

NIST HANDBOOK 150-8
2011 Edition

**National
Voluntary
Laboratory
Accreditation
Program**

**ACOUSTICAL
TESTING
SERVICES**

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Foreword

The NIST Handbook 150 publication series sets forth the procedures, requirements, and guidance for the accreditation of testing and calibration laboratories by the National Voluntary Laboratory Accreditation Program (NVLAP). The series is comprised of the following publications:

- NIST Handbook 150, *NVLAP Procedures and General Requirements*, which contains the general procedures and requirements under which NVLAP operates as an unbiased third-party accreditation body;
- NIST Handbook 150-xx program-specific handbooks, which supplement NIST Handbook 150 by providing additional requirements, guidance, and interpretive information applicable to specific Laboratory Accreditation Programs (LAPs) under NVLAP.

The program-specific handbooks are not stand-alone documents, but rather are companion documents to NIST Handbook 150. Each program-specific handbook tailors the general criteria found in NIST Handbook 150 to the specific test methods, calibrations, or types of tests or calibrations covered by a LAP.

NIST Handbook 150-8, *NVLAP Acoustical Testing Services*, presents the technical requirements and guidance for the accreditation of laboratories under the NVLAP Acoustical Testing Services LAP. The 2011 edition of NIST Handbook 150-8 supersedes and replaces the 2005 edition.

The handbook was revised with the participation of technical experts in the field of acoustical testing services and was approved by NVLAP. The following significant changes have been made to this handbook with respect to the previous edition:

- more emphasis has been given to the requirement for the use of current test methods;
- requirements for the assessment of standard field testing methods have been clarified;
- the requirement for a laboratory to have a proficiency testing plan has been added.

This handbook is also available on the NVLAP website (<http://www.nist.gov/nvlap>) under NVLAP Program-Specific Handbooks.

Questions or comments concerning this handbook should be submitted to NVLAP, National Institute of Standards and Technology, 100 Bureau Drive, Stop 2140, Gaithersburg, MD, 20899-2140; phone: 301-975-4016; fax: 301-926-2884; e-mail: nvlap@nist.gov.

Introduction

In 1980, the Department of Commerce (DOC) received a formal request from Owens-Corning Fiberglas Corporation that the need for accreditation of acoustical testing laboratories be determined. After gathering information, the DOC published a final finding of need to accredit laboratories that provide acoustical testing services (46 FR 51267-512271). Public hearings and workshops were held, and the laboratory accreditation program for Acoustical Testing Services was formally established by the National Bureau of Standards in 1982 (47 FR 39874-39878). NVLAP accreditation is based on the evaluation of a laboratory's technical qualifications and competence for conducting specific standard test methods in acoustical testing.

Test methods that relate to this program may be developed by a trade, professional, governmental, or standards-writing organization.

Accreditation is available to any laboratory (including commercial, manufacturer, university, and federal, state and local government laboratories) that tests in accordance with standard acoustical test methods. A foreign-based laboratory may also be accredited by NVLAP if the laboratory meets the same requirements as domestic laboratories and pays any required additional fees associated with conducting the on-site assessment.

To be granted accreditation, a laboratory shall satisfy the NVLAP requirements contained in NIST Handbook 150 and this handbook, and their respective checklists.

1 General information

1.1 Scope

1.1.1 NIST Handbook 150-8 specifies technical requirements and provides guidance for NVLAP accreditation of laboratories that provide acoustical testing services. This handbook supplements the NVLAP procedures and general requirements found in NIST Handbook 150, *NVLAP Procedures and General Requirements*.

1.1.2 This handbook, NIST Handbook 150, NIST Handbook 150 Checklist, and NIST Handbook 150-8 Checklist constitute the collective body of requirements that must be met by a laboratory seeking NVLAP accreditation for acoustical testing services.

1.1.3 This handbook is intended for information and use by accredited acoustical testing services laboratories, assessors conducting on-site assessments, laboratories seeking accreditation, other laboratory accreditation systems, users of laboratory services, and others needing information on the requirements for NVLAP accreditation under the Acoustical Testing Services (ACO) Laboratory Accreditation Program (LAP).

1.2 Organization of handbook

The numbering and titles of the first five clauses of this handbook match those of NIST Handbook 150. The primary subclauses in clauses 4 and 5 (e.g., 4.1, 4.2, etc.) are also numbered and titled to correspond with those of NIST Handbook 150, even when there are no requirements additional to those in NIST Handbook 150.

