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1. Purpose

- 1.1. This policy defines the way laboratories will prove their traceability of their measurements, and express their measurement uncertainty.

2. Scope

- 2.1. This policy applies to all laboratories; calibration, testing and dimensional inspection. It is the responsibility of L-A-B Assessors, Staff and Appointed Reviewers to evaluate the compliance of the laboratories with this policy. The laboratories shall have evidence of compliance available for the Assessor at the time of the desk audit prior to the assessment visit. Should the documented evidence not be available, the laboratory runs the risk of a delay in the assessment.


3. Terms and Definitions

3.1. Traceability VIM 2.41

- 3.1.1. Property of a measurement result whereby the result can be related to a reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty

3.1.2. Notes:

- 3.1.2.1. For this definition, a 'reference' can be a definition of a measurement unit through its practical realization, or a measurement procedure including the measurement unit for a non-ordinal quantity, or a measurement standard.
- 3.1.2.2. Metrological traceability requires an established calibration hierarchy.
- 3.1.2.3. Specification of the reference must include the time at which this reference was used in establishing the calibration hierarchy, along with any other relevant metrological information about the reference, such as when the first calibration in the calibration hierarchy was performed.
- 3.1.2.4. For measurements with more than one input quantity in the measurement model, each of the input quantity values should itself be metrologically traceable and the calibration hierarchy involved may form a branched structure or a network. The effort involved in establishing metrological traceability for each input quantity value should be commensurate with its relative contribution to the measurement result.
- 3.1.2.5. Metrological traceability of a measurement result does not ensure that the measurement uncertainty is adequate for a given purpose or that there is an absence of mistakes.
- 3.1.2.6. A comparison between two measurement standards may be viewed as a calibration if the comparison is used to check and, if necessary, correct the

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quantity value and measurement uncertainty attributed to one of the measurement standards.


- 3.1.2.7. The ILAC considers the elements for confirming metrological traceability to be an unbroken metrological traceability chain to an international measurement standard or a national measurement standard, a documented measurement uncertainty, a documented measurement procedure, accredited technical competence, metrological traceability to the SI, and calibration intervals (see ILAC P-10:2002).
- 3.1.2.8. NOTE 8 The abbreviated term “traceability” is sometimes used to mean ‘metrological traceability’ as well as other concepts, such as ‘sample traceability’ or ‘document traceability’ or ‘instrument traceability’ or ‘material traceability’, where the history (“trace”) of an item is meant. Therefore, the full term of “metrological traceability” is preferred if there is any risk of confusion.

3.2. Metrological Traceability Chain (traceability chain) VIM 2.42

- 3.2.1. In general, for a given set of information, it is understood that the measurement uncertainty is associated with a stated quantity value attributed to the measurand. A modification of this value results in a modification of the associated uncertainty.
- 3.2.2. Sequence of measurement standards and calibrations that is used to relate a measurement result to a reference.
- 3.2.2.1. Notes:
- 3.2.2.1.1. A metrological traceability chain is defined through a calibration hierarchy (See Annex A).
- 3.2.2.1.2. A metrological traceability chain is used to establish metrological traceability of a measurement result.
- 3.2.2.1.3. A comparison between two measurement standards may be viewed as a calibration if the comparison is used to check and, if necessary, correct the quantity value and measurement uncertainty attributed to one of the measurement standards.

3.3. Uncertainty of Measurement VIM 2.2

- 3.3.1. Non-negative parameter characterizing the dispersion of the quantity values being attributed to a measurand, based on the information used.
- 3.3.1.1. Notes:
- 3.3.1.1.1. Measurement uncertainty includes components arising from systematic effects, such as components associated with corrections and the assigned quantity values of measurement standards, as well as the definitional uncertainty. Sometimes estimated systematic effects are

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not corrected for but, instead, associated measurement uncertainty components are incorporated.

- 3.3.1.1.2. The parameter may be, for example, a standard deviation called standard measurement uncertainty (or a specified multiple of it), or the half-width of an interval, having a stated coverage probability.
- 3.3.1.1.3. Measurement uncertainty comprises, in general, many components. Some of these may be evaluated by Type A evaluation of measurement uncertainty from the statistical distribution of the quantity values from series of measurements and can be characterized by standard deviations. The other components, which may be evaluated by Type B evaluation of measurement uncertainty, can also be characterized by standard deviations, evaluated from probability density functions based on experience or other information.

