

NIST HANDBOOK 150-22

National  
Voluntary  
Laboratory  
Accreditation  
Program

VOTING  
SYSTEM  
TESTING

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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 NVLAP laboratory accreditation programs (LAPs).

The program-specific handbooks are not standalone documents, but rather are companion documents to NIST Handbook 150. They tailor the general criteria found in NIST Handbook 150 to the specific tests, calibrations, or types of tests or calibrations covered by a LAP.

NIST Handbook 150-22, *NVLAP Voting System Testing*, presents the technical requirements and guidance for the accreditation of laboratories under the NVLAP Voting System Testing LAP. The 2005 edition is based upon the newest editions of ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*, and NIST Handbook 150.

The handbook was written with the participation of technical experts in applicable fields of testing concerning voting systems and was approved by NVLAP.

The body of the handbook has been structured to conform with internationally accepted rules for the structure and drafting of standards, where appropriate, to promote ease of use and understanding.

This handbook is available on the NVLAP web site (<http://www.nist.gov/nvlap>).

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](mailto:nvlap@nist.gov).

## **Introduction**

The Help America Vote Act (HAVA) of 2002 (Public Law 107-252) was signed into law by President Bush on October 29, 2002. Section 231 of HAVA requires the Director of NIST to provide for the accreditation of laboratories that conduct testing on the hardware and software of voting systems. In response to the HAVA, the National Voluntary Laboratory Accreditation Program (NVLAP) has established a program for laboratories that test voting systems.

The Voting System Standards of 2002 (VSS-2002) were approved for release and publication by the Federal Election Commission on April 30, 2002. The VSS-2002 provides for entities called "Independent Test Authorities" (ITAs): laboratories that test to the requirements of the VSS-2002 and certify products that meet the requirements. ITAs were approved by the National Association of State Election Directors. In the future, the testing will be conducted by NVLAP-accredited Voting System Testing Laboratories (VSTLs). Product certification will be performed by the U.S. Election Assistance Commission (EAC).

VSTLs will be required to meet the requirements in NIST Handbook 150, the VSS-2002, HAVA, and any other criteria deemed necessary by the EAC. VSTLs should be familiar with the election and voting communities including the National Association of State Election Directors (NASED) and the National Association of Secretaries of State (NASS).

# **1 General information**

## **1.1 Scope**

**1.1.1** The purpose of this handbook is to set out procedures, technical requirements, and guidance for accreditation of Voting System Testing Laboratories (VSTLs).

**1.1.2** This handbook supplements the procedures and general requirements found in NIST Handbook 150. The scope of the Voting System Testing (VST) program is the set of tests contained in the Voting System Standards as specified in the Help America Vote Act (HAVA) of 2002 (Public Law 107-252) and any other tests deemed necessary by the U.S. Election Assistance Commission (EAC).

**1.1.3** The interpretive comments and additional requirements contained in this handbook make the general NVLAP criteria specifically applicable to the Voting System Testing laboratory accreditation program (VST LAP).

**1.1.4** The requirements of NIST Handbook 150, this handbook, and the NIST Handbook 150-22 Checklist are normative (i.e., mandatory) and must be combined to produce the criteria for accreditation in the VST LAP.

## **1.2 Organization of handbook**

The numbering and titles for first and most second level headings of this handbook match those of NIST Handbook 150. Lower level headings are generally specific to the VST LAP. In some cases, upper level headings have been included in the document with no additional text. In these cases, refer to NIST Handbook 150.

## **1.3 Program description**

**1.3.1** HAVA states that it is "an act to establish a program to provide funds to States to replace punch card voting systems, to establish the Election Assistance Commission to assist in the administration of Federal elections and to otherwise provide assistance with the administration of certain Federal election laws and programs, to establish minimum election administration standards for States and units of local government with responsibility for the administration of Federal elections, and for other purposes."

**1.3.2** HAVA Section 231 requires EAC and NIST to develop a national program for accrediting voting system testing laboratories. On June 23, 2004, NIST published a notice in the *Federal Register* announcing the establishment of this program.