1.3 Program description

1.3.1 This accreditation program is designed to satisfy the requirements of contractors, state and local governments, and federal agencies specifying accreditation for laboratories that perform testing for compliance to acoustical design specifications and performance testing of acoustical materials, noise producing devices, and noise protection devices.

1.3.2 Accreditation is available for standard test methods in the areas of sound absorption, acoustic impedance, sound attenuation, vibration, emitted sound power, sound pressure levels, and hearing protection, among others.

1.3.3 Test methods for which a laboratory may seek accreditation are listed in the Acoustical Testing Services Test Method Selection List, which is periodically updated and available from NVLAP. Other test methods may be added to the program upon request, if they are found to be appropriate by NVLAP.

1.4 References

The following documents are referenced in this handbook. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any

amendments) shall apply within one year of publication or within another time limit specified by regulations or other requirement documents.

- NIST Handbook 150, *NVLAP Procedures and General Requirements*
- IEEE Standard 1012, *IEEE Standard for Software Verification and Validation*
- ASTM C634, *Standard Terminology Relating to Environmental Acoustics*
- ANSI S1.1, *Acoustical Terminology*

1.5 Terms and definitions

For the purposes of this handbook, the terms and definitions given in NIST Handbook 150, the terms and definitions given in the standards for which the laboratory seeks accreditation, and the terms and definitions given in ASTM C634 and ANSI S1.1 apply.

1.6 Program documentation

1.6.1 General

NVLAP assessors use NVLAP checklists to ensure that each laboratory receives an assessment comparable to that received by others. Checklists assist assessors in documenting the assessment to the NVLAP requirements found in NIST Handbook 150 and this handbook. Checklists contain definitive statements or questions about all aspects of the NVLAP criteria for accreditation, and form part of the On-Site Assessment Report (see NIST Handbook 150). The current version of each checklist is available from the NVLAP web site at <<http://www.nist.gov/nvlap>>.

1.6.2 NIST Handbook 150 Checklist

All NVLAP programs use the NIST Handbook 150 Checklist, which contains the requirements published in NIST Handbook 150. The checklist items are numbered to correspond to clauses 4 and 5 and annexes A and B of NIST Handbook 150.

1.6.3 NIST Handbook 150-8 Checklist

The NIST Handbook 150-8 Checklist (also referred to as the ACO Program-Specific Checklist) addresses the requirements specific to the Acoustical Testing Services LAP. The checklist items are numbered to correspond to clauses 4 and 5 of NIST Handbook 150-8.

1.6.4 Test Method Review Summary

The assessor uses the Test Method Review Summary to review the laboratory's ability to perform the standard test methods for the Acoustical Testing Services LAP. The review of the test methods by the assessor ranges from observing tests to having laboratory staff describe the test procedures. The assessor notes on the Test Method Review Summary the depth into which each part of the test method was reviewed (Observed Test, Examined Apparatus, Walked/Talked Through Test, Listened to Description of Procedures).

1.6.5 NVLAP Lab Bulletins

NVLAP Lab Bulletins are issued to laboratories and assessors, when needed, to clarify program-specific requirements and to provide information about program additions and changes.

2 LAP establishment, development and implementation

This clause contains no information additional to that provided in NIST Handbook 150, clause 2.

3 Accreditation process

3.1 General

3.1.1 This clause discusses the assessment and accreditation process for laboratories in the Acoustical Testing Services LAP.

3.1.2 An overview of the laboratory accreditation process is provided in NIST Handbook 150, clause 3, and includes information pertaining to application for accreditation; on-site assessment; proficiency testing; accreditation decision; granting accreditation; renewal of accreditation; changes to scope of accreditation; monitoring visits; and suspension, denial, revocation, and voluntary termination of accreditation.

3.1.3 The assessment process consists of a NVLAP review of the laboratory's application and management system documentation and an on-site assessment visit.

3.1.4 NVLAP management may consider a pre-assessment on-site visit to better define a laboratory's requested scope of accreditation. In such cases, the pre-assessment costs will be charged to the laboratory in addition to the actual On-Site Assessment Fee.

3.2 Management system review

3.2.1 Prior to applying to NVLAP for accreditation, a laboratory should have a fully implemented management system.

3.2.2 Prior to the on-site assessment, the NVLAP assessor will review laboratory documents to ensure they cover all aspects of the management system and, if followed, satisfy the requirements in NIST Handbook 150, this handbook, and applicable test methods for which the laboratory seeks accreditation. The NVLAP assessor may also request technical documents, such as proficiency testing results, for review prior to arriving on-site. During the review, the NVLAP assessor may identify nonconformities and require changes to the management system so that it meets the requirements.

