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NVLAP Fasteners and Metals

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NVLAP AND THE NVLAP LOGO

Abstract

NIST Handbook 150-18 presents the technical requirements and guidance for the accreditation of testing laboratories under the National Voluntary Laboratory Accreditation Program (NVLAP) Fasteners and Metals program. It is intended for information and use by accredited laboratories, laboratories seeking accreditation, laboratory accreditation systems, users of laboratory services, and others needing information on the requirements for accreditation under this program. The 2024 edition of NIST. The requirements of NIST Handbook 150 and the specific requirements and interpretations in the NIST Handbook 150-18 must be combined to produce the criteria for accreditation in the NVLAP Fasteners and Metals program. For more information visit the NVLAP website.

Keywords

accreditation; conformity assessment; ISO/IEC 17025; laboratory; management system; NVLAP; standards; testing; FQA; fasteners; metals.

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Foreword

The National Institute of Standards and Technology (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 comprises 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 series program-specific handbooks, which supplement NIST Handbook 150 by providing additional requirements, guidance, and interpretive information applicable to specific NVLAP laboratory accreditation programs (LAPs).

The program-specific handbooks are not stand-alone documents, but rather are companion documents to NIST Handbook 150 and the referenced ISO/IEC 17025 requirements. They tailor the general criteria referenced in NIST Handbook 150 to the specific tests, calibrations, or types of tests or calibrations covered by a LAP.

NIST Handbook 150-18, *NVLAP Fasteners and Metals*, presents the technical requirements and guidance for the accreditation of laboratories under the NVLAP Fasteners and Metals LAP. The 2024 edition incorporates changes resulting from the release of the newest editions of ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*, and NIST Handbook 150, as well as editorial improvements. The 2024 edition of NIST Handbook 150-18 supersedes and replaces the 2009 edition.

The handbook was revised with the participation of technical experts in the field of fasteners and metals testing and was approved by NVLAP. A list of the changes is located in Appendix A.

This handbook is also available on the NVLAP website and through the NIST Research Library at https://doi.org/10.6028/NIST.HB.150-18e2024.

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; e-mail: nvlap@nist.gov.

Preface

The Fastener Quality Act (FQA), Public Law (PL) 101-592, was signed by President George H. W. Bush on November 16, 1990. The Act protects public safety by: (1) requiring that certain fasteners sold in commerce conform to the specifications to which they are represented to be manufactured; (2) providing for accreditation of laboratories engaged in fastener testing; and (3) requiring inspection, testing, and certification in accordance with standardized methods.

The Act requires the Secretary of Commerce, acting through the Director of NIST, to establish a laboratory accreditation program for fastener testing laboratories under the procedures of the National Voluntary Laboratory Accreditation Program (NVLAP). The accreditation program includes test methods that are required by fastener specifications or standards covered by the Act. Since fastener testing involves a wide range of expertise, accreditation is offered in the areas of mechanical and physical testing and inspection, metallography, nondestructive inspection, dimensional inspection, and chemical analysis.

On March 7, 1996, President William J. Clinton signed the National Technology Transfer and Advancement Act of 1995, PL 104-113, which amended the FQA to further clarify and define the requirements of the original Act. Further amendments were promulgated by PL 105-234 (August 14, 1998), an Act exempting certain fasteners approved by the Federal Aviation Administration from FQA coverage, and PL 106-34 (June 8, 1999), the FQA Amendments Act of 1999.

1 General information

1.1 Scope

1.1.1 NIST Handbook 150-18 specifies the technical requirements and provides guidance for the accreditation of laboratories under the NVLAP Fasteners and Metals Laboratory Accreditation Program (Fasteners and Metals LAP). This handbook supplements the NVLAP procedures and general requirements found in NIST Handbook 150 and the superseding requirements found in the Fastener Quality Act.

1.1.2 NIST Handbook 150, this handbook, ISO/IEC 17025, and the respective checklists (see 1.6) constitute the collective body of requirements that must be met by a laboratory seeking NVLAP accreditation to specific test methods for the Fasteners and Metals Program. The interpretive comments and additional requirements contained in this handbook make the general NVLAP criteria specifically applicable to the Fasteners and Metals Program.

