Specific Criteria for Accreditation
Applied Physics Testing

The NZ mark of competence
Tohu Matatau Aotearoa

Eighth Edition September 2023

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AS LAB C6

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Published by:

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Edition Statement

Edition	Amendment	Date of Issue	ISBN No.
1	Updated from Telarc NZ version	June 1998	0908611 40 4
2	Updated	April 2005	0908611 40 4
3	Revised and reformatted	October 2007	978-0-908611-18-8
4	Updates to selected sections References to IANZ technical policies for traceability and proficiency testing Changes to formatting and content of calibration interval tables	September 2015	978-1-877531-22-4
5	7.3.6 Goniometers update Change pressure gauge calibration interval	July 2016	978-1-877531-30-9
6	Change from Approved Signatories to Key Technical Personnel (Section 8 and Appendix 3). Other minor editorials.	November 2019	978-1-877531-68-2
7	Rebrand	July 2020	978-1-877531-90-3
8	IANZ physical address updated. Sections re-ordered for consistency between IANZ specific criteria. New sections added: 3.1 Requested extensions to scope of accreditation; 12.1 Reporting statements of conformity. Section removed: Definitions and acronyms. Sections renamed: ‘Measurement traceability’ to ‘Metrological traceability’. Classes of tests added: 6.35 (a) Fire detection and alarm systems; 6.95 (f) Pharmaceutical isolators, (g) Biological sampling. Class of test updated: 6.95 (b) Biological safety cabinets – class 1 & 2 to 6.95 (b) Biological safety cabinets – class I, II, III. Other minor editorial changes.	September 2023	978-1-99-003636-1

Contents

1 Introduction

International Accreditation New Zealand (IANZ) Specific Criteria are an elaboration of the General Criteria for Accreditation for specific fields of test and calibration, test technologies, products or materials. They address items that are essential or most important for the proper conduct of a test or calibration. Specific Criteria provide detail or add extra information to the generally stated requirements of the IANZ General Criteria for Accreditation, which remains the governing document. A list of all published Specific Criteria is available on www.ianz.govt.nz or from IANZ on request.

This criteria document must be read in conjunction with current issues of ISO/IEC 17025 and the IANZ publication *Procedures and Conditions for Accreditation* (AS 1), the latter document describing the organisation and operation of the IANZ Laboratory Accreditation Programme (references 1 and 2).

ISO/IEC 17025 is a general document designed to apply to all types of testing and calibration laboratories. This criteria document, on the other hand, provides information and interpretation on classes of test, staff, accommodation, equipment and other aspects of good laboratory management practice which are considered to be minimum standards for applied physics laboratories being accredited against ISO/IEC 17025.

2 Scope

This document sets out the specific requirements an applied physics laboratory has to meet in addition to the general requirements of ISO/IEC 17025, if it is to be accredited by IANZ.

3 Classes of Test

Accreditation by IANZ does not constitute a blanket approval of all a laboratory’s activities. Therefore, a means of identifying those activities where competence has been demonstrated and for which accreditation has been granted is necessary.

Accreditation is normally granted only for work which is performed regularly and for which the laboratory is appropriately equipped and has demonstrated its capability. The extent of a laboratory's scope of accreditation will therefore vary with the range of work performed, the scope and complexity of the tests involved, the competence and organisation of laboratory staff and the level of technology available in the laboratory.

The field of applied physics testing covers a wide range of measurements of physical quantities and tests on materials, components and structures (covered in Appendix 1). Note that where reference is made to “tests”, these should be interpreted as measurements for the purposes of accreditation in this field.

Issued Schedules to the Certificate of Accreditation (Scopes of Accreditation) can be viewed via the IANZ Directory at www.ianz.govt.nz.

3.1 Requested extensions to scope of accreditation

It is relatively common for applied physics laboratories to expand their testing capabilities for new standards, new clauses of an existing accredited standard, or for an equivalent standard of an existing accredited standard. A laboratory may request an extension of their scope and must provide records of verification (refer to verification of methods in ISO 17025) that include an analysis of the new testing standard highlighting the existing and new capabilities required to perform the testing.

Depending on the reference equipment, environment requirements, level of technical competence and other factors, such an extension may be reviewed and authorised by IANZ without a visit to the laboratory. However, at the discretion of IANZ, a limited assessment with a technical expert may be required. In any case, time spent by IANZ staff on extensions to scope, where substantial, is chargeable, as is time given by a technical expert.

Please see the *Procedures and Conditions for Accreditation* (reference 2) for more information.

