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# Test Report for EAC 2005 VVSG 1.0 Certification Testing Clear Ballot Group (CBG) ClearVote 2.5 Voting System

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U.S. Election Assistance Commission
VSTL

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NVLAP®

TESTING
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**SIGNATURES**

Approved by: Michael L. Walker — 08/28/2025

Michael Walker, VSTL Project Manager — Date

Approved by: Wendy Owens — 08/28/2025

Wendy Owens, VSTL Program Manager — Date

Approved by: Stacey Glover — 08/28/2025

Stacey Glover, QA Manager — Date

Pro V&V attests to the following: 1) all testing prescribed by the approved and published test plan or amended test plan was performed as identified or the divergence from the test plan was properly documented in this test report, 2) all identified voting system anomalies or failures were reported and resolved, and 3) this test report is accurate and complete. There are no opinions or interpretations included in this report, except as noted under Recommendations.

## REVISIONS

| Revision | Description | Date |
|---|---|---|
| 00 | Initial Release | 07/28/2025 |
| 01 | Updates per EAC comments; Added new change notes document version; Added hardware test reports; Added Voting System Software Table | 08/15/2025 |
| 02 | Updates per EAC comments; Added “Cross-party endorsement” and “Recall contest” to Sec 2.2.5; Added Bench Handling, Vibration and Acoustic Noise Level Test to Table 3-3; Added missing software components to Table 4-1. | 08/28/2025 |
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# 1.0 INTRODUCTION

The purpose of this Test Report is to document the procedures that Pro V&V, Inc. followed to perform certification testing during a system modification campaign for the Clear Ballot Group (CBG) ClearVote 2.5 Voting System to the requirements set forth for voting systems in the U.S. Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG), Version 1.0. Certification testing of ClearVote 2.5 was performed to ensure the applicable requirements of the EAC VVSG 1.0 were met. Additionally, all EAC Request for Interpretations (RFI) and Notices of Clarification (NOC) relevant to the system under test were incorporated in the test campaign.

Prior to submitting the voting system for testing, CBG submitted an application package to the EAC for certification of the ClearVote 2.5 Voting System. The application was accepted by the EAC, and the project was assigned the unique Project Number of CBG-CV-25.

*The ClearVote 2.5 EAC-approved test plan (TP-01-01-CBG-07-01.02), as published on the EAC's website at www.eac.gov, was utilized as the guiding document during test performance. Since test plan approval, and as testing progressed, minor system modifications, such as revised system documentation or updated component models, were incorporated. This test report reflects all testing completed and details the final versions of all technical documentation and system components and supersedes the approved test plan.*

## 1.1 Description and Overview of EAC System Being Modified

*The EAC Certified System, which is the baseline for the submitted modification is described in the following subsections. All information presented was derived from the previous Certification Test Report, the EAC Certificate of Conformance and/or the System Overview.*

The ClearVote 2.5 Voting System is a paper-based optical scan voting system consisting of the following major components: ClearDesign (ballot design and EMS), ClearCount (central count, tabulation, and election reporting), ClearCast (precinct count and tabulation), ClearAccess (accessible voting and ballot marking device), and ClearMark (accessible voting and ballot marking device).

The following sections contain a product description and an overview of the design methodology of the ClearVote 2.5 Voting System, as taken from the Clear Ballot Group technical documentation.

**ClearDesign**

ClearDesign is an Election Management System consisting of an interactive set of applications which are responsible for all pre-voting activities necessary for defining and managing elections. This includes ballot design, ballot proofing, ballot layout, and ballot production. The ClearDesign system consists of the physical components listed below. All the components and generation of voting machine election definition file packages are unmodified COTS that are connected via a wired, closed, and isolated network not connected to any other systems or the Internet.

- DesignServer: A laptop or desktop computer running Ubuntu with the ClearDesign software and hosting the election database.

- DesignStation(s): One or more laptops or desktops running Windows used to connect to the DesignServer. A browser is used to perform the necessary tasks. A user with administrative rights can define users and manage the elections.
- Network Switch: Used to connect DesignStations to the DesignServer using a wired, closed Ethernet-based network.

**ClearCount**

ClearCount is a central, high-speed, optical scan ballot tabulator coupled with ballot processing applications. The ClearCount software runs on unmodified COTS laptop or desktop computers running the Windows operating system and supports specific models of scanners. The ClearCount central-count system running on an Ubuntu Linux operating system, with Ethernet connections to workstations running the Windows operating system consists of the physical components listed below. All the components are unmodified COTS that are connected via a wired, closed, and isolated network not connected to any other systems or the Internet.

- CountServer: An Ubuntu Linux laptop or desktop computer running the ClearCount software and hosting its election database and the web server that serves its election reports.
- ScanStation(s): One or more Windows laptop or desktop/scanner pairs used to scan and tabulate ballots.
- Network Switch: Used to connect the ScanStations to the CountServer using a wired, closed Ethernet.
- CountStation(s): One or more Windows laptop or desktop computers installed with browser software, linked by a wired Ethernet connection to the CountServer using the network switch. This station can serve multiple uses: user administration, election administration, adjudication, and reporting. This station is also used to consolidate the vote totals and ballot images from the ClearCast precinct tabulator. The vote totals and ballot images are consolidated by the ClearCount Software via the ClearCast USB drive.

All files that make up the ClearCount software reside on a single CountServer that is shared by all client ScanStations. The Tabulator software is executed by the ScanStations at run-time from files that reside on the CountServer. The only software programs that must be installed on ScanStations, apart from the Windows operating system, are the Fujitsu PaperStream Capture software and drivers required by the scanner hardware. The ClearCount software consists of the following components:

- Tabulator: The Tabulator application handles ballot tabulation. The Tabulator software is stored on the CountServer and an instance of Tabulator runs on each ScanStation. The Tabulator counts the ballots and adjudicates the vote for the ballots scanned on that ScanStation. Upon completion of a batch of ballots, the Tabulator application sends its results and the associated card images to the central election database on the CountServer.
- Election Database: A centralized election database that resides on the CountServer and collects the output of each Tabulator.
- Election Reports: A suite of reports that provides election results and analysis and allows election officials to review individual ballot images.
- Card Resolutions tool: A web application that allows election officials to review and appropriately resolve unreadable voted ballots. It also allows manual adjudication of

automatically adjudicated ballots where officials determine changes need to be made to reflect voter intent.

- User and Election Database Management through web applications: On the User Administration dashboard, the administrator can add, rename, or delete users, assign permissions, and change user passwords. On the Election Administration dashboard, the administrator can create or delete an election, set an election as active, merge ClearCast election results, and backup or restore an election.

**ClearCast and ClearCast Go**

The ClearCast and ClearCast Go tabulators are precinct count ballot scanning solutions suitable for early and election day in-person voting, including processing ballots printed by the ClearAccess accessible ballot marking device. The ClearCast application runs on the precinct count-based tabulator, and is used to scan, count and tally marked ballots. Its functionality is divided into three essential modes, Election Mode (Early Voting and/or Election Day), which is used to process voter cast ballots, Pre-Election Mode, this occurs prior to Election Mode, and is used to test all system functionality prior to the start of the election, and Post-Election Mode, which is used to perform administrative functions following the close of the election.

**ClearAccess**

ClearAccess is an accessible touchscreen ballot marking device (BMD) used for the creation of paper ballots that can be scanned and tabulated by ClearCast or ClearCount. The ClearAccess components of the ClearVote voting system consist of computers combined with personal assistive devices, printers, and uninterruptible power supplies to form a ballot marking device.

**ClearMark**

ClearMark is an accessible touchscreen ballot marking device (BMD) used for the creation of paper ballots that can be scanned and tabulated by ClearCast or ClearCount. The ClearMark components of the ClearVote voting system consist of computers combined with personal assistive devices, printers, and uninterruptible power supplies to form a ballot marking device.

### 1.1.1 Baseline Certified System

The baseline system for this modification is the ClearVote 2.3 Voting System. Detailed descriptions of the ClearVote 2.3 test campaign are contained in Pro V&V Report No. TR-01-01-CBG-006-01.06, which is available for viewing on the EAC's website at www.eac.gov.

## 1.2 References

- Election Assistance Commission 2005 Voluntary Voting System Guidelines (VVSG) Version 1.0, Volume I, "Voting System Performance Guidelines", and Volume II, "National Certification Testing Guidelines"

- Election Assistance Commission Voting System Testing and Certification Program Manual, Version 3.0

- Election Assistance Commission Voting System Test Laboratory Program Manual, Version 3.0
- National Voluntary Laboratory Accreditation Program NIST Handbook 150, 2020 Edition, "NVLAP Procedures and General Requirements (NIST HB 150-2020)"
- National Voluntary Laboratory Accreditation Program NIST Handbook 150-22, 2021 Edition, "Voting System Testing (NIST Handbook 150-22-2021)"
- United States 107th Congress Help America Vote Act (HAVA) of 2002 (Public Law 107-252), dated October 2002
- Pro V&V, Inc. Quality Assurance Manual
- EAC Requests for Interpretation (RFI) and Notices of Clarification (NOC) (listed on www.eac.gov)
- Pro V&V Test Report No. TR-01-01-CBG-006-01.06, *Test Report for EAC 2005 VVSG Certification Testing Clear Ballot Group ClearVote 2.3 Voting System"*
- Clear Ballot Group's Technical Data Package *(A listing of the ClearVote 2.5 documents submitted for this test campaign is listed in Section 3.1 of this Test Report)*

## 1.3 Terms and Abbreviations

*This subsection lists terms and abbreviations relevant to the hardware, the software, or this Test Plan.*

"ADA" – Americans with Disabilities Act 1990

"BMD" – Ballot Marking Device

"CM" – Configuration Management

"COTS" – Commercial Off-The-Shelf

"EAC" – United States Election Assistance Commission

"EMS" – Election Management System

"FCA" – Functional Configuration Audit

"HAVA" – Help America Vote Act

"ISO" – International Organization for Standardization

"NOC" – Notice of Clarification

"PC" – Personal Computer

"PCA" – Physical Configuration Audit

"QA" – Quality Assurance

"RAM" – Random Access Memory

"RFI" – Request for Interpretation

"SCAP" – Security Content Automation Protocol

"TDP" – Technical Data Package

"UPS" – Uninterruptible Power Supply

"VSTL" – Voting System Test Laboratory

"VVSG" – Voluntary Voting System Guidelines

## 2.0 CERTIFICATION TEST BACKGROUND

The ClearVote 2.5 voting system is a modification of a previously certified system (ClearVote 2.3). Pro V&V performed an evaluation of results from the previous test campaign to determine the scope of testing required for certification of the ClearVote 2.5. Based on this evaluation, Pro V&V determined that testing from the previous test campaign would establish the baseline and that the focus of this test campaign would be on the documented system updates.

### 2.1 Revision History

The table below details the version history of the ClearVote 2.5 System:

**Table 2-1. ClearVote 2.5 System Revision History**

| System Version | Certification Type | Baseline System | Certification Number |
|---|---|---|---|
| ClearVote 1.4 | New System | --- (Original System) --- | CBG-CV-14 |
| ClearVote 1.5 | Modification | ClearVote 1.4 | CBG-CV-15 |
| ClearVote 2.0 | Modification | ClearVote 1.5 | CBG-CV-20 |
| ClearVote 2.2 | Modification | ClearVote 2.0 | CBG-CV-22 |
| ClearVote 2.3 | Modification | ClearVote 2.2 | CBG-CV-23 |
| ClearVote 2.5 | Modification | ClearVote 2.3 | CBG-CV-25* |

*Upon grant of certification by the EAC

### 2.2 Scope of Testing

The scope of testing focused on evaluating the modifications detailed in Section 2.2.1 of this Test Report. To determine the ClearVote 2.5 test requirements, the submitted modifications were evaluated against each section of the EAC VVSG 1.0 to determine the applicable tests to be performed. Based on this assessment, it was determined that multiple areas within the EAC VVSG 1.0 would be evaluated to encompass the required tests. Additionally, it was determined that Regression Testing would consist of executing the System Integration Test and the Accuracy Test.