1.1.3 This handbook is intended for information and use by accredited fasteners laboratories, assessors conducting onsite assessments, laboratories seeking accreditation, other laboratory accreditation systems, users of laboratory services, and others needing information on the requirements for accreditation under the Fasteners and Metals Program.

1.2 Organization of handbook

The numbering and titles of clauses four through eight of this handbook match those of ISO/IEC 17025:2017. The primary subclauses in clauses 4 through 8 (e.g., 4.1, 4.2, etc.) are also numbered and titled to correspond with those of ISO/IEC 17025, even when there are no additional requirements.

1.3 Program description

1.3.1 This accreditation program is designed to satisfy the requirement of the Fastener Quality Act (FQA) for accreditation of laboratories engaged in fastener testing.

1.3.2 Accreditation is available for standard test methods in mechanical and physical testing and inspection, metallography, nondestructive inspection, dimensional inspection, and chemical analysis. Non-standard or laboratory-developed test methods may be added to the program upon request if they are found to be appropriate by NVLAP. A listing of the test methods included in the program is given in the test methods and calibration parameters listing available on the NVLAP website. The list is found under the program “Fasteners and Metals.”

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.

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

— NIST Handbook 150, *NVLAP Procedures and General Requirements*.

— Fastener Quality Act, Public Law 101-592, as amended by P.L.104-113, P.L. 105-234, and P.L 106-34.

— National Technology Transfer and Advancement Act of 1995, Public Law 104-113, 1995.

1.5 Terms and definitions

For the purposes of this handbook, the terms and definitions given in NIST Handbook 150 and the Fastener Quality Act apply.

1.6 Program documentation

1.6.1 General

Assessors use NVLAP checklists to ensure that each laboratory receives an assessment comparable to that received by others and to ensure completeness, uniformity, and objectivity. Checklists assist assessors in documenting the assessment to the NVLAP requirements found in NIST Handbook 150, this handbook, and ISO/IEC 17025. Checklists contain definitive statements or questions about all aspects of the NVLAP criteria for accreditation, and form part of the onsite assessment report (see NIST Handbook 150). The current version of the program checklist is available in the NVLAP Interactive Web System (NIWS) portal.

1.6.2 NVLAP General Criteria Checklist

All NVLAP programs use the NVLAP General Criteria Checklist (formerly called the NIST Handbook 150 Checklist), which contains the requirements published in NIST Handbook 150 and ISO/IEC 17025. The checklist items are numbered to correspond to ISO/IEC 17025, clauses 4 through 8, and to NIST Handbook 150, annexes A, B, and E. Applicant or accredited laboratories may contact a NVLAP Program Manager to obtain a copy of this checklist pending provision of proof of ownership of a legal copy of the text of ISO/IEC 17025.

1.6.3 NIST Handbook 150-18 Checklist

The NIST Handbook 150-18 Checklist addresses the requirements specific to fasteners and metals testing given in NIST Handbook 150-18. This checklist is available in the NIWS portal.

1.6.4 Test Method Review Summary

The assessor uses the *Test Method Review Summary* to review the laboratory's ability to perform the test methods. 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

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

3.2 Management system review

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

3.2.2 Prior to the onsite assessment, the assigned NVLAP assessor reviews all relevant management system documentation for conformity with NVLAP requirements, included the requirements of this handbook, NIST Handbook 150 and ISO/IEC 17025. During this review, the assessor may request additional management system and/or technical documents and/or records, which will be returned upon request.

3.3 Onsite assessment

3.3.1 The purpose of the onsite assessment is to determine whether the laboratory is following its documented quality management system and to assess the competence of the laboratory's testing services. The laboratory shall be prepared to conduct test demonstrations, have equipment in good working order, and be ready for examination according to the requirements identified in ISO/IEC 17025, this handbook, and NIST Handbook 150. The assessor will need time and workspace to complete assessment of the documentation during the visit.

3.3.2 In addition to the checklists, to help assure the completeness, objectivity, and uniformity of the onsite assessment, the assessor uses the NVLAP Test Method Review Summary to document review of the capability of laboratory personnel to perform the test methods for which accreditation is sought. The test method review ranges from observing tests to having laboratory staff describe the test procedures. The assessor notes the depth to which each part of the test method was reviewed and records the results of the review on the summary.

