to a B&K 2610 measuring amplifier. The AC output of the B&K 2610 was taken to an universal counter which was used to determine the frequency averaged over 20 second of operation as required by the standard. The actual output frequency at 1 KHz was:

0.005 dB

At 1000 Hz	Actual Frequency = 999.4 Hz		
Estimated expanded uncertainty	0.1 Hz	Coverage factor k = 2.2	

#### 4, **Total Noise and Distortion**

For the Total Noise and Distortion measurement, the unfiltered AC output of the B&K 2610 measuring amplifier was connected to an Agilent Type 8903 B distortion analyser. The TND result at 1 KHz was

At 1000 Hz	TND = 0.4%
Estimated expanded uncertainty	0.7 %

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.

	Λ	- End -	1
Calibrated by:	$1 - \chi$	Checked by:	Hall
Date:	Fung Chi Yej 28-Dec-2018	Date:	Shek Kwong Tat 29-Dec-2018

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.

ID Solis & Materials Engineering Co., Ltd.

Form No.CARP198-24soue 1/Rev.CI01/05/2005