A breakdown of the areas and associated tests is listed below:

- EAC VVSG 1.0 Volume I, Section 2: Functional Requirements
  - System Integration Testing

- Functional Configuration Audit (FCA)
- Physical Configuration Audit (PCA), including System Loads & Hardening
- Technical Documentation Package (TDP) Review
- Accuracy Testing
- Volume and Stress

- EAC VVSG 1.0 Volume 1, Section 3: Usability & Accessibility
  - Usability & Accessibility Testing (ClearMark)
  - Technical Documentation Package (TDP) Review

- EAC VVSG 1.0 Volume I, Section 4: Hardware Requirements
  - Environmental Requirements
    - Electrical Tests (ClearMark)
    - Environmental Tests (ClearMark, ClearCount)
    - Technical Documentation Package (TDP) Review
- EAC VVSG 1.0 Volume I, Section 5: Software Requirements
  - Source Code Review, Compliance Build, Trusted Build, and Build Document Review
  - Technical Documentation Package (TDP) Review
  - Functional Configuration Audit (FCA)
- EAC VVSG 1.0 Volume 1, Section 7: Security Requirements
  - Security Testing
  - Technical Documentation Package (TDP) Review

*Note: Section 6 (Telecommunications Requirements) of the VVSG 1.0 is not applicable to ClearVote 2.5, therefore, it was not included in the testing. Additionally, Section 8 (Quality Assurance Requirements), and Section 9 (Configuration Management Requirements) were reviewed in previous test campaigns and were not impacted by the submitted modifications.*

### 2.2.1 Modification Overview

The submitted modifications to the ClearVote 2.5 System consisted of both software and hardware changes. Software changes and updates were implemented to accommodate defect resolutions, enhancements, and improved security and user interface features. Hardware modifications include the addition of a Ricoh fi-7600 scanner and Ricoh fi-8950 scanner to ClearCount and a Brother HL-L2460DW printer to ClearDesign and to ClearCount as a report printer, and the addition of the two ClearMark component configurations.

To verify the modifications were successfully addressed throughout the test campaign, each modification was tracked and verified to be addressed during the execution of the relevant test area. For example, source code changes were verified during the source code review.

Modifications requiring functional test verification were evaluated by executing the standard Accuracy Test, the System Integration Test, or during performance of the FCA. Modifications that were not adequately evaluated during the performance of these tests were subjected to specifically designed test cases.

Additionally, Pro V&V functionally verified that any corrected issues from the baseline system were not present in the modified system and that all enhancements implemented did not adversely impact system performance.

#### 2.2.1.1 List of Changes

The submitted modifications include the following changes from version 2.3 to 2.5, as taken from the *ClearVote 2.5 Change Notes*:

**Table 2-2. Submitted Modifications**

| Unique ID | Component(s) | Description of Fix/Modification/Enhancement |
|---|---|---|
| SW-11928 | BallotTabulator | Enables ClearCount to properly tabulate a card that only has contests on the back side. |
| SW-10691 | ClearAccess, ClearCast | minor version update to the libssl and openssl libraries |
| SW-10690 | ClearAccess, ClearDesign | Updated the ADF to account for the new page number macros introduced in this release. |
| SW-11531 | ClearCast | The ClearCast results reports now include a party breakdown rather than aggregating all the votes for a candidate into one number. |
| SW-11604 | ClearCast | Updated OpenSSL1.0 version to 1.0.2n-1ubuntu5.8 and OpenSSL1.1 version to 1.1.1f-1ubuntu2.12 to address CVE-2022-0778. |
| SW-11655 | ClearCast | Users can now log in with the poll worker password after the ClearCast unit is restarted. Previously, a user would have to log in with the election administrator password before the poll worker login was enabled. |
| SW-11694 | ClearCast | ClearCast would occasionally fail to start the application in Chrome kiosk mode and instead show the Ubuntu login screen. The system now detects when this occurs and restarts the browser if the application does not start successfully. |
| SW-12422 | ClearCast | Each ClearCast unit has a unique public/private key pair used for digitally signing ballot images and Cast Vote Records. |
| SW-12423 | ClearCast | The public key fingerprint of the ClearCast unit is printed on all result reports and the Power On report. |
| SW-12425 | ClearCast | The election_state.txt file now stores the public key value corresponding to each private key that is used to sign election data. |

**Table 2-2. Submitted Modifications** *(continued)*

| Unique ID | Component(s) | Description of Fix/Modification/Enhancement |
|---|---|---|
| SW-12467 | ClearCast | The voting_sigs.txt file now includes the digital signature of the archive.tar file. |
| SW-12648 | ClearCast | "Active Directory" value added to the Election Management screen, and metadata inconsistency errors no longer halt normal operation. |
| SW-13207 | ClearCast | ClearCast now attempts to detect a hard shutdown which may occur due to an application failure, holding down the power button, or power failure and logs a message in the system log to aid in troubleshooting. |
| SW-14397 | ClearCast | Adds 'Protected Card Count' to the vote and administrative screens. |
| SW-8167 | ClearCast | The ClearCast code has been updated to Python 3. |
| SW-9523 | ClearCast | Changing the time zone setting in ClearCast now also updates the current time accordingly. |
| SW-9689 | ClearCast | A ballot that belongs to a ballot set which is not associated with a specific vote center category in ClearDesign under the "paper scanner" settings will not be accepted by ClearCast when configured for those vote centers. |
| SW-12417 | ClearCast, ClearCount | All Cast Vote Records produced by ClearCast are digitally signed with a private key. |
| SW-12418 | ClearCast, ClearCount | All ballot images produced by ClearCast are digitally signed with a private key. |
| SW-11624 | ClearCast, ClearDesign | If a voter votes for a cross-endorsed candidate more than once, they can be notified upon inserting their ballot into ClearCast that only the first instance will count, allowing a user to take their ballot back and adjust their vote if desired. ClearDesign has an option to configure whether to warn on double vote for the paper scanner and the ability to set the wording of the double vote warning. |
| SW-13208 | ClearCast, ClearMark | The ClearCast Go operating system has been upgraded to Ubuntu 20.04.6. |
| SW-10118 | ClearCount | Add support to export card images filtered by contests, precinct, counter groups, boxes, and voting conditions (overvoted, undervote, write-ins). |
| SW-10222 | ClearCount | On the Election Administration page, the Redact Small Vote Subtotals column will no longer default to hidden. |

**Table 2-2. Submitted Modifications** *(continued)*

| Unique ID | Component(s) | Description of Fix/Modification/Enhancement |
|---|---|---|
| SW-10224 | ClearCount | Creating an election with no parser row in the metadata.csv no longer defaults to "Premier". Instead, an error is thrown stating the field is missing and required. |
| SW-10432 | ClearCount | Improve the positioning of the green line used to show what contest is being adjudicated in the Resolver. |
| SW-10663 | ClearCount | Added the Statement of Votes Cast with Parties to the reports menu. |
| SW-10733 | ClearCount | Previously the 'whole' precinct record was recorded with the minimum BallotStyleID and now it is the precinct with BallotStyleID equal to 0. |
| SW-11261 | ClearCount | Added "Precinct" Localization to BDFExport metadata. Allows Localization to be uploaded to ClearCount when creating an Election under Election Administration. |
| SW-11391 | ClearCount | Add support for displaying ClearDesign landscape ballots in the proper orientation. |
| SW-11605 | ClearCount | Updated OpenSSL1.0 version to 1.0.2n-1ubuntu5.8 and OpenSSL1.1 version to 1.1.1f-1ubuntu2.12 to address CVE-2022-0778. |
| SW-11640 | ClearCount | Changed the ClearCount API to require authentication before uploading files (such as ballot images and tabulation results) to the server. |
| SW-11641 | ClearCount | Removed dead code related to encrypted backups. |
| SW-11911 | ClearCount | Enables ClearCount to properly tabulate a card that only has contests on the back side. |
| SW-11921 | ClearCount | Previously, doing a "Safely merge updatedable BDF content" operation would create an additional "Invalid" candidate name in the Write-in Assignments Tool for each contest that has write-in choices. There is now only one "Invalid" entry in the candidate names regardless of whether a safe merge has been performed. |
| SW-11925 | ClearCount | Updated OpenSSL1.0 version to 1.0.2n-1ubuntu5.9 and OpenSSL1.1 version to 1.1.1f-1ubuntu2.13 to address https://ubuntu.com/security/notices/USN-5402-1. |
| SW-12213 | ClearCount | Installer now prompts for and sets the grub username and password |

**Table 2-2. Submitted Modifications** *(continued)*

| Unique ID | Component(s) | Description of Fix/Modification/Enhancement |
|---|---|---|
| SW-12244 | ClearCount | Previously the OpenSSL command line utility was used to check the expiry date on the SSL certificate. Now the check is done using the OpenSSL shared library. |
| SW-12247 | ClearCount | Previously, for performance reasons, the 'find' utility was used to find files, such as election backups, and ballot images. Now an equally efficient internal function has been created to 'find' the files. |
| SW-12253 | ClearCount | Data exported into CSV format (for example, cast vote records) now has double quotes around all strings to guard against SQL injection. |
| SW-12290 | ClearCount | Users logged into the Ubuntu operating system on the CountServer are logged out automatically after 5 minutes of inactivity. |
| SW-12303 | ClearCount | Previous versions incorrectly created summary counts for ballots where the card style could be determined but not the precinct. This version only creates counters when both the card style and precinct id are valid. |
| SW-12466 | ClearCount | Added functionality to detect whether system logging is running and to display an error message if it has been disabled. |
| SW-13211 | ClearCount | The ClearCount operating system has been upgraded to Ubuntu 20.04.5. |
| SW-13520 | ClearCount | Increase the maximum length of ballot supported for scanning from 28 to 30 inches |
| SW-7916 | ClearCount | The SOVC by Choice report no longer includes withdrawn candidates. |
| SW-8070 | ClearCount | The CountStation operating system has been upgraded to Windows 10 IoT Enterprise LTSC 2021. |
| SW-8071 | ClearCount | The ScanStation operating system has been upgraded to Windows 10 IoT Enterprise LTSC 2021. |
| SW-8166 | ClearCount | The ClearCount code has been updated to Python 3. |
| SW-9194 | ClearCount | "Show Party Subtotals" option should only show for a closed primary/semi-closed. These are elections with more than one party associated with it. |
| SW-10336 | ClearDesign | Fixed a bug preventing the accurate display of non-Latin characters on the digital ballot. |

**Table 2-2. Submitted Modifications** *(continued)*

| Unique ID | Component(s) | Description of Fix/Modification/Enhancement |
|---|---|---|
| SW-10639 | ClearDesign | Added "Precinct" Localization to BDFExport metadata. Allows Localization to be uploaded to ClearCount when creating an Election under Election Administration. |
| SW-10700 | ClearDesign | This release implements the New York Grid Style Ballot layout. |
| SW-11184 | ClearDesign | During a ClearAccess voting session, if a voter votes for a cross-endorsed candidate more than once, they will be notified that only the first instance will count. This warning is always enabled for ClearMark. |
| SW-11342 | ClearDesign | Changed the behavior for the 'float' language option so that each language only uses the space required rather than each language being allocated the same width. |
| SW-11606 | ClearDesign | Updated OpenSSL1.0 version to 1.0.2n-1ubuntu5.8 and OpenSSL1.1 version to 1.1.1f-1ubuntu2.12 to address CVE-2022-0778. |
| SW-11661 | ClearDesign | Updated system configuration for the CIS SCAP Ubuntu 20.04 revision 1.1.0 profile. |
| SW-11816 | ClearDesign | A unique smart card customer key is now generated when a customer is created in ClearDesign, or when a customer that did not previously have a smart card key is upgraded from a previous version. |
| SW-11817 | ClearDesign | A unique smart card election key is now generated when an election is created in ClearDesign, or when an election that did not previously have a smart card key is upgraded from a previous version. |
| SW-11819 | ClearDesign | The ADFx has been modified to contain the smart card customer and election keys. |
| SW-11820 | ClearDesign | The smart card election key can be regenerated for the Accessible Marker device. |
| SW-11927 | ClearDesign | Updated OpenSSL1.0 version to 1.0.2n-1ubuntu5.9 and OpenSSL1.1 version to 1.1.1f-1ubuntu2.13 to address https://ubuntu.com/security/notices/USN-5402-1 |
| SW-12214 | ClearDesign | The username and password for the grub boot loader are now set during the installation of the system, when the install-setup script is run. |
| SW-13204 | ClearDesign | Fix issue with not displaying the party separator '.' between parties when multiple parties endorse a choice. |

