

A stylized graphic of the American flag, featuring red and white horizontal stripes and a blue field with white stars. A large, dark blue square with a white checkmark is overlaid on the flag. The entire graphic is set against a white background.

EAC Testing & Certification Program



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Introduction

The U.S. Election Assistance Commission's (EAC) Testing and Certification Program assists state and local election officials by providing voting machine testing and certification. This program is a requirement of the Help America Vote Act (HAVA) of 2002, legislation that created the EAC and mandated that the Commission provide certification, decertification, and recertification of voting systems, as well as the accreditation of voting system testing laboratories. This legislation marked the first time the federal government provided oversight for these activities, a step that allowed states to procure new certified voting systems without the added expense of independent testing and certification. While states are not required to participate in the program, some have enacted laws or have regulations that require a level of participation.

Prior to the passage of HAVA, voting systems were assessed and qualified by the National Association of State Election Directors (NASSED), a nonpartisan association consisting of state level election directors nationwide. These voting systems were tested against the 1990 and 2002 voting system standards developed by the Federal Election Commission (FEC). With HAVA's enactment, the responsibility for developing voting system standards was transferred from the FEC to the EAC and their new iterations are now the EAC Voluntary Voting System Guidelines.

Purpose

The purpose of the EAC's national voluntary voting system certification program is to independently verify that voting systems comply with the functional capabilities, accessibility, and security requirements necessary to ensure the integrity and reliability of voting system operation, as established in the Voluntary Voting System Guidelines (VVSG). The purpose of this document is to provide an overview of the EAC Testing and Certification program.

Glossary of Terminology

Appeal Authority - The individual or individuals appointed to serve as the determination authority on appeal.

Decision Authority - The EAC Executive Director or Executive Director's designee.

Election Official - A State or local government employee who has as one of their primary duties the management or administration of a federal election.

Federal Advisory Committee Act (FACA) - The Federal Advisory Committee Act, is a United States federal law which governs the behavior of federal advisory committees. In particular, it has special emphasis on open meetings, chartering, public involvement, and reporting. The U.S. General Services Administration oversees the process.

Federal Election - Any primary, general, runoff, or special election in which a candidate or federal office (President, Senator, or Representative) appears on the ballot.

Manufacturer - The entity with ownership and control over a voting system submitted for certification.

Modification - Any change to a previously EAC-certified voting system's hardware, software, or firmware that is not classified as a minor change order or new system.

Program Director - The individual responsible for administering and managing the Testing and Certification Program.

Trusted Build - A software build where source code is converted into machine readable binary instructions (executable code) in a manner providing security measures which help ensure that the executable code is a verifiable and faithful representation of the source code.

Voluntary Voting System Guidelines (VVSG) - Voluntary voting system guidelines developed, adopted, and published by the EAC. The guidelines are identified by version number.

Voting System - The total combination of mechanical, electromechanical, and electronic equipment (including the software, firmware, and documentation required to program, control, and support the equipment) that is used to define ballots, cast and count votes, report or display election results, interface the voting system to the voter registration system, and maintain and produce any audit trail information.

Voting System Test Laboratories (VSTLs) - Laboratories accredited by the EAC to test voting systems to EAC approved voting system standards.

Help America Vote Act (HAVA)

The Help America Vote Act (HAVA; 52 U.S.C. §§20901-21145) of 2002 was passed by the United States Congress to make improvements to voting systems and voter access that were identified following the 2000 election.

HAVA created new mandatory minimum standards for states to follow in several key areas of election administration, including minimum requirements for any voting system used in federal elections. The law also provided funding to help states meet these new standards, replace voting systems, and improve election administration.

Voting Section 301(a) of HAVA specifies that voting systems must, at a minimum, meet certain requirements. Any voting system used in a federal election must:

- Allow the voter to review selections before casting a ballot
- Allow the voter to change selections before casting a final vote
- Notify the voter when more selections are made than permitted
- Provide for the production of a permanent paper record suitable to be used in a manual recount
- Provide voters with disabilities the same opportunity for access and participation (including privacy and independence)
- Provide accessibility in minority languages for voters with limited English proficiency as required by Section 203 of the Voting Rights Act of 1965
- Provide for an error rate in operating the voting system that is no greater than the error rate set forth in the 2002 Voting System Standards (2002 VSS)

State statutes and regulations may or may not explicitly state that voting systems must be tested to federal standards, be certified by the EAC, or certified in a federally accredited laboratory. Participation in the EAC testing and certification program, and adherence to voting system guidelines is voluntary. States may adopt the guidelines entirely, in part or not at all. States may also choose to enact stricter performance requirements for voting systems. A majority of states use some or all of EAC's standards, testing and certification program.