3.4. Calibration VIM 2.39


3.4.1. Operation that, under specified conditions, in a first step, establishes a relation between the quantity values with measurement uncertainties provided by measurement standards and corresponding indications with associated measurement uncertainties and, in a second step, uses this information to establish a relation for obtaining a measurement result from an indication.

3.4.1.1. Notes:

- 3.4.1.1.1. A calibration may be expressed by a statement, calibration function, calibration diagram, calibration curve, or calibration table. In some cases, it may consist of an additive or multiplicative correction of the indication with associated measurement uncertainty.
- 3.4.1.1.2. Calibration should not be confused with adjustment of a measuring system, often mistakenly called “self-calibration”, or with verification of calibration.
- 3.4.1.1.3. Often, the first step alone in the above definition is perceived as being calibration.

4. Policy for Traceability

- 4.1. The calibration program shall assure traceability of measurements, and/or verification and validation of equipment is traceable, wherever possible, through NIST or other National Metrology Institute (NMI) to the International System of Units (SI units). This is to be captured within L-A-B Form 001 - Traceability Tracking.
- 4.2. Calibration certificates, where applicable, shall indicate the traceability through an NMI or intrinsic standard, the measurement result and the associated uncertainty of the measurement and/or a statement of compliance with an identified metrological specification. The requirements for a primary reference, transfer, and working standards


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or reference materials shall be defined by the laboratory. When defining those requirements the laboratory shall identify the critical characteristics that may affect the traceability for the calibration and/or test. Those characteristics include the requirements stated in ISO/IEC 17025. Critical characteristics may include handling, reporting, equipment, and methodology using the standards etc. Depending on the level of standard and the frequency of use, transport, ownership, etc. the laboratory shall apply the appropriate degree of procedural control.


- 4.3. Where intrinsic standards are used, the laboratory shall demonstrate by measurement-assurance techniques, interlaboratory comparison, or other suitable means that its intrinsic-measurement results are correlated with an NMI.
- 4.4. When traceability to an NMI is not possible, the laboratory shall have a procedure that will provide satisfactory evidence that the results are correlated, for example by participation in a suitable interlaboratory comparison or proficiency testing. Other satisfactory evidence would be an internationally accepted standard in the field concerned; suitable reference material; ratio or reciprocity-type measurements; or mutual consent standards that are clearly specified and mutually agreed upon by all parties concerned.

5. Demonstration of Traceability

- 5.1. L-A-B prospective clients and accredited labs may submit appropriate physical standards and test and measurement equipment (M&TE) directly to NIST or when appropriate, or to another national metrology institute (NMI) to the International System of Units (SI units). Accredited laboratories may obtain certified reference materials from NIST (called Standard Reference Materials (SRM) under copyright) or from another NMI. Use of an NMI other than NIST must be documented as the appropriate NMI relevant for the scope of accreditation and stated uncertainties.
 - 5.1.1. Note – ILAC and L-A-B considers an “appropriate “ national metrology institute to be one that participates regularly and successfully in relevant international Interlaboratory comparisons performed by BIPM and/or by regional metrology bodies. ILAC encourages BIPM and regional bodies to conduct and publish details of as broad a range of international comparisons as possible to provide transparency on the equivalence and linkages of national measurement standards, which underpin accreditation activities. ILAC has taken note that the results of international comparisons carried out in the scope of the Metre Convention are published in Appendix B of the CIPM MRA (www.bipm.org).
- 5.2. Testing laboratories that perform calibrations only for themselves do not need to be accredited as a calibration laboratory. Calibration laboratories that perform specific calibrations only for themselves to support their accredited services do not need to be accredited for those calibrations. For the purpose of assuring traceability, an accredited laboratory may calibrate its own equipment if the appropriate requirements of L-A-B and 17025 have been met. The laboratory shall demonstrate its competency to perform the calibrations it undertakes.

