



ACCREDITATION SCHEME FOR INSPECTION BODIES

TECHNICAL NOTE: PV/LE01
SPECIFIC REQUIREMENTS FOR THE
ACCREDITATION OF INSPECTION
BODIES IN PRESSURE VESSELS AND
LIFTING EQUIPMENT INSPECTION

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1. INTRODUCTION

- 1.1 The purpose of inspections is to determine the conditions of lifting equipment and pressure vessels for conformance with standards or other normative documents and/or general requirements.
- 1.2 The field of pressure vessels inspection covers the inspection of various types of pressure vessels and their accessories. It includes pipes and fittings used in the storage and transportation of fluids and gases under pressure.
- 1.3 The field of lifting equipment inspection covers the inspection of various types of lifting equipment and their accessories.
- 1.4 This technical note (PV/LE 01) should be read in conjunction with documents listed in the Reference Section and government regulations where applicable.
- 1.5 Supplementary information for specific areas of inspection may be published as other Technical Notes.
- 1.6 The inspection report produced by an accredited inspection body for the scope of accredited inspection activities shall be an endorsed report.

2. EQUIPMENT

- 2.1 Equipment which affect results that are critical to the conclusion of the examination shall be appropriate for the particular inspection to be performed.
- 2.2 Inspectors shall ensure that all equipment, including equipment not under the charge of the inspection body, used during inspection work are calibrated and traceable to the SI unit. Calibration shall be performed by recognized accredited laboratories¹ or the National Measurement Institute who is a member of the BIPM² MRA where possible. The inspectors shall ensure that the acceptance of calibration reports be based on the measurement traceability as specified in SAC-SINGLAS 006: Traceability of Measurement.
- 2.3 Where calibration facilities are not available, in house calibration shall be validated using well recognized methods.
- 2.4 Table 1 sets out the recommended frequencies for calibrations and checks of critical equipment used.

¹ Recognised accredited laboratories refer to those accredited by SAC-SINGLAS or its MRA partners.

² BIPM MRA refers to listing of signatories maintained by the International Bureau of Weights and Measures (BIPM) and publicly available on the BIPM website: <http://www.bipm.fr>

3. TESTING

- 3.1 Analytical testing is a laboratory activity and therefore does not come within the scope of ISO/IEC 17020. Examples of analytical testing are chemical or metallurgical analysis.
- 3.2 Where analytical testing is required to support the evaluation, the inspection body shall ensure that the testing is performed by an accredited laboratory. The inspection body shall ensure that it receives endorsed test reports from accredited laboratories where available.
- 3.3 When an organisation is providing analytical testing and inspection for the same project, the organisation has to ensure that there is sufficient independence between the two activities (e.g. results of inspection activities and testing activities should not be approved by the same person).
- 3.4 Functional testing forms a normal part of the activities of an inspection body and is therefore within the scope of ISO/IEC 17020. Example of functional testing includes load testing of lifting equipment and accessories.

4 INSPECTION PERSONNEL

4.1 INSPECTORS

- 4.1.1 Inspectors, including approved signatories, shall be suitably qualified and have sufficient relevant experience in their scope of inspection. Example: in welding technology, welding inspection, manufacturing and inspection, material technology, corrosion, knowledge in NDT, functionality of equipment and other related technologies.
- 4.1.2 Inspectors, including approved signatories, must be familiar with the relevant standards or codes used in the inspection activities.
- 4.1.3 Inspection bodies shall note that qualification requirements of inspectors may be superseded or limited by the regulatory requirements of the countries where the equipment eventually resides.
- 4.1.4 Inspection bodies shall maintain records of inspectors' qualifications, training and experience. The records shall include how and when each inspector is authorized by the inspection bodies to perform specific inspection or functional testing.
- 4.1.5 All approved signatories shall be assessed by the assessment team prior to award of accreditation. Subsequent assessment will consist of sampling of approved signatories.
- 4.1.6 The list of nominated approved signatories assessed to be competent in their area of inspection will be submitted to the Council Committee for Inspection Bodies for endorsement as approved signatories.

- 4.1.7 Approved signatories are to sign on endorsed inspection report for inspection performed by themselves or where they have direct supervision of the inspection work.
- 4.1.8 Vision deficiencies may prevent inspectors from performing their work satisfactorily in the field of pressure vessel inspection. It is therefore the responsibility of the Inspection Body to ensure that vision problem shall not affect the quality and validity of the assessment during the inspection.

