specific criteria for accreditation

Applied Physics

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Contents

Page

1 Introduction

International Accreditation New Zealand (IANZ) Specific Criteria amplify or particularise the IANZ general accreditation criteria, for specific fields of technology or for specific types of business activity.

This document must be read together with current issues of the IANZ general criteria for accreditation NZS ISO/IEC 17025: - *General requirements for the competence of testing and calibration laboratories*, and *Procedures and Conditions of Accreditation*, the latter document describing the organisation and operation of the IANZ Accreditation Programmes.

The schedule provides information on classes of test, staff, accommodation, equipment and other aspects of good laboratory management practice considered to be a minimum standard for applied physics laboratories.

A list of all criteria documents published to date is available on www.ianz.govt.nz/publications or from IANZ on request.

2 Scope

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

3 Definitions

Uncertainty and calibration

Definitions of these terms and other terms relating to measurements are contained in *International Vocabulary of Basic and General Terms in Metrology* (VIM) (see references).

4 Classes of Test

IANZ accreditation does not constitute a blanket approval of all of a laboratory's activities. The classes of test are an arbitrary subdivision of the potential range of laboratory activities involved in applied physics testing on the basis of the type of measurements being made, the scientific disciplines involved and the techniques employed. It is therefore possible for a particular test or technique to be included under several classes of test. The classes and subclasses do not, however, constitute any restriction on the work which a laboratory can perform but provide a convenient means of expressing an accredited laboratory's capabilities (classes of applied physics tests are attached in Appendix 1).

Accreditation is normally granted only for work for which the laboratory is properly 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.

5 Laboratory Accommodation and Safety

5.1 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 (400-500 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 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 e.g. lifts, plant rooms, busy roads, etc likely to have a detrimental effect on sensitive instruments
(b) Smooth, antistatic finishes for walls, ceilings and floors and, where necessary, air filtration to facilitate dust control
(c) 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 less than 2 ^{o}C per hour
(e) Humidity control as required (typically within the range 35 % 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 which 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.

5.1.1 Acoustic and Vibration Measurements

5.1.1.1 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.

5.1.1.2 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.

5.1.2 Optics and Photometry

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.

5.2 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, the laboratory should comply with the current Health and Safety in Employment Act.

5.3 Access to Test Areas

Laboratories carrying out applied physics testing will be expected to 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.

6 Laboratory Equipment Management and Calibration

Management and calibration requirements for equipment are given in clauses 5.5 and 5.6 of NZS ISO/IEC 17025.
Guidelines on calibration intervals for laboratory equipment items are given in Appendix 2.

6.1 Traceability

Traceability of measurement is ensured when there is an unbroken chain of comparisons of equipment of known uncertainty which link one measurement result to the next and eventually to a national standard of measurement (and therefore to the SI system). Each link in the chain compares equipment with reference equipment of the same or (usually) smaller uncertainty and may involve reference artefacts or materials.

The concept of traceability also includes the competence of all the people involved, the fitness of each measurement environment, the suitability of the methods used and all other aspects of the quality and technical systems involved at each step in the chain of measurements.

Traceability must be established for all critical* measurement and calibration equipment either:

(a) Directly to the national metrology institute (IRL - Measurement Standards Laboratory) or another such national body (e.g. NPL - UK, NMI - Australia) that is a part of the international mutual recognition arrangement for NMIs
(b) From an IANZ accredited calibration laboratory which is accredited for the particular measurement or which is accredited by a national accreditation body (such as NATA, UKAS etc) with which IANZ has a mutual recognition arrangement
(c) 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 national standards.

**Critical measurements/calibrations are those which will significantly affect the accuracy or proper performance of tests.*

IRL Industrial Research Limited
NPL National Physical Laboratory
NMI National Measurement Institute

6.2 Calibration

Calibration involves controlled comparison of the Device Under Test (DUT) against a "known" instrument over the range of values of use of the DUT. The differences between the "known" instrument and the DUT are tabulated for a range of preselected calibration points. 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 themselves 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.

6.3 Heat and Temperature

6.3.1 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.

6.3.2 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.

6.3.3 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.

