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

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SIGNATURES

Approved by: Michael L. Walker — 08/02/2024

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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 will be performed as identified or the divergence from the test plan will be properly documented in the resulting test report, 2) all identified voting system anomalies or failures will be reported and resolved, and 3) the resulting test report will be accurate and complete. There will be no opinions or interpretations included in the resulting report, except as noted under 'Recommendations'.

REVISIONS

Revision	Description	Date
00	Initial Release	06/26/2024
01	Updates per EAC comments	08/02/2024

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1.0 INTRODUCTION

The purpose of this Test Plan is to document the procedures that Pro V&V, Inc. will follow 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. 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.

At test conclusion, the results of all testing performed as part of this test campaign will be submitted to the EAC in the form of a national certification test report.

1.1 Description and Overview of EAC System Being Modified

The ClearVote 2.5 configuration submitted for testing is a modification from the EAC-certified ClearVote 2.3 configuration.

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).

1.1.1 Baseline Certified System

The EAC Certified System that 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 baseline system for this modification is the ClearVote 2.3 System. Detailed descriptions of the ClearVote 2.3 test campaign, including a listing of all configurations and components, are contained in Pro V&V Report No. TR-01-01-CBG-006-01.03, available for viewing on the EAC's website at www.eac.gov.

The following sections contain a product description and an overview of the design methodology of the ClearVote 2.3 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 of 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 is able to define users and manage the elections.
- Network Switch: Used to connect the 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 of 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: 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 have to 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

The ClearCast tabulator is a precinct count ballot scanning solution 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.

1.1.2 Description of Modification

ClearVote 2.5 is a modified voting system configuration that includes upgrades to the ClearAccess, ClearCount, and ClearDesign components of the ClearVote 2.3 system, as well as introducing the Clearmark component. The submitted modifications include the following changes from ClearVote 2.3 to ClearVote 2.5, as taken from the *ClearVote 2.5 Change Notes*:

Table 1-1 Submitted Modifications

Unique ID	Component(s)	Type of Change	Description
COTS-11	ClearVote	COTS device management	Add Dell OptiPlex XE4 as an admin station for ClearDesign and ClearCount.
COTS-144	ClearVote	COTS device management	Add Dell Latitude 5540 as admin station for ClearDesign and ClearCount, and as a ClearCount ScanStation.

Table 1-1 Submitted Modifications *(continued)*

Unique ID	Component(s)	Type of Change	Description
COTS-40	ClearVote	COTS device management	Add Dell PowerEdge T150 as a DesignServer and a CountServer
COTS-41	ClearVote	COTS device management	Add Dell PowerEdge R450 as a DesignServer and a CountServer
COTS-192	ClearCount	Successor device	Ricoh fi-7600 scanner
COTS-195	ClearDesign, ClearCount	Successor device	Brother HL-L2460DW printer
HW-5555	ClearMark	Bug	Resolves an issue that resulted in errors when starting a voting session using the barcode scanner
SW-10118	ClearCount	Enhancement	Add support to export card images filtered by contests, precinct, counter groups, boxes, and voting conditions (overvoted, undervote, writeins).
SW-10177	ClearDesign, ClearMark	Bug	Fixes an issue that caused elements of the touchscreen to be accidentally double-clicked by voters.
SW-10222	ClearCount	Enhancement	On the Election Administration page, the Redact Small Vote Subtotals column will no longer default to hidden.
SW-10224	ClearCount	Bug	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-10275	ClearAccess	Enhancement	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-10336	ClearDesign	Bug	Fixed a bug preventing the accurate display of non-Latin characters on the digital ballot.
SW-10353	ClearMark	Enhancement	Sets the default screen orientation for ClearMark to portrait mode.

Table 1-1 Submitted Modifications *(continued)*

Unique ID	Component(s)	Type of Change	Description
SW-10432	ClearCount	Enhancement	Improve the positioning of the green line used to show what contest is being adjudicated in the Resolver.
SW-10460	ClearDesign, ClearMark	Enhancement	Support new key mappings specific to ClearMark keypad.
SW-10508	ClearCount	Enhancement	Database and threading updates to make ClearCount more performant, especially with many concurrent tasks and larger elections.
SW-10551	ClearMark	Enhancement	A new landing page for voters is displayed if the Ballot Verification feature is enabled, which prompts the user to choose whether they want to vote (mark a ballot) or verify the votes on their ballot.
SW-10560	ClearDesign, ClearMark	Bug	Instructional text bugfix for sip-and-puff input device.
SW-10639	ClearDesign	Enhancement	Added "Precinct" Localization to BDFExport metadata. Allows Localization to be uploaded to ClearCount when creating an Election under Election Administration.
SW-10663	ClearCount	Enhancement	Added the Statement of Votes Cast with Parties to the reports menu.
SW-10690	ClearAccess, ClearDesign	Bug	Updated the ADF to account for the new page number macros introduced in this release.
SW-10691	ClearAccess, ClearCast	Bug	minor version update to the libssl and openssl libraries
SW-10700	ClearDesign	Enhancement	This release implements the New York Grid Style Ballot layout.
SW-10733	ClearCount	Bug	Previously the 'whole' precinct record was record with the minimum BallotStyleID and now it is the precinct with BallotStyleID equal to 0.

