

Voluntary Electronic Poll Book Certification Requirements VEPBCR 1.0

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U.S. Election Assistance Commission

Prepared by the *Election Supporting Technology Evaluation Program*

Executive Summary

The United States Congress passed the *Help America Vote Act of 2002 (HAVA) [HAVA02]* to modernize the administration of federal elections and to establish the U.S. Election Assistance Commission (EAC) to provide guidance to the states in their efforts to comply with the HAVA administrative requirements. Under the authority of HAVA, the EAC adopted the Election Supporting Technology Evaluation Program (ESTEP) in December 2023, responsible for the evaluation of technologies not covered under the Voluntary Voting System Guidelines (VVSG). In response to the increasing demands from the public and various stakeholders, ESTEP piloted the nation's first voluntary program for testing e-poll books on the federal level in 2023.

The purpose of these requirements is to provide a set of specifications against which e-poll books can be tested to determine if they meet baseline standards for functionality, security, and accessibility. This document, the ***Voluntary Electronic Poll Book Certification Requirements Version 1.0*** (herein referred to as the Requirements or VEPBCR 1.0), is the second iteration of e-poll book standards that have been released at the federal level and is designed to ensure consistent security and accessibility in e-poll books utilized across the United States of America.

This document was produced by the EAC's Election Supporting Technology Evaluation Program (ESTEP) working in conjunction with the National Institute of Information Technology (NIST) and Mandiant, to aid in developing requirements for making accessible, accurate, and secure elections possible.

EAC staff must annually review the VEPBCR for proposed revisions. Determinations must be sent to the EAC's Executive Director (or a person operating in that capacity) to begin the review process required to ensure the timely adoption of revisions. Under the direction of the Executive Director, EAC staff in consultation with NIST staff may make minor technical changes to the requirements in a timely manner. EAC staff are responsible for updating the test assertions and issuing requests for interpretation or notices of clarification, as needed, to ensure efficiency in the process.

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Introduction

This document is the second iteration of federal-level e-poll book functional, security, and accessibility standards and was developed by the EAC to specifically address e-poll books. Adherence to these requirements is voluntary and governed by state and territory-specific laws and procedures.

Audience

This document will be used primarily by e-poll book manufacturers and Voting System Test Laboratories (VSTLs) as a baseline set of requirements for e-poll book functionality, security, and accessibility, to which states or territories will add their specific requirements, as necessary. This audience includes:

- Manufacturers, who will use these requirements when they design and build new e-poll books, including jurisdictions looking to develop in-house solutions.
- Voting System Test Laboratories, who will refer to this document when they develop test plans for the analysis and testing of e-poll books to verify whether the system meets these requirements.

Scope

The scope of this document is limited to e-poll books acquired by states and localities and evaluated by the EAC. E-poll books are defined in this document as:

Equipment (including hardware, firmware, and software), materials, and documentation used to partially automate the process of checking in voters, assigning voters the correct ballot style, and marking off voters who have been issued a ballot.

E-poll books are used in voting locations to assist election workers in checking in voters, ensuring that they are eligible to vote and, in some places, managing updating voter records. Additionally, e-poll books also have administrative functions to prepare for an election and extract data reports afterwards. E-poll books may use an air-gapped configuration at the precinct with a separate local copy of the registration list or can be connected (wired or wireless) via a public or private network with a central repository of registration information where records can be checked and updated in real time across the jurisdiction.

While e-poll books can provide additional functionality such as poll worker time-keeping, ballot printing, or communications between a central office and polling places, the requirements in this document specifically apply to the following functionality (**where allowed by state, territorial, or jurisdictional laws or rules**):

- Allows voters to check-in electronically
- Allows poll workers to easily direct voters to the correct polling location
- Is capable of scanning voter identification and accessing voter information
- Allows poll workers to look up voters across precincts, enabling consolidated vote centers
- Allows real-time updates of voter history when operated in a connected configuration
- Notifies poll workers of a voter's status
- Produces voter statistics and lists of voters who were issued a ballot
- Allows for same-day voter registration
- Can display a photo to verify a voter's identity (when applicable)
- Can be used to print receipts and issue ballots

The EAC acknowledges that this list is not exhaustive of all state procedures surrounding the use of e-poll books. Rather, this list is intended to highlight some of the primary uses for these systems.

Conformance Information

This section provides information and requirements about how manufacturers can use the material in this document to assess whether an e-poll book conforms to the VEPBCR. Conformance here means that the requirements of the VEPBCR have been met; it does not imply certification according to the EAC's Election Supporting Technology Evaluation Program.

- **Identifying Requirements.** Requirements are indicated by the presence of a unique number in the left margin, followed by a descriptive title.
- **Discussion Fields.** Requirements that have a "Discussion" field are intended to aid readers in their understanding of the requirement. Information presented in this field does not constitute a requirement.
- **Documentation Requirements.** Requirements that have been marked with a badge labeled "Documentation Required" indicate that the requirement can only be evaluated with the review of technical documentation. Further details regarding these requirements can be found under "[Guidance for Documentation Requirements](#)" within this document.
- **'If Applicable' Requirements.** Requirements that have been marked with a badge labeled "If Applicable" are not required for certification but must be evaluated if the e-poll book supports the functionality. Further details regarding these requirements can be found under "[Guidance for 'If Applicable' Requirements](#)" within this document.

Guidance for Documentation Requirements

Prior to submitting an e-poll book for evaluation, the EAC requires a comprehensive set of technical documentation to be included as part of a complete Application Package. The Application Package shall include the following:

1. **Customer maintenance documentation** describing any maintenance that the vendor recommends can be performed by a customer with limited technical knowledge of the e-poll book.
2. **Operations manual(s)** to be supplied to the customer for use by the person(s) who will operate the equipment.
3. **Use procedures** providing specific election administration procedures recommended for use with the e-poll book.
4. **Software system design** documentation describing the logical design of the software or software architecture. This documentation should clearly indicate the various modules of the software, their functions, and their interrelationships with each other. This shall include the data format(s) the e-poll book is capable of importing and exporting.
5. Any available **test data** that can be used to demonstrate the various functions of the electronic poll book or verify that the version of the applications submitted are identical to the versions that will be certified. This shall include test reports for certification of the identical e-poll books in other jurisdictions.
6. **Security procedures documentation** containing the recommended security procedures and system hardening setting(s) to ensure the optimal security and functionality of the e-poll book.
7. **Training manual(s)** to be supplied to the customer for use by the person(s) that will conduct staff and poll worker training.

Although the list provided in this section is intended to be comprehensive, manufacturers should review the sections of this document for specific areas where thorough documentation will be required to attain federal certification. As required by the Election Supporting Technology Evaluation Program Manual, manufacturers will also be required to conduct a preliminary Test Readiness Review (TRR), specifying where documentation can be located for each Requirement for ease of e-poll book evaluation.

Manufacturers must clearly mark any documentation they request to be treated as confidential and proprietary before providing it to the EAC and its designated VSTL for evaluation. Marking the entire package as confidential and/or proprietary is insufficient. All pages of the documentation that contain information the vendor considers confidential and/or proprietary information must be clearly marked as such.

Disclaimer: All requirements labeled as “documentation required” may require further testing to ensure conformance. The EAC and VSTLs have the discretion to request further documentation or testing to ensure that the e-poll book has met the minimum requirements for certification.

Guidance for 'If Applicable' Requirements

All requirements in this document must be met to achieve federal certification unless they have been indicated as “If Applicable.” However, if an e-poll book supports a functionality currently listed as “If Applicable” in these requirements, and the manufacturer wishes to market that functionality to its customers, the e-poll book **must** be evaluated to ensure the e-poll book’s conformance with the requirement. This is necessary to achieve and maintain an e-poll book certification from the EAC. Some requirements currently listed as “If Applicable” may become mandatory in future iterations of this document, and manufacturers should prepare accordingly.

Summary of Version Changes

This document is intended to replace the previous version of the VEPBCR (0.9), released on January 19, 2023. Various changes have been implemented to enhance the readability of this document and improve the security, interoperability, accessibility, and usability of e-poll books. As demonstrated in this section, certain requirements have been revised to accommodate device limitations, consistent with findings from the EAC's [Voluntary Electronic Poll Book Pilot Program](#).

New Additions

The following information has been added to enhance understanding and improve overall readability of this document:

- [Conformance Information](#), including subsections, and
- [Summary of Version Changes](#), including subsections.

The following sections have been added to include new requirements necessary to achieve certification, strengthening the operability of e-poll books.

- [Section 1 – Functionality and Interoperability](#), including subsections.

Reorganization

This document has experienced considerable reorganization to accommodate new requirements for evaluating functionality and interoperability (now under Section 1). Each requirement in this document has been assigned a new number to correspond with its newly affiliated section. All usability requirements (formerly under “Accessibility”) have been moved to Section 1 – Functionality and Interoperability. Requirements under Section 3 – Accessibility and Usability have also been reorganized to easily identify those that are related to visual or physical features of these systems.