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- 5.3. L-A-B prospective clients and accredited labs may use a State Weights and Measure lab that is recognized by the NIST Office of Weights and Measures (OWM) State Laboratory Program and has a current "Certificate of Measurement Traceability" issued by the Weights and Measures Division of NIST for the calibration of mass standards, including test carts. This certificate must be available during the assessment of the laboratory.
- 5.3.1. Foreign L-A-B prospective clients and accredited labs may use a national, state or provincial Weights and Measure laboratory that is recognized and/or traceable to the country NMI. Evidence of recognition and/or traceability shall be available during the assessment
- 5.4. L-A-B Accredited Laboratories that do not demonstrate traceability as defined in 1, 2 or 3 above, shall use accredited calibration laboratory services wherever available. Accredited calibration laboratories are those accredited by L-A-B or an accreditation body that is recognized as a signatory of the Asia Pacific Laboratory Accreditation Cooperation "APLAC" MRA and/or International Laboratory Accreditation Cooperation "ILAC" MRA. A listing of L-A-B accredited laboratories is available on our website at www.l-a-b.com. When utilizing accredited calibration laboratory services, the calibration certificates shall be accompanied by a recognized accreditation body symbol or otherwise make reference to accredited status to be considered satisfactory for traceability purposes.
- 5.5. If a L-A-B applicant or accredited laboratory submits physical standards or M&TE to a calibration provider that is not accredited by L-A-B or other L-A-B acceptable laboratories, the laboratory shall submit directly to L-A-B the following:
- 5.5.1. Document that an appropriate accredited calibration provider is not available. Documented evidence is required including results of searches of appropriate AB's websites.
- 5.5.2. Audit the claim of traceability of the provider of the calibration service and document the following areas related to the calibration and claim of traceability of its standards and M&TE:
- 5.5.3. Information regarding assessment of the quality system used by the calibration service provider. The information must include details on an assessment of the calibration service provider. The assessment can be done by the laboratory (if a qualified person is on staff) or another AB.
- 5.5.4. The calibration procedure(s) used by the calibration service provider.
- 5.5.5. The physical standards or other M&TE used by the calibration service provider (including evidence of traceability to standards maintained by NIST or an appropriate NMI and copies of relevant calibration certificates).
- 5.5.6. Information regarding the calibration intervals of relevant standards or other M&TE.
- 5.5.7. The environmental conditions of the laboratory.