**1.3.3** The purpose of the VST LAP is to accredit VSTLs to conduct testing of voting systems and components, providing a measure of confidence that such laboratories are capable of performing testing to meet the requirements of HAVA. VSTLs will provide testing services for core voting requirements and may subcontract requirements that are not voting-specific. VSTLs will use tests and test methods from VSS-2002, including test methods incorporated by reference (e.g., electromagnetic compatibility).

**1.3.4** Laboratories that achieve NVLAP accreditation will be recommended by NIST to the EAC for designation as approved Voting System Test and Certification Authorities (VSTCAs). The EAC will

maintain a list of VSTCAs to help vendors and elections officials identify resources to fulfill system testing requirements.

**1.3.5** EAC-accredited VSTCAs will test and certify voting systems for conformance with the voluntary voting system standards. Once testing is complete, the results will be reviewed by the EAC to determine whether the system is eligible to be designated by the EAC as a qualified voting system.

## **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*, available at <<http://www.nist.gov/nvlap>>
- Help America Vote Act (HAVA) of 2002 (Public Law 107-252), available at <<http://www.eac.gov>>
- Voting System Standards of 2002 (VSS-2002), available at <[http://www.eac.gov/election\\_resources/vss.html](http://www.eac.gov/election_resources/vss.html)>

## **1.5 Terms and definitions**

The Voting System Testing LAP brings together requirements from a number of different communities. Each of these communities may have its own special vocabulary and its own definitions. Where the same word is used by more than one community, the laboratory must ensure that all involved parties understand which definition the laboratory is using in its contracts, test plans, reports, etc.

For the purposes of this handbook, the terms and definitions given in NIST Handbook 150, the VSS-2002, Volume I, Appendix A, and the following apply.

### **1.5.1**

#### **core voting system tests**

The core voting system tests in the VST LAP include: Technical Data Package review, physical configuration audit, source code review, functional configuration audit, system integration test, volume tests, and security tests. While the VSS-2002 includes testing for the following, they are not included in the VST LAP: electromagnetic compatibility, telecommunications, environmental, electrical, acoustical, and cryptographic modules.

### **1.5.2**

#### **EAC-accredited laboratory**

A NVLAP-accredited, non-federal Voting System Testing Laboratory (VSTL) located in the United States that has been accredited by the EAC per HAVA Section 231.

### **1.5.3**

#### **letter of intent**

A written agreement between the laboratory and the EAC committing the laboratory to meet the EAC requirements. The letter of intent must be sent to the EAC prior to EAC accreditation.



#### **1.5.4**

##### **test campaign**

The sum of the work by a VSTL on a single product or system from contract through test plan, conduct of testing for each requirement (including hardware, software, and systems), reporting, archiving, and responding to issues afterwards.

NOTE Testing of modified products and systems for re-qualification is a new test campaign.

#### **1.5.5**

##### **Voluntary Voting System Guidelines**

Future issues of the Voting System Standards (VSS) will be called Voluntary Voting System Guidelines (VVSG). The VVSG will be approved and published by the EAC.

#### **1.5.6**

##### **voting system** (verbatim from VSS-2002, Volume I, Section 1.5.1)

A voting system is a combination of mechanical, electromechanical, or electronic equipment. It includes the software required to program, control, and support the equipment that is used to define ballots; to cast and count votes; to report and/or display election results; and to maintain and produce all audit trail information. A voting system may also include the transmission of results over telecommunication networks.

Additionally, a voting system includes the associated documentation used to operate the system, maintain the system, identify system components and their versions, test the system during its development and maintenance, maintain records of system errors and defects, and determine specific changes made after system qualification. By definition, this includes all documentation required in Section 9.4 [VSS-2002, Volume I].

#### **1.5.7**

##### **Voting System Testing Laboratory (VSTL)**

A testing laboratory accredited by NVLAP under the Voting System Testing LAP for core voting system tests in the VSS-2002. A VSTL provides attestation to the EAC that a voting system conforms to the VSS-2002 for consideration as a qualified voting system.

NOTE In the VSS-2002, test laboratories are referred to as *Independent Test Authorities (ITAs)*, *test authorities*, and *test agencies*. The term *Voting System Testing Laboratory* includes all test laboratory functions described in the VSS-2002 and replaces the other terms.