Quick Reference Labels

‘Documentation Required’ Labels

The following requirements must be evaluated through an examination of the e-poll book’s technical documentation. These requirements are identified in this document by the label, “Documentation Required.” Manufacturers should reference the section labeled “[Guidance for Documentation Requirements](#)” for further guidance on preparing documentation.

- 1.1.1 – User-centered design process
- 1.1.2 – Instructions for election workers

- 1.1.3 – Plain language
- 1.1.4 – Usability testing with voters
- 1.1.5 – Usability testing with election workers
- 1.1.6 – Physical manipulation
- 1.2.1 – Check-in procedures
- 1.2.2 – Maintain voter registration records
- 1.2.3 – Maintain digital signatures
- 1.2.4 – Record and display election information
- 1.2.5 – Printing capabilities
- 1.3.1 – Compatibility with hardware
- 1.3.2 – Compatibility with software
- 1.3.3 – Compatibility with voter registration systems
- 1.4.1 – Communication with voter registration systems
- 1.4.2 – Communication with other e-poll books
- 1.5.1 – Batteries or power supply
- 1.5.2 – Memory storage
- 1.5.3 – Loss of connectivity
- 1.5.6 – System failure
- 2.1.2 – Access control policies and procedures
- 2.2.1 – Documentation of asset management features
- 2.2.2 – Device disk encryption
- 2.2.4 – Document the application of tamper-evident sealing
- 2.2.5 – Document anti-theft controls, and emergency system decommissioning
- 2.3.1 – Endpoint detection and response (EDR) tool
- 2.3.2 – Antivirus tool
- 2.3.4 – Verification of voter information
- 2.3.7 – Cryptographic key management documentation
- 2.4.3 – Disallow connections to unapproved external devices
- 2.4.6 – Documentation of the network and communications architecture
- 2.4.7 – Secure network configuration documentation
- 2.5.3 – Utilized recognized software standards
- 2.5.8 – Third-party code and libraries
- 2.5.9 – Application allowlisting
- 2.5.11 – Documentation of media sanitization procedures
- 2.6.3 – Application errors
- 2.7.1 – List of approved suppliers
- 2.7.2 – Authenticity of components
- 2.7.3 – Provenance of devices
- 3.1.2 – Accessibility documentation

'If Applicable' Labels

The following requirements have now been labeled as “If Applicable” and will not be required to achieve certification under the VEPBCR 1.0. Manufacturers should reference the section labeled “[Guidance for ‘If Applicable’ Requirements](#)” to ensure that these requirements do not apply to their submitted e-poll book for evaluation. Some requirements currently listed as “If Applicable” may become mandatory in future iterations of this document, and manufacturers should prepare accordingly.

- 1.2.2 – Maintain voter registration records
- 1.2.3 – Maintain digital signatures
- 1.2.5 – Printing capabilities
- 1.3.3 – Compatibility with voter registration systems
- 1.4.1 – Communication with voter registration systems
- 1.4.2 – Communication with other e-poll books
- 2.1.4 – Multi-factor authentication
- 2.1.7 – Session termination, device lock, and reauthentication
- 2.1.8 – Unsuccessful logon attempts
- 2.1.9 – System use notification
- 2.2.5 – Document anti-theft controls, and emergency system decommissioning
- 2.3.1 – Endpoint detection and response (EDR) tool
- 2.3.4 – Verification of voter information
- 2.4.2 – Disallow connections to unapproved external networks
- 2.4.4 – Network firewall
- 2.4.7 – Secure network configuration documentation
- 3.1.1 – Federal standards for accessibility
- 3.2.1 – Reset to default settings
- 3.2.8 – Text size (paper)
- 3.2.13 – Electronic display screens
- 3.3.2 – Touch screen gestures
- 3.3.4 – Touch area size
- 3.3.8 – Secondary ID and biometrics
- 3.4.1 – Sound cues
- 3.4.2 – Information in all modes
- 3.4.3 – Audio synchronized
- 3.4.4 – Audio settings
- 3.4.5 – Speech frequencies
- 3.4.6 – Audio comprehension
- 3.4.7 – Audio control
- 3.4.8 – Standard audio connectors

- 3.5.1 – Languages
- 3.5.2 – Presenting content in all languages
- 3.5.3 – Language selections

Section 1 – Functionality and Interoperability

This area of testing will target the specific functionality claimed by the manufacturer to ensure the product functions as documented and expected. This testing will use both positive and negative test data to assess the robustness of the e-poll book.

Functional Configuration and Interoperability requirements are organized based on the following categories:

1. Usability features
2. Functional configuration
3. Compatibility
4. Telecommunications
5. System maintenance and troubleshooting

Each numbered section below contains a brief explanatory description followed by the actual requirements.

Section 1.1 – Usability Features

All features of the e-poll book must be clearly documented so that the system can be effectively used by election workers and voters. E-poll book manufacturers must:

1. Demonstrate that the e-poll book was developed using a user-centered design process,
2. Clearly document instructions for election workers,
3. Provide instructions written in plain language,
4. Submit an e-poll book for usability testing with voters,
5. Submit an e-poll book for usability testing with election workers,
6. Design the e-poll book so that it is capable of physical manipulation, and
7. Design the e-poll book so that it is capable of producing auditable records in English.

1.1.1 – User-centered design process

DOCUMENTATION REQUIRED

The manufacturer must submit a report providing documentation that the e-poll book was developed following a user-centered design process.

The report must include, at a minimum:

1. A listing of user-centered design methods used;
2. the types of voters and election workers included in those methods;
3. how those methods were integrated into the overall implementation process; and

4. how the results of those methods contributed to developing the final features and design.

Discussion

The goal of this requirement is to allow the manufacturer to demonstrate, through the report, the way their implementation process included user-centered design methods.

ISO-9241-210:2019 Ergonomics of human-system interaction – Part 210: Human-centered design for interactive systems provides requirements and recommendations for human-centered principles and activities throughout the life cycle of computer-based interactive systems. It includes the idea of iterative cycles of user research to understand the context of use and user needs, creating prototypes or versions, and testing to confirm that the product meets the identified requirements.

This requirement does not specify the exact user-centered design methods to be used, or their number or timing.

The ISO group of requirements, *Software engineering – Software product quality requirements and evaluation (SQUARE) – Common Industry Format (CIF) for Usability* includes several standards that are a useful framework for reporting on user-centered design activities and usability reports:

- *ISO/IEC TR 25060:2010: General framework for usability-related information*
- *ISO/IEC 25063: 2014: Context of use description*
- *ISO/IEC 25062:2006: Usability test reports*
- *ISO/IEC 25064:2013: User needs report*
- *ISO/IEC 25066:2016: Evaluation report*

References: 2.1.36, 2.1.37, VVSG 2.0 (2.2-A), ISO-9241-210:2019, ISO/IEC TR 25060:2010, ISO/IEC 25063:2014, ISO/IEC 25062:2006, ISO/IEC 25064:2013, ISO/IEC 25066:2016

1.1.2 – Instructions for election workers

DOCUMENTATION REQUIRED

The e-poll book must include clear, complete, and detailed instructions and messages for setup, check-in, shutdown, and how to use accessibility features.

1. The documentation required for normal operation must be:
 - a. Presented at a level appropriate for election workers who are not experts in e-poll books and computer technology, and
 - b. in a format suitable for use in the polling place.
2. Printed procedural instructions and on-screen instructions and messages must enable the election workers to verify that the e-poll book:

- a. Has been set up correctly (setup),
- b. is in correct working order to check-in voters, and
- c. has been shut down correctly (shutdown).

References: VVSG 2.0 (7.3-O)

1.1.3 – Plain language

DOCUMENTATION REQUIRED

Information and instructions for voters and election workers must be written clearly, following the best practices for plain language. This includes messages generated by the e-poll book for election workers in support of the operation, maintenance, or safety of the system.

References: VVSG 2.0 (7.3-P)

1.1.4 – Usability testing with voters

DOCUMENTATION REQUIRED

The manufacturer is required to perform usability tests on the e-poll book, involving voters using the system to complete any actions intended for voters. The results of these usability tests, along with all relevant documentation, must be included in the TDP.

1. The tests must include checking-in participant voters who represent the following:
 - a. General population
 - b. Voters who are native speakers of the language being tested or for each language defined as being supported in the manufacturer's documentation
 - c. Blind voters
 - d. Voters with low vision
 - e. Voters with limited dexterity
2. The manufacturer must submit a report of the results of their usability tests, including effectiveness, efficiency, and satisfaction measures, as part of their documentation using ISO/IEC 25062:2006: Common Industry Format (CIF) for usability test reports.