**Table 2-2. Submitted Modifications** *(continued)*

| Unique ID | Component(s) | Description of Fix/Modification/Enhancement |
|---|---|---|
| SW-13210 | ClearDesign | The ClearDesign operating system has been upgraded to Ubuntu 20.04.5. |
| SW-13263 | ClearDesign | Resolves an issue that could cause HTML ballots to not layout properly due to the VoterGroupID not being set properly. |
| SW-8069 | ClearDesign | The DesignStation operating system has been upgraded to Windows 10 IoT Enterprise LTSC 2021. |
| SW-8168 | ClearDesign | The ClearDesign code has been updated to Python 3. |
| SW-10177 | ClearDesign, ClearMark | Fixes an issue that caused elements of the touchscreen to be accidentally double-clicked by voters. |
| SW-10460 | ClearDesign, ClearMark | Support new key mappings specific to ClearMark keypad. |
| SW-10560 | ClearDesign, ClearMark | Instructional text bugfix for sip-and-puff input device. |
| SW-11108 | ClearDesign, ClearMark, ClearAccess | Fixed issue with not displaying contests if there were contests for only one partisan party and no nonpartisan contests on the ballot in an open primary election. |
| SW-10353 | ClearMark | Sets the default screen orientation for ClearMark to portrait mode. |
| SW-10840 | ClearMark | Added support for the Lexmark MS520 Series. |
| SW-11062 | ClearMark | Added a "Save System Info" feature to ClearMark which enables export of system logs and other troubleshooting information. |
| SW-11133 | ClearMark | Added feature for a voter to be able to initiate a voting session with a smart card. |
| SW-11134 | ClearMark | Added feature for a poll worker to be able to activate a smart card for a voter to use in ClearMark. |
| SW-11135 | ClearMark | Added feature for an administrator to initialize a blank smart card, enabling its use by that jurisdiction for session activation. |
| SW-11136 | ClearMark | Simplified the payload for barcodes used to select a ballot style in ClearMark to make the resulting QR code easier to read. |
| SW-11487 | ClearMark | Change version of ADF to support grid style ballots. |
| SW-11598 | ClearMark | Updated OpenSSL1.0 version to 1.0.2n-1ubuntu5.8 and OpenSSL1.1 version to 1.1.1f-1ubuntu2.12 to address CVE-2022-0778. |
| SW-8164 | ClearMark | The ClearMark code has been updated to Python 3. |

**Table 2-2. Submitted Modifications** *(continued)*

| Unique ID | Component(s) | Description of Fix/Modification/Enhancement |
|---|---|---|
| SW-9892 | ClearMark | The ClearAccess software was ported to run on Ubuntu for ClearMark. |
| SW-11930 | ClearVote | Upgraded to use Windows Enterprise IoT 21H2 release. |
| SW-10275 | ClearAccess | When the user opens an election, if there are more than 1000 logs in the system log, the system log will now be automatically rolled to a new log to prevent performance issues. |
| SW-14573 | ClearAccess | Exported csv files now have double quotes around all strings. |
| SW-14711 | ClearAccess | Allows for Windows IoT OS to run on all required versions of ClearAccess hardware. |
| SW-14825 | ClearAccess | Updates hardening scripts to more thoroughly protect software and OS. |
| SW-14888 | ClearAccess | Resolves an issue that caused a timeout when using the "Save System Info" feature as a maintenance user |
| SW-14993 | ClearAccess | Provides more specificity of which ClearAccess build/version number is being used. |
| SW-14572 | ClearAccess, ClearMark | Resolves an issue that caused an extra column in the CSV when exporting logs. |
| SW-14830 | ClearAccess, ClearMark | Updates battery status indicators/messaging to remove confusion that could result from some hardware configurations. |
| SW-13575 | ClearAccess, PrintNow | Updates the ClearAccess software to allow it to run on all needed hardware configurations and associated operating systems. |
| SW-11841 | ClearCast | Resolves error that resulted from a System Admin attempting to validate an election. |
| SW-12469 | ClearCast | Creates an interface for regenerating private keys when an election is not loaded in ClearCast. |
| SW-13388 | ClearCast | Resolves an issue that could cause ClearCast to not properly delete an election |
| SW-13526 | ClearCast | Resolves an issue that would let FolderScanner continue to scan ballots even after the USB stick is full. |
| SW-14639 | ClearCast | ClearCast database upgraded to MySQL 8. |
| SW-14831 | ClearCast | Updates older versions of ClearCast to be compatible with changes made to other ClearVote components. |

**Table 2-2. Submitted Modifications** *(continued)*

| Unique ID | Component(s) | Description of Fix/Modification/Enhancement |
|---|---|---|
| SW-14930 | ClearCast | This allows an election worker to generate reports in ClearCast that include RCV contests as well as a RCV-specific contest report that shows rank data. |
| SW-15441 | ClearCast | Adds a total count of duplicate/double votes to each rank in the RCV contest report on ClearCast. |
| SW-9597 | ClearCast | Updates logging to record any time that a low battery warning is presented. |
| SW-14241 | ClearCast, ClearCount, ClearDesign, ClearMark | ClearCount, ClearMark and ClearCast are now compatible with BDFs and ADFs that include RCV contest and ruleset data. |
| SW-14471 | ClearCast, ClearCount, ClearMark | Updated ballot tabulation functionality in ClearCount, ClearCast, and ClearMark to be able to adjudicate ranked-choice contests. |
| SW-13877 | ClearCast, ClearMark | Expands the ClearMark hardware offering to include a tabletop variation. |
| COTS-192 | ClearCount | Ricoh fi-7600 scanner |
| DEV-648* | ClearCount | Ricoh fi-8950 scanner |
| SW-10508 | ClearCount | Database and threading updates to make ClearCount more performant, especially with many concurrent tasks and larger elections. |
| SW-10792 | ClearCount | Reduces ClearCount security vulnerabilities regarding SQL injection. |
| SW-14459 | ClearCount | Allows for RCV contests to be included in ClearCount web and PDF reports with a Rank filter to determine which ranks should be included on those reports. |
| SW-14470 | ClearCount | This creates a function in ClearCount to export a zip with the RCV CVRs and their associated configuration files that are needed to tabulate the contest in RCTab. |

**Table 2-2. Submitted Modifications** *(continued)*

| Unique ID | Component(s) | Description of Fix/Modification/Enhancement |
|---|---|---|
| SW-14549 | ClearCount | Upgrades the ClearCount database to MySql 8 and InnoDB. |
| SW-14710 | ClearCount | Resolves an issue that caused Ballot Tabulator to fail to start properly. |
| SW-14727 | ClearCount | Provides more specificity of which ClearCount build/version number is being used. |
| SW-14743 | ClearCount | This updates manual adjudication for RCV contests to work through the contest one rank at a time and seamlessly integrates it with adjudication of non-RCV contests. |
| SW-14744 | ClearCount | This allows Oval Visualization in ClearCount to display ovals for RCV contests, applies a Rank filter to the page so that a user can choose to see ovals for only a given rank or ranks, and updates the oval hover to show the RCV contests appropriately. |
| SW-14758 | ClearCount | Added a new report "Statement of Votes Cast by Rank' which is available on the report menu if the election contains RCV contests. This report displays the votes grouped by Contest and Rank. |
| SW-14806 | ClearCount | Updates to ClearCount to ensure core functionality remains intact after the database upgrades. |
| SW-14817 | ClearCount | Updates requirements to reach MySql database to prevent any unintentional access. |
| SW-14822 | ClearCount | Updates user creation to validate usernames to prevent errors with logging. |
| SW-14877 | ClearCount | Updates the XML functionality to accommodate RCV contest data. |
| SW-14913 | ClearCount | Provides more specificity of which ClearDesign build/version number is being used. |
| SW-15395 | ClearCount | Resolves an issue that could cause XML exports to have inconsistent count of Ballots Cast when using multi-card ballots. |
| SW-15634 | ClearCount | RCV contest exports are created more efficiently, so that files can be ready for download more quickly. |

**Table 2-2. Submitted Modifications** *(continued)*

| Unique ID | Component(s) | Description of Fix/Modification/Enhancement |
|---|---|---|
| SW-16037 | ClearCount | Resolves the issue in the previous ClearCount 2.5 version that did not correctly handle duplicate boxes. |
| SW-13545 | ClearCount, ClearDesign | Previous versions of ClearDesign did not reserve space for the Judges Initial's box and so could end up with a box of zero height. The new release ensures the box is at least 2/3 of a timing mark high. |
| SW-13555 | ClearDesign | Enhance the message displayed when ovals overlap front to back (coincide) to include the candidate and contest names cause the issue. |
| SW-13760 | ClearDesign | Allows a user to save name and sort seq changes to an image without requiring a change of the image itself. |
| SW-14012 | ClearDesign | SW-14012. Added support for ranked-choice voting tabulation rulesets and ranked-choice voting contest type. |
| SW-14062 | ClearDesign | This allows ClearDesign to layout a paper ballot that includes an RCV contest, with consideration of the RCV contest's layout configurations, number of ranks/candidates and the other contests and content on the ballot. |
| SW-14063 | ClearDesign | This updates the voter experience on the HTML ballot to allow for ranking and re-ranking of candidates in RCV contests on HTML ballots, provide appropriate on-screen and audio warnings for RCV contests, updates the Review page to show candidates ranked and allows for printing of a ballot with RCV contests. |
| SW-14253 | ClearDesign | This allows for the creation and editing of an RCV ruleset with specific tabulation and layout rules. The ruleset can then be associated with an RCV contest, where some of the rules can be overwritten. |
| SW-14754 | ClearDesign | This allows for the RCV Ruleset functionality to be disabled or enabled for a given user. |
| SW-14818 | ClearDesign | Updates the BDF/ADF to allow for contests with no candidates, or with Label Only candidates, to be used throughout ClearVote. |
| SW-14864 | ClearDesign | Updates the Text Editor translation tool to hide a Google Translator overlay which made it difficult to click the Save button. |
| SW-15242 | ClearDesign | Updates the way that ballot PDFs are named by ClearDesign to they can be more easily identified and organized. |

**Table 2-2. Submitted Modifications** *(continued)*

| Unique ID | Component(s) | Description of Fix/Modification/Enhancement |
|---|---|---|
| SW-15280 | ClearDesign | Updates the BlankBallotFileName value in the BDF to match the updates made to ballot PDF naming in SW-15242. |
| SW-15583 | ClearDesign | Previous versions did not include the audio that was recorded in ClearDesign in the file created using the Export Audio function. This version now includes them. |
| SW-15587 | ClearDesign | Resolves an issue on very large elections/ballot sets that could cause Printing of ballots to result in an internal server error. |
| SW-15917 | ClearDesign | Ensure functionality conforms with VVSG 1.0 Volume 1 Sec 3.1.6 d. ii. "No key or control on a voting machine shall have a repetitive effect as a result of being held in its active position." |
| COTS-195 | ClearDesign, ClearCount | Brother HL-L2460DW printer. |
| HW-5555 | ClearMark | Resolves an issue that resulted in errors when starting a voting session using the barcode scanner. |
| SW-14567 | ClearMark | Resolves an issue when exporting logs that caused the CSV to have an extra column. |
| SW-14684 | ClearMark | Resolves an issue that would show no information about an attached Smart Card Reader on the ClearMark Setup page. |
| SW-14992 | ClearMark | Provides more specificity of which ClearMark build/version number is being used. |
| SW-15116 | ClearMark | Resolves an issue that caused unnecessary and repetitive system logs during scanner calibration. |
| SW-15142 | ClearMark | Resolves an issue that could sometimes cause paper jam error messages to not be displayed at the correct time. |
| COTS-11 | ClearVote | Add Dell OptiPlex XE4 as an admin station for ClearDesign and ClearCount. |
| COTS-144 | ClearVote | Add Dell Latitude 5540 as admin station for ClearDesign and ClearCount, and as a ClearCount ScanStation. |
| COTS-40 | ClearVote | Add Dell PowerEdge T150 as a DesignServer and a CountServer. |
| COTS-41 | ClearVote | Add Dell PowerEdge R450 as a DesignServer and a CountServer. |

**Table 2-2. Submitted Modifications** *(continued)*

| Unique ID | Component(s) | Description of Fix/Modification/Enhancement |
|---|---|---|
| COTS-208 | ClearVote | Add Dell Latitude 5550 as admin station for ClearDesign and ClearCount, and as a ClearCount ScanStation. |
| DEV-1139* | ClearDesign | This resolves an issue that caused an error message when creating an election in ClearCount using a BDF that was originally generated from the 2.3 version of ClearDesign. |
| DEV-3519* | ClearMark, ClearAccess | This resolves an issue that caused various buttons to be too small to meet VVSG 1 size/spacing requirements. |
| DEV-3723* | ClearDesign, ClearMark, ClearAccess | Introduces a new default ABC onscreen keyboard for voters when adding write-in candidates with buttons that meet size requirements and moves the QWERTY keyboard to an optional alternate input method. |
| DEV-3252* | Doc | Legacy device has entered end of production lifecycle. |
| DEV-4193* | Doc | Legacy device has entered end of production lifecycle. |
| DEV-3474* | Doc | Product management preference. |
| DEV-1489* | ClearCount | Adds the option in the Ballot Saving queue views to requeue any items that have not moved out of the queue. |
| DEV-3306* | ClearCount | Resolves an issue where logs could sometimes contain incorrect information |
| DEV-3305* | ClearCount | Resolves an issue where the flash message content could be unrelated to the action the user just took. |
| DEV-4521* | ClearCount | Resolves an issue where the user isn't given an appropriate error message when they attempt to merge a ClearCast USB stick with an invalid HMAC or hash value. |
| DEV-4556* | ClearDesign | Resolves an issue in the HTML ballot wherein ballots printed via ClearMark display write-in lines as misaligned with their corresponding ovals. |
| DEV-4909* | ClearDesign | Updates the RCV Ruleset configuration dialog to remove the option for Bottoms Up Percentage Threshold as a RCV Type option. |

*Submitted with revised change notes.