6.3.4 Thermocouples

The effects of inhomogeneities, compensating leads, cold junction compensation and thermal losses on temperature measurements should be evaluated. It is important to note that the emf in a thermocouple is produced at a temperature gradient and not at the thermocouple tip. Calibrations of thermocouples should include the compensating lead to be used.

Type K thermocouple wire can suffer from large errors arising from its immersion history. Where critical high temperature measurements need to be made, use of a type N wire is advised in place of type K.

6.4 Optics and Photometry

6.4.1 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.

6.4.2 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.

6.4.3 Photocells

Photocells should be provided with a matching glass $V(\lambda)$ 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.

6.4.4 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.

6.4.5 Goniometers

The accuracy of angular settings should be established. An accuracy of better than ten degrees of arc is recommended.

6.4.6 Photometric Integrating Enclosures

Enclosures should meet the requirements of BS EN 13032-1:2004

6.4.7 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.

7 Laboratory Staff

NZS ISO/IEC 17025 gives the general requirements for laboratory staff and management. The requirements for laboratory approved signatories 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. Calibration 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 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. (See the first two references, Section 14)

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.

10 Identification of Test Items

Test items 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 characterization of the design type that was certified as complying is critical.

11 Reports and Records

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

12 Computer Controlled Test Equipment

Appropriate quality assurance is needed of all in-house developed software (see NZS ISO/IEC 17025, 5.4.7.2). 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.

13 Proficiency Testing

Proficiency testing is defined as the “determination of laboratory testing performance by means of inter-laboratory comparisons” (ISO/IEC Guide 2:2004) and is thus a very important tool in a laboratory’s quality control programme to demonstrate the validity and comparability of results.

In accordance with the policy of the Asia Pacific Laboratory Accreditation Co-operation (APLAC), to which IANZ is a full member of their Mutual Recognition Arrangement (MRA), (see Reference 7), it is IANZ policy that applicant/accredited applied physics testing laboratories shall:

(a) Demonstrate their technical competence by the satisfactory participation in proficiency testing activity where such activity is available; and that
(b) The minimum amount of appropriate proficiency testing required per laboratory is one activity prior to gaining accreditation, followed by participation in as many inter-laboratory comparison programmes (where available) required to cover the scope of accreditation.

Aside from the issues of coverage and frequency, laboratories are expected to select proficiency testing activities according to the following criteria (in a generally decreasing order of preference):

(a) Mandated programmes (where relevant)
(b) International inter-laboratory comparison programmes
(c) National inter-laboratory comparison programmes
(d) Proficiency testing programmes operated in accordance with ISO/IEC Guide 43: Part 1
(e) Formal inter-laboratory comparison programmes involving several independent laboratories
(f) Less formal inter-laboratory comparison programmes between two or more laboratories
(g) Where none of the above is available or applicable, intra-laboratory comparisons between technicians within the same laboratory could be considered a valid proficiency testing activity.

The participation in a programme is of little value without the combined results being analysed to determine the nature of any discrepancies and the effect of this on any routine test results. Discrepancies may be in the order of expected uncertainty or they may indicate a serious shortcoming in a laboratory's procedure. It is important for laboratories to have undertaken this analysis and to have adequately determined and implemented appropriate corrective action.
Records of the above analysis, and any action taken, of all proficiency testing results are required, including those for which no further action is considered appropriate i.e. satisfactory results.

The results from proficiency testing activities and their analysis will be viewed by IANZ at each assessment.

13.1 APLAC Proficiency Testing Programmes

From time to time APLAC arranges for proficiency testing programmes to be run and expects accredited laboratories in all economies which are members of the MRA to participate. (The European Accreditation (EA) co-operation also operates similar programmes and the following comments apply equally given that IANZ is also a member of the EA MRA.)

On receipt of an invitation to participate, IANZ nominates (usually to a maximum of four) accredited laboratories to participate, provided the programme is relevant to their scope of accreditation. Nominated laboratories are expected to participate (usually no fee is charged) unless there are valid reasons for not doing so.

The results from these APLAC Proficiency Testing Programmes are required to be treated by IANZ in a formal manner. Both the participating laboratories and IANZ receive a copy of the report. Where a particular laboratory has outlier or non-conforming results they will be required to submit to IANZ detail on the investigations conducted and any corrective action taken. (It should be noted that all accredited laboratories in any inter-laboratory comparison programme are expected to do this, but would not normally report it to IANZ. Such records would be reviewed at the next on-site visit.)