References: VVSG 2.0 (8.3-A), ISO/IEC 25062:2006: Common Industry Format (CIF) for Usability Test Reports

1.1.5 – Usability testing with election workers

DOCUMENTATION REQUIRED

The manufacturer must conduct usability tests of the e-poll book setup, operation during voting, and shutdown as documented by the manufacturer, with representative election workers, to demonstrate that election workers can learn, understand, and perform these tasks

successfully. The results of these usability tests, along with all relevant documentation, must be included in the TDP.

The test must include handling all variations in voter check-in conditions and other tasks for election workers using the e-poll book at a voting location, including:

1. Setup and opening for polling
2. Operation during voting
3. Use of assistive technology or language options that are part of the e-poll book
4. Shutdown at the end of a voting day during a multi-day early voting period, if supported by the e-poll book
5. Setting up the e-poll book to use different display formats and interaction modes.

The test participants must include election workers representing a range of experience.

The manufacturer must submit a report of the results of their usability tests as part of their documentation using ISO/IEC 25062:2006: Common Industry Format (CIF) for Usability Test Reports.

References: VVSG 2.0 (8.4-A), ISO/IEC 25062:2006: Common Industry Format (CIF) for Usability Test Reports

1.1.6 – Physical manipulation

DOCUMENTATION REQUIRED

The check-in steps of the e-poll book must allow for assistance from the election worker if the voter needs to manipulate or use any aspect of the e-poll book, including attached devices.

1.1.7 – Vote records

All records produced by the e-poll book must have the information required to support auditing by election workers and others who can only read English.

References: VVSG 2.0 (5.1-C), WCAG 2.0, and Section 508

Section 1.2 – Functional Configuration

All EPBs must be configured to perform basic tasks during an election. These tasks include:

1. Check-in procedures,
2. Maintaining voter registration records (when applicable),
3. Maintaining digital signatures (when applicable),
4. Recording and displaying election information, and
5. Printing.

1.2.1 – Check-in procedures

DOCUMENTATION REQUIRED

The e-poll book must enable users to check-in voters that are registered and voters who are not found on the system (when applicable). At a minimum, the voter record must be capable of recording the following information:

1. First Name,
2. Middle Name,
3. Last Name,
4. Date of Birth,
5. Voter registration status,
6. Absentee status,
7. Address, and
8. Signature (if applicable).

Discussion

Certain testing exceptions may be considered for states or territories that don't require the above information to be recorded on an e-poll book developed in-house.

1.2.2 – Maintain voter registration records

IF APPLICABLE DOCUMENTATION REQUIRED

The e-poll book must demonstrate that it correctly processes all activity regarding each voter registration record. Compliance with these requirements requires the mapping of the data life cycle of the voter registration record as processed by the electronic poll book. At a minimum, the e-poll book should be capable of performing the following functions in a secure, accurate, effective, and efficient manner:

1. Display voter registration records,
2. Update voter registration records,
3. Store voter registration records,
4. Import/retrieve voter registration records,
5. Transmit voter registration records (if applicable),
6. Backup voter registration records (if applicable),
7. Restore voter registration records (if applicable), and
8. Export voter registration records.

For the purposes of evaluating this requirement, a “voter registration record” involves the eight pieces of information required under section 1.2.1 of this document.

The only personally identifiable information (PII) permitted for display, storage, or record on an e-poll book should include driver's license numbers (DLN), voter registration numbers, passport numbers, the last four digits of a social security number (SSN), or any other identifying number permitted by state legislation.

1.2.3 – Maintain electronic signatures

IF APPLICABLE

DOCUMENTATION REQUIRED

The e-poll book must be capable of maintaining an electronic image of the voter's signature, which involves:

1. Capturing electronic signatures,
2. Storing electronic signatures, and
3. Reviewing or comparing a voter's signature to the image of one on file.

1.2.4 – Record and display election information

DOCUMENTATION REQUIRED

The e-poll book must be capable of recording and displaying information for identifying relevant information for an election, including:

1. Date of an election, including the:
 - a. Month of an election, and
 - b. Year of an election.
2. Type of an election, such as:
 - a. General election,
 - b. Primary election,
 - c. Municipal election, or
 - d. Special election.

1.2.5 – Printing capabilities

IF APPLICABLE

DOCUMENTATION REQUIRED

A printer, whether separate from or built-in to the e-poll book, must be capable of printing an acknowledgment that the voter may proceed with casting a vote, such as receipts, stickers for ballot cards, ballots, etc.

Section 1.3 – Compatibility

The e-poll book must be compatible with the minimum list of approved devices in this section, necessary to perform and execute basic functions of the system. These include:

1. Hardware,
2. Software, and
3. Voter registration systems (if applicable).

1.3.1 – Compatibility with hardware

DOCUMENTATION REQUIRED

The e-poll book must be compatible with any hardware attached to the e-poll book, such as:

1. Digital signature capturing devices,
2. Bar code capturing devices,
3. Printing devices, and/or
4. Network devices (if applicable).

1.3.2 – Compatibility with software

DOCUMENTATION REQUIRED

The e-poll book must have the ability to interface with software systems used to prepare voter information to be included on the e-poll book.

1.3.3 – Compatibility with voter registration systems

IF APPLICABLE DOCUMENTATION REQUIRED

The e-poll book must have the ability to access an electronic poll list, or interface with a voter registration system.

Section 1.4 – Telecommunications

When applicable, the e-poll book must have the capability to transmit and receive data from:

1. Voter registration systems, and
2. Other e-poll books.

1.4.1 – Communication with voter registration systems

IF APPLICABLE DOCUMENTATION REQUIRED

The e-poll book must have the ability to securely, accurately, effectively, and efficiently transmit and receive data electronically and communicate with the poll list server, typically through a secured web services framework designed by the manufacturer.

1.4.2 – Communication with other e-poll books

IF APPLICABLE

DOCUMENTATION REQUIRED

The e-poll book must have the ability to securely, accurately, effectively, and efficiently transmit and receive data electronically among other e-poll books in the same polling location.

Section 1.5 – System Maintenance and Troubleshooting

An e-poll book must contain information in its documentation pertaining to maintenance and troubleshooting procedures for:

1. Batteries or power supply
2. Memory storage
3. Loss of connectivity
4. System response time
5. System-related errors
6. System failure
7. Feedback
8. Warnings, alerts, and instructions
9. Icon labels

1.5.1 – Batteries or power supply

DOCUMENTATION REQUIRED

The e-poll book should contain information in its documentation regarding batteries and/or power supply used in the system, including:

1. A list of all batteries and/or power supply to be used in the e-poll book and any peripherals;
2. The expected life span of each battery and/or power supply;
3. The expected duty cycle of a battery and/or power supply in heavy use (i.e. on election day);
4. A log documenting when each battery and/or power supply was installed or subsequently replaced;
5. A schedule for battery and/or power supply maintenance (i.e. how often should the battery be recharged?);
6. A schedule for the replacement of each battery and/or power supply not later than thirty (30) days before the end of the expected life span of each battery;
7. Plans to test batteries and/or power supplies before each election; and
8. Plans for the emergency replacement of batteries and/or power supplies that fail.

1.5.2 – Memory storage

DOCUMENTATION REQUIRED

The e-poll book should contain documentation regarding:

1. The total amount of internal memory storage on the system, and
2. Procedures to troubleshoot issues of insufficient memory.

1.5.3 – Loss of connectivity

DOCUMENTATION REQUIRED

In the event of a network failure or other interruption, documentation should outline how the e-poll book:

1. Captures and saves voter activity, including:
 - a. New Registrations (if applicable),
 - b. Voter Updates, and
 - c. Signature Updates.
2. Syncs with the poll list or other e-poll books, once connectivity is restored, and
3. Reconnects with any hardware, including:
 - a. Digital signature capturing devices,
 - b. Bar code capturing devices,
 - c. Printing devices,
 - d. Network devices (i.e. routers), and/or
 - e. Network cards (if applicable).

In addition to the steps above, documentation should also include any troubleshooting steps a poll worker may take to verify the outage isn't localized to the device.

Discussion

While it is not a required function of the e-poll book, it is recommended that jurisdictions implement administrative practices to refrain from issuing ballots from the impacted system(s) if connectivity cannot be restored within 10-15 minutes.

1.5.4 – System response time

The e-poll book must complete a visual response or display in no more than 1 second or display an indicator that a response is still being prepared.

This is to allow the user to quickly perceive that an action has been detected by the e-poll book and is being processed. The user never gets the sense of dealing with an unresponsive or “dead” system.

References: VVSG 2.0 (7.2-N)

1.5.5 – System-related errors

The e-poll book must help election workers complete their duties accurately and effectively, ensuring that the design or features of the system do not lead to election workers making errors.

References: VVSG 2.0 (7.3-A)

1.5.6 – System failure

DOCUMENTATION REQUIRED

The e-poll book should contain documentation regarding procedures to resolve a system failure, which is defined as a problem either with hardware or operating system software that causes the system to perform abnormally.

Discussion

These procedures are defined, in part, by the jurisdiction. As a result of this, documentation is not expected to provide exact procedures, but rather recommended procedures for resolving system failure.