### 2.2.2 Block Diagram

The system overview of the submitted voting system is depicted in Figure 2-1.

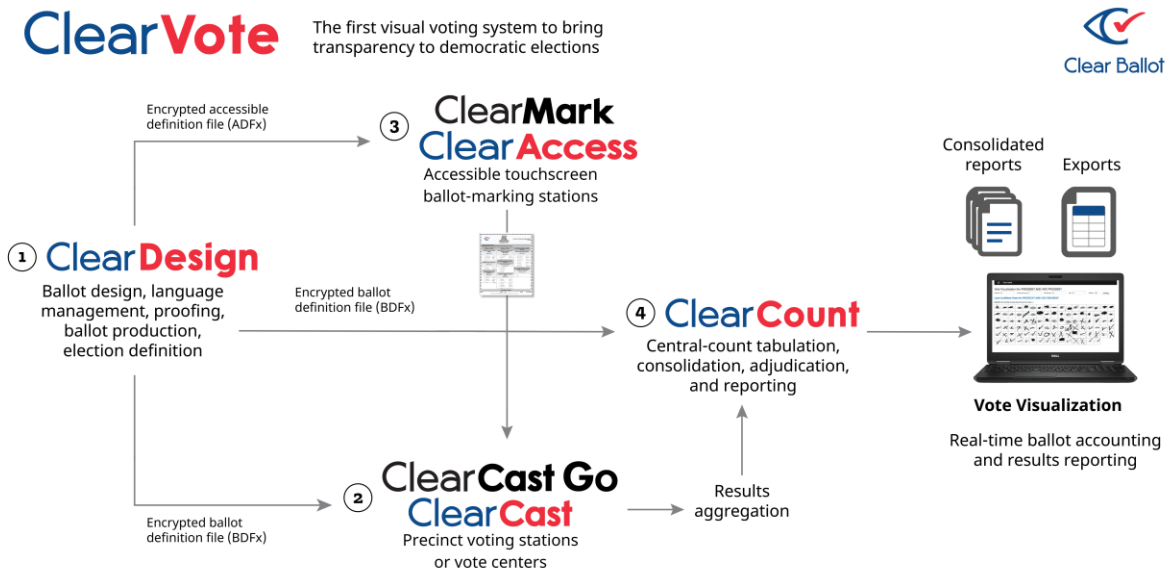


**Figure 2-1. ClearVote 2.5 Product Relationship**

### 2.2.3 System Limits

The system limits that CBG has stated to be supported by the ClearVote 2.5 Voting System are listed in the tables below.

**Table 2-3. ClearVote System Limits**

| Characteristic | Limit |
|---|---|
| *Election Parameters* | |
| Precincts per election | 3200 |
| Splits per election | 3200 |
| District categories per election | 100 |
| Districts per single category | 3200 |
| Districts per election | 3200 |
| Contests per election | 3200 |
| Choices per election | 3200 |
| Choices per contest | 300 |
| Vote positions per side | 420 |

**Table 2-3 ClearVote System Limits** *(continued)*

| Characteristic | Limit |
|---|---|
| Card styles per election | 3200 |
| Contests per ballot style | 60 |
| Card styles per precinct | 50 |
| Parties per election | 50 |
| Counter groups per election | 7 |
| "Vote for" per contest | 50 |
| Languages per election | 15 |
| Cards per ballot (per language) | 5 |
| Write-ins per contest | 50 |
| *Reporting Name Parameters (Reports Only)* | |
| Election name (characters) | 60 |
| Jurisdiction name (characters) | 60 |
| Precinct name (characters) | 60 |
| Vote center name (characters) | 60 |
| Contest name (characters) | 60 |
| Candidate name (characters) | 60 |
| Party name (characters) | 60 |
| Write-in length (characters) | 60 |
| *System Parameters* | |
| Central-count scanners per network | 10 |
| Cards per precinct-voting device | 10,000 |
| Cards per central-count device | 4,000,000 |

### 2.2.4 Supported Languages

The submitted voting system supports:

- English
- Spanish
- Chinese
- Korean
- Vietnamese
- Danish
- Dutch
- Flemish
- French
- German
- Italian
- Japanese
- Norwegian
- Portuguese

- Swedish

Due to the limited scope of testing, only English and Spanish language ballots were cast during the performance of functional testing. Additionally, one character-based language (Chinese) was tested during System Integration Testing.

For the character-based language, the ballot was created by Pro V&V and voted utilizing both paper ballots and ADA voting devices along with all applicable peripherals. The Chinese language for the ballot was created using a readily available online translation tool. The translated language text was entered into the ClearDesign Application. A ballot preview was generated in the ClearDesign application. The Chinese characters displayed in the ballot preview were compared to the characters generated by the online translation tool, to ensure that the characters matched. The ballots were then generated and printed, and the election loaded onto the tabulators and the BMD units. The Chinese characters displayed on both the printed ballots and displayed on the BMD units were compared to the original Chinese characters generated by the online translation tool to verify that the characters matched.

### 2.2.5 Supported Functionality

ClearVote 2.5 was verified to support the following voting variations:

- General Election
- Primary Election (Open and Closed)
- Early Voting
- Partisan/Non-Partisan Offices
- Write-In Voting
- Primary Presidential Delegation Nominations
- Straight Party Voting
- Split Precincts
- Vote for N of M
- Ballot Rotation
- Provisional or Challenged Ballots
- Cross-party endorsement
- Recall contest
- Ranked Choice Voting (RCV)

### 2.2.6 VVSG

ClearVote 2.5 was evaluated against the relevant requirements contained in the EAC VVSG 1.0. To evaluate the ClearVote 2.5 test requirements, the submitted modifications were evaluated against each section of the EAC VVSG 1.0 to determine the applicable tests to be performed. Additionally, all requirements that were excluded from the previous test campaign (ClearVote 2.3) were also deemed not applicable to this test campaign. The submitted modifications did not require the evaluation of any requirements that were not included in the baseline system.

### 2.2.7 RFIs

There are no RFIs released by the EAC as of the date of this Test Report that pertain to this test campaign that were not in effect at the time of the baseline system certification.

### 2.2.8 NOCs

There are no NOCs released by the EAC as of the date of this Test Report that pertain to this test campaign that were not in effect at the time of the baseline system certification.

## 3.0 TEST FINDINGS AND RECOMMENDATION

The ClearVote 2.5 Voting System was evaluated against the relevant requirements contained in the EAC 2005 VVSG, Volumes I and II. The focus of this test campaign was on the modifications made to the baseline certified system. The summary findings and recommendations for each area of testing are provided in the following sections.

### 3.1 Summary Findings and Recommendation

Summary findings for the System Level Testing (System Integration, Accuracy, Volume and Stress, and FCA), Hardware Testing, and Source Code Review are detailed in the relevant sections of this report. In addition to these areas of testing, a PCA and a limited TDP Review were performed, as described below.

**TDP Review**

To determine compliance of the modified TDP documents with the EAC 2005 VVSG, a limited TDP review was conducted. This review focused on TDP documents that have been modified since the certification of the baseline system. The review consisted of a compliance review to determine if each regulatory, state, or manufacturer-stated requirement had been met based on the context of each requirement. Results of the review of each document were entered into the TDP Review Checklist and reported to the manufacturer for resolution of any anomalies. This process continued until all anomalies were addressed. Any revised documents during the TDP review process were compared with the previous document revision to determine changes made, and the document was re-reviewed to determine whether subject requirements had been met.

Summary Findings

The submitted TDP was determined to be in compliance with the requirements set forth in the EAC 2005 VVSG. A listing of all documents contained in the ClearVote 2.5 TDP is provided in Table 3-1.

**Table 3-1. ClearVote 2.5 TDP Documents**

| Document Number | Description | Version |
|---|---|---|
| ***ClearVote Documents*** | | |
| 100101 | ClearVote 2.5 Approved Parts List | 2.5.15 |
| 100067 | ClearVote 2.5 Ballot Stock and Printing Specification | 2.5.7 |
| 100057 | ClearVote 2.5 Configuration Management Plan | 2.5.4 |
| 100151 | ClearVote 2.5 ClearVote Disc Content and Compilation Procedures | 2.5.12 |
| 100069 | ClearVote 2.5 Glossary | 2.5.6 |
| 100058 | ClearVote 2.5 Personnel Deployment and Training Plan | 2.5.3 |
| 100059 | ClearVote 2.5 Quality Assurance Program | 2.5.5 |
| 100086 | ClearVote 2.5 Security Policy | 2.5.4 |
| 100071 | ClearVote 2.5 System Overview | 2.5.7 |
| 100073 | ClearVote 2.5 Test and Verification Specification | 2.5.4 |
| 100132 | ClearVote 2.5 Change Notes | 14-Aug-25 |
| ***ClearDesign Documents*** | | |
| 100011 | ClearDesign 2.5 Acceptance Test Checklist | 2.5.2 |
| 100062 | ClearDesign 2.5 Administration Guide | 2.5.6 |
| 100083 | ClearDesign 2.5 Build Procedures | 2.5.5 |
| 100103 | ClearDesign 2.5 Database Specification | 2.5.1 |
| 100046 | ClearDesign 2.5 Functionality Description | 2.5.4 |
| 100098 | ClearDesign 2.5 Hardware Specification | 2.5.4 |
| 100063 | ClearDesign 2.5 Installation Guide | 2.5.12 |
| 100082 | ClearDesign 2.5 Maintenance Guide | 2.5.3 |
| 100045 | ClearDesign 2.5 Security Specification | 2.5.4 |
| 100072 | ClearVote 2.5 ClearDesign Software Design and Specification | 2.5.5 |
| 100043 | ClearDesign 2.5 System Overview | 2.5.5 |
| 100133 | ClearDesign 2.5 Accessible Definition File Guide | 2.5.6 |
| 100131 | ClearDesign 2.5 Ballot Definition File Guide | 2.5.6 |
| 100074 | ClearDesign 2.5 System Identification Guide | 2.5.2 |
| 100041 | ClearDesign 2.5 User Guide | 2.5.8 |
| 100121 | ClearVote 2.5 ClearDesign DesignServer SCAP Checklist Ubuntu 20.04 | 2.5.2 |