4 Laboratory Accommodation and Safety

4.1 Accommodation

Accommodation requirements for applied physics laboratories vary quite widely depending upon the nature of the items to be tested and the uncertainty with which measurements are to be made. A formal laboratory area will be required for precise measurements but many measurements and tests can, and need to be, satisfactorily performed in production areas or in the field.

Formal laboratory areas must have good lighting (minimum 400 lux), adequate bench space, freedom from dust and fumes, freedom from vibration and acoustic noise and have control of temperature and humidity appropriate for the tests being conducted. The extent to which these environmental factors apply will vary according to the type of measurement and precision (uncertainty) with which measurements are to be made.

When precise measurements are to be made in laboratories, the following factors may assume greater importance:

(a) Isolation from sources of mechanical vibration and shock likely to have a detrimental effect on sensitive instruments, e.g. lifts, plant rooms, busy roads, etc.

(b) Smooth antistatic finishes for walls, ceilings and floors, and air filtration—where necessary—to facilitate dust control

(c) Wall insulation, double glazing of windows and shading from direct sunlight

(d) Temperature control of the laboratory where relevant but in any case with a rate of variation typically less than 2 °C per hour

(e) Humidity control as required (typically within the range 35 %rh to 70 %rh)

(f) Stabilisation or filtering of incoming mains power supply where purity of waveform and constancy of voltage are important

(g) Freedom from fumes that are likely to have an adverse effect on equipment (and staff)

(h) Management of the laboratory environment by regular cleaning

(i) Appropriate shielding from electromagnetic fields.

4.2 Safety

The safety of people associated with applied physics testing must be a matter of concern to those responsible for the management of such testing. While safety falls outside the scope of accreditation, applied physics testing laboratories are expected to comply with the Electrical Safety Regulations and any other relevant health and safety requirements. AS 2243 is recommended as a guide to safe practices in laboratories

4.3 Access to test areas

Laboratories carrying out applied physics testing should control the access to test areas, to provide security for clients' new designs and innovative solutions, particularly where the laboratory is contained within a production facility and performs tests for the public.

5 Equipment Management and Calibration

Management and calibration requirements for equipment are given in ISO/IEC 17025. Guidelines on calibration intervals for laboratory equipment items are given in Appendix 2.

5.1 Metrological Traceability

Traceability of a measurement result is ensured when the result can be related to a stated reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty (see reference 3). The IANZ policy on traceability of measurement is set out in the IANZ Technical Policy No.1: *Traceability of Measurement* (reference 4). All IANZ accredited applied physics testing laboratories are required to maintain conformity with this policy.

The calibration certificates issued by accredited laboratories must be endorsed in accordance with the requirements of the accreditation bodies concerned. This constitutes proof of traceability to the International System of Units (SI), via national standards. The calibration certificate must include a statement on the traceability to the SI (or appropriate International Reference, such as ITS-90 for temperature), and reference may be made to the national measurement institute if desired. An example of such a statement is: “Measurements reported in this certificate are traceable to the SI via the Measurement Standards Laboratory of New Zealand” or similar.

The endorsement on a calibration certificate does not automatically mean that the calibration is fit for the purpose and meets the requirements of the laboratory. However, a laboratory receiving a calibration certificate will need to consider its contents before placing the reference equipment back into use. If this step is missed and/or if a piece of reference equipment had not been appropriately verified before being put back into service, it can mean that the laboratory may need to recall work which has already been completed and reported in endorsed reports.

For example, some things to consider may be: are all the required ranges and/or parameters reported, is the uncertainty presented in an understandable and appropriate way, are there any non-compliances with specification, or measurements in the window of uncertainty (WOU), is the report suitably (fully) endorsed.

Calibration certificates endorsed with the logo of an ISO 9001 certifying body alone will not be accepted for critical measurements where traceability is required.

5.2 Calibration

Calibration involves controlled comparison of the device under calibration (DUC) against a “known” instrument over the range of values of use of the DUC. The differences between the “known” instrument and the DUC are tabulated as corrections to the DUC for a range of pre-selected calibration points. Calibration does not involve adjustment; that is a separate process which may also be carried out as part of the service offered by the calibration agency. The uncertainty, and these differences, must be reported for the comparison process. Applied physics laboratories must maintain current calibration certificates for all critical measuring equipment. Alternatively, they may perform comparisons in-house where they have appropriate reference equipment and can demonstrate performance to a documented method. Uncertainty of measurement must be determined for internal calibration of critical items.

Where applied physics instruments submitted to a calibration laboratory are likely to be adjusted, appropriate “as received” measurements must be requested by the submitting applied physics laboratory. The full calibration is then carried out after the adjustment. If this procedure is not followed, then both historical stability data and the applied physics laboratory's ability to take appropriate corrective action on out-of-calibration equipment is lost. Historical stability data can also be used to justify extending calibration intervals.