1.5.7 – Feedback

The e-poll book must provide unambiguous feedback confirming each election worker action.

References: VVSG 2.0 (7.3-E)

1.5.8 – Warnings, alerts, and instructions

Warning, alerts, and instructions issued by the e-poll book must be distinguishable from other information.

1. Warnings and alerts must clearly state, in plain language:
 - a. The nature of the issue or problem,
 - b. whether the election worker has performed or attempted an invalid operation or whether the e-poll book itself has malfunctioned in some way, and
 - c. the responses available to the election worker.
2. Each step in an instruction or item in a list of instructions must be separated:
 - a. Spatially in visual formats, and
 - b. with a noticeable pause in audio formats (if applicable).

References: VVSG 2.0 (7.3-K), WCAG 2.0, Section 508

1.5.9 – Icon labels

When an icon label is used in the electronic interface to convey information, indicate an action, or prompt a response, it must be accompanied by a corresponding label that uses text.

Discussion

Icons are not meant to be the only means in which information is conveyed. As not all icons have a universal meaning, each icon must be accompanied by text to provide the voter enough information. References: VVSG 2.0 (7.3-L), ADA Standards for Accessible Design (Chapter 7).

Section 2 - Security

Security requirements are organized based on the following security categories:

1. Access control
2. Physical security measures
3. System integrity
4. Network/telecommunications security
5. Software design/architecture standards
6. Logging
7. Supply chain risk management

Each numbered section below contains a brief explanatory description followed by the actual requirements.

Section 2.1 – Access Control

Access to both physical and digital spaces containing e-poll books, voter information, and communication equipment must be strictly controlled during the entire e-poll book lifecycle from development to end-of-life disposal of the information and equipment to detect and prevent supply chain attacks.

E-poll book manufacturers must establish procedures and technical controls that reflect applicable federal and state laws, Executive Orders, regulations, directives, policies, standards, and guidance to control access to physical sites and networks containing EPBs and related communications equipment. Access control systems will be automated when possible.

An e-poll book must be configured to:

- Implement account management
- Follow established account management procedures and processes
- Implement and enforce role-based access
- Implement and support multi-factor authentication
- Implement and enforce separation of duties
- Implement and enforce principles of least privilege
- Implement and enforce session termination, device lock, and reauthentication
- Record unsuccessful logon attempts
- Implement system use notification

2.1.1 – Account management

E-poll books and related components such as databases or network communications equipment must authenticate each user with access to the system using an automated account

management system. If available, the device's operating system can be used for automated account management. Regardless of the method employed, the account management system must enforce the use of codewords or passwords for each user. E-poll books must require their users to develop a password based on [NIST SP 800-63-3](#) guidelines.

Discussion

The following are best practices for account management:

- Remove vendor access when no longer necessary
- Automatically remove temporary or emergency accounts after a specified date or period
- Automatically disable inactive accounts after a specific period
- Audit account creation, modification, enabling, disabling, and account removal actions with a notification to auditing personnel
- Limit the use of dynamic privilege management capabilities
- Do not allow the use of shared or group accounts
- Remove assigned privileges from accounts when removed from the group

References: NIST SP 800-53 rev. 5 (AC-2)

2.1.2 – Access control policies and procedures

DOCUMENTATION REQUIRED

The e-poll book must have documentation for access control policies and procedures describing how the requirements in Section 2 are implemented.

References: NIST SP 800-53 rev. 5 (AC-1)

2.1.3 – Role-based access

The e-poll book must implement role-based access control (RBAC) with least privilege. Each role must be limited to the functions, processes, and data authorized for the specific role.

References: NIST SP 800-53 rev. 5 (AC-2)

2.1.4 – Multi-factor authentication

IF APPLICABLE

The e-poll book shall enforce multi-factor authentication (MFA) for all privileged operations if the system has a multi-factor authentication option.

Privileged operations can include account creation, deletion, permission modification, or when directly updating external databases such as voter registration databases. Additionally, Multi-factor authentication does not mean having multiple passwords.

References: NIST SP 800-63-3

2.1.5 – Separation of duties

The e-poll book must be configurable to enforce separation of duties as defined by the jurisdiction.

For example, changes to voter information or system configurations may need to be authorized by two or more personnel to mitigate insider threats, depending on the jurisdictional requirements.

References: NIST SP 800-53 rev. 5 (AC-5)

2.1.6 – Least privilege

The e-poll book must enforce the concept of least privilege for accounts to restrict both privileged and non-privileged accounts to only permission required to carry out the role assigned to the account.

A poll worker should be prevented from making configuration changes on the system. The concept of least privilege should also be applied to administrators and supervisor groups and accounts.

References: NIST SP 800-53 rev. 5 (AC-6)

2.1.7 – Session termination, device lock, and reauthentication

IF APPLICABLE

The e-poll book must include session termination, device lock, and reauthentication functionality including:

1. a user-initiated or time-configurable automatic lockout when a user is away from the system, which can be defined and implemented by the jurisdiction;
2. a configurable mechanism to automatically terminate a user session after a defined period of inactivity and lock the device; which can be defined and implemented by the jurisdiction;
3. requiring reauthentication of the authorized user after the session is terminated and the device locked; and
4. the account lockout must include a standard or configurable screen when the system is locked to obscure any data presented on the screen when terminated.

References: NIST SP 800-53 rev. 5 (AC-11, AC-12)

2.1.8 – Unsuccessful logon attempts

IF APPLICABLE

The e-poll book must be configured to lock after a configurable number of login attempts for 15 minutes or until an administrator or technician can unlock the account.

References: NIST 800-53 rev. 5 (AC-7)

2.1.9 – System use notification

IF APPLICABLE

The e-poll book must include a configurable logon banner or system use notification for the user to accept upon logon.

References: NIST SP 800-53 rev. 5 (AC-8)

2.1.10 – Information and data flow

Information flows between e-poll books and other systems connected to networks must be limited to only the required information to protect voter data from being accessible by unauthorized users.

The use of unique IDs not easily associated with a voter should be used to transmit information rather than using actual voter PII during data exchanges.

References: NIST 800-53 rev. 5 (AC-4)

Section 2.2 – Physical Security Measures

Physical security measures must be in place to prevent unauthorized access to devices, communications equipment, and voter information to include any database backups.

An e-poll book must:

- Document asset management features
- Implement and enforce device disk encryption
- Enforce BIOS or firmware interface access restrictions
- Document the application of tamper evident sealing
- Document anti-theft controls, and emergency system decommissioning

2.2.1 – Documentation of asset management features

DOCUMENTATION REQUIRED

The e-poll book documentation must detail the location and use of any unique serial numbers, part numbers, or other identifying features for each individual hardware component of the system that can be used for asset management.

References: NIST SP 800-53 rev. 5 (CM-8)

2.2.2 – Device disk encryption

DOCUMENTATION REQUIRED

Each component of the e-poll book containing internal memory used to store voter or ballot information must enforce whole disk encryption.

References: NIST SP 800-53 rev. 5 (AC-19)

2.2.3 – Device BIOS or other firmware interface access

Each component of the e-poll book containing BIOS or other firmware interface must require authentication to access the device BIOS or other firmware interface. If passwords/codes are used, they should follow strong password guidelines, and be changed from any manufacturer defaults.

References: NIST SP 800-53 rev. 5 (SI-7)

2.2.4 – Document the application of tamper evident sealing

DOCUMENTATION REQUIRED

The e-poll book's documentation must include information on tamper evident precautions, including:

1. How and where to apply tamper evident sealing of the physical components of the system that contain voter or ballot information,
2. How to apply tamper evident sealing to any opened or unused ports on the system, such as USB ports, power ports, headphone jacks, etc., and
3. Any built-in tamper evident protections (lights, alarms, logging).

References: NIST SP 800-53 rev. 5 (SR-5, SA-18)

2.2.5 - Document anti-theft controls, and emergency system decommissioning

IF APPLICABLE

DOCUMENTATION REQUIRED

The e-poll book must include the functionality to remotely remove content or access from the device, whether or not it has data stored locally or access to cloud data.

In addition to the functionality, the e-poll book must also include documentation on how to remotely secure a stolen or lost device with access to pertinent data.

This requirement is only applicable to devices with wireless telecommunications.

Section 2.3 – System Integrity

The e-poll book must implement security measures to prevent malicious activity and protect the integrity, confidentiality, and availability of data. The e-poll book must be configured to:

- Support an endpoint detection and response (EDR) tool (network connected e-poll books only)
- Support an antivirus tool to detect and alert on malicious code
- Support file integrity checking to monitor file changes

2.3.1 – Endpoint detection and response (EDR) tool

IF APPLICABLE

DOCUMENTATION REQUIRED

If the e-poll book requires connection to a network during election day operation, the system must support an EDR tool to prevent, detect, and respond to attempts to manipulate the system.