Voluntary Voting System Guidelines

Voluntary Voting System Guidelines (VVSG) are a set of specifications and requirements that voting systems, including voting devices and software, must meet in order to receive a certification from the EAC.

The VVSG covers pre-voting, voting, and post-voting operations consistent with the definition of a voting system in HAVA Section 301, which defines a voting system as the total combination of mechanical, electromechanical, or electronic equipment (including the software, firmware, and documentation required to program, control, and support the equipment), that is used to define ballots; cast and count votes; report or display election results; and maintain and produce any audit trail information.

The VVSG include guidance regarding design, quality, cybersecurity, transparency, interoperability, accessibility, privacy, usability, auditability, secrecy, access control, physical security, data protection, system integration, detection, and monitoring of voting systems.

Since 2005, the EAC has adopted three versions of VVSG, with the latest iteration VVSG 2.0 adopted by the EAC Commissioners on February 10, 2021. A history of VVSG including all versions, drafts, and supporting documentation can be found on the EAC website: <https://www.eac.gov/voting-equipment/voluntary-voting-system-guidelines>.

VVSG 2.0

VVSG 2.0 was designed to meet the challenges ahead, to replace decade's old voting system standards, to improve the voter experience, and provide necessary safeguards to protect the integrity of the voting process.

All sections of the prior VVSG versions were reviewed, reevaluated, and updated to meet modern expectations, which address how voters interact with voting systems. The VVSG 2.0 requirements represent the latest in both industry and technology best practices. The guidelines allow for an improved and consistent voter experience, enabling all voters to vote privately and independently; ensuring votes are marked, verified, and cast as intended; and that the final count represents the true will of the voters.

VVSG 2.0 also requires systems to comply with all federal laws, including [Section 508 of the Rehabilitation Act](#), Web Content and Accessibility Guidelines (WCAG) and the Voting Rights Act. Below is a list of the features included in the new guidelines.

Accessibility

- The features offered to accessible voters must be consistent with visual functionality including the same options, instructions, etc.
- Visually impaired voters and voters with limited dexterity are able to perform paper-based verification or feed their own optical scan ballots into a scanner, if all other voters do so.
- All voting variations available to voters using a visual ballot must also be available to voters using other interaction modes.
- Manufacturers must describe disability scenarios they are intended to support.

Language access

- Manufacturers are required to test language capabilities with native speakers of the supported languages.
- An electronic voting interface must allow for authorized languages to be switched throughout a voting session (e.g., English to Chinese to Spanish).

Voter privacy

- Voters must be able to enable and disable audio or visual output throughout a voting session (e.g., turn the screen off, turn off audio, etc.).

Security

- Software independence is a requirement. A software independent voting system does not rely solely on software and an undetected change or error in its software cannot cause an undetectable change or error in an election outcome. This includes the use of paper ballots, cryptographically verifiable (E2E) ballots, access controls, encryption, physical security, logging, and auditing.
- Wireless systems are disallowed. Voting systems are not allowed to connect wirelessly to external networks. Unused ports and processes must be removed or disabled. Accessibility is provided for by allowing the use of Bluetooth adapters connected to the voting device's headphone jack as this does not increase the attack surface of the system. The use of firewalls, intrusion prevention, and other means is recommended in the requirements.
- Physical security includes logically disabling physical ports that are not essential to voting operations. All new connections and disconnections must be logged.
- Multi-factor authentication is required for all critical operations such as software updates, aggregating and tabulating votes, enabling network functions, changing device states (opening/closing polls), or modifying authentication mechanisms.
- System integrity requires risk assessment and supply chain risk management strategy, removes non-essential services, requires exploit mitigation (e.g., address space layout randomization (ASLR), data execution prevention) and the system to be free of known vulnerabilities, cryptographic boot validation, and authenticated updates.
- Data protection requires FIPS 140-2 validated cryptographic modules (except E2E), cryptographic protection of various election artifacts and digitally signed cast vote records and ballot images.