When the laboratory's reference equipment contains software adjustments for calibration purposes these adjustments must be made only by the laboratory carrying out the reference equipment calibration. Once an adjustment has been made, any existing calibration certificate is invalidated.

6 Computer Controlled Test Equipment

Appropriate quality assurance is needed of all in-house developed software (see ISO/IEC 17025). Automatic test equipment must be calibrated in a similar manner to other equipment being calibrated.

The following comments apply to the use of computers for direct data capture and control of the calibration operation. Where control is by proprietary software such as that supplied with some calibrators, validation will only be required of the individual calibration routines for instruments and not for the programme supplied by the manufacturer.

For in-house developed software, standard packages of raw data can be developed for feeding through the system to check routines on development or modification of the system. Care should be taken to ensure that such packages cover the expected range of values and include combinations of peculiar circumstances to highlight faults in basic logic of the programme or its subroutines. Alternative systems using spreadsheets or other software may also be used.

Reference artefacts may be held to check the operation of the whole system at appropriate intervals.

The results of this testing should be recorded and incorporated in the maintenance history. Software maintenance should include a back-up regime and a system recovery plan.

Electronic data must be treated in an equivalent way to hard copy to ensure it is not lost or changed without an audit trail. In most situations this takes the form of version control and change history.

7 Laboratory Staff

ISO/IEC 17025 gives the general requirements for laboratory staff and management. The requirements for laboratory Key Technical Personnel are set out in Appendix 3.

8 Laboratory Test Methods

Where test methods and in-house calibration methods are based on standard test methods or manufacturers' methods these must be tailored for the laboratory's own test equipment. Procedures must exercise all relevant parts of the hardware and software of the DUT, particularly for in-house calibration purposes. Tailored test methods should be fully documented.

9 Additional requirements of testing

9.1 Acoustic and Vibration Measurements

9.1.1 Anechoic and Reverberant Rooms

Such rooms must be evaluated in terms of the requirements of particular test procedures. Reports of evaluations must be available and include a description of room dimensions, volume and construction, ambient noise and vibration levels, environmental conditions, microphone placements and measurement techniques and conclude with an estimation of measurement uncertainty and the frequency range over which measurements can be performed satisfactorily.

9.1.2 Field sites

Sites used for acoustic performance tests must be inspected and comply with the requirements of test procedures. Sites used for measurement of sound and vibration levels must be adequately described, preferably with an attached map of site location. Measurement sites must be identified, the period of measurement reported, and temperature, humidity and weather conditions must be recorded at the time of measurement.

9.2 Heat and Temperature

9.2.1 Reaction to Fire Apparatus

The critical dimensions of the apparatus must be measured and documented to establish compliance with the requirements of the test method.

9.2.2 Environmental Enclosures

These enclosures may be used for conditioning of test specimens prior to test or for performance testing of equipment or appliances. The enclosures must be tested at least annually to ensure that they comply with the requirements of the test procedures. The results of these tests must be available during an assessment.

9.2.3 Test Furnaces, Baths and Ovens

Furnaces, baths and ovens used for test work must be examined at least annually to determine their compliance with the temperature requirements of test procedures. These results should be documented and made available during an assessment.

9.2.4 Thermocouples

All base-metal thermocouples (Type T, N, K, J, E) suffer from errors due to metallurgical changes that occur at temperatures above 150 °C. Because the thermocouple emf is produced by those parts of the thermocouple located in temperature gradients (not at the thermocouple tip as commonly thought), thermocouples exposed to these temperatures may be sensitive to immersion conditions and history of thermal exposure. For the highest accuracy at these temperatures, thermocouples should be used only for a single application and fixed in position so the immersion conditions cannot change. Where accuracy better than the indication given by the manufacturers 'limits of error' is required, they must be (i) calibrated in situ, or (ii) taken new from a batch for which a sample has been calibrated, and (iii) replaced regularly according to observed drift rates and users accuracy requirements.

The effects of inhomogeneity caused by cold work or previous heat treatment, compensating leads, cold junction compensation and thermal losses on temperature measurements should be included in the uncertainty assessment. Calibrations of thermocouples must include the compensating lead to be used.

An approximate expression for the standard uncertainty due to inhomogeneity in base-metal thermocouples can be obtained using the following formula:

$$u = 0.15 + 0.0003 \bullet t + 0.000004 \bullet t^2$$

Where:

u = standard uncertainty for thermocouple inhomogeneity,

t = temperature in degrees Celsius.