3.3 On-site assessment

3.3.1 When the management system review has been completed and identified nonconformities have been resolved, NVLAP schedules the on-site assessment.

3.3.2 The on-site assessment will take place at the laboratory site. The NVLAP assessor typically conducts the on-site assessment over a two- to three-day time period. The on-site assessment time may be longer depending on the number of standard test methods for which a laboratory requests accreditation. The on-site assessment time may be longer if a laboratory is accredited for standard field-testing methods. The laboratory will be charged for extended on-site assessment time. Efforts will be made to minimize disruption to the normal working routines during the assessment. The NVLAP assessor will need time and workspace to complete assessment documentation during his/her time at the laboratory site.

3.3.3 The laboratory should have its facilities and equipment in good working order and be ready for examination according to the requirements identified in this handbook, NIST Handbook 150, and the laboratory's management system documents, including the quality manual.

3.3.4 At the beginning of the on-site assessment, the laboratory should make available all supporting technical information in a format that is conducive to a detailed review.

3.3.5 NVLAP assessors will use the NIST Handbook 150 Checklist, NIST Handbook 150-8 Checklist, and the Test Method Review Summary to record the results of the assessment. The checklist and the technical specifics contained in this handbook ensure that the assessment is complete and that all assessors cover the same items at each laboratory.

3.3.6 The activities covered during a typical on-site assessment are discussed below. The NVLAP assessor, prior to the visit, will provide a preliminary agenda, which may change due to findings observed during the on-site assessment.

- a) *Opening meeting:* The NVLAP assessor will meet with laboratory management, supervisory personnel, and other staff members at the discretion of laboratory's management to explain the purpose of the on-site assessment and to discuss the schedule for the assessment activities. Information provided by the laboratory on its application form may be discussed during this meeting.
- b) *Staff interviews:* The assessor will ask the laboratory manager to assist in arranging times for individual interviews with laboratory staff members. The assessor will interview staff members filling key positions (e.g., Laboratory Manager, Technical Director, Quality Manager, Authorized Representative) and staff members who have an effect on the outcome of the testing. The assessor does not need to talk to all staff members; however, the assessor will select staff members representing all aspects of the laboratory. These interviews are conducted to determine if the staff members are properly trained, assigned, and supervised, and are technically competent for the tasks assigned to them.
- c) *Records review:* The assessor will review laboratory documentation, including the management system, quality manual, equipment and maintenance records, record-keeping procedures, testing procedures, laboratory test records and reports, personnel competency records, personnel training plans and records, and safeguards for the protection of sensitive and proprietary information. The assessor may request additional information in an effort to clarify issues regarding a nonconformity or to delve more deeply into a technical issue. Laboratory staff should be available to answer questions.

- d) *Internal audit and management review:* The assessor will review and discuss with the laboratory staff the laboratory's internal audit and management review activities. The discussion will include all aspects of those activities including the management system procedures, the audit findings, the results of the management review, and the actions taken to resolve those findings.
- e) *Equipment and software:* The assessor will examine and determine the suitability of all equipment and facilities required to perform the standard test methods for which the laboratory is accredited (or is seeking accreditation). The appropriate environmental conditions required for testing will be assessed. The assessor will review acoustical test room qualifications and test data, examine hardware and software for function and appropriateness, and review software validation and verification procedures.
- f) *Demonstrations:* Based on the scope of accreditation, the assessor will observe demonstrations of selected testing procedures conducted by technical personnel assigned to conduct the tests, and will discuss the tests to assure that the staff understands the procedures. The assessor may select and trace the history of one or more samples from receipt to final issuance of the test reports.
- g) *Proficiency testing:* The assessor will discuss all aspects of proficiency testing results with appropriate staff. Test methodology and records documenting the laboratory's execution of the testing will be reviewed and discussed. Unusual trends and outlying results will be discussed.
- h) *On-site assessment report:* The assessor will complete an on-site assessment report, which summarizes the findings and clearly lists nonconformities and comments (positive or negative). This report normally consists of the On-Site Assessment Report, the NIST Handbook 150 Checklist, the NIST Handbook 150-8 Checklist, and the Test Method Review Summary.
- i) *Closing meeting:* The assessor will conduct a closing meeting with the laboratory manager, supervisory personnel, and other staff members at the discretion of the laboratory's management to discuss the findings. During the visit, the assessor will have categorized each problem identified as either a nonconformity or a comment, which will be discussed at the closing meeting. Resolutions may be mutually agreed upon. The assessor will specifically note items that have been corrected during the on-site assessment along with any requirements for additional action.