**Table 3-1. TDP Documents** *(continued)*

| Document Number | Description | Version |
|---|---|---|
| 100122 | ClearVote 2.5 ClearDesign DesignStation SCAP Checklist | 2.5.2 |
| --- | ClearDesign 2.5 Election Model | --- |
| --- | ClearDesign 2.5 System Model | --- |
| --- | CBG Web Model | --- |
| ***ClearCount Documents*** | | |
| 100102 | ClearCount 2.5 Acceptance Test Checklist | 2.5.2 |
| 100009 | ClearCount 2.5 Build Procedures | 2.5.5 |
| 100005 | ClearCount 2.5 Database Specification | 2.5.4 |
| 100004 | ClearCount 2.5 Election Administration Guide | 2.5.8 |
| 100006 | ClearCount 2.5 Installation Guide | 2.5.12 |
| 100021 | ClearCount 2.5 Functionality Description | 2.5.4 |
| 100022 | ClearCount 2.5 Hardware Specification | 2.5.4 |
| 100023 | ClearCount 2.5 Maintenance Guide | 2.5.2 |
| 100070 | ClearCount 2.5 Reporting Guide | 2.5.7 |
| 100013 | ClearCount 2.5 Scanner Operator Guide | 2.5.5 |
| 100026 | ClearCount 2.5 Security Specification | 2.5.3 |
| 100019 | ClearCount 2.5 Software Design and Specification | 2.5.4 |
| 100024 | ClearCount 2.5 System Operations Procedures | 2.5.2 |
| 100025 | ClearCount 2.5 System Overview | 2.5.4 |
| --- | ClearCount 2.5 Quick Guide XML Report Conversion Tool | --- |
| 100047 | ClearCount 2.5 System Identification Guide | 2.5.3 |
| 100119 | ClearVote 2.5 ClearCount CountServer SCAP Checklist Ubuntu 20.04 | 2.5.1 |
| 100120 | ClearVote 2.5 ClearCount CountStation SCAP Checklist Windows 10 loT LTSC | 2.5.2 |
| 100156 | ClearVote 2.5 ClearCount ScanStation SCAP Checklist Windows 10 loT LTSC | 2.5.2 |
| ***ClearCast Documents*** | | |
| 100134 | ClearCast 2.5 Hardware Acceptance Test Checklist | 2.5.2 |
| 100135 | ClearCast 2.5 Software Acceptance Test Checklist | 2.5.2 |
| 100097 | ClearCast 2.5 System Identification Guide | 2.5.3 |
| 100094 | ClearCast 2.5 Build Procedures | 2.5.4 |

**Table 3-1. TDP Documents** *(continued)*

| Document Number | Description | Version |
|---|---|---|
| 100079 | ClearCast 2.5 Functionality Description | 2.5.2 |
| 100080 | ClearCast 2.5 Installation Guide | 2.5.4 |
| 100081 | ClearCast 2.5 Hardware Specification | 2.5.2 |
| 100089 | ClearCast 2.5 Maintenance Guide | 2.5.7 |
| 100090 | ClearCast 2.5 Poll Worker Guide | 2.5.8 |
| 100084 | ClearCast 2.5 Security Specification | 2.5.2 |
| 100093 | ClearCast 2.5 Software Design and Specification | 2.5.3 |
| 100100 | ClearCast 2.5 Supervisor Guide | 2.5.9 |
| 100078 | ClearCast 2.5 System Overview | 2.5.4 |
| 100148 | ClearVote 2.5 ClearCast Go System Identification Guide | 2.5.2 |
| 100142 | ClearVote 2.5 ClearCast Go Maintenance Guide | 2.5.6 |
| 100143 | ClearVote 2.5 ClearCast Go Poll Worker Guide | 2.5.10 |
| 100144 | ClearVote 2.5 ClearCast Go Supervisor Guide | 2.5.11 |
| 100147 | ClearCast Go 2.5 Hardware Acceptance Test Checklist | 2.5.2 |
| 100146 | ClearVote 2.5 ClearCast Go Installation Guide | 2.5.2 |
| 100145 | ClearVote 2.5 ClearCast Go Build Procedures | 2.5.5 |
| 100149 | ClearCast Go 2.5 SCAP Checklist Ubuntu 20.04 | 2.5.2 |
| 100123 | ClearVote 2.5 ClearCast SCAP Checklist Ubuntu 20.04 | 2.5.3 |
| ***ClearAccess Documents*** | | |
| 100109 | ClearAccess 2.5 Acceptance Test Checklist | 2.5.2 |
| 100051 | ClearAccess 2.5 Build Procedures | 2.5.7 |
| 100049 | ClearAccess 2.5 Functionality Description | 2.5.3 |
| 100085 | ClearAccess 2.5 Hardware Specification | 2.5.2 |
| 100053 | ClearAccess 2.5 Installation Guide | 2.5.10 |
| 100052 | ClearAccess 2.5 Maintenance Guide | 2.5.6 |
| 100054 | ClearAccess 2.5 Poll Worker Guide | 2.5.6 |
| 100050 | ClearAccess 2.5 Security Specification | 2.5.3 |
| 100099 | ClearAccess 2.5 Software Design and Specification | 2.5.4 |

**Table 3-1. TDP Documents** *(continued)*

| Document Number | Description | Version |
|---|---|---|
| 100055 | ClearAccess 2.5 Supervisor Guide | 2.5.6 |
| 100044 | ClearAccess 2.5 System Overview | 2.5.4 |
| 100056 | ClearAccess 2.5 Voter Guide | 2.5.2 |
| 100038 | ClearAccess 2.5 System Identification Guide | 2.5.4 |
| 100118 | ClearVote 2.5 ClearAccess SCAP Checklist Windows 10 loT LTSC | 2.5.3 |
| --- | Clear Ballot Report Final_Perkins | --- |
| --- | Perkins Prior Test Addendum | --- |
| ***ClearMark Documents*** | | |
| 100159 | ClearMark 2.5 Build Procedures | 2.5.5 |
| 100172 | ClearMark 2.5 Functionality Description | 2.5.3 |
| 100165 | ClearMark 2.5 Hardware Acceptance Test Checklist | 2.5.2 |
| 100161 | ClearMark 2.5 Hardware Specification | 2.5.3 |
| 100160 | ClearMark 2.5 Installation Guide | 2.5.4 |
| 100162 | ClearMark 2.5 Maintenance Guide | 2.5.4 |
| 100163 | ClearMark 2.5 Poll Worker Guide | 2.5.5 |
| 100169 | ClearMark 2.5 Security Specification | 2.5.3 |
| 100166 | ClearMark 2.5 Software Acceptance Test Checklist | 2.5.2 |
| 100170 | ClearMark 2.5 Software Design and Specification | 2.5.5 |
| 100164 | ClearMark 2.5 Supervisor Guide | 2.5.6 |
| 100168 | ClearMark 2.5 System Identification Guide | 2.5.4 |
| 100171 | ClearMark 2.5 System Overview | 2.5.4 |
| 100167 | ClearMark 2.5 SCAP Checklist Ubuntu 20.04 | 2.5.2 |
| --- | Usability Test Report ClearMark Ballot Marking System | --- |

**Physical Configuration Audit (PCA)**

The physical configuration audit compares the voting system components submitted for qualification to the manufacturer's technical documentation, and shall include the following activities:

- Establish a configuration baseline of software and hardware to be tested; confirm whether manufacturer's documentation is sufficient for the user to install, validate, operate, and maintain the voting system

- Verify software conforms to the manufacturer's specifications; inspect all records of manufacturer's release control system; if changes have been made to the baseline version, verify manufacturer's engineering and test data are for the software version submitted for certification
- If the hardware is non-COTS, review drawings, specifications, technical data, and test data associated with system hardware to establish system hardware baseline associated with software baseline
- Review manufacturer's documents of user acceptance test procedures and data against system's functional specifications; resolve any discrepancy or inadequacy in manufacturer's plan or data prior to beginning system integration functional and performance tests
- Subsequent changes to baseline software configuration made during testing, as well as system hardware changes that may produce a change in software operation are subject to re-examination

Summary Findings

During execution of the PCA, components of the ClearVote 2.5 were documented by component name, model, serial number, major component, and any other relevant information needed to identify the component. For COTS equipment, every effort was made to verify that the COTS equipment had not been modified for use. Additionally, each technical document submitted in the TDP was recorded by document name, description, document number, revision number, and date of release. At the conclusion of the test campaign, test personnel verified that any changes made to the software, hardware, or documentation during the test process were fully and properly documented.

### 3.1.1 Source Code Review, Compliance Build, Trusted build, and Build Documentation Review

Pro V&V evaluated the submitted source code against the EAC 2005 VVSG and the manufacturer-submitted coding standards using both Automated Source Code Review and Manual Review methods. Prior to initiating the software review, Pro V&V verified that the submitted documentation was sufficient to enable Pro V&V to: (1) conduct a review of the source code and (2) design and conduct tests at every level of the software structure to verify that design specifications and performance guidelines are met.

Summary Findings

- Automated Source Code Review: The Automated Source Code Review was performed to review the changes in the source code from the previously certified ClearVote 2.3 voting system. No source code issues were found during the Automated Source Code review.
- Manual Source Code Review: The Manual Source Code Review was performed on 10% of the comments for compliance to VVSG Volume I, Section 5.2.7. No source code issues were found during the Manual Source Code Review.
- Compliance Build: The compliance build was performed following the compliance review. Once the compliance review was performed and the source was deemed stable enough to

proceed with testing, the source code and all additional packages were compiled into a Compliance Build.

- Trusted Build: The Trusted Build consisted of inspecting proprietary source code, COTS software, and third-party software products and combining them to create the executable code. This inspection followed the documented process from the "United States Election Assistance Commission Voting System Test Laboratory Program Manual" Section 5.5 – 5.7. Completion of the trusted build included the build documentation review. The Trusted Build was performed following the completion of the Functional Configuration Audit.

### 3.1.2 System Level Testing

System Level Testing was implemented to evaluate the complete system. This testing included all proprietary components and COTS components (software, hardware, and peripherals) in a configuration of the system's intended use. For software system tests, the tests were designed according to the stated design objective without consideration of its functional specification. The system level hardware and software test cases were prepared independently to assess the response of the hardware and software to a range of conditions.

Pro V&V reviewed the manufacturer's program analysis, documentation, and module test case design and evaluated the test cases for each module with respect to flow control parameters and entry/exit data.

The software system functions for the previously certified voting system (ClearVote 2.3) remain unchanged for the submitted modifications. The ClearVote 2.5 Election Management System (EMS) consists of a set of applications responsible for all pre-voting and post-voting activities used in election definition and management process. The ClearVote 2.5 EMS applications are as follows:

- ClearDesign
- ClearCount

System Level Testing included the evaluations of the following test areas: FCA, Accuracy Testing, Volume and Stress, System Integration Testing, and Regression Testing. Each of these areas is reported in detail in the subsections that follow.

Summary Findings

Component Level Testing was implemented during the FCA for each component and subcomponent. During the source code review, compliance builds, and security testing, Pro V&V utilized limited structural-based techniques (white-box testing). Additionally, specification-based techniques (black-box testing) were utilized for the individual software components.

Pro V&V defined the expected result for each test and the ACCEPT/REJECT criteria for certification. If the system performed as expected, the results were accepted. If the system did not perform as expected, an analysis was performed to determine the cause. If needed, the test was repeated in an attempt to reproduce the results. If the failure could be reproduced and the expected results were not met, the system was determined to have failed the test. If the results

could not be reproduced, the test continued. Any errors encountered were documented and tracked through resolution.

#### 3.1.2.1 Functional Configuration Audit (FCA)

The Functional Configuration Audit encompasses an examination of manufacturer's tests, and the conduct of additional tests, to verify that the system hardware and software perform all the functions described in the manufacturer's documentation submitted in the TDP.
In addition to functioning according to the manufacturer's documentation, tests are conducted to ensure all applicable EAC 2005 VVSG requirements are met.

For this campaign FCA testing included several exhaustive paths applied in concert:

- FCA-VVSG Testing: Each component of the system was evaluated against a standardized test-case suite centered upon requirements stated in the VVSG and administered through a test-management software tool. All applicable test cases were performed while any non-applicable test cases were logged as "n/a" for substantiation. The system operations and functional capabilities were categorized in the tool as follows by the phase of election activity in which they are required:

    - Pre-voting Capabilities: These functional capabilities are used to prepare the voting system for voting. They include ballot preparation, the preparation of election-specific software (including firmware), the production of ballots, the installation of ballots and ballot counting software (including firmware), and system and equipment tests.
    - Voting System Capabilities: These functional capabilities include all operations conducted at the polling place by voters and officials including the generation of status messages.
    - Post-voting Capabilities: These functional capabilities apply after all votes have been cast. They include closing the polling place; obtaining reports by voting machine, polling place, and precinct; obtaining consolidated reports; and obtaining reports of audit trails.