References: NIST SP 800-53 rev. 5 (SI-4)

2.3.2 – Antivirus tool

DOCUMENTATION REQUIRED

The e-poll book must implement an antivirus tool to detect and alert on malicious code.

References: NIST SP 800-53 rev. 5 (SI-3)

2.3.3 – Authentication to access configuration file

The e-poll book must allow only authenticated system administrators to access and modify device configuration files.

References: NIST SP 800-53 rev. 5 (SI-7), VVSG 2.0 13.1.1-A

2.3.4 – Verification of voter information

IF APPLICABLE

DOCUMENTATION REQUIRED

Verifying voter information is an essential defense-in-depth measure aimed at safeguarding against accidental errors or malicious incidents involving altered or false voter data.

Therefore, the e-poll book must:

1. cryptographically verify the integrity and authenticity of all voter data.
2. immediately log any verification error; and
3. immediately present on-screen any verification errors.

References: VVSG 2.0 13.2-B

2.3.5 – Cryptographic module validation

The e-poll book's cryptographic functionality must be implemented in a cryptographic module that meets current FIPS 140 validation, operating in FIPS mode.

This applies to:

1. software cryptographic modules, and
2. hardware cryptographic modules.

References: VVSG 2.0 13.3-A

2.3.6 – Cryptographic strength

The e-poll book's cryptography must employ NIST approved algorithms with a security strength of at least 112-bits.

References: VVSG 2.0 13.3-C

2.3.7 – Cryptographic key management documentation

DOCUMENTATION REQUIRED

The e-poll book's documentation must describe how key management is to be performed. This documentation should provide procedural steps that can be taken to ease the burden of key management and how to safely perform these operations.

References: VVSG 2.0 13.3-E

Section 2.4 – Network/Telecommunications Security

The e-poll book must be configured to:

- Implement FIPS 140 approved encryption for the transfer of data
- Disallow connections to unapproved external networks
- Disallow connections to unapproved external devices
- Implement network firewall settings for approved communication (network connected e-poll book's only)
- Documentation of the network and communications architecture

2.4.1 – Network encryption

The e-poll book must be configured to utilize FIPS 140 approved network encryption for the transfer of data.

References: NIST SP 800-53 rev. 5 (AC-17)

2.4.2 – Disallow connections to unapproved external networks

IF APPLICABLE

DOCUMENTATION REQUIRED

If the e-poll book requires connection to a network during election day voter check-in operations, the e-poll book must be configured to disallow connections to unapproved external networks. This may be accomplished through IP or MAC address allow listing or other configurations where external network access is explicitly granted.

Documentation must clearly indicate what types of network access the e-poll book supports, including whether it is equipped with an Ethernet port.

Discussion

In the interest of security, jurisdictions may prefer to avoid or minimize the usage of wireless connectivity, preferring instead to utilize a hardware connection whenever possible.

References: NIST SP 800-53 rev. 5 (AC-3, AC-4)

2.4.3 – Disallow connections to unapproved external devices

DOCUMENTATION REQUIRED

The e-poll book must be configured to disallow connections to unapproved external devices.

This requirement applies to devices that can be recognized as approved, such as only allowing connections to managed devices. Security documentation must be clear on how this requirement is satisfied.

References: NIST SP 800-53 rev. 5 (AC-4, AC-20)

2.4.4 – Network firewall

IF APPLICABLE

If the e-poll book requires connection to a network during voter check-in operations during the election period, the e-poll book must implement a firewall configured to only allow approved communication with each device within the system.

References: NIST SP 800-53 rev. 5 (AC-3)

2.4.5 – Confidentiality and integrity of transmitted data

The e-poll book must:

1. mutually authenticate all network connections;
2. cryptographically protect the confidentiality of all data sent over a network; and
3. cryptographically protect the integrity of all voter information sent over the network.

Mutual authentication can be performed using various protocols, such as IPsec and SSL/TLS. This requirement includes network appliances such as switches, firewalls, and routers within its scope.

This does not prevent the use of “double encrypted” connections employing cryptography at multiple layers of the network stack. Data must be encrypted before transmission.

References: VVSG 2.0 13.4-A

2.4.6 – Documentation of the network and communications architecture

DOCUMENTATION REQUIRED

The e-poll book’s documentation must include the network and communications architecture of any network used by any portion of the system.

Documentation can assist with data flow analysis, proper network configuration, and architecture to properly support the system.

References: NIST SP 800-53 rev. 5 (PL-8, PM-7, SA-17); VVSG 2.0 15.4-A

2.4.7 – Secure network configuration documentation

IF APPLICABLE

DOCUMENTATION REQUIRED

The e-poll book’s documentation must list security configurations and be accompanied by network security best practices according to the National Institute of Standards and Technology (NIST) and as suggested by the manufacturer.

This documentation should include the use of wireless security protocols, firewalls and intrusion detection systems, and switch and/or router configuration.

Discussion

It is important to clarify that wireless connectivity should only be used in state and local jurisdictions where legislation permits the use of wireless connections on e-poll books.

References: NIST SP 800-53 rev. 5 (PL-8, PM-7, SA-17); VVSG 2.0 15.4-B

Section 2.5 – Software Design and Architecture

The e-poll book or its documentation must:

- Execute on a supported operating system
- Support updates and patching
- Utilize recognized software standard(s)
- Perform client-side input validation
- Perform server-side input validation
- Document the use of third-party code or libraries
- Disable unneeded services and applications
- Document proper media sanitization

2.5.1 – Execute on a supported operating system

The e-poll book software must execute on an operating system that is currently supported with updates and/or patches.

References: NIST SP 800-53 rev. 5 (SA-22)

2.5.2 – Support updates and patching

The e-poll book's applications must have the ability to be updated and/or patched.

References: NIST SP 800-53 rev. 5 (SA-22)

2.5.3 – Utilize recognized software standards

DOCUMENTATION REQUIRED

Application logic must adhere to a published, credible set of coding rules, conventions, or standards (called "coding conventions") that enhance the workmanship, security, integrity, testability, and maintainability of applications.

Coding conventions may be specified by the EAC in conjunction with voting system test labs and the e-poll book manufacturer must include information on coding conventions used in their e-poll book as part of their TDP submission.

The requirements to follow coding conventions serve two purposes. First, by requiring specific risk factors to be mitigated, coding conventions support the integrity and maintainability of voting system logic. Second, by making the logic more transparent to a reviewer, coding conventions facilitate test lab evaluation of the logic's correctness to a level of assurance beyond that provided by operational testing.

References: NIST SP 800-53 rev. 5 (SI-2, SI-7); VVSG 2.0 2.1-C

2.5.4 – Input validation and error defense

The e-poll book must:

1. monitor I/O operations;
2. validate all input against expected parameters, such as data presence, length, type, format, uniqueness, or inclusion in a set of whitelisted values;
3. report any input errors and how they were corrected; and
4. check information inputs to ensure that incomplete or invalid inputs do not lead to irreversible error.

Input includes data from any input source: input devices (such as touch screens, keyboards, keypads, and assistive devices), networking port, data port, or file.

References: NIST SP 800-53 rev. 5 (SI-10); VVSG 2.0 2.5.2-A

2.5.5 – Escaping and encoding output

E-poll book software output must be properly encoded, escaped, and sanitized.

Ensuring that outputted data is of an expected type or format assists in preventing this abuse. Additional information about this software weakness can be viewed at *MITRE CWE 116: Improper Encoding or Escaping of Output [MITRE20c]*.

References: VVSG 2.0 2.5.3-A

2.5.6 – Sanitize output

The e-poll book must sanitize all output to remove or neutralize the effects of any escape characters, control signals, or scripts contained in the data which could adversely manipulate the output destination.

Output includes data to any output destination: output devices (such as touch screens, LCD screens, printers, and assistive devices), networking port, data port, or file.

References: VVSG 2.0 2.5.3-B

2.5.7 – Stored injection

The e-poll book must sanitize all output to files and databases to remove or neutralize the effects of any escape characters, control signals, or scripts contained in the data which could adversely manipulate the system if the stored data is read or imported at a later date by another part of the system.

References: VVSG 2.0 2.5.3-C

2.5.8 – Third-party code and libraries

DOCUMENTATION REQUIRED

The e-poll book's documentation must identify and list all third-party code and libraries in a way that allows users to track against CVE listings. This should include software name, version, and manufacturer.

References: NIST SP 800-53 rev. 5 (SI-2)

2.5.9 – Application allowlisting

DOCUMENTATION REQUIRED

The e-poll book must only run applications that have been verified against an allowlist. This requirement helps ensure only authorized applications run on the e-poll book.

References: NIST SP 800-53 rev. 5 (SA-8); VVSG 2.0 14.3.2-C

2.5.10 – Integrity protection for software allowlists

The e-poll book must protect the integrity and authenticity of the allowlist configuration files. If the allowlist is improperly modified, the software allowlisting mitigation can be defeated. The most common way of providing allowlist configuration file protection could be a digital signature.