The process for resolving nonconformities identified during the on-site assessment is documented in NIST Handbook 150. Any unresolved disagreements between the laboratory and the assessor may be referred to NVLAP headquarters for resolution. All information obtained by the assessor is held in strictest confidence.

The first page of the on-site assessment report is signed by the assessor and the laboratory Authorized Representative to acknowledge the discussion, but this does not necessarily indicate agreement by the laboratory. A copy of the report is given to the laboratory representative for retention, and the assessor sends the original to NVLAP.

3.3.7 The laboratory's response to all nonconformities should be clearly documented, providing a reference to applicable sections in the management system, the assessor's on-site assessment report, and any other technical supporting information. If found to be incomplete, NVLAP may reject the laboratory's response submission and request that the laboratory resubmit and provide the necessary documentation in order to facilitate a complete review of the resolved nonconformities.

3.3.8 The laboratory should review all comments for potential improvements in acoustical testing.

3.4 Proficiency testing

3.4.1 The laboratory shall have a plan for participating in proficiency testing (e.g., interlaboratory comparisons).

3.4.2 Laboratories shall participate in interlaboratory comparisons (ILCs) sponsored by standards organizations (ASTM International, ANSI, etc.) when the laboratory is accredited for the test method that is being used in the ILC.

3.4.3 Laboratories shall participate in proficiency testing activities announced by NVLAP.

3.4.4 Procedures for receiving, analyzing, and monitoring the laboratory's proficiency test results shall be in the laboratory's quality manual.

3.4.5 The laboratory shall evaluate the proficiency testing results, identify all outliers, and follow the requirements of NIST Handbook 150 for the control of nonconforming work.

3.4.6 The laboratory shall correct the problems that led to the poor performance in proficiency testing.

4 Management requirements for accreditation

4.1 Organization

There are no requirements additional to those set forth in NIST Handbook 150.

4.2 Management system

4.2.1 The requirements for a management system are contained in NIST Handbook 150, *NVLAP Procedures and General Requirements*.

4.2.2 The controlled version of the laboratory management system documentation may be paper-based or computer-based. Version control shall be maintained in either case.

4.2.3 If the laboratory uses a computer-based documentation system, the laboratory should consider the ease of usability by the staff. The laboratory shall ensure that staff is knowledgeable of the online documentation system and can readily retrieve appropriate information.

4.2.4 The laboratory shall create a cross-reference document allowing the laboratory and a NVLAP assessor to verify that all requirements of clauses 4 and 5 and annexes A and B of NIST Handbook 150 and the corresponding NIST Handbook 150-8 are addressed in the management system documentation.

4.2.5 The laboratory shall develop, document, and implement procedures covering all the technical requirements of this handbook and the standard test methods for which accreditation has been requested.

4.2.6 The most recent editions of the documents listed in 1.4 shall be available as references in maintaining the management system.

4.2.7 The laboratory shall have readily available the latest published version of all of the test methods for which accreditation has been requested.

4.2.8 If a regulation requires performance against previous versions of a standard test method, then the laboratory shall document that requirement and shall have available the required version of the standard test method.

4.2.9 The laboratory shall have copies of applicable referenced standards, practices and procedures.

4.3 Document control

There are no requirements additional to those set forth in NIST Handbook 150.

4.4 Review of requests, tenders and contracts

There are no requirements additional to those set forth in NIST Handbook 150.

4.5 Subcontracting of tests and calibrations

There are no requirements additional to those set forth in NIST Handbook 150.

4.6 Purchasing services and supplies

There are no requirements additional to those set forth in NIST Handbook 150.

4.7 Service to the customer

There are no requirements additional to those set forth in NIST Handbook 150.

4.8 Complaints

There are no requirements additional to those set forth in NIST Handbook 150.

4.9 Control of nonconforming testing and/or calibration work

There are no requirements additional to those set forth in NIST Handbook 150.

4.10 Improvement

There are no requirements additional to those set forth in NIST Handbook 150.

4.11 Corrective action

There are no requirements additional to those set forth in NIST Handbook 150.

4.12 Preventive action

There are no requirements additional to those set forth in NIST Handbook 150.