3.3.3 An assessor performs the following activities during a typical onsite assessment:

a) Conducts an opening meeting with the laboratory manager to explain the purpose of the onsite visit and to discuss the schedule for the assessment activities. At the discretion of the laboratory manager, other staff may attend the meeting.

b) Reviews laboratory documentation not provided for review prior to the assessment, including the quality management system, equipment and maintenance records, record-keeping procedure, 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.

At least one laboratory staff member shall be available to answer questions; however, the assessor may wish to review the documents while alone. Documents previously supplied will be returned.

c) Examines equipment and facilities, observes the demonstration of selected procedures by appropriate personnel assigned to conduct the tests, and interviews those personnel. The demonstrations requested may be selective or all-inclusive and shall include sample test material(s), preparation and calibration of devices and equipment, and establishment of test conditions and the setup/use of major equipment.

d) Completes an onsite assessment report, which contains the NVLAP General Criteria Checklist (ISO/IEC 17025), the NIST Handbook 150-18 Checklist, and the Test Method Review Summary. A copy of the report will be given to the laboratory representative for retention, and the assessor will upload all reports, comments and nonconformities into the NIWS portal.

e) Conducts a closing meeting with the laboratory to explain the findings of the visit. At the closing meeting, the report shall be signed by the assessor and the laboratory's Authorized Representative to acknowledge the discussion of the outcome of the onsite assessment. The Authorized Representative's signature does not necessarily indicate agreement, merely receipt, and challenges may be made through NVLAP. The process for resolving nonconformities identified during the onsite assessment is documented in NIST Handbook 150.

3.3.4 The information gathered by the assessor is held in strict confidence.

3.4 Proficiency testing

3.4.1 Participation in proficiency testing is required biannually (twice a year) for:

a) Rockwell hardness of fasteners (externally threaded),
b) axial tensile strength of full-size threaded fasteners,
c) wedge tensile strength of full-size threaded fasteners,
d) tensile strength tests of machined aluminum and steel,
e) fastener double shear,
f) case depth,
g) round dimensional,
h) chemical analysis.

3.4.2 Participation in proficiency testing is based on availability for these test methods. If no proficiency testing is available for other test methods on the laboratory's scope, the laboratory shall meet requirements of ISO/IEC 17025, section 7.7 to ensure the validity of results.

3.4.3 If an accredited laboratory fails a proficiency test, it shall complete the following requirements to maintain its accreditation:

a) Within 30 days of notification of failure, submit detailed, written documentation to NVLAP that includes an analysis of why the laboratory failed each part of the test and what corrective actions it has taken (analyst training, revised procedures, quality assurance activities, etc.) to resolve its analytical problems to avoid similar errors in the future.

Documented evidence that the corrective actions have been effectively implemented is also required.

b) Participate successfully in the next round of proficiency testing. See 7.7 below.

3.4.4 If a laboratory fails the same type of proficiency testing twice in succession, its accreditation for test methods of the type tested will be suspended. Accreditation will be reinstated upon successful participation in the next round of proficiency testing.

If a laboratory generally exhibits an erratic pattern in testing, NVLAP will review all current and previous proficiency testing results and advise the laboratory of what actions must be taken by the laboratory in response to the nonconformities causing the erratic testing. Failure to correct the nonconformities may result in suspension of accreditation. In some cases, to regain accreditation, the laboratory shall undergo a complete onsite assessment to determine the cause of the nonconformities and to determine by further proficiency testing that effective corrective actions have been implemented. The laboratory shall provide NVLAP with documentation within 30 days of the assessment that adequately demonstrates that the nonconformities noted by the assessor have been satisfactorily resolved. Failure to perform satisfactorily in the onsite assessment will result in accreditation remaining suspended.

The laboratory shall pay for the full cost of an onsite assessment in advance. NVLAP staff will make every effort to expedite these extraordinary assessments to give a laboratory every reasonable opportunity to demonstrate competence to perform the test method and regain accreditation.

