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Building Engineering Group (#12-00)

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1 March 2016

See **Distribution**

Dear Sir/Madam

CALIBRATION OF EQUIPMENT FOR PILE LOAD TEST BY SAC-SINGLAS ACCREDITED LABORATORIES

This circular is to remind the industry on the regulatory requirements relating to pile load tests carried out in connection with building works.

2 Under Regulation 39(2)(b) of the Building Control Regulations, any test for the purpose of Section 7A(2) of the Building Control Act is to be carried out in a SAC-SINGLAS accredited laboratory. These tests include calibration tests for equipment like load cells, pressure gauges and movement gauges used in pile load testing.

3 Before commencement of any pile load testing at site, Qualified Persons (QP) supervising the pile load test will have to inspect the test equipment to check that they are functional and properly calibrated. BCA would like to remind QP to exercise vigilance to check and verify the calibration reports issued by the laboratories.

4. QPs are to take note that not all laboratories are SAC-SINGLAS accredited, and that accreditation may only be for specific services rendered by these companies. QPs are therefore reminded to ensure that the laboratory that you have engaged to carry out the test is SAC-SINGLAS accredited for that specific scope of test. The accreditation status of companies and their scopes of accreditation can be found at the Singapore Accreditation Council's website (www.sac-accreditation.gov.sg).

5. QPs are advised to check that each of the test equipment used in the pile load testing bears a valid calibration certificate, issued by a SAC-SINGLAS accredited laboratory to the full capability or capacity of the test equipment. QPs should also check for the SAC accreditation mark on the endorsed calibration reports and certificates for the test equipment as proof that the services has attained accreditation from SAC, before allowing them to be used for pile load testing at site. A sample of an endorsed calibration report for load cell is shown in Annex A.

6 QPs supervising building works that require the use of load cells or hydraulic jacks to measure forces are also reminded to check and verify the calibration reports of these equipment. Examples of building work that require the use of these equipment include pre-loading of ERSS struts, prestressing, ground anchors, etc.

7 I would appreciate it if you could bring to the attention of your members the contents of this circular. Please contact Dr Yet Nai Song or Mr Kwa Chin Soon at Tel 6804 4600 or email kwa_chin_soon@bca.gov.sg, if you need further clarification. Thank you.

Yours faithfully

A handwritten signature in black ink, appearing to read 'Kiefer Chiam', written in a cursive style.

ER. KIEFER CHIAM
DIRECTOR
BUILDING ENGINEERING GROUP
For COMMISSIONER OF BUILDING CONTROL

ANNEX A – SAMPLE OF ENDORSED CALIBRATION REPORT FOR LOAD CELL

CALIBRATION REPORT

Submitted by:

Calibration Date	: 16/07/15	Page 1 of 2	
UUT Brand / Model	:	Report Number	:
UUT Serial Number	:	Job Number	:
UUT Capacity	:	Procedure	:
UUT Display Brand / Model	:	Test Location	:
UUT Display Serial Number	:	Relative Humidity	: 41 ±10% R.H.
UUT Cable Brand / Model	: Hardwired to UUT	Ambient Temperature	: 26.0 ±1.0 °C
UUT Cable Serial Number	: Not Applicable	Date of Report	: 17/07/15

METHOD OF CALIBRATION

The instrument was calibrated at _____ Force Measurement Laboratory.
The method used in the calibration is in accordance with _____

The laboratory's acceptable environmental conditions during calibration is:
Temperature: 18°C to 28°C and Relative Humidity: 20% to 80%.

The following tests were performed (Compression only):

1. Preloading: The instrument was preloaded 3 times at maximum force. The duration for each preload was 60 seconds.
2. Creep: The creep test was performed after the preload test. The maximum force was applied to the instrument for a duration of 60 seconds. The creep measurement was performed after the maximum force was removed.
3. Repeatability/Reproducibility (Rotation): There were 2 runs at 0°, 1 run at 120° and 1 run at 240°, all incremental forces only.

The mean indicated deflections for each applied loads were calculated from Runs 1, 3 and 4.

TRACEABILITY

The reference force transducer used is traceable to National Institute of Metrology (NIM, China) certificate number: _____, with the serial number: _____ and display serial number: _____

The force measuring system was calibrated by National Metrology Centre, A* STAR, Singapore with the calibration report number: _____

Calibrated By: _____

Calibration Officer

Checked By: _____

Approved Signatory



Results of Calibration

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Creep Test	UT Reading (kN)
Zero Load	0.00
Full Load	5000.08
Zero Load @ 30sec	0.52
Zero Load @ 300sec	0.10

Repeatability / Reproducibility (Rotation) Test

Nominal Force	UT Reading (kN)					Deviation kN	Deviation (%)	Expanded Uncertainty kN	Expanded Uncertainty (%)	Coverage Factor k
	1st Run 0°	2nd Run 0°	3rd Run 120°	4th Run 240°	Mean					
500	501.44	501.38	501.32	501.36	501.37	1.373	0.27	2.08	0.42	2.00
1000	1002.76	1002.78	1002.74	1002.72	1002.74	2.740	0.27	3.38	0.34	2.00
1500	1503.38	1503.32	1503.24	1503.36	1503.33	3.327	0.22	4.59	0.31	2.00
2000	2003.26	2003.30	2003.24	2003.28	2003.26	3.260	0.16	5.84	0.29	2.00
2500	2502.86	2502.68	2502.86	2502.76	2502.83	2.827	0.11	7.02	0.28	2.00
3000	3002.20	3002.24	3002.16	3002.20	3002.19	2.187	0.07	8.08	0.27	2.00
3500	3501.56	3501.48	3501.48	3501.52	3501.52	1.520	0.04	9.04	0.26	2.00
4000	4000.84	4000.80	4000.74	4000.78	4000.79	0.787	0.02	10.07	0.25	2.00
4500	4500.14	4500.20	4500.12	4500.16	4500.14	0.140	0.00	11.12	0.25	2.00
5000	4999.60	4999.72	4999.62	4999.68	4999.63	-0.367	-0.01	12.18	0.24	2.00

Calculated Relative Error (%)

Nominal Force (kN)	Reproducibility (b)	Repeatability (b')	Interpolation (fc)	Zero (fo)	Creep (c)
500	0.024	0.012	0.013	0.009	0.008
1000	0.004	0.002	0.007	0.009	0.008
1500	0.009	0.004	0.006	0.009	0.008
2000	0.002	0.002	0.001	0.009	0.008
2500	0.004	0.007	0.003	0.009	0.008
3000	0.001	0.001	0.003	0.009	0.008
3500	0.002	0.002	0.001	0.009	0.008
4000	0.002	0.001	0.002	0.009	0.008
4500	0.001	0.001	0.001	0.009	0.008
5000	0.002	0.002	0.001	0.009	0.008

The computed outputs are derived by fitting the data using the following equations:

$$F = A + A1(R) + A2(R^2) + A3(R^3)$$

where: $A = 6.052636E-01$

$A1 = 9.950372E-01$

$A2 = 1.865145E-06$

$A3 = -1.768964E-10$

$$R = B + B1(F) + B2(F^2) + B3(F^3)$$

where: $B = -5.962222E-01$

$B1 = 1.004956E+00$

$B2 = -1.864134E-06$

$B3 = 1.769075E-10$

F is the applied force and R is the UUT reading.

The reported measurement uncertainties were estimated at a level of confidence of approximately 95%.

The user should determine the suitability of the instrument for its intended use.

Calibrated By:

Calibration Officer



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