ACCREDITATION SCHEME FOR LABORATORIES

Technical Notes CE 001
Specific Requirements for Civil Engineering Testing Laboratories

Technical Notes CE 001, 29 March 2019
The SAC Accreditation Programme is managed by Enterprise Singapore

1. Introduction

1.1 The field of Civil Engineering Testing covers a wide range of tests in the measurement of strength, mechanical and physical testing of materials, structure and assemblies. It may be divided into the following broad categories:

- Concrete and its constituents, including admixtures
- Soil
- Bituminous mixtures and its constituents
- NDT for concrete
- Assemblies, example: pull out tests, curtain wall
- other building materials and products, example: bricks, tiles, paint

1.2 These Technical Note should be read in conjunction with documents SAC 01 "Terms and Conditions for Accreditation" and ISO/IEC 17025 "General requirements for the competence of testing and calibration laboratories".

1.3 Supplementary information for specific areas of testing within the Civil Engineering Testing field may be published as other Technical Notes.

2. Testing Machines

2.1 All testing machines shall be of appropriate types for the particular tests to be performed and each shall be of a suitable capacity. Where applicable, the testing machine shall be capable of applying the required load at continuous defined speeds until no greater load can be sustained.

2.2 The readability, accuracy and repeatability of testing machines shall comply with the requirements of the appropriate standard for which accreditation is sought.

3. Calibration of Equipment

3.1 Table 1 in this document sets out the normal frequencies for calibrations and checks of general equipment used in the field of Civil Engineering Testing

3.2 These frequencies are generally considered to be the minimum appropriate, unless the other criteria specified below are met:

(a) the equipment is of good quality and of proven stability , and

(b) the laboratory has both the equipment capability and staff expertise to perform adequate internal checks, and

(c) if any suspicion or indication of overloading or mishandling arises, the equipment will be checked immediately and thereafter at fairly frequent intervals until it can be shown that stability has not been impaired.

3.3 Where the criteria in 3.2 cannot be met or the relevant test standards have specified more stringent requirements, Table 1 or the more stringent requirements, whichever is more stringent shall be adopted.

3.4 Submissions for extension of calibration intervals based on factors such as history of stability, frequency of use, accuracy required and ability of staff to perform regular check may be considered. It is the responsibility of the testing laboratory to provide evidence that its calibration system would ensure that confidence in the equipment could be maintained.

3.5 Sensitive equipment such as balances, compressive strength testing machine shall be rechecked or recalibrated if they are moved.

TABLE 1 RECOMMENDED EQUIPMENT CALIBRATION INTERVALS

General (Civil Engineering Testing Laboratories)

S/N	TYPE OF EQUIPMENT	FREQUENCY OF CALIBRATION OR CHECK	PARAMETERS TO BE CHECKED	GENERAL PROCEDURES AND COMMENTS
1.	Accelerometers	1 year		
2.	Anemometers	1 year		
3.	Balances	1 year In addition: i) * Each weighing ii) * Monthly iii) * Half yearly	 i) Zero check ii) One point check using known mass close to sample weight iii) Repeatability, linearity or accuracy	 Reference mass to be calibrated every three years For repeatability of reading, ten weighing are made of mass having a value close to the maximum load of balance
4.	Barometers	* 3 months (single point)		Telephone comparison with meteorology department
5.	Dial gauges	1 year		
6.	Dies and cutters (For preparation of test specimens such as Geosynthetics)		Full dimensional check whenever sharpen	Frequent examination for damage

S/N	TYPE OF EQUIPMENT	FREQUENCY OF CALIBRATION OR CHECK	PARAMETERS TO BE CHECKED	GENERAL PROCEDURES AND COMMENTS
7.	Environmental chambers	1 year	Temperature and humidity variation	
8.	Extensometers a) Lever and mirror type b) Micrometer screw type c) Dial indicator type d) Recording types with electrical output	 1 year 1 year 1 year 1 year		
9.	Force Measuring Device (proving ring, transducer or load cell)	1 year		
10.	Force Testing Machine (Tension, Compression, Universal)	1 year		
11.	Gauge Blocks a) Reference standards b) Working equipment	 4 years 2 years		

S/N	TYPE OF EQUIPMENT	FREQUENCY OF CALIBRATION OR CHECK	PARAMETERS TO BE CHECKED	GENERAL PROCEDURES AND COMMENTS
12.	Hygrometers and Psychrometers a) Assman hygrometers and sling type hygrometers b) Recorders (accuracy of ± 1% RH) c) Other recorder including hair types	 5 years 2 years 1 year		
13.	Linear Variable Differential Transducers (LVDTS)	* Daily or whenever used 1 year complete calibration	Check against length standards	
14.	Length Measuring Devices a) Steel Rule b) Vernier calipers	 Initial 5 years (Reference) 1 year * Routine checks monthly or less depending on use		

S/N	TYPE OF EQUIPMENT	FREQUENCY OF CALIBRATION OR CHECK	PARAMETERS TO BE CHECKED	GENERAL PROCEDURES AND COMMENTS
	c) Micrometer	1 year * Routine checks monthly or less depending on use	Check anvil for flatness	
15.	Manometers	1 year		
16.	Orifice Plates	* Initial * 6 months	Visual inspection for damage, wear or contamination	
17.	Ovens	1 year		
18.	Pressure and Vacuum Gauges a) Working gauges subjected to shock loading b) Working gauges not subjected to shock loading	 6 monthly or less depending on use 1 year		
19.	Stop watches and clocks	* 3 months		Comparison against the Singapore Standard Time over at least ten minutes
20.	Strain Meters	* 6 months		Using stop watch

S/N	TYPE OF EQUIPMENT	FREQUENCY OF CALIBRATION OR CHECK	PARAMETERS TO BE CHECKED	GENERAL PROCEDURES AND COMMENTS
21.	Tachometers	1 year		
22.	Thickness Gauges	1 year		
23.	Thermohygrograph	1 year		
24.	Thermometers a) Liquid-in-glass b) Electronic	 2 years * 1 year 1 year	Checks at ice-points and at one point within the working range	
25.	Thermocouples	Initial * 6 month	Replace or perform inhomogeneity test	<u>Inhomogeneity Test</u> Use an oil bath with temperature set at the working temperature. Immerse the thermocouple at different depth by moving it slowly while recording the output. A sudden change at the output indicates a change in the seebeck coefficient in the wire. A high quality wire will have the seebeck coefficient almost the same anywhere along the wire. The wire will then be considered as homogeneous. <u>Reference</u>: Traceable Temperature, An Introduction to the Temperature Measurement and Calibration, 2nd edition by J.V. Nicholas and D.R. White

Note:

1) An * in the table denotes those equipment calibration that may be carried out by the staff of a laboratory if it is suitably equipped and the staff competent to perform such calibrations / checks.

2) Where calibrations have been performed by the staff of a laboratory, adequate records of these measurements shall be maintained.