9.3 Optics and Photometry

9.3.1 Accommodation

Dark rooms used for photometric measurements commonly have walls painted matt black and preferably have provision for screening any stray light.

Electric power supplies matching the requirements of the reference standard lamps and providing a voltage stability of better than ± 0.1 % must be available.

9.3.2 Standard lamps – incandescent

A group of at least six standard lamps (three references and three working standards) is required. Lamp current and voltage should be measured and recorded using instruments with accuracies of ± 0.1 % or better. There must be an appropriate warm-up time and the burning times must be recorded.

At least four intensity standard lamps (preferably six), which need not all be of the same type, are required.

9.3.3 Standard Lamps – discharge

For luminous flux measurements, a group of at least four and preferable six standard lamps is required for each type of discharge lamp tested with a suitable ballast. Unfortunately, there is a great variety of types of these lamps which exhibit poor stability.

As an alternative, discharge lamps may be compared with reference incandescent lamps. This procedure reduces the number of lamps needed but requires knowledge of the spectral properties of each lamp type tested, of the photometric integrator and of the photocell used.

9.3.4 Photocells

Photocells should be provided with a matching glass V(λ) correction filter supplied by the manufacturer. The linearity, sensitivity and spectral response of the photocell/filter combination should be checked regularly. Linearity checks may be performed by inverse square law, multiple aperture or neutral density filter techniques. For neutral density filter techniques, common soda glass, metallised films on glass or gelatine filters are, in general, not acceptable. The stability of the spectral response of photocells may be checked by the use of glass optical colour filters. The following types of filters are suggested:

Blue filter	Schott type BG 28 (1 mm or 2 mm)
Green filter	Schott type VG 6 (1 mm)
Red filter	Schott type RG 610 (3 mm).

However, other suitable combinations of filters are acceptable.

9.3.5 Distribution Photometers

Any mirror on a distribution photometer should be checked for flatness and uniformity of reflection factor. The light path length and the accuracy of angular settings should be established.

9.3.6 Goniometers

The accuracy of angular settings should be established. The angular accuracy must be known and validated periodically. This should be taken into account (as with every other parameter) when estimating uncertainties.

9.3.7 Photometric Integrating Enclosures

Enclosures should meet the requirements of BS EN 13032-1 (reference 5).

9.3.8 Spectrophotometers

The wavelength accuracy, stray light error, linearity of response and repeatability of a spectrophotometer should be checked every six months. Optical glass colour filters should be used to check the spectral response of the spectrophotometer and the accuracy of colour measurements.

10 Uncertainty of Measurement

Uncertainty of measurement must include consideration of all contributions to uncertainty (type A and type B) and must define the method the laboratory will use to combine these effects and the confidence interval within which the test result can be expressed. Where required by the customer or test method, measurement uncertainties must be reported in test reports (references 6 and 7).

When test results lie within the uncertainty band about a specification limit the laboratory must define its policy on reporting conformance and must report the uncertainty.

11 Identification of Items under Test

Items under test must be uniquely and unambiguously identified. This may include circuit diagrams, block diagrams, operating manuals, board layouts, photographs, drawings as well as the version and configuration of any software used in the item. For type testing in particular, accurate characterisation of the design type that was certified as complying is critical.

12 Reports and Records

Reports covering applied physics tests must cover all relevant clauses of the applicable test method. Where any clause is not applied the report must clearly show that it is not relevant.

12.1 Reporting statements of conformity

ISO/IEC 17025 (clause 7.8.6) requires the Decision Rule to be defined when making a statement of conformity. This usually refers to stating the measurement uncertainty and whether it was applied as a guard band to the acceptance tolerance or not. For many testing standards the Decision Rule is inherent in the standard by stating the accuracy requirements of the testing and measuring equipment to be used. In this case laboratories may report compliance to the limit of the acceptance tolerance. Laboratories must assess equipment calibration records to confirm that equipment meets specified accuracy requirements (including the measurement uncertainty and any unapplied corrections (errors of indication). If specified accuracy requirements cannot be met the laboratory must apply an appropriate guard band to the acceptance tolerance.

13 Proficiency Testing

The IANZ policy on participation in proficiency testing activities is set out in the IANZ Technical Policy No.2: *Participation in Proficiency Testing Activities* (reference 8). All IANZ accredited applied physics testing laboratories are required to maintain conformity with this policy.