#### **1.5.8**

##### **Voting System Test and Certification Authority (VSTCA)**

An organization accredited by the EAC to test, certify, decertify, and recertify voting systems under HAVA. The EAC defines the conditions and requirements for accreditation of VSTCAs (see HAVA, Section 231(b)(2)(A)).

## **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. Checklists assist assessors in documenting the assessment to the NVLAP

requirements found in NIST Handbook 150, this handbook, and the checklists themselves. 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 on the NVLAP web site <<http://www.nist.gov/nvlap>>.

### **1.6.2 NIST Handbook 150 Checklist**

All NVLAP programs use the NIST Handbook 150 Checklist (formerly called the General Operations 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 150-22 Checklist**

The NIST Handbook 150-22 Checklist (also referred to as the VST Program-Specific Checklist) addresses the requirements specific to voting system testing given in NIST Handbook 150-22. The checklist may contain requirements expressed at a more detailed level than found in this handbook.

## **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 Voting System Testing Laboratories.

**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** NVLAP may consider a pre-assessment on-site visit to better define the 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.

**3.1.4** Proficiency testing may be required before initial accreditation and periodically thereafter. Laboratories will be informed when proficiency testing is required.

### **3.2 Management system review**

**3.2.1** Prior to applying to NVLAP, the laboratory shall have a fully implemented management system. A copy of the quality manual and relevant associated documents are sent to NVLAP with the application forms.

**3.2.2** Prior to an on-site assessment, one or more NVLAP assessors review the documents to ensure they cover all aspects of the management system and, if followed, satisfy the requirements in NIST Handbook 150 and this handbook. During the review, the assessors may identify nonconformities and require changes to the management system so that it meets the requirements.

**3.2.3** It is recommended that the laboratory create a cross-reference document to allow the laboratory and the assessors to verify that all NVLAP requirements are addressed in the management system documentation.

### **3.3 On-site assessment**

**3.3.1** When the management system review has been completed and nonconformities resolved, NVLAP will schedule the on-site assessment.

**3.3.2** The number of assessors on the team and the duration of the visit are dependent on the scope of accreditation requested by the laboratory. A typical NVLAP on-site assessment is conducted by a team of two NVLAP assessors over a two-and-one-half day time period. For a laboratory with a limited scope, the team and duration may be smaller. For a laboratory seeking accreditation for all of the core testing requirements, the team and duration will be larger. The assessment will normally take place at the main laboratory site.

**3.3.3** The laboratory shall have its facilities and equipment in good working order and be ready for examination according to the NVLAP requirements and the laboratory quality manual. Efforts will be made to minimize disruption to the normal working routines during the assessment. The assessors will need time and workspace to complete assessment documentation during their time at the laboratory site.

**3.3.4** The assessors will use the checklists described in 1.6 to ensure that the assessment is complete and that all assessors cover the same items at each laboratory. The assessors may request additional information in an effort to clarify checklist responses or delve more deeply into a technical issue.

**3.3.5** The activities covered during a typical on-site assessment are described below. The assessor, prior to the visit, will provide a specific agenda.

- a) *Opening meeting:* The assessors meet with laboratory management and supervisory personnel 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. At the discretion of the laboratory manager, other staff members may attend this meeting.
- b) *Staff interviews:* The assessors ask the laboratory manager to assist in arranging times for individual interviews with laboratory staff members. The assessors interview staff members filling key positions (e.g., laboratory manager and Authorized Representative) and staff members who have an effect on the outcome of the testing. It is not necessary for the assessors to talk to all staff members; however, they will select staff members representing all aspects of the laboratory.

These interviews are conducted to determine if the staff members are properly trained, assigned, supervised and technically competent for the tasks assigned to them. The staff are expected to know HAVA, the VSS-2002, and the specific technical aspects of the systems that the laboratory tests.

- c) *Records review:* The assessors 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, procedures for updating pertinent information (e.g., the VSS-2002 and state regulations), and safeguards for the protection of vendor-sensitive and proprietary information.