IANZ staff will review the response and comment where appropriate. The records will also be reviewed at subsequent on-site assessments – particularly by a technical assessor where appropriate.

It should be noted that APLAC Proficiency Testing Programmes are as much a measure of the IANZ performance in accrediting laboratories as they are a measure of the participating laboratory's performance. The co-operation of the nominated laboratories is appreciated by IANZ.

14 References

1. NAMAS M3003, January 2007, *The Expression of Uncertainty and Confidence in Measurement for Calibration*.

2. *Guide to the Expression of Uncertainty in Measurement (GUM)*, 1995, issued by BIPM, IEC, IFCC, ISO, IUPAC, IUPAP and OIML.

3. *International Vocabulary of Basic and General Terms in Metrology, (VIM)*, 1993, issued by BIPM, IEC, IFCC, ISO, IUPAC, IUPAP and OIML.

4. *Procedures and Conditions of Accreditation,* IANZ AS 1.

5. NZS ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories.*

6. BS EN 13032-1:2004, *Measurement and presentation of photometric data of lamps and luminaires. Measurement and file format*

7. APLAC MR-001: *Procedures for Establishing and Maintaining Mutual Recognition Arrangements amongst Accreditation Bodies*, (issue No.4, December 2002).

APPENDIX 1
Classes of Test

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) Thermal detectors
(b) Thermally released links
(c) Fire extinguishers

6.37 Heat Transfer
(a) Heat exchangers (transfer coefficients)
(b) 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

6.95 Controlled Environments
(a) Clean rooms and workstations
(b) Biological safety cabinets – class 1 & 2
(c) Cytotoxic drug safety cabinets

(d) Laminar airflow enclosures
(e) Filter installations

Miscellaneous tests

6.99 Specified Physical Tests
e.g. Static balancing
Viscosity
Specific gravity

APPENDIX 2
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.

International Accreditation New Zealand (IANZ) is, however, 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 * in the table are those which can be calibrated 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.

Types of Equipment	**Maximum Period Between Successive Calibrations**		
	Initial Calibration		**Subsequent Calibration**
Acoustics and vibration			
Accelerometers	One year		One year
Acoustic calibrators	One year	Intercompare every six months.	One year
Anemometers	One year		One year
Attenuators	Three years	Frequency response. Resistance and return loss check annually where appropriate.	Three years
Bandpass filter sets	Two years		Two years
Beat frequency oscillators	One year		One year
Calibration unit for audio frequency	One year	Calibrate the voltmeter’s AC/DC transfer error of thermal element every five years.	One year
Community noise level analysers	Two years		Two years

Types of Equipment	**Maximum Period Between Successive Calibrations**		
	Initial Calibration		**Subsequent Calibration**
Digital meters	One year		Two years
Frequency analysers	Five years		Five years
Frequency counters	One year		Two years
Frequency standards		Refer Metrology and Calibration booklet	
Impedance matching networks	Two years	Check annually.	Five years
Microphones	One year	Three monthly check of frequency response and sensitivity. Calibrate annually or when +/- 1 dB change is detected whichever is sooner.	One year
Microphone amplifiers	One year	Frequency response and meter scale.	One year
Multimeters	One year	See electrical instruments in the heat and temperature section.	One year
Pistonphones	One year	Intercompare every six months.	One year
Potentiometers	Five years		Five years
Sound level meters	Two years	Check every three months.	Two years
Sound power sources	Five years		Five years
Tachometers	One year	Mechanical and electronic	Two years
Tape recorders	Five years	Check annually.	Five years
Thermometers		See heat and temperature section.	
Velocity transducers	Two years	Sensitivity and frequency response every two years. Check every six months.	Two years
Voltmeters	One year		Two years
Weighing appliances - balances and scales			
(a) Precision laboratory scales	One year		Three years
(b) All types of large capacity scales and weighing appliances	One year		Three years
Weights		Refer Metrology and Calibration booklet	