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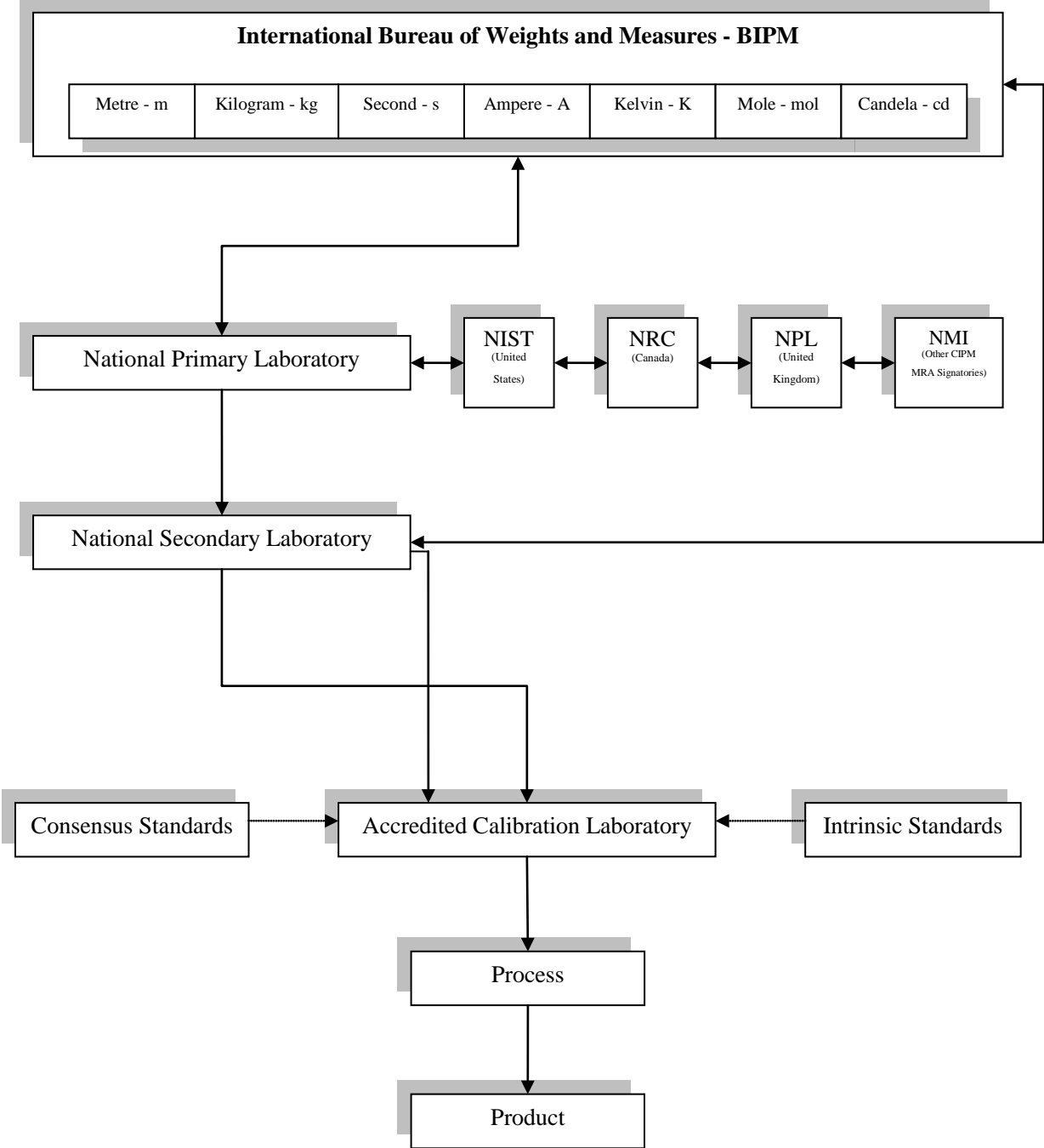
- 5.5.8. The method(s) by which uncertainties are determined e.g., ISO Guide to the Expression of Uncertainty in Measurement (GUM).
- 5.5.9. The relative uncertainties achieved at all steps of the process.
- 5.5.10. Pursue the traceability chain until traceability to appropriate stated references is completely validated, when a calibration service provider submits physical standards and/or M&TE used in the calibration to another laboratory(s) not accredited by L-A-B or L-A-B acceptable accreditation body.
- 5.5.11. Enter the audit documentation, including all findings of noncompliance and resolutions of those findings, into the laboratory's quality management record system.
- 5.5.12. If traceable calibration is not available or appropriate, laboratories may demonstrate comparison to a widely used standard that is clearly specified and mutually agreeable to all parties concerned, particularly in measurements where NIST does not maintain a US national standard. For example, NIST does not maintain a standard for all hardness testing scales. There are several widely used commercial standards available for hardness. However, these standards may not all give equivalent measurement results; therefore, it is important to specify which standard is used and to obtain agreement among all parties involved that the choice made is acceptable.


6. Reporting

- 6.1. Reporting the traceability on a certificate / report, L-A-B requires the following:
- 6.2. A statement of traceability to be on a certificate / report to consist of the following verbiage or equivalent:
 - 6.2.1. The calibrations / test within the certificate / report are traceable through NIST or another National Metrology Institute to the International System of Units (SI units).
- 6.3. The certificate or report is to provide evidence of actual traceability.
 - 6.3.1. Traceability may be evidenced by reporting the unique identification of the standard(s) used, and/or the unique certificate or report number by which traceability has been established. (Note: The unique identification in combination with the calibration date of the Unit Under Test provides a point in time where the reference standard can be traced to its unique calibration certificate for which the reference standard shall be found in calibration)
 - 6.3.2. NIST test report numbers shall only be reported when the laboratory has established its traceability directly from NIST.

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Annex - A Chain of Traceability



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7. Revision History

Revision Level	Revision Date	Revised By	Brief Description of Revision
Original Issue through Rev 12	1/10/01 Through 02/13/07	Archived	Archived
Rev 13	06/01/09	Ryan Fischer	Further defined the traceability acceptance for the State Laboratories for Mass Standards. Removed the uncertainty of measurement to make it its own policy. Updated the definition of traceability, calibration and uncertainty of measurement in accordance with the 3 rd edition of the VIM. Added specific verbiage for making statements of traceability. See 4.1, 5.1, 5.3 and 6. for specific changes.
Rev 14	06/07/10	Doug Leonard/ Randy Long/Ryan Fischer	Clarified traceability reporting requirements (6.0 reporting)

APPROVED: _____



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