The assessors do not need access to employee information that may be considered sensitive or private such as salary, medical information, or performance reviews for work done outside the scope of the laboratory's accreditation. However, this information is often stored together with technical information that the assessors need to check (e.g., job descriptions, resumes, and technical performance reviews). In these cases, the assessors work with the laboratory to ensure that they are able to perform their review without violating individual privacy. At the discretion of the laboratory, a member of its human resources department may be present during the review of personnel information.

- d) *Internal audit and management review:* The assessors 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 problems identified.
- e) *Demonstrations:* Test personnel are requested to demonstrate their competence to perform the test methods for which accreditation is sought. The demonstrations include system configuration. For tests that cannot be completed during the on-site visit, portions of tests are observed. The laboratory should have a voting system available during the on-site visit for the purpose of these demonstrations.
- f) *Proficiency testing:* When applicable, the assessors discuss all aspects of proficiency testing with laboratory staff. Test methodology and the records documenting the laboratory's execution of the testing are reviewed and discussed.
- g) *On-site assessment report:* The assessors draft an on-site assessment report, which summarizes their findings (nonconformities and comments). This report normally consists of the On-Site Report, the NIST Handbook 150 Checklist, and the VST Program-Specific Checklist.
- h) *Closing meeting:* At the end of the on-site assessment, the assessors hold a closing meeting with the laboratory manager and staff to discuss the on-site assessment report and the laboratory's plans for resolution of nonconformities. The process for resolving nonconformities is documented in NIST Handbook 150.

At the conclusion of the discussion, the report is finalized and the assessors and the laboratory's Authorized Representative sign the report. A copy of the complete report is given to the laboratory representative. Any disagreements between the laboratory and the assessors are referred to NVLAP.

### **3.4 Proficiency testing**

**3.4.1** Proficiency testing requirements for this LAP are under development. Proficiency testing may include the testing of artifacts and quizzes and written examinations.

**3.4.2** Applicant and accredited laboratories will be informed when proficiency testing is required.

## **3.5 NVLAP recommendation to EAC**

**3.5.1** NVLAP will accept an application for accreditation from any laboratory. However, HAVA permits the EAC to list only "independent, non-Federal" laboratories.

**3.5.2** Once a VSTL has been granted NVLAP accreditation, NVLAP will recommend it to the Director of NIST for submission for consideration by the EAC (see HAVA 231 (b) (1)).

**3.5.3** The EAC will determine if the laboratory meets EAC requirements and that a letter of intent has been filed before it grants accreditation (see HAVA 231 (b) (2)).

## **4 Management requirements for accreditation**

### **4.1 Organization**

**4.1.1** The laboratory shall establish and maintain policies and procedures for maintaining laboratory impartiality and integrity in the conduct of voting system testing. When conducting testing under HAVA, the laboratory policies and procedures shall ensure that:

- a) laboratory staff members cannot both develop and test a product or system;
- b) laboratory staff members cannot provide consulting services for and then participate in the test of that product or system.

**4.1.2** The laboratory shall have physical and electronic controls augmented with an explicit policy and set of procedures for maintaining separation, both physical and electronic, between the laboratory test personnel and laboratory consultants, product developers, system integrators, and others who may have an interest in and/or may unduly influence the outcome of the test.

### **4.2 Management system**

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

**4.2.2** The following general management system procedures (required, but not limited to) shall be included with the quality manual when it is submitted as part of the application package:

- a) internal audits and management review;
- b) writing and implementing system procedures;
- c) writing and implementing system instructions;
- d) staff training and individual development plans;
- e) contract review;

- f) staff members who work at home and at alternate work sites outside the laboratory (e.g., telecommuting);
- g) referencing NVLAP accreditation and use of the NVLAP symbol.