References: VVSG 2.0 14.3.2-D

2.5.11 – Documentation of media sanitization procedures

DOCUMENTATION REQUIRED

The e-poll book's documentation must include instructions on the proper sanitization of storage media prior to transfer or disposal of equipment.

References: NIST SP 800-53 rev. 5 (MP-6)

Section 2.6 – Logging

The e-poll book must be configured to log records for:

- General system usage
- Operational maintenance activity
- Resolving system issues
- Validating system integrity
- Generating reports

2.6.1 – General system usage

The e-poll book must be configured to log records of general system usage including, but not limited to:

1. Account management
2. User access and session information, including failed logins
3. Application execution

References: NIST SP 800-53 rev. 5 (AU-2, AU-3, AU-6)

2.6.2 – Operational maintenance activity

The e-poll book must be configured to log records including, but not limited to:

1. Software updates or patching
2. System startup and shutdown
3. Changes in system configuration

References: NIST SP 800-53 rev. 5 (AU-2, AU-3, AU-6)

2.6.3 – Application errors

DOCUMENTATION REQUIRED

The e-poll book must be configured to log all application errors. The system documentation must contain descriptions of error codes and messages for use in troubleshooting.

References: NIST SP 800-53 rev. 5 (AU-2, AU-3, AU-6)

2.6.4 – System integrity

The e-poll book must be configured to log records including, but not limited to:

1. EDR alerts
2. Antivirus alerts
3. File integrity monitoring

4. Physical tamper alerts (if applicable)

References: NIST SP 800-53 rev. 5 (AU-2, AU-3, AU-6)

2.6.5 – Report generation

The e-poll book must be configured to log the generation of all reports.

Discussion

The purpose of this requirement is to ensure that the e-poll book is capable of informing decisions regarding security and maintenance. Logs provide a detailed record of activities that occur within the system and allow for the investigation of malicious activity. Detailed logs of report generation can alert administrators to potential issues before they become serious problems.

Section 2.7 – Supply Chain Risk Management

The e-poll book's documentation must detail the risk assessments and controls utilized to reduce the potential for supply chain compromises. The documentation must contain:

- List of approved suppliers
- Verification of authenticity of components
- Verification of provenance of system devices

2.7.1 – List of Approved Suppliers

DOCUMENTATION REQUIRED

The e-poll book's documentation must include a list of approved suppliers. If the supplier goes out of business or is purchased by another company, the e-poll book's documentation must be updated to include current information.

References: NIST SP 800-53 rev. 5 (SR-6)

2.7.2 – Authenticity of Components

DOCUMENTATION REQUIRED

The e-poll book's documentation must detail controls used to determine if the system's software, firmware, hardware, or other system components are authentic and unaltered. For software or firmware, this must include hash validation procedures. For hardware, this must include details on identifying manufacturer-approved hardware through checking labeling, tamper evidence, or other characteristics.

References: NIST SP 800-53 rev. 5 (SR-4, SA-19)

2.7.3 – Provenance of Devices

DOCUMENTATION REQUIRED

The e-poll book's documentation must detail the origin and ownership of any software, firmware, or hardware used within the system.

References: NIST SP 800-53 rev. 5 (SR-4)

Section 3 – Accessibility

The requirements for e-poll book usability and accessibility are based on the requirements for voting systems in the VVSG 2.0. They have been adapted for e-poll books with changes in wording as well as adding to or removing sections of the original requirement.

There are three groups of requirements:

1. Baseline accessibility
2. Supporting visual features
3. Supporting physical features
4. Supporting audio features
5. Additional languages

In some cases, new requirements have been added to the end of each group.

Section 3.1 – Baseline Accessibility

3.1.1 – Federal standards for accessibility

IF APPLICABLE

E-poll books and their software must meet federal standards for accessibility, including:

1. the version of *Section 508 Information and Communication Technology (ICT) Final Standards and Guidelines*, in effect as of January 18, 2018, and
2. the *WCAG 2.0 Level AA checkpoints* included in that standard.

Discussion

Section 508 standards apply to electronic and information technology, including computer hardware and software, websites, multimedia, and other technology such as video, phone systems, and copiers. This requirement also supports the ADA.

References: VVSG 2.0 (8.2-A), WCAG 2.0, Section 508

3.1.2 – Accessibility documentation

DOCUMENTATION REQUIRED

As part of the overall e-poll book documentation, the manufacturer must include descriptions and instructions for all accessibility features that describe:

1. Recommended procedures for supporting the use of the system by voters with disabilities, and,
2. How the e-poll book supports those procedures.

References: VVSG 2.0 (5.1-F), WCAG 2.0, and Section 508

Section 3.2 – Supporting Visual Features

3.2.1 – Reset to default settings

IF APPLICABLE

To ensure that the e-poll book presents the same initial appearance to each election worker, any adjustable settings of an e-poll book must automatically reset to the default setting when an election worker signs out.

This requirement covers all settings that can be adjusted, including font size, color, contrast, audio volume, rate of speech, turning on or off audio or video, and enabling alternative input devices.

References: VVSG 2.0 (7.1-A)

3.2.2 – Reset by election worker

The e-poll book must give the election worker the ability to restore the system to default settings, while preserving the current state of any transaction or activity that the election worker is engaged in.

This will allow a voter or election worker who has adjusted the system to an undesirable state to reset all settings with the information presented to the voter, including any data already entered.

References: VVSG 2.0 (7.1-B)

3.2.3 – Default contrast

The default contrast ratio must be at least 10:1 for all elements that visually convey information such as text, controls, and infographics or icons.

1. For electronic displays for voters and election workers, this is measured as a luminosity contrast ratio between the foreground and background colors of at least 10:1.
2. For paper records, the contrast ratio will be at least 10:1 as measured based on ambient lighting of at least 300 lx.

This applies to information such as voter names or informational icons identifying election worker selections or other information.

Purely decorative elements that do not communicate meaning do not have to meet this requirement.

A 10:1 luminosity contrast ratio provides enough difference between the text and background to enable people with most color vision deficiencies to read the screen. This is higher than the highest contrast requirements of 7:1 in WCAG 2.0 Checkpoint 1.4.6 (Level AAA) to accommodate a wider range of visual disabilities. There are many free tools available to test color luminosity contrast using the WCAG 2.0 algorithm.

References: VVSG 2.0 (7.1-C), WCAG 2.0, and Section 508

3.2.4 – Contrast options

The e-poll book must provide options for high and low contrast displays, including the alternative display contrast options as listed below:

1. A high contrast option with a white background and dark text, with a luminosity contrast ratio of at least 20:1.
2. A high contrast option with a black background (between #000000 and #111111) and one of the following foreground options, including:
 - a. yellow text similar to #FFFF00, providing a contrast ratio of at least 17.5:1,
 - b. cyan text similar to #00FFFF, providing a contrast ratio of at least 15:1, and
 - c. white text similar to #FAFAFA, providing a contrast ratio of at least 18:1.
3. A low contrast option, providing a contrast ratio in the range of 4.5:1 to 8:1.

Discussion

This requirement for options for the overall display contrast ensures that there is an option for the visual presentation for people whose vision requires either high or low contrast.

High and low contrast options apply to the entire screen, including decorative elements.

Examples of color combinations for low contrast options include:

- brown text similar to #BB9966 on a black background,
- black text on a background with text similar to #BB9966,
- grey text similar to #6C6C6C on a white background,
- grey/brown text similar to #97967E on a black background, and
- grey text similar to #898989 on a dark background similar to #222222

References: VVSG 2.0 (7.1-D), WCAG 2.0, and Section 508

3.2.5 – Color conventions

The use of color by the e-poll book must follow these common conventions:

1. Green, blue, or white is used for general information or as a normal status indicator;
2. Amber or yellow is used to indicate warnings or a marginal status;
3. Red is used to indicate error conditions or a problem requiring immediate attention.

References: VVSG 2.0 (7.1-E)

3.2.6 – Using color

Color coding must not be used as the only means of communicating information, indicating an action, prompting a response, distinguishing a visual element, or providing feedback on system actions or selections.

While color can be used for emphasis, some other non-color design element is also needed. This could include shape, lines, words, text, or style. For example, an icon for “stop” can be red enclosed in an octagon shape. Or a background color can be combined with a bounding outline and a label to group elements on the screen.

References: VVSG 2.0 (7.1-F)

3.2.7 – Text size (electronic display)

An e-poll book’s electronic display for check-in screens must be capable of showing all information in a range of selectable text sizes, with a default text size at least 4.8 mm (based on the height of the uppercase I), allowing the text to both increase and decrease in size.