4.2 QUALIFICATION CRITERIA AND CATEGORIES FOR APPROVED SIGNATORIES

- 4.2.1 Approved Signatories for Pressure Vessels shall be certified to recognized national or international inspection standards or codes. Example will be API 510 Certified Pressure Vessel Inspector.
- 4.2.2 The categories for the approved signatories are as follows:

Category 1a

Professional Engineer registered with the Professional Engineer Board (Singapore) with at least 3 years of working experience in inspection of lifting equipment/pressure vessel.

Category 1b

Engineer having degree in relevant engineering discipline from an institute of learning recognised by the relevant regulatory authority, with at least 3 years of working experience in inspection of lifting equipment/pressure vessel.

Category 2

Engineering Technician with diploma in relevant engineering discipline from an institute of learning recognised by the relevant regulatory authority with at least 5 years of working experience in inspection of lifting equipment/pressure vessel.

- 4.2.3 Only a Professional Engineer who is an Authorised Examiner under the Workplace Safety and Health Act, is permitted to carry out inspection on any repair or modification; or to review change to any operating parameter or calculation for statutory lifting equipment/pressure vessel.

5 CLASSIFICATION OF EQUIPMENT

5.1 CLASSIFICATION OF LIFTING EQUIPMENT

5.1.1 Class A: Powered Lifting Equipment

Lifting equipment - including attachments for fixing, anchoring or supporting equipment - that operate by means of motive power such as electric, hydraulic or pneumatic or other powered means. Examples are gantry cranes and truck mounted mobile crane.

5.1.2 Class B: Manual Lifting Equipment

Lifting equipment - including attachments for fixing, anchoring or supporting equipment - that operate solely by means of the operator without any powered assistance. Examples are manual hoist and manual chain block.

5.1.3 Class C: Lifting Accessories

Accessories used for attaching loads to both powered lifting equipment and manual lifting equipment. Examples are wire ropes, chains and hooks.

5.2 CLASSIFICATION OF PRESSURE VESSELS

5.2.1 Class A: Major Systems

Major systems are those which because of their size, complexity or hazardous contents require the highest level of expertise in determining their condition. They include steam-generating systems where the individual capacities of the steam-generators are more than 10 MW, any pressure storage system where the pressure-volume product for the largest pressure vessel is more than 10^6 bar litres (100 MPa m³) and any manufacturing or chemical reaction system where the pressure-volume product for the largest pressure vessel is more than 10^5 bar litres (10 MPa m³). Pipelines are included if the pressure-volume product is greater than 10^5 bar litres.

5.2.2 Class B: Intermediate Systems

Intermediate systems include the majority of storage systems and process systems which do not fall into either of the other two categories. Pipelines are included unless they fall into the major system category.

5.2.3 Class C: Minor Systems

Minor systems include those containing steam, pressurised hot water, compressed air, inert gases or fluorocarbon refrigerants which are small and present few engineering problems. The pressure (above atmospheric pressure) should be less than 20 bar (2.0 MPa) (except for systems with a direct-fired heat source when it should be less than 2 bar (200 kPa)). The pressure-volume product for the largest vessel should be less than 2×10^5 bar litres (20 MPa m³).

The temperatures in the system should be between -20°C and 250°C except in the case of smaller refrigeration systems operating at lower temperatures which will also fall into this category. Pipelines are not included.

6. INSPECTION METHODS AND PROCEDURES

- 6.1 The inspection body shall have detailed procedures and instructions for the application of the appropriate regulations, codes of practice, standards, specifications, guidance documents and customer requirements.
- 6.2 Where risk based inspection (RBI) techniques are used to establish the nature and frequency of inspections, the inspection body shall document the techniques used in procedures including a demonstrable justification for using the technique.
- 6.3 Codes, Standards and other technical literature applicable to the design, construction, operation, inspection and repair of lifting equipment, pressure systems and their components within the accredited scope shall be maintained up to date and be readily available to the staff.

7. FORMAT OF ACCREDITATION SCOPE

The scope of accreditation is granted only for specific items, materials or systems being inspected. An example of the accreditation scope is attached in Appendix 1.