**4.2.3** The following program-specific procedures (required, but not limited to) shall be included with the quality manual when it is submitted as part of the application package:

- a) review of the vendor Technical Data Package (VSS-2002, Volume II, Section 2);
- b) selecting the laboratory staff for a qualification test team;
- c) writing a Qualification Test Plan for first-time testing and testing of modified systems (VSS-2002, Volume II, Appendix A);
- d) writing Test Operation Procedures (VSS-2002, Volume II, Appendix A.6.4);
- e) conducting testing at a customer's site (if the laboratory offers such services);
- f) writing a Qualification Test Report (VSS-2002, Volume II, Appendix B);
- g) writing the Configuration Management Plan (VSS-2002, Volume II, Section 2.11);
- h) ensuring the protection of proprietary information against threat from persons outside the laboratory, from visitors to the laboratory, from laboratory personnel without a need to know, and from other unauthorized persons;
- i) cooperating with the EAC during test campaigns;
- j) witnessing of system build and installation.

### **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**

**4.4.1** The procedures for review of contracts shall include procedures to ensure that the customer understands that its products and systems must meet the requirements of HAVA, the VSS-2002, and the EAC.

**4.4.2** The review shall include (but is not limited to): laboratory competencies and resources to provide the service, vendor-supplied documentation, tests to be conducted, testing in additional Qualification Testing, and subcontracting.

**4.4.3** The laboratory may conduct Certification Testing for products and systems for which it previously conducted Qualification Testing.

**4.4.4** When conducting a contract review, the VSTL should determine if there are any special or changed requirements from the EAC or from state or local election authorities.

## **4.5 Subcontracting of tests and calibrations**

**4.5.1** Subcontracting of tests and calibrations is the use of laboratory services outside of the VSTL to perform tests and calibrations, e.g., electromagnetic compatibility testing, environmental testing, shock and vibration testing, FIPS 140 validation, and physical test instrument calibration. The word *subcontracting* is not used to describe a mechanism by which the laboratory employs staff members (see 5.2.7).

**4.5.2** If the VSTL subcontracts testing for any test within its scope of accreditation, the subcontracted laboratory shall also be an EAC-accredited VSTL. All core voting system testing shall be conducted by a VSTL.

**4.5.3** If the VSTL subcontracts core voting system testing that is outside of its scope of accreditation, the subcontracted laboratory must be located in the United States and must be accredited by NVLAP.

Subcontractors for non-core testing do not need to be accredited under the VST LAP. If laboratories accredited in another LAP are available for non-core testing, VSTLs should use accredited laboratories. When an accredited laboratory is not available for non-core testing, the VSTL shall conduct an audit of the subcontracted laboratory and shall document that the laboratory is competent and qualified for use.

**4.5.4** When a VSTL subcontracts to another laboratory, the VSTL is responsible for ensuring that setup, configuration, testing, and reporting is competent, appropriate, and conducted by qualified people. The VSTL shall ensure that there are no gaps in the knowledge required to conduct the testing. For example, a VSTL subcontracting with another laboratory to conduct temperature cycling tests should conduct the functional testing itself rather than allowing the subcontractor to do so. The VSTL is responsible for ensuring that the entire voting system is properly tested.

## **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** The laboratory shall set policies and procedures on the retention of records that meet the requirements of HAVA and the EAC and meet the needs of its customers as agreed in a contract. Volume I, Section 2.2.11 of the VSS-2002, "Data Retention," does not apply to the retention of records of testing by the VSTL.

**4.13.2** The laboratory shall maintain a functional record-keeping system that is used to track each product or system. Records shall be easily accessible and contain complete information for each qualification test. Required records of testing activities shall be traceable to requirements in the VSS-2002. Computer-based records shall contain entries indicating the date created and the individual(s) who performed the work, along with any other information required by the management system. Entries in laboratory notebooks shall be dated and signed or initialed. All records shall be maintained in accordance with laboratory policies and procedures and in a manner that ensures record integrity. There shall be appropriate backups and archives.

**4.13.3** Laboratory records shall be maintained, released, or destroyed in accordance with the laboratory's policy on proprietary information and contractual agreements with customers.

**4.13.4** The Qualification Test Report plus the laboratory's records of the qualification test shall contain sufficient information to allow repeating, reproducing and/or auditing the entire qualification test.

## **4.14 Internal audits**

**4.14.1** Internal audits shall be performed on a schedule prescribed by the laboratory policies and procedures. Recent internal audit reports shall be available for review during NVLAP on-site assessments.