Ballot secrecy

- Ballot secrecy is specifically defined as a principle with its own specific requirements (e.g., preventing the association of a voter identity to ballot selections).

Auditability

- Auditability has its own robust requirements, including:
 - Focusing on machine support for post-election results.
 - Making software independence mandatory.
 - Requiring paper-based and end-to-end verifiable systems.
 - Supporting all types of audits, including risk-limiting audits (RLAs), compliance audits, and ballot-level audits.

User-centered design

- Requires voting systems to be developed and implemented using best practice user-centered design methods that consider a wide range of representative voters, including those with disabilities, and election workers. This process must be documented as part of the systems technical data package.

The EAC's Testing and Certification Program is working to bridge manufacturers to certifying voting systems to VVSG 2.0 while not stranding current jurisdictions with voting systems certified to previous versions of VVSG.

Program Manuals

The [Testing and Certification program manual](#) and the [Voting System Test Laboratory Program Manual](#) provide clear written procedures for testing and certification of voting systems to VVSG standards. These procedures in the program manuals include a requirement for penetration testing on top of the vulnerability management and other security testing that is done throughout certification testing. In addition, a component testing pilot program has been outlined in the updated manuals that will allow new or existing manufacturers to produce best-in-breed components that are interoperable with VVSG 2.0 certified voting systems. This could include both currently existing technology such as a precinct scanner or accessible ballot marking device or new devices that have not previously been available such as independent ballot review stations.

Federal Advisory Boards and NIST

The EAC was primarily tasked with the responsibility to adopt VVSG, however the Board of Advisors, the Standards Board and the Technical Guidelines Development Committee are all chartered pursuant to the Federal Advisory Committee Act (FACA) to provide recommendations on voluntary standards and guidelines related to voting equipment and technologies.

Nation Institute of Standards and Technology (NIST)

The [National Institute of Standards and Technology](#) (NIST) was founded in 1901 and is now part of the U.S. Department of Commerce. NIST is one of the nation's oldest physical science laboratories. HAVA gave NIST a key role in helping to realize nationwide improvements in voting systems. To assist the EAC with the development of VVSG, HAVA established the Technical Guidelines Development Committee (TGDC) and directs NIST to chair the TGDC.

Technical Guidelines Development Committee (TGDC)

The Technical Guidelines Development Committee (TGDC) assists EAC in developing the VVSG. The chairperson of the TGDC is the director of NIST. The TGDC is composed of 14 other members, consisting of the representatives of the EAC Standards Board, the EAC Board of Advisors, the Architectural and Transportation Barrier Compliance Board (Access Board) under section 502 of the Rehabilitation Act of 1973 (29 U.S.C. 792); a representative of the American National Standards Institute; a representative of the Institute of Electrical and Electronics Engineers (IEEE); two representatives of the National Association of State Election Directors (NASSED); and not more than seven other special or regular government employees with technical and scientific expertise relating to voting systems and voting equipment.

Board of Advisors (BOA)

The Board of Advisors is a 35-member board composed of representatives from the National Governors Association; National Conference of State Legislatures; National Association of Secretaries of State; The National Association of State Election Directors; National Association of Counties; the International Association of Government Officials (created from the merger of the National Association of County Recorders, Election Officials and Clerks and the International Association of Clerks, Recorders, Election Officials, and Treasurers); Election Center; International Association of Clerks, Recorders, Election Officials, and Treasurers; U.S. Commission on Civil Rights; and Architectural and Transportation Barriers Compliance Board; representatives from the U.S. Department of Justice, Office of Public Integrity, and the Civil Rights Division; the director of the U.S. Department of Defense Federal Voting Assistance Program; four professionals from the field of science and technology, one each appointed by the Speaker and the Minority Leader of the U.S. House of Representatives, and the Majority and Minority leaders of the U.S. Senate; and eight members representing voter interests, with the chairs and the ranking minority members of the U.S. House of Representatives Committee on House Administration and the U.S. Senate Committee on Rules and Administration each appointing two members.