- FCA-Claims Testing: System user instructions and procedures found in the TDP were followed to verify their accuracy and completeness. In addition, any functional claims discovered in the TDP that were not specifically examined in other areas or that were items of interest were also tested.
- FCA-Mapping: Any modified functional paths (buttons, dropdowns, etc.) were mapped by qualified VSTL personnel, to help ensure all functional options had been noted and exercised. Any items of interest were examined and/or tested.

All issues (if any) found during these efforts are detailed in Section 3.3. Any issues noted were tracked using an issue tracking software program and issue tracking spreadsheets.

Summary Findings

All functional tests were successfully executed. During execution of the test procedure, it was verified the ClearVote 2.5 System successfully completed the system level integration tests with

all actual results obtained during test execution matching the expected results. At the conclusion of the test campaign, it was determined that all issues communicated to Clear Ballot Group had been successfully reconciled.

#### 3.1.2.2 Accuracy

The Accuracy Test ensures that each component of the voting system can each process at least 1,549,703 consecutive ballot positions correctly within the allowable target error rate. The Accuracy Test is designed to test the ability of the system to "capture, record, store, consolidate and report" specific selections and absences of a selection. The required accuracy is defined as an error rate. This rate is the maximum number of errors allowed while processing a specified volume of data. For paper-based voting systems the ballot positions on a paper ballot must be scanned to detect selections for individual candidates and contests, and those selections converted into digital data.

Summary Findings

The accuracy requirements for ClearCount were met by the execution of the standard accuracy test utilizing pre-marked and hand-marked paper ballots of each ballot length supported by the system. ClearCount was tested by utilizing a combination of hand marked (70%) and pre-marked (30%) ballots.

The accuracy requirements for ClearMark were met by the execution of the standard accuracy test utilizing BMD ballots of each ballot length supported by the system produced by each ClearMark configuration. These ballots were cast on the ClearCast and ClearCast Go configurations.

The ClearVote 2.5 System successfully passed the Accuracy Test. Any deficiencies encountered during the Accuracy Test are detailed in Section 3.3. Any issues noted were successfully resolved. During execution of the test procedure, it was verified that the ClearVote 2.5 System successfully completed the test with all actual results obtained during test execution matching the expected results.

#### 3.1.2.3 System Integration

System Integration is a system level test for the integrated operation of both hardware and software. System Integration evaluates the compatibility of the voting system software components or subsystems with one another, and with other components of the voting system environment. This compatibility was determined through functional tests integrating the voting system software with the remainder of the system. During test performance, the system was configured exactly as it would be for normal field use. This included connecting all supporting equipment and peripherals including ballot boxes, voting booths (regular and accessible), and any physical security equipment such as locks and ties.

Summary Findings

During System Integration testing, two General Elections and two Primary Elections were exercised on the voting system, as described below:

Two general elections with the following breakdowns:

- General Election GEN-01: A General Election with Straight Party held in four precincts, one of which is a split precinct. This election contains nineteen contests compiled into four ballot styles. Five of the contests are in all four ballot styles. The other fourteen contests are split between at least two of the precincts with a maximum of four different contests spread across the four precincts.

- General Election GEN-03: A General Election held in two precincts. This election contains eight contests compiled into two ballot styles. Four of the contests are in both ballot styles. The other four contests are split between the two precincts. This election is designed to functionally test the handling of multiple ballot styles, support for at least three languages including a character-based language, support for common voting variations, and audio support for at least three languages and an ADA binary input device.

Two primary elections with the following breakdowns:

- Primary Election PRIM-01: This election is designed to functionally test a Closed Primary Election with multiple ballots and support for common voting variations. This election contains thirty-one contests and six parties compiled into eighteen ballot styles, each ballot containing six contests.
- Primary Election PRIM-03: A Closed Primary Election held in two precincts. This election contains ten contests and is compiled into two ballot styles. Two of the contests are in both ballot styles. The other eight contests are split between the two parties' ballots. This election is designed to functionally test the handling of multiple ballot styles, support for at least three languages including a character-based language, support for common voting variations, and audio support for at least three languages and an ADA binary input device.

The ClearVote 2.5 System successfully passed the System Integration Test. Any deficiencies encountered during the System Integration test are detailed in Section 3.3. All issues noted were successfully resolved. During execution of the test procedure, it was verified that the ClearVote 2.5 System successfully completed the system level integration tests with all actual results obtained during test execution matching the expected results.

#### 3.1.2.4 Volume & Stress

The Volume & Stress test investigates the system's response to conditions that tend to overload the system's capacity to process, store, and report data. The test parameters will focus on the system's stated limits and the ballot logic for areas such as the maximum number of active voting positions, maximum number of ballot styles, maximum candidates, maximum contests, and stated limits within the EMS. This test was utilized to ensure the system can achieve the manufacturer's TDP claims of what the system can support. Testing was performed by exercising an election definition and test cases developed specifically to test for volume and stress conditions of the system being tested.

Summary Findings

Previous test results were utilized for all components except for ClearMark which was subjected to focused testing. The ClearVote 2.5 System successfully passed Volume and Stress Testing. Any deficiencies encountered during the Volume and Stress testing are detailed in Section 3.3. Any issues noted were successfully resolved.

#### 3.1.2.5 Regression Testing

Regression testing was conducted on ClearVote 2.5 to establish assurance that the modifications have no adverse impact on the compliance, integrity, or performance of the system. ClearVote 2.5 is a modified voting system configuration that includes functional upgrades and modifications to the baseline system. Modified system testing is an abbreviated testing campaign built upon a regression review of the modifications against the baseline system and requirements. Modifications, alone and collectively, are reviewed (tested) to see if they fall under any requirement(s) or functionally impact the ability of the modified system to continue to meet requirements. Regression reviews consist of targeted investigations to determine if further testing is necessary based on the nature and scope of the communicated modifications (whether activated

or deactivated), and any other submitted information. The objective of regression testing was to establish assurance that the modifications have no adverse impact on the compliance, integrity, or performance of the system.

Summary Findings

All functional regression tests were successfully completed with no issues discovered.

### 3.1.3 Usability & Accessibility Testing

Usability & Accessibility Testing was performed to evaluate the usability of the ClearMark component to the requirements set forth in the EAC VVSG 1.0.

Summary Findings

All usability and accessibility tests were successfully completed.

### 3.1.4 Security Testing

The objective of the Security Testing was to evaluate the effectiveness of the voting system in detecting, preventing, recording, reporting, and recovering from security threats. To evaluate the integrity of the system, Pro V&V developed specifically designed test cases in an attempt to defeat the access controls and security measures documented in the system TDP.

The threat matrix identifying the system's risks and vulnerabilities was evaluated for completeness and to determine that mitigating controls are adequately implemented. An evaluation of the system shall be accomplished by utilizing a combination of functional testing and source code review. All findings will be reported to the EAC and CBG.

The test methods for performing the Security Testing are execution and review. Prior to performance of Security testing, the examiner will verify that security hardening scripts have been properly applied to system components per the system documentation. The examiner will review the submitted TDP to verify that documented access and physical controls are in place. Following the documented procedures, the examiner will configure the voting system for use and functionality to verify that the documented controls are in place and adequate and meet the stated requirements.

Pro V&V has determined that there were no modifications made to Physical and Administrative Security in the ClearVote 2.5 system. Pro V&V will not specifically test these areas, however Physical and Administrative Security testing is performed throughout the test campaign.

Logical Security will be tested as part of FCA testing by a recognized security expert who not only will review the physical and administrative testing outcomes but will perform the following tests on system components: Vulnerability Scans, SCAP Scans, and Physical Bypass Attempts. Logical security testing will assess the effectiveness of the security hardening scripts applied during the system setup and install process.

Summary Findings

All functional regression tests were successfully completed with no issues discovered.

### 3.1.5 Hardware Testing

The ClearVote 2.5 Voting System is a paper-based voting system that consists of the following major components: ClearDesign, ClearAccess, ClearCast, ClearCast Go, ClearCount, and ClearMark. ClearVote is comprised of three proprietary hardware components (ClearCast, ClearCast Go and ClearMark) and three COTS hardware components (ClearCount, ClearAccess, and ClearDesign). All ClearDesign functions are managed by proprietary software running on COTS PCs/laptops/servers, which are excluded from hardware testing.

Previous hardware examinations were performed on the certified baseline system (ClearVote 2.3) and/or previous certified versions of the ClearVote 2.5 components; however, to satisfy requirements for this campaign, the submitted modifications require the full suite of electrical and operational environmental hardware testing to be performed on the ClearMark component and operational environmental hardware testing to be performed on the ClearCount component. Testing on the ClearMark component was conducted on a parallel state certification effort and accepted by the EAC for reuse for this campaign.

Hardware modifications to the baseline system required the following hardware testing to be performed.

**Electrical Tests:**

- Radiated Emissions – ClearMark
- Conducted Emissions – ClearMark
- Electrostatic Discharge – ClearMark
- Radiated RF Immunity – ClearMark
- Voltage Dips and Interruptions – ClearMark
- Electrical Fast Transient – ClearMark
- Surge Immunity – ClearMark
- Conducted RF Immunity – ClearMark
- Magnetic Fields Immunity – ClearMark
- Electrical Supply – ClearMark

**Environmental Tests:**

- Temperature Power Variation –ClearMark, ClearCount

Pro V&V utilized third party testing during the performance of hardware testing. All hardware testing was performed at the NTS Longmont facility located in Longmont, Colorado. All testing at the NTS Longmont facility was witnessed on-site by Pro V&V personnel, except for Temperature Power Variation Test in which Pro V&V qualified staff executed all testing. Testing was performed by personnel verified by Pro V&V to be qualified to perform the test. All pre/post-tests were conducted by Pro V&V personnel.

Summary Findings

Electrical Testing was performed on the ClearVote 2.5 components listed above. The procedures and results for the testing are included in the following NTS Test reports:

- Test Report ETR-PR162132, Revision 1, presented in Appendix A
- Test Report TR-PR172905 Immunity, Revision 0, presented in Appendix A

The test results from the testing are summarized in Table 3-2.

**Table 3-2. Electrical Hardware Test Results**

| Standard/Method | Description | Criteria | Class/Level | Result |
|---|---|---|---|---|
| FCC 15.107<br>ICES-003<br>VVSG Vol. 1 4.1.2.9 | Power Line Conducted Emissions | Normal Operation & No Data Loss | Class B | Pass |
| FCC 15.109<br>ICES-003<br>VVSG Vol. 1 4.1.2.9 | Radiated Emissions | Normal Operation & No Data Loss | Class B | Pass |
| EN61000-4-11<br>VVSG Vol. 1 4.1.2.5 | Electrical Power Disturbance | Normal Operation & No Data Loss | Various | Pass |
| EN61000-4-4<br>VVSG Vol. 1 4.1.2.6 | Electrical Fast Transient | Normal Operation & No Data Loss | ±2kV - Mains | Pass |
| EN61000-4-5<br>VVSG Vol. 1 4.1.2.7 | Lightning Surge | Normal Operation & No Data Loss | ±2kV Line - Line<br>±2kV Line - Ground | Pass |
| EN61000-4-2<br>VVSG Vol. 1 4.1.2.8 | Electrostatic Disruption | Normal Operation & No Data Loss | ±8kV Contact<br>±15kV Air | Pass |
| EN61000-4-3<br>VVSG Vol. 1 4.1.2.10 | Electromagnetic Susceptibility | Normal Operation & No Data Loss | 10 V/m,<br>80 MHz – 1 GHz | Pass |
| EN61000-4-6<br>VVSG Vol. 1 4.1.2.11 | Conducted RF Immunity | Normal Operation & No Data Loss | 10 Vrms,<br>150 kHz – 80 MHz | Pass |
| EN61000-4-8<br>VVSG Vol. 1 4.1.2.12 | Magnetic Immunity | Normal Operation & No Data Loss | 30 A/m | Pass |

Environmental Testing was performed on the ClearVote 2.5 components listed above. The procedures and results for the testing are included in the following NTS Test reports:

- Test Report TR-PR162131, Revision 0, presented in Appendix A
- Test Report TR-PR172905-00, Revision 0, presented in Appendix A
- Test Report TR-PR178694, Revision 0, presented in Appendix A
- Test Report TR-PR184737, Revision 0, presented in Appendix A

The test results from this testing are summarized in Table 3-3:

**Table 3-3. Environmental Hardware Test Results**

| Standard/Method | Description | Criteria | Result |
|---|---|---|---|
| MIL-STD-810D, 501.2/502.2 VVSG Vol. 1 4.1.2.13, 4.3.3, VVSG Vol 2 4.7.1 | Reliability, Temperature-Power Variation Testing | Normal Operation & No Data Loss | Pass |
| MIL-STD-810D, 516.3, I-3.8 VVSG Vol. 1 4.1.2.14, VVSG Vol. 2 4.6.2 | Shock – Bench Handling | Normal Operation & No Data Loss | Pass |
| MIL-STD-810D, 514.3, I-3.2.1 VVSG Vol. 1 4.1.2.14, VVSG Vol 2 4.6.3 | Vibration - Basic Transportation | Normal Operation & No Data Loss | Pass |
| VVSG Vol. 1 3.1.7.1, 3.2.2.2 (c) | Acoustic Noise Level Test | Normal Operation & No Data Loss | Pass |

The Temperature/Power Variation Test was completed successfully.