Types of Equipment	**Maximum Period Between Successive Calibrations**		
	Initial Calibration		**Subsequent Calibration**
Heat and temperature			
Anemometers	One year		Two years
Barometers - Fortin and Kew types	Five years	See NATA Technical Note No. 8	Five years
- Aneroid	Three years		Three years
Bridges	Three years	Full calibration. Range check annually.	Five years
Calibration baths and furnaces	Three years	Complete temperature survey initially. Check every three years.	Five years
Deadweight gauge testers	Five years		Five years
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 instruments	Three years	Inter-compare every six months or more frequently as required.	Three years
(b) Digital instruments	One year		Two years
Flammability apparatus	Six monthly using cotton.		
Gas meters	Two years		Two years
Kilowatt-hour meters	One year		Three years
Manometers			
(a) Reference	Five years		Five years
(b) Working	Three years		Three years
Micrometers	Five years	See IANZ Technical Guide AS TG 1 *Simple Linear Measurements – their use, care and calibration*.	Five years
Neutral density filters	Five years		Ten years
Orifice plates and nozzles		Six monthly check after initial calibration	
Potentiometers	Five years		Five years
Pyrometers, optical	Three years		Three years
Radiometers: Thermal	Two years	Or one hundred tests whichever occurs first, against a known radiant heat source.	Two years
Resistors	One year	After initial drift has been established. Intercompare annually.	Three years

Types of Equipment	**Maximum Period Between Successive Calibrations**		
	Initial Calibration		**Subsequent Calibration**
Rotameters	Two years		Two years
Smoke detectors		Six month check of linearity of response using neutral density filters	
Strip lamps	Five years	Or 100 hours use whichever occurs first.	Five years
Thermocouples			
(a) Rare metal	Three years	Or 100 hours use whichever occurs first.	Three years
(b) Base metal		Interval to suit the application.	
Thermometers			
(a) Liquid in glass, reference	Five years	Full calibration. Check ice point immediately after initial calibration then at least every six months.	Five years
(b) Liquid in glass working	Five years	Full calibration. Check ice point immediately after initial calibration then at least every six months.	Five years
or alternatively		Intercompare with reference thermometer(s) at points in the working range every six months. (See IANZ Technical Guide AS TG 3 *Working Thermometers – Calibration Procedures*).	
(c) Electronic (sensors that are thermocouples, thermistors or other integrated circuit devices).	One year	Full calibration.	One year
(d) Resistance	Five years	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 years
Timing devices		Refer Metrology and Calibration booklet.	
Voltage references	One year		One year
Weighing appliances		Refer Metrology and Calibration booklet.	

Types of Equipment	Maximum Period Between Successive Calibrations		
	Initial Calibration		Subsequent Calibration
Optics and Photometry Current shunts	Five years		Five years
Digital instruments	One year	See (b) under electrical instruments in Heat and Temperature section.	Two years
Decade resistance boxes	Five years		Five years
Decade bridges	Five years		Five years
Electrical indicating instruments		See electrical instruments in Heat and Temperature section.	
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 plate for luminance measurements	Five years		Five years
Potentiometers	Five years		Five years
Pyrheliometers	Three years	Check every six months.	Three years
Quartz control plates	Five years		Five years
Reference ballasts	Five years		Five years
Reference glass filters			
(a) Spectrophotometry	Five years		Ten years
(b) Colorimetry	Five years		Ten years
(c) Luminous transmittance	Five years		Ten years
Refractive index standards			
(a) Liquid	Five years		Five years
(b) Solid	Five years	or 40 measurements whichever comes first.	Five years
Spectrophotometers		Check spectral response, wavelength accuracy, stray light error, linearity of response and repeatability every six months.	
Standard Lamps			
(a) Luminous flux Luminous intensity Illuminance Spectral radiance Spectral irradiance	Five years	or after each 20 hour period of burning.	Five years
(b) Distribution temperature	Five years	or after each 50 hour period of burning.	Five years