**4.14.2** The internal audit shall cover the laboratory management system and the application of the management system to all laboratory activities, including compliance with NVLAP, HAVA, VSS-2002, contractual, laboratory management system, and any additional EAC requirements.

**4.14.3** In the case where only one member of the laboratory staff is competent to conduct a specific aspect of a test method, and performing an audit of work in this area would result in that person auditing his or her own work, then the audit may be conducted by another staff member. The audit shall cover the



methodology for that test method and shall include a review of documented procedures and instructions, adherence to procedures and instructions, and review of previous audit reports. External experts may also be used in these situations.

**4.14.4** The laboratory shall perform at least one complete internal audit of its management system prior to the first on-site assessment.

## **4.15 Management reviews**

**4.15.1** Management reviews shall be performed on a schedule prescribed by the laboratory policies and procedures. Recent management review reports shall be available for review during NVLAP on-site assessments.

**4.15.2** The laboratory shall perform at least one management review prior to the first 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 a competent administrative and technical staff appropriate for testing voting systems to be recognized by the EAC under the HAVA. The laboratory shall maintain position descriptions, training records and resumes for responsible supervisory personnel and laboratory staff members who have an effect on the outcome of qualification tests.

**5.2.2** The laboratory shall maintain a list of personnel designated to fulfill NVLAP requirements including: laboratory director, technical director, Authorized Representative, Approved Signatories, and team leaders. The laboratory shall also identify a staff member as quality manager who has overall responsibility for the quality system and maintenance of the quality manual. An individual may be assigned or appointed to serve in more than one position; however, to the extent possible, the laboratory director and the quality manager positions should be independently staffed.

**5.2.3** The laboratory shall notify both NVLAP and the EAC within 30 days of any change in key personnel. When key personnel are added to the staff, the notification of changes shall include a current resume for each new staff member.

**5.2.4** Laboratories shall document the required qualifications for each staff position. The staff information may be kept in the official personnel folders or in separate, official folders that contain only the information that the NVLAP assessors need to review.

**5.2.5** The laboratory shall have documented a detailed description of its training program for new and current staff members. Each new staff member shall be trained for assigned duties. The training program

shall be updated and current staff members shall be retrained when the VSS-2002 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. Training materials that are maintained within the laboratory shall be kept up-to-date.

**5.2.6** The laboratory shall review annually the competence of each staff member for each test method the staff member is authorized to conduct. The staff member's immediate supervisor, or a designee appointed by the laboratory director, shall conduct annually an assessment and an observation of performance for each staff member. A record of the annual review of each staff member shall be dated and signed by the supervisor and the employee. A description of competency review programs shall be maintained in the management system.

**5.2.7** 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 VSTL maintain responsibility for and control of any work performed within its scope of accreditation. To that end, the VSTL shall ensure all individuals performing testing activities satisfy all NVLAP requirements, irrespective of the means by which individuals are compensated (e.g., the VSTL shall ensure all test personnel receive proper training and are subject to annual performance reviews, etc.).

**5.2.8** The records for each person having an effect on the outcome of the testing shall include:

- a) position description;
- b) resume/CV/bio to match the person to the position;
- c) duties assigned;
- d) annual competence review;
- e) training records and training plans.

**5.2.9** In order to maintain confidentiality and impartiality, the laboratory shall maintain proper separation between personnel conducting testing and other personnel inside the laboratory or outside the laboratory, but inside the parent organization.

### **5.3 Accommodation and environmental conditions**

**5.3.1** The laboratory shall have adequate facilities to conduct the voting system testing that it offers. This includes facilities for staff training, record keeping, document storage, and software storage. If testing activities are conducted at more than one location, all locations shall meet the NVLAP requirements, and mechanisms shall be in place to ensure secure communication between all locations.

**5.3.2** A protection system shall be in place to safeguard customer proprietary hardware, software, test data, electronic and paper records, and other materials. This system shall protect the proprietary materials and information from personnel outside the laboratory, visitors to the laboratory, laboratory personnel without a need to know, and other unauthorized persons.

