

NVLAP Assessor Training

Assessing Traceability and Uncertainty Impacts on Traceability

Pertinent Requirements Documents

- VIM – *International Vocabulary of Metrology*
- NVLAP Handbook 150:2006, Clause 5.6
- NVLAP Handbook 150:2006, Annex B
- NVLAP Assessor Bulletin: AB-10-2010
- ILAC-P10: 01/2013
- ILAC-P14: 01/2013

The Requirements: Handbook 150

5.6.1 General

All equipment used for tests and/or calibrations, including equipment for subsidiary measurements (e.g., for environmental conditions) having a significant effect on the accuracy or validity of the result of the test, calibration or sampling shall be calibrated before being put into service. The laboratory shall have an established program and procedure for the calibration of its equipment.

NOTE Such a program should include a system for selecting, using, calibrating, checking, controlling and maintaining measurement standards, reference materials used as measurement standards, and measuring and test equipment used to perform tests and calibrations.

NVLAP Note: See Annex B for requirements for the implementation of traceability policy in NVLAP-accredited laboratories.

The Requirements: Handbook 150

5.6.2.1.1

For calibration laboratories, the program for calibration of equipment shall be designed and operated so as to ensure that calibrations and measurements made by the laboratory are **traceable to the International System of Units (SI) (*Système international d'unités*)**.

A calibration laboratory establishes traceability of its own measurement standards and measuring instruments to the SI by means of an unbroken chain of calibrations or comparisons linking them to relevant primary standards of the SI units of measurement. The link to SI units may be achieved by reference to national measurement standards. National measurement standards may be primary standards, which are primary realizations of the SI units or agreed representations of SI units based on fundamental physical constants, or they may be secondary standards which are standards calibrated by another national metrology institute. When using external calibration services, traceability of measurement shall be assured by the use of calibration services from laboratories that can demonstrate competence, measurement capability and traceability. The calibration certificates issued by these laboratories shall contain the measurement results, including the measurement uncertainty and/or a statement of compliance with an identified metrological specification (see also 5.10.4.2).

NOTE 1 Calibration laboratories fulfilling the requirements of this handbook are considered to be competent. **A calibration certificate bearing an accreditation body logo from a calibration laboratory accredited to this handbook**, for the calibration concerned, is sufficient evidence of traceability of the calibration data reported.

The Requirements: Handbook 150

5.6.2.2 Testing , 5.6.2.2.1

For testing laboratories, the requirements given in 5.6.2.1 apply for measuring and test equipment with measuring functions used, unless it has been established that the associated contribution from the calibration contributes little to the total uncertainty of the test result. When this situation arises, the laboratory shall ensure that the equipment used can provide the uncertainty of measurement needed.

NOTE The extent to which the requirements in 5.6.2.1 should be followed depends on the relative contribution of the calibration uncertainty to the total uncertainty. If calibration is the dominant factor, the requirements should be strictly followed.

The Requirements: Handbook 150 Annex B.3

- **B.3.1** NVLAP-accredited laboratories may submit appropriate physical standards and test and measurement equipment directly to NIST or, when appropriate, to another national metrology institute. Accredited laboratories may obtain certified reference materials from NIST (called Standard Reference Materials under copyright) or from another national metrology institute. Use of a national metrology institute other than NIST shall be documented and will be assessed by NVLAP.
- **B.3.2** Testing laboratories that perform calibrations only for themselves do not need to be accredited as calibration laboratories. 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 NIST Handbook 150 have been met.
- **B.3.3** NVLAP-accredited laboratories that do not demonstrate traceability as described in B.3.1 or B.3.2, shall use accredited calibration laboratory services wherever available. Accredited calibration laboratories are those accredited by NVLAP or by any accrediting body with which NVLAP has a mutual recognition arrangement. A listing of NVLAP-accredited calibration laboratories and of accreditation bodies with which NVLAP currently has agreements is available from NVLAP.

Assessing Traceability

Results of calibrations (deemed to have “significant effect” on the measurement) shall be traceable to the SI.