## 3.2 Anomalies and Resolutions

When a result is encountered during test performance that deviates from what is standard or expected, a root cause analysis is performed. Pro V&V considers it an anomaly if no root cause can be determined. In instances in which a root cause is established, the results are then considered deficiencies.

Summary Findings

There was an anomaly encountered during Hardware Testing. During Environmental Control – Operating Environment, a ClearMark unit exhibited an unresponsive ClearMark splash screen that appeared during the transition from the completed voting session screen to the login screen. A root cause analysis was performed with no root cause determined. For a detailed description of the root cause analysis please refer to the document Print Screen Transition Anomaly.

## 3.3 Deficiencies and Resolutions

Any violation of the specified requirement or a result encountered during test performance that deviates from what is standard or expected in which a root cause is established was considered a deficiency. When a root cause can be determined, instances of nonstandard or unexpected results are considered deficiencies, rather than anomalies. Throughout the test campaign, any deficiencies encountered were logged in the Pro V&V tracking system (Mantis) for disposition and resolution. In each instance, if applicable, the resolution was verified to be resolved through all required means of testing (regression testing, source code review, and TDP update) as needed.

The noted deficiencies are listed in Table 3-4.

**Table 3-4. Noted Deficiencies**

| ID# | Test Category | Deficiency | Resolution |
|---|---|---|---|
| -- | Hardware | ClearMark failed Radiated Emissions | ClearMark was able to pass Radiated Emissions by adding ferrites to the USB extension cables of the unit. |
| -- | Hardware | ClearMark failed Environmental Control – Operating Environment | Implemented a corrective action revising the code used in ballot style selection by reordering the sequence of enabling and disabling the barcode scanner. For a detailed description of the corrective actions please refer to the document ClearMark Internal Server Anomaly RCA 03-15-2024. |
| -- | Hardware | Ricoh fi-8950 and the fi-7600 scanners failed Environmental Control – Operating Environment | For the Ricoh fi-7600, a corrective action was implemented by updating documentation and implementing training. For the Ricoh fi-8950, a corrective action was implemented by updating documentation and software enhancement. For a detailed description of the corrective actions please refer to the documents Ricoh 7600 Multi-feed RCA & Ricoh Scanner Temp Power RCA (Cv 2.5). |
| 553 | System Loads and Hardening | New ClearCast D 2.5.3 build - While setting time and Time zone, system would not allow setting the hour after selecting a new time zone. | The issue was related to a degraded battery causing issues with the system clock. The unit was replaced with a new unit and the issue is no longer present. |
| 555 | FCA | ClearMark UI does not meet VVSG 2005 Vol 1. - Sec. 3.1.6.d.i | In the new ClearMark 2.5.6 build, the UI was scaled up to meet the minimum height and minimum vertical distance between the centers of the sensitive touch areas. |
| 556 | FCA | In ClearAccess 2.5.5, the dimensions of the button on the Write-In menu, and the distance between the centers of the buttons, do not meet VVSG 2005 Vol 1 - Sec 3.1.6.d.i | In the new ClearAccess 2.5.6 build the write-in screen was fixed to where the horizontal width of the buttons is 0.7 inches and the horizontal distance between the centers of adjacent buttons is 0.8 inches. Also added different UI with an ABC keyboard layout as the default and a QWERTY keyboard option. |

## 4.0 RECOMMENDATION FOR CERTIFICATION

The ClearVote 2.5 Voting System, as presented for testing, successfully met the requirements set forth for voting systems in the U.S. Election Assistance Commission (EAC) 2005 Voluntary Voting System Guidelines (VVSG), Version 1.0. Additionally, Pro V&V, Inc. has determined that the ClearVote 2.5 functioned as a complete system during System Integration Testing. Based on the test findings, Pro V&V recommends the EAC grant the ClearVote 2.5 system, as identified in Tables 4-1 and 4-2, certification to the EAC 2005 VVSG.

**Table 4-1. ClearVote 2.5 Voting System Software**

| Firmware/Software | Version |
|---|---|
| ***ClearDesign Components, Version 2.5.9*** | |
| Google Chrome | 87.0.4280.141 |
| Ubuntu | 20.04.5 LTS |
| MySQL | 5.7.37 |
| Apache | 2.4.29 |
| PhantomJS | 1.9.8 |
| Unzip | 6.0 |
| Samba | 4.15.13 |
| auditd | 2.8.5 |
| libpam-pwquality | 1.4.2 |
| apparmor-utils | 2.13.3 |
| libapache2-mod-apparmor | 2.12 |
| Python PIP | 22.0.4 |
| Zip | 3.0.11 |
| Pyinstaller | 4.7 |
| Python JSMIN | 3.0.0 |
| Python altgraph | 0.17 |
| Python dev | 3.8.10 |
| Python wheel | 0.37.0 |
| Python setuptools | 59.5.0 |
| jaraco.functools | 3.4.0 |
| gcc | 10.3.0 |
| build-essential | 12.8 |
| m4 | 1.14.18 |
| bc | 1.07.1 |
| Python | 3.8.10 |
| Python Webpy | 0.62 |
| PyMySQL | 1.0.2 |

**Table 4-1. ClearVote 2.5 Voting System Software** *(continued)*

| | |
|---|---|
| SQLAlchemy | 1.3.24 |
| Python Pillow | 8.3.2 |
| Python DBUtils | 1.3 |
| Python XLRD | 1.2.0 |
| Python FontTools | 3.41.0 |
| Python RTF | 0.2.1 |
| Python Gunicorn | 20.0.4 |
| OpenSSL (FIPS) | 2.0.16 |
| OpenSSL | 1.0.2n |
| LibSSL | 1.0.2n |
| DataTable | 1.10.16 |
| DataTable-Buttons | 1.4.2 |
| DataTable-Buttons-Bootstrap | 1.4.2 |
| DataTable-Buttons-JSZip | 2.5.0 |
| DataTable-Buttons-Pdfmake | 0.1.32 |
| DataTable-Plugins | 1.10.16 |
| bootstrap | 3.0.0 |
| jquery | 2.2.4 |
| jquery-impromptu | 6.2.3 |
| jquery-qrcode | 1.0 |
| jquery-splitter | 0.27.1 |
| jquery-ui | 1.12.1 |
| jscolor | 1.4.2 |
| tinymce | 4.1.9 |
| jslibmp3lame | 0.5.0 |
| jszip | 3.2.0 |
| jsmin | 4.6 |
| papaparse | 4.6.0 |
| jquery-throttle-debounce | 1.1 |
| ***ClearAccess Components, Version 2.5.6*** | |
| nsis | 3.06.1 |
| PyInstaller | 4.2 |
| Windows | Windows 10 IoT Enterprise LTSC 2021 |
| Google Chrome | 87.0.4280.141 |
| DataTables | 1.10.16 |
| EloPOS driver pack | 12/5/2019 |
| jquery | 1.10.2 |

**Table 4-1. ClearVote 2.5 Voting System Software** *(continued)*

| Firmware/Software | Version |
|---|---|
| jsmin | 10/30/2019 |
| LGPO | 3 |
| pefile | 2019.4.18 |
| pyserial | 3.5 |
| Python | 3.8.10 |
| Python-future | 0.18.2 |
| pywin | 302 |
| Webpy | 0.62 |
| Zebra Corescanner Driver | 3.07.0042 |
| ***ClearCast Components, Version 2.5.3*** | |
| Ubuntu | 20.04.5 |
| chromium-browser | 112.0.5615.49 |
| pyinstaller | 3.2.1 |
| openssl-fips | 2.0.16 |
| openssl | 1.0.2n |
| libScanAPI.a | 2.0.5.0 |
| DataTables | 1.10.22 |
| JTSage DateBox | 4.0.0 |
| jQuery.NumPad | 1.4 |
| jQuery | 3.5.1 |
| jquery.ui | 1.12.1 |
| ***ClearCast Go Components, Version 2.5.3*** | |
| Ubuntu | 20.04.5 |
| Linux kernel | 5.4.52 |
| U-boot | 2020.1 |
| rk3399_loader | 1.25.126 |
| rk3399_bl31 | 1.35 |
| trust_merger | 1.0 (2015-06-15) |
| boot_merger | 1.31 |
| rk3399_ddr-800MHz | 1.25 |
| rk3399_miniloader | 1.26 |
| rkdeveloptool | 1.2 |
| chromium-browser | 112.0.5615.49 |
| libssl | 1.0.0_1.0.2n |
| openssl | 1.0.0_1.0.2n |
| libscanAPI.a | 1.0.7.0 |
| DataTables | 1.10.22 |

**Table 4-1. ClearVote 2.5 Voting System Software** *(continued)*

| Firmware/Software | Version |
|---|---|
| JTSage DateBox | 4.0.0 |
| jQuery.NumPad | 1.4 |
| jQuery | 3.5.1 |
| jquery.ui | 1.12.1 |
| ***ClearCount Components, Version 2.5.8*** | |
| Windows | Windows 10 IoT Enterprise LTSC 2021 |
| Google Chrome | 87.0.4280.141 |
| Ubuntu | 20.04.5 LTS |
| Python(part of Ubuntu) | 3.8.10 |
| MySQLdb (part of Ubuntu) | 8.0.37 |
| OpenSSL | 1.0.2n |
| OpenSSL FIPS Object Module | 2.0.10 |
| sqlalchemy | 1.3.24 |
| Six | 1.14.0 |
| Python-DateUtil | 2.8.2 |
| Apache | 2.4.29 |
| auditd | 2.8.5 |
| debconf | 1.5.73 |
| pmount | 0.9.23 |
| Samba | 4.15.13 |
| udisks2 | 2.8.4 |
| python3-audit | 2.8.5 |
| python3-debconf | 1.5.73 |
| libzbar0 | 0.23 |
| libpam-pwquality | 1.4.2 |
| apparmor | 2.13.3 |
| apparmor-utils | 2.13.3 |
| ufw | 0.36 |
| xserver-xorg-core | 1.20.13 |
| xinit | 1.4.1 |
| lightdm | 1.30.0 |
| xfce4 | 4.14 |
| menu | 2.1.47 |
| menu-xdg | 0.6 |
| xubuntu-default-settings | 20.04.4 |
| xfce4-whiskermenu-plugin | 2.4.3 |
| xfce4-terminal | 0.8.9.1 |

**Table 4-1. ClearVote 2.5 Voting System Software** *(continued)*

| Firmware/Software | Version |
|---|---|
| xfce-power-manager | 1.6.6 |
| leafpad | 0.8.18.1 |
| exfat-fuse | 1.3.0 |
| exfat-utils | 1.3.0 |
| screen | 4.8.0 |
| zip | 3.0 |
| unzip | 6.0 |
| sudo | 1.8.31 |
| JavaScript Bootstrap library | 2.3.2, & 4.3.1 |
| JavaScript Chosen library | 1.8.7 |
| JavaScript jQuery splitter library | 0.28.3 |
| JavaScript jQuery library | 1.10.2J |
| JavaScript jQuery-migrate library | 1.2.1 |
| JavaScript jQuery hotkeys library | 0.8 |
| JavaScript jQuery tooltip library | 1.3 |
| JavaScript DataTables library | 1.10.18 |
| JavaScript DataTables Buttons | 1.5.6 |
| JavaScript DataTables Buttons ColVis Library | 1.0.8 |
| JavaScript DataTables Buttons html5 library | 1.3.3 |
| JavaScript DataTables FixedHeader library | 3.1.4 |
| JavaScript DataTables pdfmaker library | 0.1.36 |
| JavaScript vue library | 2.6.10 |
| JavaScript bootstrap-vue library | 2.0.2 |
| Fujitsu fi-6400 | PaperStream IP (TWAIN) 2.10.3 |
| Fujitsu fi-6800 | PaperStream IP (TWAIN) 2.10.3 |
| Fujitsu fi-7180 | PaperStream IP (TWAIN) 2.10.3 |
| Fujitsu fi-7600 | PaperStream IP (TWAIN) 2.10.3 |
| Fujitsu fi-7800 | PaperStream IP (TWAIN) 2.10.3 |
| Fujitsu fi-7900 | PaperStream IP (TWAIN) 2.10.3 |
| Fujitsu fi-8950 | PaperStream IP (TWAIN) 3.30.0 |
| ***ClearMark Components, Version 2.5.6*** | |
| Ubuntu | 20.04.6 |
| chromium-browser | 97.0.4692.99 |
| DataTables | 1.10.16 |
| jquery | 1.10.2 |
| jsmin | 09/30/2011 |
| pefile | 2019.4.18 |