14 References

1. ISO/IEC 17025: *General requirements for the competence of testing and calibration laboratories*
2. IANZ General Criteria: *Procedures and Conditions for Accreditation* (AS 1)
3. JCGM 200: *International vocabulary of metrology - Basic and general concepts and associated terms (VIM)*
4. IANZ Technical Policy No.1: *Traceability of Measurement* (AS TP1)
5. BS EN 13032-1: *Measurement and presentation of photometric data of lamps and luminaires*
6. UKAS M3003: *The Expression of Uncertainty and Confidence in Measurement for Calibration*
7. JCGM 100: (GUM 1995 with minor corrections) - *Evaluation of measurement data — Guide to the expression of uncertainty in measurement*
8. IANZ Technical Policy No.2: *Participation in Proficiency Testing Activities* (AS TP2)

Appendix 1: Classes of Test – Applied Physics Testing

Laboratories are accredited in terms of classes of test. Individual laboratories may be accredited for the performance of a single class of test, for any combination of the classes of test listed or even for one specific test within a class of test.

Divisions in the list of classes of test are based essentially on the nature of instruments, equipment, components or materials under test. While some exceptions to the general principle have been inevitable, this method of division of the field has been adopted to reduce repetition. As the scope of accreditation of any individual laboratory normally detail the range in which measurements are made, it is possible for each class of test to cover the work of laboratories with widely differing interests.

The list of classes of test is used with flexibility to ensure that the scope of accreditation of each laboratory is fully informative, to the advantage of both the laboratory and its clients.

Acoustic and Vibration Measurement

6.02 Determination of Acoustic Characteristics of Materials, Structures and Spaces

- (a) Reverberation
- (b) Absorption (steady state, impulsive)
- (c) Transmission (steady state, impulsive)

6.03 Audiometric Testing

- (a) Screening audiometry
- (b) Reference audiometry

6.05 Field Measurement of Sound

- (a) Room acoustics
- (b) Community noise assessments
- (c) Occupational noise exposure
- (d) Noise on board vessels
- (e) Noise in occupied spaces
- (f) Noise on building and construction sites
- (g) Acoustic performance of building elements
- (h) Noise monitoring
- (i) Other specified measurements

6.06 Determination of Sound Power

- (a) Free field
- (b) Free field above a reflecting plane
- (c) Diffuse field (reverberant field)
- (d) Semireverberant field
- (e) Near field

6.07 Acoustic Performance Tests

- (a) Aircraft
- (b) Motor vehicles
- (c) Industrial and agricultural vehicles
- (d) Air conditioning and distribution systems
- (e) Fans and blowers
- (f) Machinery other than electrical machinery
- (g) Electrical machinery
- (h) Ear protectors
- (i) Hearing aids
- (j) Acoustic enclosures and booths
- (k) Loud speakers
- (l) Sound recording and reproducing systems
- (m) Public address systems
- (n) Telephone and communication systems
- (o) Emergency signal systems
- (p) Domestic appliances and hand tools
- (q) Other specified tests

6.11 Determination of Vibration Characteristics of Materials, Components, Assemblies and Structures

- (a) Natural frequencies and modes of vibration
- (b) Stiffness
- (c) Damping
- (d) Transmissibility

6.15 Measurement of Mechanical Vibration

- (a) Steady state (sustained)
- (b) Transient (shock)
- (c) Torsional
- (d) Seismic surveys