Following the passage of HAVA, the National Association of County Recorders, Election Officials and Clerks and the International Association of Clerks, Recorders, Election Officials, and Treasurers merged to form the International Association of Government Officials.

Standards Board (SB)

The Standards Board is a 110-member board consisting of 55 state election officials selected by their respective chief state election official, and 55 local election officials selected through a process supervised by the chief state election official.

Roles

The EAC tasked the TGDC with developing the next iterations of the VVSG. NIST delivers recommended requirements to the EAC’s Executive Director. Drafts are circulated for comment from the public and the EAC’s Board of Advisors and Standards Board, prior to final adoption.

Agency	Roles in Developing or Adopting the VVSG	Roles in Testing or Certifying Voting Systems to the VVSG
EAC	<p>Provide for publication of final VVSG and notice of proposed VVSG in Federal Register.</p> <p>Provide for public comment and hearing on proposed VVSG, Vote on adoption.</p>	<p>Provide for testing, certification, decertification, and recertification of voting systems.</p> <p>Vote on accreditation and revocation of accreditation of voting system test laboratories (VSTLs).</p>
TGDC	<p>Assist EAC Executive Director with developing VVSG.</p>	
BOA and SB	<p>Review proposed VVSG and submit comments and recommendations.</p>	<p>Provide consultation on VSTL performance.</p>
NIST	<p>Chair TGDC and provide technical support upon request.</p>	<p>Recommend VSTLs for accreditation.</p> <p>Monitor VSTL performance and make recommendations about continuing accreditation.</p>

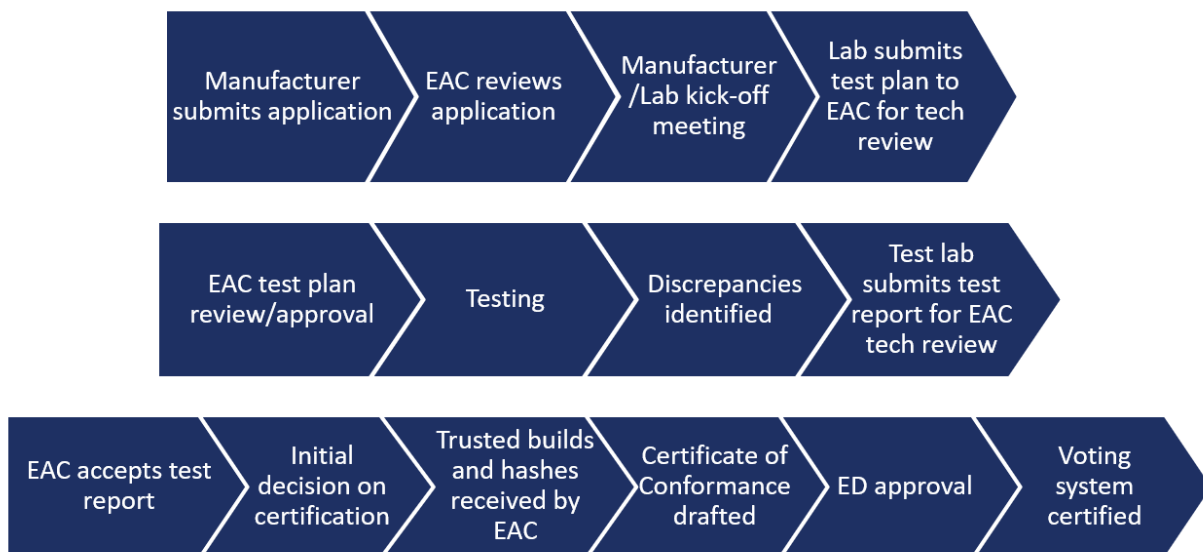
Voting System Certification

A voting system is considered EAC certified when it has been tested by a federally accredited test laboratory, has successfully met the requirements of the VVSG and any other claims made by the voting system manufacturer and the EAC has issued a certificate that all the steps required by the lab and the manufacturer have been completed.