3.4.5 Failure to participate in a round of proficiency testing will result in immediate suspension of accreditation for the specific test method(s) covered by the proficiency test, and the laboratory shall successfully participate in the next regularly scheduled round to have its accreditation reinstated.

3.4.6 In no case shall proficiency test samples be considered as calibration standards or standard reference materials or be used as substitutes for calibration standards that are traceable to national (i.e., NIST) or international standards laboratories.

4 General requirements

There are no requirements additional to those set forth in ISO/IEC 17025.

5 Structural requirements

There are no requirements additional to those set forth in ISO/IEC 17025.

6 Resource requirements

There are no requirements additional to those set forth in ISO/IEC 17025.

7 Process requirements

7.1 Review of requests, tenders and contracts

There are no requirements additional to those set forth in ISO/IEC 17025.

7.2 Selection, verification and validation of methods

There are no requirements additional to those set forth in ISO/IEC 17025.

7.3 Sampling

There are no requirements additional to those set forth in ISO/IEC 17025.

7.4 Handling of test or calibration items

There are no requirements additional to those set forth in ISO/IEC 17025.

7.5 Technical records

There are no requirements additional to those set forth in ISO/IEC 17025.

7.6 Evaluation of measurement uncertainty

There are no requirements additional to those set forth in ISO/IEC 17025.

7.7 Ensuring the validity of results

Outlying results shall be processed through the laboratory's corrective action and nonconforming work processes (see sections 8.7 and 7.10 of ISO/IEC 17025).

7.8 Reporting of results

Corrections or additions to test reports shall specify which test result is in question, the content of the result, the explanation of the result, and the reason for acceptance of the result. (see section 7.8.8 of ISO/IEC 17025).

7.9 Complaints

There are no requirements additional to those set forth in ISO/IEC 17025.

7.10 Nonconforming work

There are no requirements additional to those set forth in ISO/IEC 17025.

7.11 Control of data and information management

There are no requirements additional to those set forth in ISO/IEC 17025.

8 Management system requirements

8.1 Options

There are no requirements additional to those set forth in ISO/IEC 17025.

8.2 Management system documentation

There are no requirements additional to those set forth in ISO/IEC 17025.

8.3 Control of management system documents

There are no requirements additional to those set forth in ISO/IEC 17025.

8.4 Control of records

8.4.1 Records shall be kept for a period of at least three years unless a longer period is required by the customer, regulation, or the laboratory's own procedures.

8.4.2 If a fastener testing laboratory is part of a fastener manufacturing business, "Records of Conformance," as defined in the FQA, Section 3, Definitions, Part 13, designated for each lot of fasteners sold or offered for sale shall be retained by the laboratory for a minimum of five years.

8.5 Actions to address risks and opportunities

There are no requirements additional to those set forth in ISO/IEC 17025.

8.6 Improvement

There are no requirements additional to those set forth in ISO/IEC 17025.

8.7 Corrective actions

There are no requirements additional to those set forth in ISO/IEC 17025.

8.8 Internal audits

8.8.1 An applicant laboratory shall conduct at least one complete internal audit prior to the first onsite assessment. The records will be reviewed by the NVLAP assessor before or during the onsite assessment visit.

8.8.2 Internal audits are separate and distinct from both management reviews (see sections 8.8 and 8.9 of ISO/IEC 17025) and NVLAP onsite assessments.

8.9 Management reviews

An applicant laboratory shall perform at least one complete management review prior to the first onsite assessment. The records will be reviewed by the NVLAP assessor before or during the onsite assessment visit.

Appendix A Change Log

The 2024 edition incorporates changes resulting from the release of the newest editions of ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*, and NIST Handbook 150, as well as editorial improvements.

The following main changes have been made to this handbook with respect to the previous edition:

- All references to applicable international guides and standards have been updated;
- The numbering has been updated to correspond to that used by ISO/IEC 17025:2017, *General requirements for the competence of testing and calibration laboratories*.
- Redundant requirements for specific equipment, records, etc. found in the various standards for test methods used in the program were removed.
- Annex A (informative) – "Fasteners and Metals Program major areas of testing" was removed. A listing of the test methods included in the program is now given in the test methods and calibration parameters listing available on the NVLAP website. The list is found under the program "Fasteners and Metals."