**Table 4-1. ClearVote 2.5 Voting System Software** *(continued)*

| Firmware/Software | Version |
|---|---|
| pyserial | 3.5 |
| Python | 3.8.10 |
| Webpy | 0.62 |
| Linux Kernel | 5.4.52 |
| U-boot | 2020.1 |
| rk3399_loader | 1.24.126 |
| rk3399_bl31 | 1.35 |
| trust_merger | 1.0 (2015-06-15) |
| boot_merger | 1.31 |
| rk3399_ddr-800Mhz | 1.25 |
| rk3399_miniloader | 1.26 |
| rkdeveloptool | 1.2 |
| libssl | 1.0_1.0.2n |
| openssl | 1.0.0_1.0.2n |
| libscanAPI.a | 1.0.7.0 |
| pycups | 2.0.1 |
| evdev | 1.4.0 |
| more-itertools | 8.6.0 |
| Pillow | 8.3.1 |
| multiprocess | 0.70.12.2 |
| argparse | 1.4.0 |
| pysub | 1.2.1 |

**Table 4-2. ClearVote 2.5 Voting System Components**

| Component | Model |
|---|---|
| ***ClearDesign Components*** | |
| Dell Latitude Laptop (DesignStation) | 5580, 5590, 5500, 5511, 5521, 5540,5550 |
| Lenovo ThinkPad (DesignStation) | E14 G-series |
| Dell OptiPlex (DesignStation) | XE3 SFF, XE4 SFF |
| Dell PowerEdge Server (DesignServer) | T130, T140, T150, R440, R450, T440, T630 |
| Cisco 8-Port Switch | SG250-08-K9-NA |
| Cisco Catalyst 8-port switch | 1300-8T-E-2G |
| Cisco Business 8-Port Switch | CBS350-8T-E-2G-NA |
| NetGear 8-Port Switch | FVS318G |
| TRENDnet 8-Port Switch | TEG-S80G |

**Table 4-2. ClearVote 2.5 Voting System Components** *(continued)*

| Component | Model |
|---|---|
| TP-Link 8-Port Switch | TL-SG108E |
| TP-Link 4-Port Switch | TL-R600VPN |
| Brother Laser Printer | HL-L2350DW |
| Brother Laser Printer | HL-L2460DW |
| ***ClearAccess Components*** | |
| ELO 15 inch EloPOS | EPS15E2 |
| ELO 15 inch AIO | E-Series (ESY15E2) |
| ELO 15 inch AIO | X-Series (ESY20X2) |
| Dell OptiPlex | 5250 |
| Oki Data Laser Printer | B432dn |
| Lexmark Laser Printer | MS521dn |
| Lexmark Laser Printer | MS531dw |
| CyberPower Smart App UPS | PR1500RT2U |
| APC Smart UPS | SMT2200C |
| APC Smart UPS | SRT1500RMXLA |
| Zebra Barcode scanner | DS457-SR |
| ELO Barcode scanner | UM600149 |
| Storm EZ Access Keypad | EZ08-22200,<br>EZ08-22201 |
| ClearAccess Transportation and Setup Case | 62311-1-1,<br>62312-1-1 |
| ***ClearCount Components*** | |
| Dell PowerEdge Server (CountServer) | T140, T150, R440, R450, T440 |
| Dell OptiPlex (CountStation, ScanStation) | XE3 SFF, XE4 SFF |
| Dell OptiPlex (ScanStation) | XE4 SFF |
| Dell Latitude Laptop (CountStation, ScanStation) | 5580,5590, 5500, 5511, 5521, 5540, 5550 |
| Lenovo ThinkPad Laptop (CountStation, ScanStation) | E14 G-series |
| Fujitsu Scanner | fi-6400 |
| Fujitsu Scanner | fi-6800 |
| Fujitsu Scanner | fi-7180 |
| Fujitsu/Ricoh Scanner | fi-7600 |
| Fujitsu/Ricoh Scanner | fi-7800 |
| Fujitsu/Ricoh Scanner | fi-7900 |

**Table 4-2. ClearVote 2.5 Voting System Components** *(continued)*

| Component | Model |
|---|---|
| Ricoh Scanner | fi-8950 |
| Cisco 8-Port Switch | SG250-08-K9-NA |
| Cisco 26-Port Switch | SG250-26-K9-NA |
| Cisco Catalyst 8-Port switch | 1300-8T-E-2G |
| Cisco Business 8-Port Switch | CBS350-8T-E-2G-NA |
| Cisco Business 24-Port Switch | CBS350-24T-4G-NA |
| NetGear 8-Port Switch | FVS318G |
| TRENDnet 8-Port Switch | TEG-S80G |
| TP-Link 8-Port Switch | TL-SG108E |
| TP-Link 4-Port Switch | TL-R600VPN |
| Brother Laser Printer | HL-L2350DW |
| Brother Laser Printer | HL-L2460DW |
| APC Smart-UPS | SMT-1500C |
| ***ClearCast Components*** | |
| ClearCast | Model D Revision 5 |
| ClearCast Go | ClearCast Go |
| Corsair Flash Padlock 32 GB USB | CMFPLA3B-32GB |
| Corsair Flash Voyager GTX 128 GB USB | CMFVYGTX3C-128GB |
| SanDisk Extreme Go 64 GB USB | SDCZ800-064G-G46 |
| SanDisk Extreme Pro 128 GB USB | SDCZ880-128G-G46 |
| SanDisk Ultra Flair 32 GB USB | SDCZ73-032G-A46/G46 |
| SanDisk Ultra Flair 64 GB USB | SDCZ73-064G-A46/G46 |
| Clear Ballot Group Collapsible Ballot Bag | CV-1032-1.5,<br>CV-1032-2.0 |
| Clear Ballot Group Collapsible Ballot Box | CV-1033-1.5,<br>CV-1033-2.0 |
| ClearCast Go Transport Ballot Box | 61211-1-3 |
| ClearCast Soft Collapsible Ballot Box | Standard (14620)<br>Long (14616) |
| ClearCast Soft Insert Collapsible Ballot Receptacle | Standard (14452)<br>Long (14460) |
| ClearCast Go Soft Collapsible Ballot Box | Standard (14148)<br>Long (14156) |
| ClearCast Go Soft Insert Collapsible Ballot Receptacle | Standard (14452)<br>Long (14460) |

**Table 4-2. ClearVote 2.5 Voting System Components** *(continued)*

| Component | Model |
|---|---|
| ***ClearMark Components*** | |
| Clear Ballot Group ClearMark AIO Touchscreen | 46100-1-1 |
| Clear Ballot Group ClearMark Thermal Printer | 46200-1-1 |
| Lexmark Laser Printer | MS521dn |
| CyberPower Smart App UPS | PR1500RT2U |
| ClearMark Thermal Printer Transportation and Setup Case | 62321-1-2 |
| ClearMark Lexmark Printer Transportation and Setup Case | 62322-1-2 |
| ***ClearVote Components*** | |
| SySTOR 1:15 USB Duplicator & Sanitizer | SYSUSBD-15 |

**APPENDIX A**

**Hardware Test Reports**

***(Provided Separately)***

**Electrical Test Reports**

ITR-PR162132, Revision 0

ETR-PR162132, Revision 1

TR-PR172905 Immunity, Revision 0

**Environmental Test Report**

TR-PR162131, Revision 0

TR-PR172905-00, Revision 0

TR-PR178694, Revision 0

TR-PR184737, Revision 0

# APPENDIX B

**Trusted Builds**

## Trusted Builds

The ClearVote 2.5 Voting System Trusted Build was performed using the steps described in section 5.5 of the EAC Voting System Testing and Certification Program Manual, Version 2.0. The Trusted Build yielded the following software outputs which are described below along with their associated Filenames and Hash Values in SHA 256 format:

ClearAccess Version 2.5.6 – The ClearAccess trusted build was performed using the "ClearAccess 2.5 Build Procedures" document Version 2.5.6, dated 09/30/2024, provided by Clear Ballot Group. The trusted build yielded the following output file and the associated Hash Value:

- ClearAccess-2.5.6.exe
  SHA256: 5f2b790581c6538067432eeddb5cec2f74bd8089ca6fa323446e8f89b84c2556
- ClearAccess-2.5.6 Installer.exe
  SHA256: 1db0ff1389776614772e3b3d11a7fe84e3dfddc8e79b7ed89c8f8a47aebe421c

ClearCount Version 2.5.8 – The ClearCount trusted build was performed using the "ClearCount 2.5 Build Procedures" document Version 2.5.4, dated 06/11/2025, provided by Clear Ballot Group. The trusted build yielded the following output file and the associated Hash Value:

- clearcount-2.5.8-20250613-204743.iso
  SHA256: 5c55d64a99870dbd4f9d4bd7eb1edc67cf3dc054721d3dff9cc81cdab40e85a0

ClearDesign Version 2.5.9 – The ClearDesign trusted build was performed using the "ClearDesign 2.5 Build Procedures" document Version 2.5.4, dated 06/11/2025, provided by Clear Ballot Group. The trusted build yielded the following output files and their associated Hash Values:

- ClearDesign-2.5.9.zip
  SHA256: 07b68a976bdb00135af75a28187242b8d7b6493cabd740627e4ca502f7b9858c
- install-setup.zip
  SHA256: dff3365063194fc4850bb658b95bc7de79618bd789aa28acc3b50f5bbd36e891

ClearMark Version 2.5.6 – The ClearMark trusted build was performed using the "ClearMark 2.5 Build Procedures" document Version 2.5.4, dated 10/28/2024, provided by Clear Ballot Group. The trusted build yielded the following output files and their associated Hash Values:

- ClearMarkImage-2.5.6-20250410-172955-09224d3e.tar
  SHA256: 2d8eae42cb812a8828eb8b21d2e4660e6c9f56b85bcc6f9395f2f76e6b8c04cc

ClearCast Version 2.5.3 – The ClearCast trusted build was performed using the "ClearCast 2.5 Build Procedures" document Version 2.5.3, dated 11/25/2024, provided by Clear Ballot Group. The trusted build yielded the following output files and their associated Hash Values:

- ClearCastD-2.5.3-20241119-175824-b8d2197.iso
  SHA256: 811a68d553de65454636b420e9201d94b66e58823ea2be98517feefd717eb358

ClearCastGo Version 2.5.3 – The ClearCastGo trusted build was performed using the "ClearCastGo 2.5 Build Procedures" document Version 2.5.4, dated 11/25/2024, provided by Clear Ballot Group. The trusted build yielded the following output files and their associated Hash Values:

- ClearCastImage-2.5.3-20241101-175633-04089f41.tar
  SHA256: 51acd59c0d02f422aaa17a844b213e5b9e518b8d9b6ee4a905793b741a604445

# APPENDIX C

## Warrant of Accepting Change Control Responsibility

Clear Ballot

7/22/2025

Mr. Michael Walker
Pro V&V
Huntsville AL 35802

***transmitted via email***

Re: Voting System Durability Attestation

Dear Mr. Walker:

This document addresses EAC 2005 VVSG Volume I, Section 4.3.2 and more specifically EAC RFI 2008-05.

Clear Ballot attests that the ClearVote 2.5 paper-based optical scan voting system is engineered to withstand normal use without deterioration and without excessive maintenance costs for a period of (10) years.

Sincerely,

Russ Dawson
Federal Certification Program Manager
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512.350.5720

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