4.13 Control of records

4.13.1 Records shall be maintained for at least three years.

4.13.2 Records will be reviewed during the on-site visit either in total or by selected sampling.

4.13.3 All technical records (test/calibration/verification, etc.), in both hard-copy and electronic format, shall include the identity of the personnel responsible for the preparation, calibration, testing, and checking of the results and, where appropriate, the associated document date.

4.14 Internal audits

4.14.1 The internal audit shall cover compliance with NVLAP, laboratory management system, regulatory, test standard, and contractual requirement.

4.14.2 A laboratory applying to NVLAP for the first time shall conduct at least one complete internal audit and shall submit the audit records to NVLAP with the management system documentation prior to the first on-site assessment.

4.14.3 For accredited laboratories, records of internal audits conducted since the previous on-site assessment shall be available for review during an on-site assessment.

4.15 Management reviews

4.15.1 Periodic reviews of the management system shall reflect adherence to NVLAP requirements and the laboratory's quality objectives.

4.15.2 A laboratory applying to NVLAP for the first time shall conduct at least one complete management review and shall submit the records to NVLAP with the management system documentation prior to the first on-site assessment.

4.15.3 For accredited laboratories, records of management reviews conducted since the previous on-site assessment shall be available for review during an on-site assessment.

5 Technical requirements for accreditation

5.1 General

The quality manual shall contain, or refer to, documentation that describes and details the laboratory's implementation of procedures covering all of the technical requirements in NIST Handbook 150 and this handbook.

5.2 Personnel

5.2.1 The laboratory shall maintain records of personnel designated to fulfill NVLAP requirements including: Laboratory Director, Technical Director, Quality Manager, Team Leaders, NVLAP Authorized Representative, and NVLAP Approved Signatories.

NOTE The staff information may be kept in the official personnel folders or in separate, official folders that contain only information that the NVLAP assessors need to review. The assessors do not need to see any documents not related to the accreditation of the laboratory.

5.2.2 Laboratories shall document the required qualifications for each staff position.

5.2.3 The laboratory shall have a detailed and documented description of its training program for new and current staff members who have an effect on the outcome of acoustical testing. The laboratory shall establish and document performance criteria to determine when a staff member is qualified to work independently.

5.2.4 Staff members shall be retrained when procedures change, laboratory equipment and/or test chambers change, scope of accreditation changes, or when the individuals are assigned new responsibilities. Each staff member may receive training for assigned duties either through on-the-job training, formal classroom study, attendance at conferences, or another appropriate mechanism.

5.2.5 Training materials that are maintained within the laboratory shall be kept up-to-date and readily available to laboratory staff.

5.2.6 For each staff member, the staff member's immediate supervisor, or a designee appointed by the Laboratory Director, shall conduct annually an assessment and an observation of performance.

5.2.7 A record of the annual review of each staff member shall be dated and signed by the supervisor or designee and the employee.

5.2.8 Individuals hired to perform testing activities are sometimes referred to as "subcontractors." NVLAP does not make a distinction between full-time laboratory employees and individuals hired on a contract. NVLAP requires that the acoustical testing laboratory maintain responsibility for and control of any work performed within its scope of accreditation. The laboratory shall ensure all individuals performing testing activities satisfy all NVLAP requirements, irrespective of the means by which they are compensated (e.g., the laboratory must ensure all test personnel receive proper training and are subject to annual performance reviews, etc.).

5.3 Accommodation and environmental conditions

There are no requirements additional to those set forth in NIST Handbook 150.

5.4 Test and calibration methods and method validation

5.4.1 Standard test methods

5.4.1.1 The laboratory shall follow the current version of the standard test method for laboratory methods and field testing methods (see NIST Handbook 150, 5.4.2).

5.4.1.2 The laboratory may be accredited to perform standard test methods in their entirety or to perform only certain sections in the test method.

5.4.1.3 When customers request testing to previous or obsolete versions of a standard test method, the laboratory shall clearly identify to the customer that the testing is not part of their current scope of accreditation.

5.4.1.4 The laboratory shall have written procedures for laboratory personnel to follow when conducting tests. If determined suitable by NVLAP, the laboratory may use the specific standard test method as the only written procedure.

5.4.1.5 The procedures shall address any information not specifically contained in the standard method and any deviations used by the laboratory.

5.4.1.6 The procedures shall include equipment operation, calibration checks, and quality control checks.

5.4.2 Standard field-testing methods

5.4.2.1 A laboratory may be accredited for standard field-testing methods.

5.4.2.2 The field test may be performed in the laboratory only, or in the laboratory and field situation, or in the field only.