**5.3.3** Laboratories shall have systems (e.g., firewall, intrusion detection) in place to protect internal systems from untrusted external entities. The laboratory shall have regularly updated protection for all systems against viruses and other malware. The laboratory shall have an effective backup system to ensure that data and records can be restored in the event of their loss.

**5.3.4** If the laboratory is conducting multiple, simultaneous tests, it shall maintain a system of separation between the products of different customers. This includes the product itself, the test platform, peripherals, documentation, electronic media, manuals, and records.

**5.3.5** If testing activities will be conducted outside of the laboratory, the management system shall include procedures for conducting activities at customer sites or other off-site locations. For example, procedures may explain how to secure the site, where to store records and documentation, and how to control access to the test facility.

**5.3.6** If the laboratory is conducting its tests at a customer site or other location outside the laboratory facility, the environment shall conform, as appropriate, to the requirements for a laboratory environment. If a customer's system on which a test is conducted is potentially open to access by unauthorized entities during test, the VSTL shall control the test environment. This is to ensure that the systems are in a defined state compliant with the requirements for the test before starting to perform testing work and that the systems ensure that unauthorized entities do not gain access during testing.

## **5.4 Test and calibration methods and method validation**

**5.4.1** The test methods for this program are given in the VSS-2002 approved by the Federal Election Commission on April 30, 2002, and adopted in the HAVA. In the VSS-2002, there are specific test methods, references to test methods, and provisions for laboratory-developed test methods. The EAC may amend and augment the VSS-2002. When the EAC amends or augments the VSS-2002, the laboratory shall develop procedures for implementation of the new requirements.

**5.4.2** For each test in the Test Plan, the laboratory shall document all aspects of the test including the test method. The level of detail shall be such that the laboratory can repeat the test or another laboratory can reproduce the test and the results of the test will be equivalent to the original test. Where the laboratory has developed test methods to meet the requirements of the VSS-2002, validation of the test methods shall be included in the documentation.

**5.4.3** For the purposes of achieving product certification under HAVA, laboratories shall comply with interpretations of the test methods as provided by the EAC. When exceptions to the testing methodology may be necessary for technical reasons, the laboratory shall ask the EAC for an interpretation, the customer shall be informed, and details of an interpretation shall be described in the test report.

**5.4.4** As a part of the testing procedure, the laboratory shall describe by whom and how the voting system will be configured. If the customer configures any part of the voting system, then the laboratory shall verify the configuration, including all software.

**5.4.5** Testing may be conducted at the customer site, the laboratory or another location that is mutually agreed to by the laboratory and the customer. When testing activities are conducted outside the laboratory, the laboratory shall have additional procedures to ensure the integrity of all tests and recorded results. These procedures shall also ensure that the same requirements that apply in the laboratory and its facility are maintained at the non-laboratory site.

**5.4.6** The laboratory shall clearly identify any test methods included in the test campaign that are outside of the laboratory's scope of accreditation.

## **5.5 Equipment**

**5.5.1** The laboratory shall document and maintain records on all test equipment or test suites used during testing. Test equipment includes software and hardware products or other assessment mechanisms used by the laboratory to support the testing of products and systems. The laboratory shall also know how to configure and operate all equipment within its control.

**5.5.2** Computer systems, and other platforms used during the conduct of testing shall be under configuration control. The laboratory shall have procedures to ensure that any equipment (hardware and software) used for testing is in a known state prior to use for testing.

**5.5.3** Test equipment shall be properly calibrated. For test equipment, calibration means verification of correctness and suitability. Any software test tools shall be validated to be sure that they are accurately testing to the standard. They shall also be examined to ensure they do not interfere with the conduct of the test and do not modify or impact the integrity of the product under test in any way. VSS-2002, Volume II, Section B.3 requires the documentation of the tested software and supporting hardware.

**5.5.4** Laboratories shall have procedures that ensure appropriate configuration of all test equipment. Laboratories shall maintain records of the configuration of test equipment and all analyses to ensure the suitability of test equipment to perform the desired testing.