The e-poll book may meet this requirement in one of the following ways:

1. Provide continuous scaling with a minimum increment of 0.5 mm that covers the full range of text sizes from 3.5 mm to 9.0 mm.
2. Provide at least four discrete text sizes, in which the main options fall within one of these minimum ranges:
 - a. 3.5-4.2 mm (10-12 points)
 - b. 4.8-5.6 mm (14-16 points)
 - c. 6.4-7.1 mm (18-20 points)
 - d. 8.5-9.0 mm (24-25 points)

These ranges are not meant to limit the text on the screen to a single size. The text can fall in several of these text sizes. For example, primary instructions might be in the 4.8-5.6 mm range, secondary information in the 3.5-4.2 mm range, and titles or button labels in the 6.4-7.1 mm range.

References: VVSG 2.0 (7.1-G), WCAG 2.0, Section 508

3.2.8 – Text size (paper)

IF APPLICABLE

If the e-poll book provides printed materials to the voter, they must have a font size of at least 3.5 mm (10 points).

Although the e-poll book can be capable of printing in several font sizes, local or state laws and regulations can also govern the use of various font sizes.

If the system includes a large-print display option, a good range for the text size is 6.4-7.1 mm matching the size in 2.1.11 – *Text size (electronic display)*.

References: VVSG 2.0 (7.1-I), WCAG 2.0, Section 508

3.2.9 – Scaling and zooming

When the text size is changed, all other information in the interface, including informational icons, screen titles, buttons, and entry fields, must change size to maintain a consistent relationship to the size of the text. Informational elements in the interface do not have to be scaled beyond the size of the text.

1. When the text is enlarged up to 200% (or 7.1 mm text size), the layout must adjust so that there is no horizontal scrolling or panning of the screen.

If some interface designs include elements already large enough that making them any larger would distort the layout, those elements are excluded from this requirement.

This requirement does not preclude novel approaches to on-screen magnification such as a zoom lens showing an enlarged view of part of the screen (as long as it meets the requirements for the operability of the controls).

References: VVSG 2.0 (7.1-H), WCAG 2.0

3.2.10 – Toggle keys

The status of all locking or toggle controls or keys (such as the “shift” key) for the e-poll book that are available to the election worker or voter must be visually discernable, and discernable through either touch or sound.

Discussion

This applies to any physical controls or keys that have a locking or toggle function.

References: VVSG 2.0 (7.1-O), WCAG 2.0, Section 508

3.2.11 – Identifying controls

Buttons and controls used to operate the e-poll book must be distinguishable by both shape and color for visual and tactile perception.

Well-known arrangements or groups of keys may be used only for their primary purpose. For example, a full alphabetic keyboard may be used for entering text in a form, or navigation keys on the keyboard may be used by election workers.

Discussion

This applies to buttons and controls implemented either on-screen or in hardware. For on-

screen controls, shape includes the label on the button. Redundant cues help those with low vision. They also help individuals who have difficulty reading the text on the screen, those who are blind but have some residual vision, and those who use the controls on a system because of limited dexterity. While this requirement primarily focuses on those with low vision, features such as tactile controls and on-screen controls intended to primarily address one kind of disability often assist others as well. The Trace Center's EZ Access design is an example of button functions distinguishable by both shape and color.

Some examples are:

- Color can be helpful to make different sets of functions visually distinct: groups of buttons can share a color, such as volume up/down.
- Tactile perception requires different shapes, so that finding a control does not rely solely on the layout: all the shapes cannot be squares, but two or four triangles can be used if they point in different directions.
- As a group of well-known keys, a full alphabetic keyboard is acceptable for entering information, but individual keys cannot be used for navigation or selection. Using these keys for functions would require an election worker or voter to see the visual labels or know the arrangement for those functions.

References: VVSG 2.0 (7.1-P), WCAG 2.0, Section 508

3.2.12 – Display and interaction options

The e-poll book must provide at least a visual format with enhanced visual options, supporting full functionality under all visual options. Full functionality includes at least instructions and feedback regarding:

1. how to use accessibility features and settings;
2. changes in the display format or control options;
3. navigating the screen;
4. activating options; and
5. confirming choices.

References: VVSG 2.0 (7.2-A), WCAG 2.0, Section 508

3.2.13 – Electronic display screens

IF APPLICABLE

If the e-poll book uses an electronic display screen, the display must have the following characteristics:

1. For all electronic display screens:

- a. Antiglare screen surface that shows no distinct virtual image of a light source or a means of physically shielding the display from such reflections such as an anti-glare screen protector or shroud, and
 - b. Minimum uniform diffuse ambient contrast ratio for 500 lx luminance: 10:1.
2. If the display is the primary visual interface for e-poll book functions:
 - a. minimum display resolution: 1920 x 1080 pixels.

This requirement does not apply to non-primary display screens such as those used by peripheral devices such as printers or signature pads.

References: VVSG 2.0 (8.1-A), WCAG 2.0, Section 508

3.2.14 – Flashing

If the e-poll book emits light in flashes, there must be no more than three flashes in any one-second period.

References: VVSG 2.0 (8.1-B), WCAG 2.0, Section 508

Section 3.3 – Supporting Physical Features

3.3.1 – Scrolling

If the amount of information that needs to be shown means that it does not fit on a single screen using the election worker’s visual display preferences, the e-poll book must provide a way to view all of the information.

1. The e-poll book may display the information by:
 - a. Pagination – dividing the list of voters or other information into “chunks,” each filling one screen and providing ways for the election worker to navigate among the different chunks, or
 - b. Scrolling – keeping all of the content on a single long display and providing controls that allow the election worker to scroll continuously through the content.
2. For either display method, the interface must:
 - a. Have a fixed header or footer that does not disappear, so election workers always have access to navigation elements.
 - b. Include easily perceivable cues in every display format to indicate that there is more information available.

Information elements that need not scroll might include instructions and general controls including preference settings or navigation controls.

A scrolling interface that meets this requirement offers election workers a combination of easily perceivable controls or gestures to navigate through long lists or other lengthy content. For example:

- Navigation does not rely on knowledge of any particular computer platform or interface standard.
- Navigation does not only rely on conventional platform scroll bars, which operate differently on two of the major commercial computer platforms.
- Controls have visible labels that include words or symbols.
- Controls are located in the election worker’s visual viewing area at the bottom (or top) of the scrolling area, for example in the center of a column of names or a paragraph of text. This is especially helpful for people with low digital or reading literacy.

References: VVSG 2.0 (7.2-D), WCAG 2.0, Section 508

3.3.2 – Touch screen gestures

IF APPLICABLE

E-poll books may use touch screen gestures (physical movements by the user while in contact with the screen to activate controls) in the interface if the following conditions are met:

1. Gestures are offered as another way of interacting with a touch screen and an optional alternative to the other touch interactions.
2. Gestures work consistently.
3. Gestures are used in a way that does not create accidental activation of an action through an unintended gesture.
4. Gestures are limited to simple, well-known gestures.
5. Gestures do not require sequential, timed, or simultaneous actions.

Discussion

In relying on simple and common gestures, this requirement does not intend to fully duplicate the gestures for commercial mobile platforms used with an audio format for accessibility.

Tapping (touching the screen briefly) is the most basic gesture and is used on all touch screens.

Other commonly used gestures include:

- Pinching or spreading fingers to zoom,
- swiping to scroll, and
- pressing and holding to drag.

Examples of gestures that require sequential or simultaneous actions are double-tapping, 2, 3, or 4 finger swiping, touch and hold for a set period of time, or those that require coordinated actions with fingers on both hands. On desktop systems, assistive preference options like Sticky

Keys can make these complex gestures accessible, but they require familiarity beyond what is acceptable in an e-poll book.

Examples of timed gestures include differentiating between long and short touches, or which require touching twice in rapid succession to highlight and then activate a button or selection.

References: VVSG 2.0 (7.2-E)

3.3.3 – Accidental activation

Both on-screen and physical controls on the e-poll book must be designed to prevent accidental activation.

1. This requirement aims to mitigate unintended activations, which can happen a number of ways depending on the device. Two examples are, but not limited to: When a control is activated to execute an action as it is being “explored” by the user because the control is overly sensitive to touch.
2. When a control is in a location where it can easily be activated unintentionally. For example, when a button is in the very bottom left corner of the screen where a user might hold the unit for support.

Discussion

The e-poll book should always provide a simple method of undoing accidental actions, such as mistakenly checking in a voter, or sending incorrect information to the voter registration system. Any action that needs to be undone should be guided by the manufacturer.

References: VVSG 2.0 (7.2-H), WCAG 2.1

3.3.4 – Touch area size

IF APPLICABLE

If the e-poll book has a touch screen, the touch target areas must:

1. Be at least 12.7 mm (0.5 inches) in both vertical and horizontal dimensions;
2. be at least 2.54 mm (0.1 inches) away from adjacent touch areas; and
3. not overlap another touch area.

Discussion

The requirements for touch size areas are larger than commercial standards for mobile devices:

- to ensure that the touch areas are large enough for users with unsteady hands;
- to ensure that systems allow full adjustment to the most comfortable posture; and
- to allow for touch screens that do not include advanced algorithms to detect the center point of a touch.