5.4.2.3 If a laboratory selects standard field-testing methods to be included in its scope of accreditation, the laboratory shall provide to the NVLAP assessor the following:

- a) complete step-by-step procedure for personnel to follow when performing the standard field test;
- b) demonstration or mock-up of the test procedure;
- c) folder or file containing raw data for a specific standard field test previously performed by the laboratory;
- d) test reports and test data sheets.

5.4.2.4 The laboratory shall select an appropriate acoustic component (e.g., office wall partition) within its facility as the designated field testing reference specimen. All quality control and monitoring procedures outlined both in NIST Handbook 150 and in this handbook shall apply to the field testing

reference specimen, including the regularly scheduled analysis of quality control data required in NIST Handbook 150, section 5.9.

5.4.3 Parallel standard test methods

5.4.3.1 Some standard test methods produced by the American National Standards Institute (ANSI), the International Organization for Standardization (ISO), and other standards organizations may be similar enough to allow for parallel accreditation.

5.4.3.2 A laboratory may request that its scope of accreditation reflect parallel standard test methods.

5.4.3.3 The laboratory shall provide evidence that the laboratory meets the requirements of the parallel standard test method.

5.4.3.4 NVLAP will determine if the laboratory meets all the requirements before NVLAP adds the parallel standard test method to the laboratory's scope of accreditation.

5.5 Equipment

There are no requirements additional to those set forth in NIST Handbook 150.

5.6 Measurement traceability

5.6.1 Proper performance of calibrated testing equipment shall be periodically verified under routine use and when the test equipment has been shipped or transported. The performance verification shall be documented in the laboratory calibration/verification log(s) or other suitable record.

5.6.2 The laboratory shall determine equipment calibration intervals based on the equipment's frequency of use and the environment in which it is used, and/or in accordance with standard test methods.

5.6.3 The laboratory shall document that the calibration intervals used by the laboratory are sufficient.

5.6.4 The reference standards used and the environmental conditions at the time of calibration shall be documented for all calibrations.

5.6.5 A laboratory may calibrate its own measurement and test equipment if it has trained personnel, written instructions, and the proper equipment and environment to provide traceability.

5.6.6 In addition to the equipment records specified in NIST Handbook 150, testing equipment calibration records shall include the following:

- a) notation of all equipment variables requiring calibration or verification;
- b) range of calibration/verification;
- c) resolution (precision or the number of digits read) of the instrument and its tolerance (allowable error);

- d) calibration/verification date and schedule;
- e) identity of the laboratory individual or external service responsible for calibration;
- f) source of reference standard and traceability.

5.6.7 Calibration records and evidence of the traceability of the reference standards used shall be made available for inspection during the on-site visit.

5.7 Sampling

There are no requirements additional to those set forth in NIST Handbook 150.

5.8 Handling of test and calibration items

There are no requirements additional to those set forth in NIST Handbook 150.

5.9 Assuring the quality of test and calibration results

5.9.1 The laboratory shall choose an appropriate reference specimen(s) to be used when conducting tests. The reference specimen(s) shall be tested annually and whenever a change is made to the test chambers or test instrumentation.

5.9.2 The analysis of test data for the purpose of quality control shall be presented in a suitable format, such as a table and/or a graph, for review and interpretation by staff and the NVLAP assessor. The quality control data may be presented by hard copy or electronically.

5.9.3 The laboratory shall provide documentation on the calculation of various test data, such as reverberation times.

5.9.4 The laboratory should experimentally characterize the sound field(s) by measuring and documenting sound pressure at a number of different locations and, from these measurements, obtain an estimate of the mean and standard deviation of the sound field when determining, e.g., sound absorption, sound power output, transmission loss, etc.

5.9.5 When computer software is purchased, updated, and/or algorithms revised, the laboratory shall verify through hand calculations the accuracy of the test results before using the computer software for reporting valid tests.

5.10 Reporting the results

5.10.1 Test report templates shall be developed for each standard test method for which the laboratory requests accreditation.

5.10.2 Test reports shall provide all necessary information to permit the same or another laboratory to reproduce the test plan.

5.10.3 When a test report contains results from tests that are outside the laboratory's scope of accreditation (e.g., testing is performed against previous or obsolete versions of a standard test method), the results shall be clearly identified.

5.10.4 The measurement uncertainty shall be reported numerically in relation to the test results if required by the test method or the customer.

6 Additional requirements

There are no additional requirements beyond NIST Handbook 150 and its associated normative annexes, and any other normative references cited in this handbook.