- Calibration of standards directly by the NMI;
or
- Calibration of the standards by an accredited calibration service provider; or
- In-house calibration service.

NMI Calibration

What are you looking for in determining traceability?

- Calibration directly by NIST or another CIPM MRA-recognized national metrology institute (NMI) (*ILAC-P10*)
 - If not NIST, why? (*Annex B, B.3.1: "... Use of a national metrology institute other than NIST shall be documented and will be assessed by NVLAP."*)
 - CIPM MRA information can be found at <http://kcdb.bipm.org/>
 - Appendix C contains the CMCs listed for the NMIs

Calibration and Measurement Capabilities - CMCs



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- Approval dates are shown for CMCs published after 24 May 2004. Only the latest version of the CMCs is shown here. Further details on the history of a CMC should be requested from the issuing National Metrology Institute.



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Accredited Calibration Service Provider

What are you looking for in determining traceability?

- Calibration by provider accredited by NVLAP or accredited by an accreditation body who is a signatory to the ILAC arrangement (*ILAC-P10*)
 - Who are acceptable accreditation bodies for accreditation of calibration laboratories?
- Check the lab's determination of acceptability of the calibration service provider
 - Is the provider accredited for the measurement? Are the uncertainties adequate for the lab's use? Does the lab have appropriate contract review in place?

U.S.-Recognized Accreditation Bodies (for Calibration) and Their Symbols



NVLAP LAB CODE 000000-0



ACCREDITED



CALIBRATION



**PILA
Calibration**

In-House Calibrations

- Accreditation of these calibrations is NOT required if the specific calibrations are only being provided for the laboratory's standards.
- For the purpose of assuring traceability, . . . calibrate its own equipment if the appropriate requirements of NIST Handbook 150 have been met (*Annex B, Clause B.3.2*).
 - *Procedure for performing the calibration – 5.4.1, 5.4.2, 5.4.5;*
 - *Adequate environment to perform the calibration – 5.3;*
 - *Measurement traceability – 5.6.2.1.1;*
 - *Adequate trained personnel – 5.2.5;*
 - *Estimation of uncertainty – 5.4.6.1, 5.4.6.3; and*
 - *Reporting of results – 5.10.4.*

Use of Non-Accredited Calibration Service Provider

B.3.4

If a NVLAP-accredited laboratory submits physical standards or test and measurement equipment to a calibration service provider that is not accredited by NVLAP or by an accrediting body with which NVLAP has a mutual recognition arrangement, the laboratory shall:

a) document that an appropriate accredited calibration service provider is not available;

b) 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 test and measurement equipment:.....

c) pursue the traceability chain until traceability to appropriate stated references is completely validated, when a calibration service provider submits physical standards and/or test and measurement equipment used in the calibration to another laboratory(s) not accredited by NVLAP;

d) enter the audit documentation, including all findings of nonconformance and resolutions of those findings, into the laboratory's quality management record-keeping system.

NOTE An on-site visit to the provider of the calibration service is encouraged, but is not required as long as the information listed above is obtained and otherwise verified. **Self-declaration of compliance to ISO/IEC 17025 or other relevant standards by a calibration service provider is not acceptable evidence of verification of traceability. Citation of a NIST Test Number by the calibration service provider likewise is not acceptable evidence of verification of traceability.**

No Traceable Calibration Service

B.3.5

If traceable calibration services are 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 U.S. 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.

ILAC-P14, Section 6

6.1

ISO/IEC 17025 requires calibration laboratories to report, in the calibration certificate, the uncertainty of measurement and/or a statement of compliance with an identified metrological specification or clauses thereof.

Accredited calibration laboratories shall report the measured quantity value and the uncertainty of measurement, in compliance with the requirements in 6.2 – 6.5 of this section.

By exception, and where it has been established during contract review that only a statement of compliance with a specification is required, then the measured quantity value and the measurement uncertainty may be omitted on the calibration certificate.

The following shall however apply:

- **The calibration certificate is not intended to be used in support of the further dissemination of metrological traceability (i.e. to calibrate another device)**

National Voluntary Laboratory Accreditation Program