The required marking area size is within the sizes suggested in the draft WCAG 2.1 for target areas that accept a touch action.

An MIT Touch Lab study of [Human Fingertips to Investigate the Mechanics of Tactile Sense](#) found that the average human finger pad is 10-14 mm and the average fingertip is 8-10 mm.

References: VVSG 2.0 (7.2-I), WCAG 2.1

3.3.5 – Key operability

Physical keys, controls, and other manual operations on the e-poll book must be operable with one hand and not require tight grasping, pinching, or twisting of the wrist. The force required to activate controls and keys must be no greater than 5 lbs. (22.2 N).

This includes operations such as inserting a smart card or swiping magnetic stripe cards.

This does not apply to on-screen controls.

References: VVSG 2.0 (7.2-K), WCAG 2.0, Section 508

3.3.6 – Bodily contact

The e-poll book controls must not require direct bodily contact or for the body to be part of any electrical circuit. If some form of contact is required, a stylus or other device with built-in permanent tips will be supplied to activate capacitive touch screens.

References: VVSG 2.0 (7.2-L), WCAG 2.0, Section 508

3.3.7 – No repetitive action

E-poll book keys or controls must not have a repetitive effect when they are held in an active position.

This is to preclude accidental activation. For instance, if a user is typing a name, depressing and holding the “e” key results in only a single “e” added to the name.

References: VVSG 2.0 (7.2-M), WCAG 2.0, Section 508

3.3.8 – Secondary ID and biometrics

IF APPLICABLE

If the e-poll book uses biometric measures for identifying or authenticating election workers, it must provide an alternative that does not depend on the same biometric capabilities.

For example, if fingerprints are used for identification, another mechanism will be provided for users without usable fingerprints.

References: VVSG 2.0 (8.1-D), WCAG 2.0, Section 508

3.3.9 – Eliminating hazards

The e-poll book and all associated devices must be certified in accordance with the requirements of *IEC/UL 62368-1, Edition 3: Standard for Audio/video, Information and Communication Technology Equipment – Part 1: Safety Requirements* by a certification organization accredited by the Department of Labor, Occupational Safety and Health Administration’s Nationally Recognized Testing Laboratory program. The certification organization’s scope of accreditation is acceptable if it includes *IEC/UL 62368-1*.

In addition to meeting the technical specifications outlined in this requirement, manufacturers are also required to provide clear and comprehensive documentation demonstrating compliance with IEC/UL 62368-1. Documentation can include test reports, certification documents, and any other relevant records.

References: VVSG 2.0 (8.1-K), IEC/UL 62368-1

Section 3.4 – Supporting Audio Features

3.4.1 – Sound cues

IF APPLICABLE

Sound and visual cues must be coordinated so that sound cues are accompanied by visual cues.

For example: The equipment might beep if the election worker or voter makes an error. If so, there must be an equivalent visual cue, such as the appearance of an icon or blinking element.

Audio output must also support non-written languages, voters with low literacy, or voters with low vision.

References: VVSG 2.0 (5.2-E), WCAG 2.0, and Section 508

3.4.2 – Information in all modes

IF APPLICABLE

Instructions, warnings, and messages must be presented to election workers in the display formats and interaction modes supported by the e-poll book.

For audio mode, this requirement can be met with audio that includes cues to help users know what to expect. For example, announcing the number of voters in the list makes it easier to jump from one item to another without waiting for the audio to complete. Audio cues can also ensure the election worker is aware of notifications or error conditions.

References: VVSG 2.0 (5.2-C), WCAG 2.0, Section 508

3.4.3 – Audio synchronized

IF APPLICABLE

The e-poll book must provide the option for synchronized audio output to convey the same information that is displayed visually to the election worker or voter.

This requirement covers all information, including information entered by an election worker or voter unless the information is not easily readable, such as a voter's signature.

This requirement applies to any audio output, whether it is recorded or generated as text-to-speech.

Any differences between audio and visual information are for functional purposes only, with variations only based on differences in the display format and interaction mode, especially for instructions.

References: VVSG 2.0 (5.2-D), WCAG 2.0, Section 508

3.4.4 – Audio settings

IF APPLICABLE

The e-poll book's audio format interface must meet the following requirements:

1. The settings for volume and rate of speech are followed regardless of the technical means of producing audio output.
2. The default volume for each election worker's log-in session is set between 60 and 70 dB SPL.
3. The volume is adjustable from a minimum of 20 dB SPL up to a maximum of 100dB SPL, in increments no greater than 10dB.
4. The rate of speech is adjustable throughout a voter check-in transaction while preserving the current state, with 6 to 8 discrete steps in the rate.
5. The default rate of speech is 120 to 125 words per minute (wpm).
6. The range of speech rates supported is from 60-70 wpm to 240-250 wpm (or 50% to 200% of the default rate), with no distortion.
7. Adjusting the rate of speech does not affect the pitch of the voice.

The top speech rate is slower than some audio users prefer for narrative reading to ensure that names are pronounced clearly and distinctively.

Note that the calculation of rate of speech can vary based on the length of the words in the sample, so requirements are stated as a small range.

Speech rates as slow as 50 wpm and as fast as 300 wpm can be included if this can be done without distortion or flanging.

This requirement is intended to be tested using “real ear” measurements, not simply measurements at the point of the audio source.

According to an explanation written by the Trace Center, 60dB SPL is the volume of ordinary conversation.

FCC regulations for hearing aids, *47 CFR Parts 20 and 68: Hearing Aid Standard*, includes useful information about how to test audio volume and quality.

References: VVSG 2.0 (7.1-K), WCAG 2.0, Section 508

3.4.5 – Speech frequencies

IF APPLICABLE

The e-poll book’s audio format interface must be able to reproduce frequencies over the audible speech range of 315 Hz to 10 KHz.

The required frequencies include the range of normal human speech. This allows the reproduced speech to sound natural.

References: VVSG 2.0 (7.1-L), WCAG 2.0, Section 508

3.4.6 – Audio comprehension

IF APPLICABLE

The e-poll book’s audio format interface must be capable of presenting audio content so that it is comprehensible to people who have normal hearing and are proficient in the language with:

1. Proper enunciation, normal intonation, accurate pronunciation in the context of the information, and the capability to pronounce voter names as intended;
2. low background noise; and
3. recording or reproduction in dual-mono, with the same audio information in both ears.

This requirement covers both recorded and synthetic speech. It applies to those aspects of the audio content that are inherent to the system or that are generated by default. To the extent that election officials determine the audio presentation, it is beyond the scope of this requirement.

Support for non-written languages and low literacy includes audio output that is usable by voters who can see the screen.

The International Telecommunications Union (ITU) provides a set of freely available test signals for testing audio quality in *Rec. ITU-T P.50 Appendix I*.

References: VVSG 2.0 (7.1-M), WCAG 2.0, Section 508, ITU-T (P.50 Appendix I)

3.4.7 – Audio control

IF APPLICABLE

The e-poll book must allow the election worker to control the audio format either through custom controls or using the platform or device controls, including:

1. Pausing and resuming the audio; and
2. repeating any information.

References: VVSG 2.0 (7.2-G)

3.4.8 – Standard audio connectors

IF APPLICABLE

If audio output is supported by the system, the e-poll book hardware platform must provide its audio signal for the audio format interface through an industry standard connector using a 3.5 mm (1/8 inch) stereo headphone jack to allow voters and election workers to use their own audio assistive devices for private listening.

References: VVSG 2.0 (8.1-E)

Section 3.5 – Additional Languages

3.5.1 – Languages

IF APPLICABLE

The e-poll book must be capable of displaying and printing all the information contained in the e-poll book and accompanying instructions in all languages the manufacturer has declared the system supports, in visual formats, and in audio formats for e-poll books that support audio formats. Both written and unwritten languages are within the scope of this requirement.

The e-poll book will be tested in all languages that the manufacturer claims it is capable of supporting.

References: VVSG 2.0 (5.1-B), Voting Rights Act

3.5.2 – Presenting content in all languages

IF APPLICABLE

All information that is presented to the election worker and information presented to the voter in English must also be capable of being presented in all other languages that are supported, whether the language is in visual or audio format (for e-poll books that include audio). This includes instructions, warnings, and messages.

Discussion

It is not sufficient simply to present options in an alternative language. All of the supporting information election workers or voters need to complete their tasks is also covered in this requirement.

References: VVSG 2.0 (5.1-B), Voting Rights Act

3.5.3 – Language selections

IF APPLICABLE

It must be possible to select languages separately for the election worker screens and for screens or information presented to the voter.

1. Changing the language for the election worker must not cause any language changes in the e-poll book interface or attached devices that are viewed by voters.
2. Changing the language used for any voter-facing interface of the e-poll book or by attached devices must not cause any language changes to the interface used by election workers.

References: VVSG 2.0 (5.1-B), Voting Rights Act