**5.5.5** For software testing, calibration is used to mean that all hardware, software, interfaces, etc. have been brought under configuration management and that the laboratory can reproduce the conditions under which each specific test was conducted. Where an operating system, user applications, test tools, and customer software are loaded onto a platform, calibration covers the hardware platform, all software, and the order in which the software was loaded.

## **5.6 Measurement traceability**

**5.6.1** For this NVLAP program, *traceability* is used in two different ways. The first applies to classical test and measurement equipment. The second to software and system testing.

**5.6.2** The classical definition of *traceability* is a comparison of a measured value to a stated reference through an unbroken chain of comparisons all having stated uncertainties. For example, a micrometer is calibrated using a gauge block that has been assigned a value that is traceable through the national standard to the International System of Units (SI).

**5.6.3** For software and some systems testing, *traceability* means that the operations performed by a test or test tool have been demonstrated to embody the assertions contained in the documentary standard. This means that test tools and test methodology demonstrate that the tests conducted by the tools and the test assertions they make are traceable to specific criteria and methodology.

## **5.7 Sampling**

**5.7.1** The laboratory shall use documented procedures for sampling. When sampling is used during a test campaign, the laboratory shall document its sampling strategy, the decision-making process, and the nature of the sample. Sampling may include (but is not limited to):

- a) hardware items;
- b) software;
- c) system configuration;
- d) test methods;
- e) system states at time of test.

**5.7.2** The VSS-2002 requires that the laboratory document its plan for the minimum number of combinations or alternatives of input and output conditions that can be exercised to constitute an acceptable test of the parameters involved (VSS-2002, Volume II, A.5.2).

**5.7.3** Sampling shall be part of the test record.

## **5.8 Handling of test and calibration items**

**5.8.1** The laboratory shall protect products and systems under test and calibrated tools from modification, unauthorized access, and use. The laboratory shall also maintain separation between and control over the items from different tests, to include the product being tested, its platform, peripherals, and all documentation.

**5.8.2** When the product being tested includes software components, the laboratory shall ensure that configuration management mechanisms are in place to prevent inadvertent modifications to the software components during the testing process. This includes the customer's software, test tools, and commercial off-the-shelf (COTS) software.

**5.8.3** The laboratory shall have procedures to ensure proper retention, disposal or return of software and hardware after the completion of the test.

## **5.9 Assuring the quality of test and calibration results**

The laboratory shall have procedures for conducting final review of testing, Qualification Test Reports and any other test reports it issues, and laboratory records of the testing prior to submission to the customer and/or the EAC.

## **5.10 Reporting the results**

**5.10.1** The laboratory shall issue test reports of its work that accurately, clearly, and unambiguously present the test plan, test conditions, test setup, test methods, test results, and all other required

information. Test reports shall provide all necessary information to permit the same or another laboratory to reproduce the test plan and obtain comparable results.

**5.10.2** There may be more than one type of test report issued by the VSTL, including:

- a) Qualification Test Reports (VSS-2002, Volume II, Appendix B) that are to be submitted to the EAC-designation certification body;
- b) test reports submitted to a state for its use in Certification Testing;
- c) test reports that are produced under contract and intended for use by the customer.

**5.10.3** Qualification Test Reports created for submission to the EAC shall meet the requirements of the VSS-2002 and any additional EAC requirements. The report shall contain sufficient information for the exact test conditions and results to be reproduced at a later time if a re-examination or retest is necessary. Reports shall be submitted in the form and by the method specified by VSS-2002. Information required to reproduce the test but not included in the Qualification Test Report shall be kept by the laboratory as part of the testing records.

**5.10.4** Reports intended for use only by the customer shall meet customer-laboratory contract obligations and be complete, but need not necessarily meet all VSS-2002 requirements. Information required to reproduce the test but not included in the test report shall be kept by the laboratory as part of the testing records.

**5.10.5** The test reports shall clearly indicate that the test results apply to the product or system as tested. Testing of products or systems that have been modified may or may not produce the same test results.

**5.10.6** The section of a Qualification Test Report that meets the VSS-2002 requirement for a summary or the recommendation section of a test report for a customer shall also meet the requirements of NIST Handbook 150 on opinions and interpretations under *Reporting the results*.

## **6 Additional requirements**

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