6.20 Dynamic Balancing

- (a) In a balancing machine

(b) In situ

(c) Performance testing of balancing machines

Heat and Temperature Measurements

6.31 Thermal Properties of Materials

(a) Conductivity

(b) Transmissivity

(c) Diffusivity

(d) Specific heat

(e) Latent heat

(f) Expansion

(g) Resistance to thermal shock

6.32 Reaction to Fire

(a) Combustibility

(b) Flammability

(c) Early fire hazard

(d) Cone calorimeter

(e) Other fire tests

6.33 Fire Resistance Tests

6.35 Tests on Fire Prevention Systems

(a) Fire detection and alarm systems

(b) Thermal detectors

(c) Thermally released links

(d) Fire extinguishers

6.37 Heat Transfer

Heat exchangers (transfer coefficients)
Heat storage

6.45 Performance Testing of Appliances and Components

(a) Frozen food retail cabinets

(b) Domestic refrigerators and freezers

(c) Water heaters

(d) Air conditioners

(e) Heat pumps

(f) Gas fired appliances

(g) Oil fired appliances

(h) Solid fuel fired appliances

(i) Electrical appliances

(j) Solar heaters

(k) Other specified appliances and components

Optics and Photometry

6.51 Geometry of Optical Components and Systems

(a) Rear view mirrors

(b) Eye protection wear

(c) Sunglasses

6.52 Optical quality

(a) Windows

(b) Windscreens

(c) Photographic filters

6.65 Distribution Temperature

6.70 Luminous Intensity

(a) Incandescent lamps

(b) Non-incandescent lamps

6.71 Distribution of Luminous Intensity

6.72 Luminous Flux

(a) Incandescent lamps

(b) Non-incandescent lamps

6.73 Traffic Signals and Signage

(a) Traffic signal lanterns

(b) Lane indicators

(c) Retroreflective materials for signage

6.74 Radiograph Viewers

6.75 Luminous Transmittance

(a) Broad band measurements

6.76 Luminous reflectance

(a) Broad band measurements

6.77 Luminance factor

(a) Broad band measurements

6.78 Illuminance

6.79 Lasers: Classification

6.81 Solar Protection Fabrics

(a) UV protection factor for protective clothing

(b) Shadecloth

6.82 Photobiological safety of lamps and lamp systems

6.95 Controlled Environments

(a) Clean rooms and workstations

(b) Biological safety cabinets
– class I, II, III

(c) Cytotoxic drug safety cabinets

(d) Laminar airflow enclosures

(e) Filter installations

(f) Pharmaceutical isolators

(g) Biological sampling

Miscellaneous tests

6.99 Specified Physical Tests

E.g. Viscosity, Specific gravity, Static balancing

Appendix 2: Recommended Calibration Intervals

The following table sets out the normal periods between successive calibrations for a number of reference standards and measuring instruments. It must be stressed that each period is generally considered to be the maximum appropriate in each case providing that the other criteria as specified below are met:

(a) The equipment is of good quality and of proven adequate 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 frequent intervals until it can be shown that stability has not been impaired.

Appropriately shorter intervals may be necessary where the above criteria cannot be met.

IANZ is prepared to consider submissions for extension of calibration intervals based on factors such as history of stability, frequency of use, accuracy required, ability of staff to perform regular checks and successful participation in proficiency testing programs. It is the responsibility of the testing laboratory to provide evidence that its calibration system will ensure that confidence in the equipment is maintained. Application of the requirements of ISO 10012, Parts 1 and 2 needs to be considered when seeking an extension of intervals.

Items marked with an asterisk in the table are those which can be calibrated in-house by the staff of a laboratory if it is suitably equipped and the staff are competent to perform such re-calibrations. Inter-comparisons may also be carried out by laboratory staff.

Where calibrations have been performed by the staff of a laboratory adequate record of these measurements must be maintained which includes the uncertainty.

The second column shows the maximum recommended period between the initial calibration and the first recalibration. The third column shows the maximum period between subsequent recalibrations provided that the two earlier calibrations indicate that the item is stable. These recalibration intervals apply only to equipment of good quality and stability that is used, handled and stored with care. Excessive usage of equipment would lead to a reduction in these periods.

Equipment	**Recommended maximum period between successive calibrations (years)**	
	Initial	**Subsequent**
Accelerometers	One	One
Acoustic calibrators	One. Inter-comparison every six months	One
Aerosol generators	Initial verification of Laskin nozzles, hose and fittings dimensions, followed by regular checks to confirm compliance with AS 1807.	
Aerosol photometers	One. Calibration to confirm compliance with AS 1807 plus regular checks of sample flow rate to verify compliance with 28 ± 3 L/min specification.	One
Ammeters	One	Three

Equipment	Recommended maximum period between successive calibrations (years)	
	Initial	Subsequent
Anemometers	One	One
Attenuators	Three. Frequency response. Resistance and return loss check annually where appropriate.	Three
Barometers (a) Fortin and Kew types (b) Aneroid	 Five One	 Five Three
Bandpass filter sets	Two	Two
Beat frequency oscillators	One	One
Bridges	Three. Full calibration. Range check annually.	Three
Calibration baths and furnaces	Three. Complete temperature survey initially.	Five
Calibration unit for audio frequency	One. Calibrate the voltmeter's AC/DC transfer error of thermal element every five years	One
Community noise level analysers	Two	Two
Current shunts	Five	Five
Dead weight testers	Five	Five
Decade bridges	Five	Five
Decade resistance boxes	Five	Five
Digital meters	One	Two
Early fire hazard apparatus	Six monthly smoke meter linearity and radiant gas panel heat output check. Check annually using 4.7 mm hardboard.	
Electrical instruments (a) analogue	 Three. Inter-comparison every six months or more frequently as required.	 Three