The EAC accredits independent test laboratories (voting system test laboratories or VSTLs) that evaluate voting systems, including their software against the VVSG to determine if they provide all of the basic functionality, accessibility, and security capabilities required of these systems. The test laboratory provides a recommendation to the EAC, and the Commission's Testing and Certification Division, working through the Executive Director, makes the determination whether to issue a certification. Once a decision has been made, the EAC will post the information on the Voting System Certification section of the EAC website.

Before final certification is granted, the VSTL must deliver specified elements in the EAC repository including, the source code used for the trusted build and its file signatures, a detailed description of the build environment including setup and configuration, executable code, and all documentation to provide evidence to verify that a particular system has met all requirements.

In addition to system certifications, the EAC also processes engineering change orders such as updating end of life commercial hardware components or applying security patches.



The diagram above outlines the process steps for voting system certification

Quality Monitoring Program

The quality of any product, including a voting system, depends on two specific elements: (1) the design of the product or system; and (2) the consistency of the manufacturing process. The EAC's testing and certification process focuses on voting system design by ensuring that a representative sample of a system meets the technical specifications of the applicable VVSG requirements. The quality of the manufacturing is the responsibility of the manufacturer.

After a system is certified, the manufacturer assumes primary responsibility for compliance of the products produced. This level of compliance is accomplished by the manufacturer's configuration management and quality control processes. The EAC's Quality Monitoring Program provides an additional layer of quality control by allowing the EAC to perform manufacturing site audits, carry out fielded system reviews, and gather information on voting system anomalies from election officials. These additional tools help ensure that voting systems continue to meet the VVSG requirements as the systems are manufactured, delivered, and used in federal elections. These aspects of the program enable the EAC to independently monitor the continued compliance of fielded voting systems.

The purpose of the Quality Monitoring Program is to:

- Ensure systems used by election jurisdictions are identical to those tested and certified by the EAC.
- Monitor the completeness and adequacy of testing with the desired performance in fielded voting systems.
- Monitor the effectiveness of the VVSG.

This level of quality control is accomplished primarily by identifying potential quality problems in manufacturing, uncertified voting system configurations, and field performance issues with certified systems.

The EAC's Quality Monitoring Program is not a substitute for the manufacturer's own quality control program. All manufacturers must have an acceptable quality control program in place before they may be registered. The EAC's program serves as an independent and complementary process of quality control that works in tandem with the manufacturer's efforts.

The information the EAC gathers from manufacturing site audits, fielded system reviews, and field anomaly reports is used to improve the program and ensure the quality of voting systems. The Quality Monitoring Program is not designed to be punitive but to be focused on improving the compliance of fielded voting systems. Information gathered is used to accomplish the following:

- Identify areas for improvement in the EAC's Testing and Certification Program
- Improve the manufacturing quality and change control processes
- Increase voter confidence in voting technology
- Inform manufacturers, election officials, and the EAC of issues associated with voting systems in a real-world environment
- Share information among jurisdictions that use similar voting systems
- Resolve problems associated with voting technology or manufacturing by involving manufacturers, election officials, and the EAC
- Strengthen the coordination between certification testing and the desired performance in

deployed voting systems

- Inform the VVSG review process
- Initiate an investigation when information suggests decertification is warranted

Manufacturers are held accountable through the EAC's Quality Monitoring Program and its decertification process. If a system is denied certification or is decertified, the manufacturer may not represent the system as being certified, may not label the system as certified, and the system will be removed from the EAC's list of certified voting systems. The manufacturer may request an opportunity to cure defects identified by the EAC. In addition, the manufacturer may request that the EAC reconsider the initial decision after the manufacturer has had the opportunity to review the record and submit supporting written materials, data, and the rationale for its position. Finally, in the event reconsideration is denied, the manufacturer may appeal the decision. The final decision to either grant or deny an appeal will be provided to the manufacturer in writing. The decision on appeal is final.

As elections are decentralized throughout the country, the EAC Testing and Certification Program and VVSG are the only set of uniform specifications and requirements against which voting systems can be tested to determine if the voting systems meet required standards. Therefore, voluntarily adopting VVSG serves as a foundational tool for ensuring that the voting systems used in U.S. elections will be secure, reliable, and easy for all voters to use accurately.