8. REFERENCE

- a) ISO/IEC 17020:2012 – Conformity Assessment-Requirements for the operation of various types of bodies performing inspection
- b) ILAC P15:06/2012 – Application of ISO/IEC 17020:2012 for the Accreditation of Inspection Bodies
- c) SAC-SINGLAS 006 – Traceability of Measurement
- d) UKAS RG 2 – Accreditation for In-Service Inspection of Pressure Systems / Equipment. Edition 4 (January 2010)
- e) UKAS RG 6 – Accreditation for In-Service Inspection of Lifting Equipment. Edition 3 (July 2010)
- f) Workplace Safety and Health Act (Chapter 354A):2009 and its subsidiary legislation

Appendix 1

Inspection body: Type A or B or C

Type of product	Type and range of inspection	Inspection method, codes or standards used
Pressure Vessels		
A. Air Receiver	i) Statutory Inspection ii) Fabrication Inspection iii) In-service Inspection	ASME Section VIII Div 1 : 2007 BS 5500 : 2000 API 510 : 2006
B. Heat Exchanger	In-service Inspection	API 510 : 2006
C. Tank	In-service Inspection	API STD 653 : 1998
Lifting Equipment		
D. Chain Blocks	In-service Inspection	In-house inspection method
E. Slings Alloy Chain Slings Synthetic Webbing Slings	In-service Inspection	SS CP standard ASME standard

Approved signatories

Er. [Signatory A] (Category 1a & Authorised Examiner)	- for A(i), A(ii)
Er. [Signatory B] (Category 1a)	- for item A(iii), B to C
Mr [Signatory C] (Category 1b)	- for item A(iii), B to C
Mr [Signatory D] (Category 1b)	- for item D, E

NOTE :

Only Professional Engineer who is an Authorised Examiner under the Workplace Safety and Health Act, is permitted to carry out inspection on repair and modification; and to review changes to operating parameters and calculations for statutory pressure vessels/lifting equipment.

Type A inspection body

The inspection body providing "third party" services.

Type B inspection body

The inspection body which forms a separate and identifiable part of an organisation involved in the design, manufacture, supply, installation, use or maintenance of the item it inspects and has been established to supply inspection services to its parent organisation.

Type C inspection body

The inspection body which is involved in the design, manufacture, supply, installation, use or maintenance of the items it inspects or of similar competitive items and may supply inspection services to other parties not being its parent organisation.

TABLE 1 RECOMMENDED EQUIPMENT CALIBRATION AND CHECK INTERVALS

S/N	TYPE OF EQUIPMENT	FREQUENCY OF CALIBRATION OR CHECK	EQUIPMENT / PARAMETERS TO BE CHECKED	GENERAL PROCEDURES AND COMMENTS
1.	Pit Gauge	a) Functional check before each and every inspection at site b) To be calibrated once every 2 years	Dimensional	
2.	Weld Gauge	a) Functional check before each and every inspection at site b) To be calibrated once every 2 years	Dimensional	
3.	Vernier Caliper	a) Functional check before each and every inspection at site b) To be calibrated once every 2 years	Dimensional	
4.	Ultrasonic Thickness Gauging			
	Probe and sensory electronics (setting up the assembly)	Functional check before each and every inspection at site		To conduct a functional check using the Standard calibration block (Reference / Working Block)
	Standard calibration block (For reference / working use)	Initial	Material properties	As per specific standard method (e.g. EN 27963, or equivalent)

S/N	TYPE OF EQUIPMENT	FREQUENCY OF CALIBRATION OR CHECK	EQUIPMENT / PARAMETERS TO BE CHECKED	GENERAL PROCEDURES AND COMMENTS
	Standard calibration block (For reference / working use)	Functional check before each and every inspection at site	Surface conditions	Visual examination for deterioration such as corrosion or mechanical damage.
	Standard calibration block (For reference use)	To be calibrated once every 5 years	Radius and other dimensional checks	By an accredited calibration laboratory or 'National Metrology Institute (NMI)' as defined in Clause 3.2.1 of SAC-SINGLAS 006.
	Standard calibration block (For working use)	To be verified once every 2 years	Radius and other dimensional checks	By verification with Standard calibration block (Reference Block). If no Standard calibration block (Reference Block) is available, the Standard calibration block (Working Block) shall be calibrated by an accredited calibration laboratory or 'National Metrology Institute (NMI)' as defined in Clause 3.2.1 of SAC-SINGLAS 006.