Equipment	Recommended maximum period between successive calibrations (years)	
	Initial	Subsequent
(b) digital	One	Two
Flammability apparatus	Six monthly using cotton.	
Frequency analysers	Five	Five
Frequency counters	One	Five
Frequency standards	See “Time” instruments below.	
Gas meters	Two	Two
Impedance matching networks	Two. Check annually.	Five
Kilowatt-hour meters	One	Two
Light meter	One	One
Light-scattering photometers	One. Sampling flow to be checked against a flow meter every month.	One
Manometers (a) reference (b) working	 Five Three	 Five Three
Micrometers*	*See IANZ Technical Guide AS TG 1*	
Microphones	One. Three monthly checks of frequency response and sensitivity. Calibrate annually or when ± 1 dB change is detected, whenever is sooner.	One
Microphone amplifiers	One. Frequency response and meter accuracy.	One
Multi-meters	See electrical instruments	
Neutral density filters	Two	Two
Orifice plates and nozzles	Six monthly check after initial calibration	

Equipment	Recommended maximum period between successive calibrations (years)	
	Initial	**Subsequent**
Particle counter	One. Sampling flow to be checked against a flow meter every month.	One
Photocells	Check linearity of response every six months. Check spectral response annually with colour filters and calibrate every five years or when apparent filter transmittances change significantly.	
Photometric test plates for luminance measurements	Five	Five
Pistonphones	One. Inter-comparison every six months.	One
Potentiometers	Five	Five
Pressure and vacuum gauges (a) Reference (b) Working*	One One (with three-to-six monthly internal intermediate checks)	Two One
Pyrheliometers	Three. Check every six months.	Three
Pyrometers, optical	Three	Three
Quartz control plates	Five	Five
Radiometers (a) visible (b) UVA (c) UVB, UVC (d) Irradiance meters for solar radiation	 One One One One	 Three Two One One
Reference ballasts	Five	Five
Reference glass filters (a) spectrophotometry (b) colorimetry (c) luminous transmittance	Five	Ten

Equipment	Recommended maximum period between successive calibrations (years)	
	Initial	Subsequent
Refractive index standards (a) liquid (b) solid	 Five Five, or 40 measurements whichever comes first.	 Five Five
Resistors (including standard resistors)	One. After initial drift has been established. Inter-comparison annually.	Three
Rotameters	Two	Two
Smoke detectors	Six monthly check of linearity of response using neutral density filters.	
Sound level meters	Two. Check every three months.	Two
Sound power sources	Five	Five
Spectrophotometers*	Six months. Wavelength and absorbance calibration See IANZ Technical guide AS TG 4 and section 7.3.8 above.	Six months
Standard Lamps (a) luminous flux luminous intensity illuminance spectral radiance spectral irradiance (b) distribution temperature	 Five, or after each 20 hour period of burning. Five, or after each 50 hour period of burning.	 Five Five
Strip lamps	Five, or 100 hours of use, whichever occurs first.	Five
Tachometers (mechanical and electronic)	One	Two
Tape recorders	Five. Check annually	Five
Thermocouples (probe only); rare metal and base metal	Three, or 100 hours use, whichever occurs first. Interval to suit the application.	

Equipment	Recommended maximum period between successive calibrations (years)	
	Initial	**Subsequent**
Thermometers (a) liquid in glass, reference and (b) liquid in glass, working*	Five. Full calibration. Check ice point immediately after initial calibration then at least every six months. ***or alternatively*** Inter-comparison with reference thermometer(s) at points in the working range every six months. See IANZ Technical Guide AS TG 3	Five
(c) Electronic (sensors that are thermocouples, thermistors or other integrated circuit devices)	One. Full calibration.	One
(d) Resistance	Five. Full calibration, or when the ice point drift is more than five times the uncertainty of calibration. Check at ice point before use or at least every six months. *Working hand-held resistance thermometers can be checked using the alternative method for glass thermometers above.*	Five
Time, time interval, and frequency standards	One. However, calibration interval dependent on equipment frequency type and accuracy required. This may be as frequently as daily if the highest possible performance is required. Audit the data collection system every two years.	
Velocity transducers	Two. Sensitivity and frequency response every two years. Check every six months.	Two
Volt ratio boxes	Three. Annual resistance checks.	
Voltage references	One	One
Voltmeters	One	Two
Weighing appliances (balances and scales); all types	One	Three
Weights/masses (integral, stainless steel or nickel-chrome alloys) (a) reference (b) working*	 One One	 Five Three

Equipment	Recommended maximum period between successive calibrations (years)	
	Initial	Subsequent
Weights/masses (all other types)	One	Three

Appendix 3: Key Technical Personnel and Other Staff

Supervisory staff in accredited organisations must be competent and experienced in the technical areas covered by their accreditation. They must be able to oversee the operations and cope with any problems that might arise in their work or that of their colleagues or those who report to them. Such staff members, formally appointed by the senior management of the laboratory, are referred to as Key Technical Personnel.