Types of Equipment	**Maximum Period Between Successive Calibrations**		
	Initial Calibration		**Subsequent Calibration**
Standard resistors	One year	After initial drift rate has been established. Intercompare annually.	Three years
Thermometers		See Heat and Temperature section.	
Volt ratio boxes	Three years	Annual resistance checks.	Three years
Testing of biohazard cabinets			
Ammeter	One year		One year
Anemometer	One year		One year
Light meter	One year		One year
Manometer			
(a) Working	Three years		Three years
(b) Reference	Five years		Five years
Particle counter	One year	Sampling flow to be checked against a flow meter every month.	One year
Light scattering photometers	One year	Sampling flow to be checked against a flow meter every month.	One year
Pressure gauges	One year		One year
Sound level meter		See acoustics and vibration section.	
Aerosol generators		Six-monthly check of flow rate at outlet. Specification: 75 +2, -5 L/min.	
or alternatively		Six-monthly checks of pressure at outlet and of Laskin nozzle critical dimensions to AS 1807.0	

APPENDIX 3
Approved Signatories and Other Staff

Supervisory staff in accredited organisations must be competent and experienced in the 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 subordinates. Such staff members, nominated by their organisations, may be granted signatory approval by International Accreditation New Zealand (IANZ). Approved Signatories authorise technical procedures and the release of IANZ endorsed work.

The qualifications and experience required of Approved Signatories and other staff members cannot be rigidly specified but must be appropriate to the work in which they are engaged. Approved Signatories 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 Signatory with appropriate practical experience and specific training in that work but without formal qualifications.

Approved Signatories

Approved Signatories 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 all reports
(e) Take responsibility for the validity of test results.

For Inspection Bodies, NDT laboratories and Applied Physics laboratories performing tests on controlled environments, the Approved Signatory must also have performed or closely supervised the critical observations and measurements.

Every accredited organisation must have at least one Approved Signatory covering each item of its scope of accreditation. Accreditation is automatically suspended for any scope item(s) where there is no signatory for the item(s) due to Approved Signatory/ies leaving the organisation.

All IANZ endorsed work must be authorised for release by an Approved Signatory holding approval in that discipline, who will take full responsibility for the validity of the work.

Signatory approval is recognition of personal competence. However, it relates to the accreditation of the employing organisation and is therefore not automatically transferable to another organisation. It lapses when an Approved Signatory leaves the accredited organisation or changes their role significantly within the accredited organisation.

The following are considered when IANZ assesses the suitability of staff members as Approved Signatories:

(a) Relevant qualifications and/or experience. If the signatories do not have relevant tertiary qualifications they must have sufficient relevant experience enabling them to comply with the requirements listed below
(b) Position in the staff structure. Approved Signatories must be personnel closely involved in the day to day operations of the accredited organisation
(c) Familiarity with procedures and awareness of any limitations of these procedures. Approved Signatories must have appropriate personal experience in the work procedures for which they hold approval. They must be aware of any limitations of these procedures and must understand the scientific basis of the procedures
(d) Ability to evaluate test results critically and a position in the staff structure which makes them responsible for their adequacy
(e) Knowledge of the quality assurance procedures in operation and ability to take appropriate and effective corrective action when required

(f) Knowledge of and a commitment to the IANZ requirements for Approved Signatories and for accreditation. This will include being conversant with the principles of effective quality management embodied in NZS ISO/IEC 17025 and relevant Specific Criteria
(g) Sufficient experience with the accredited organisation to address the above points. It is difficult to specify an exact time a proposed signatory should have spent in the organisation, as it is dependent on their previous knowledge and experience and their current role in the accredited organisation. It is unlikely that the time would be less than six months, but exceptional circumstances may apply.

Signatory approval is normally granted only to a staff member in charge, a section leader, a departmental manager or a senior staff member who authorises the release of reports and who can also satisfy the above requirements.

Staff members may be granted signatory approval for all of the work included in their organisation's scope of accreditation or for only specific work or classes of work relating to their area of personal expertise.

Signatory approval is available 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 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 for signatory approval, provided that the circumstances in which they are called upon to exercise their signatory function and their access to, and knowledge of, the operations are such that they are able to take full responsibility for the reports they authorise.

The position and function of an Approved Signatory 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. The organisation may, however, have several Signatories approved by IANZ and with their own individual areas of expertise.

An Authorised Representative who is not also an Approved Signatory may not authorise the release of IANZ endorsed reports.