Key Technical Personnel are the knowledgeable staff members who, where relevant:

(a) Develop and implement new procedures
(b) Design quality control procedures, set action criteria and take corrective actions
(c) Identify and resolve problems
(d) Authorise the release of reports/results
(e) Take responsibility for the validity of test results.

Every accredited organisation must have at least one Key Technical Person covering each class of test activity on its scope of accreditation. Accreditation is automatically suspended for any scope item(s) where there is no Key Technical Person for the item(s) due to Key Technical Personnel leaving the organisation or otherwise losing their approval for that part of the scope.

The qualifications and experience required of Key Technical Personnel and other technical staff members cannot be rigidly specified but must be appropriate to the work in which they are engaged. Key Technical Personnel would normally hold tertiary qualifications or equivalent professional recognition in the relevant discipline. Organisations engaged in a restricted range of repetitive work may have that work controlled by a Key Technical Personnel with appropriate practical experience and specific training in that work but without formal qualifications.

Requirements for Key Technical Personnel

(a) Appointment of Key Technical Personnel will be the responsibility of a designated senior laboratory officer who is a member of the laboratory's senior management team. Laboratories are required to have a documented person/position specification for Key Technical Persons and a documented and formal process for their qualification and appointment.

(b) The laboratory will maintain a list of current Key Technical Personnel, including the technical scope of their areas of responsibility. This list may be included in the laboratory's quality manual or as a separate document, but must be maintained up-to-date at all times. The technical scope for each individual will be described in a manner to suit the laboratory's circumstance and organisational structure, but there must be at least one Key Technical Person appointed for each test or group of testing activities in the laboratory's scope of accreditation. The laboratory may choose to use the Classes of Tests detailed in Appendix 1, with additional qualifiers as appropriate, but this is not mandatory.

(c) The list of Key Technical Personnel and their individual scope of responsibility must be notified to IANZ who will maintain this listing for each accreditation. IANZ will request this information in the Application for Accreditation and will review it with laboratories during their assessment.

(d) Changes to Key Technical Personnel listings (including individuals who have left the laboratory, new Key Technical Person appointments, or changes in the technical scope of responsibility) made between annual assessments must also be notified to IANZ. This is the responsibility of the laboratory's Authorised Representative.

(e) In addition to the laboratory's usual training records, each Key Technical Person is required to have a brief CV-type summary of qualifications and experience. This CV information will be requested to be provided to IANZ for each appointed Key Technical Person in the Application for Accreditation/Reassessment documentation. This information is also expected to be provided to IANZ when new Key Technical Personnel are appointed and notified to IANZ outside of annual assessments.

(f) Where a laboratory loses the sole Key Technical Person for all or part of their scope of accreditation, and no new appointment is made by the laboratory management then the laboratory's accreditation (or part thereof) will be suspended until such time as a new appointment is notified to IANZ. Where new Key Technical Personnel appointments are made outside of routine reassessments, and particularly when a new appointment is the sole Key Technical Person for all or part of the accreditation, IANZ reserves the right to conduct an on-site assessment of the laboratory to be assured the laboratory's systems and integrity of the laboratory's test results will continue to be maintained.

(g) All IANZ-endorsed test reports issued by an accredited laboratory must be signed or authorised by a Key Technical Person holding approval in the relevant class(es) of test, who will take full responsibility for the validity of the work. Authorisation can be by signing or by electronic signature with appropriate software safeguards covering release of the report information.

A Key Technical Personnel may be appointed to a person engaged by an accredited organisation as a consultant, with respect to work done within the scope of accreditation of that organisation, provided that there is a written agreement between the parties setting out the extent of the authority and responsibility of the consultant in relation to the services provided. The consultant's position in the organisation must be such that they can perform their role as a technical decision maker, as effectively as if they were an employee.

Staff members of the accredited organisation who are not engaged full time are also eligible as a Key Technical Person, provided that the circumstances in which they are called upon to exercise their function and their access to, and knowledge of, the technical operations are such that they are able to take full responsibility for the results they authorise.

The position and function of a Key Technical Person are quite distinct from that of an Authorised Representative. An organisation will normally have only one Authorised Representative who is appointed by the organisation and is only the contact point for IANZ and need not have any particular professional or technical expertise. However, the organisation may have several Key Technical Personnel approved by IANZ and with their own individual areas of expertise.

An Authorised Representative who is not also a Key Technical Person may not authorise the release of IANZ endorsed reports.