Table 1-1 Submitted Modifications *(continued)*

Unique ID	Component(s)	Type of Change	Description
SW-10792	ClearCount	Enhancement	Reduces ClearCount security vulnerabilities regarding SQL injection.
SW-10840	ClearMark	Enhancement	Added support for the Lexmark MS520 Series.
SW-11062	ClearMark	Enhancement	Added a "Save System Info" feature to ClearMark which enables export of system logs and other troubleshooting information.
SW-11108	ClearDesign, ClearMark	Bug	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-11133	ClearMark	Enhancement	Added feature for a voter to be able to initiate a voting session with a smart card.
SW-11134	ClearMark	Enhancement	Added feature for a poll worker to be able to activate a smart card for a voter to use in ClearMark.
SW-11135	ClearMark	Enhancement	Added feature for an administrator to initialize a blank smart card, enabling its use by that jurisdiction for session activation.
SW-11136	ClearMark	Enhancement	Simplified the payload for barcodes used to select a ballot style in ClearMark to make the resulting QR code easier to read.
SW-11184	ClearDesign	Bug	During a ClearMark 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-11261	ClearCount	Bug	Added "Precinct" Localization to BDFExport metadata. Allows Localization to be uploaded to ClearCount when creating an Election under Election Administration.

Table 1-1 Submitted Modifications *(continued)*

Unique ID	Component(s)	Type of Change	Description
SW-11342	ClearDesign	Bug	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-11391	ClearCount	Enhancement	Add support for displaying ClearDesign landscape ballots in the proper orientation.
SW-11487	ClearMark	Enhancement	Change version of ADF to support grid style ballots.
SW-11531	ClearCast	Enhancement	The ClearCast results reports now include a party breakdown rather than aggregating all the votes for a candidate into one number.
SW-11598	ClearMark	Bug	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-11604	ClearCast	Bug	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-11605	ClearCount	Bug	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-11606	ClearDesign	Bug	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	Bug	Changed the ClearCount API to require authentication before uploading files (such as ballot images and tabulation results) to the server.
COTS-208	ClearVote	COTS device management	Add Dell Latitude 5550 as admin station for ClearDesign and ClearCount, and as a ClearCount ScanStation.

Table 1-1 Submitted Modifications *(continued)*

Unique ID	Component(s)	Type of Change	Description
SW-11624	ClearCast, ClearDesign	Enhancement	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-11641	ClearCount	Bug	Removed dead code related to encrypted backups.
SW-11655	ClearCast	Bug	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-11661	ClearDesign	Enhancement	Updated system configuration for the CIS SCAP Ubuntu 20.04 revision 1.1.0 profile.
SW-11694	ClearCast	Bug	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-11816	ClearDesign	Enhancement	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	Enhancement	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.

Table 1-1 Submitted Modifications *(continued)*

Unique ID	Component(s)	Type of Change	Description
SW-11819	ClearDesign	Enhancement	The ADFx has been modified to contain the smart card customer and election keys.
SW-11820	ClearDesign	Enhancement	The smart card election key can be regenerated for the Accessible Marker device.
SW-11841	ClearCast	Bug	Resolves error that resulted from a System Admin attempting to validate an election.
SW-11911	ClearCount	Bug	Enables ClearCount to properly tabulate a card that only has contests on the back side.
SW-11921	ClearCount	Bug	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	Bug	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-11927	ClearDesign	Bug	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-11928	BallotTabulator	Bug	Enables ClearCount to properly tabulate a card that only has contests on the back side.
SW-11930	ClearVote	Enhancement	Upgraded to use Windows Enterprise IoT 21H2 release.

Table 1-1 Submitted Modifications *(continued)*

Unique ID	Component(s)	Type of Change	Description
SW-12213	ClearCount	Enhancement	Installer now prompts for and sets the grub username and password
SW-12214	ClearDesign	Enhancement	The username and password for the grub boot loader and now set during the installation of the system, when the install-setup script is run.
SW-12244	ClearCount	Bug	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	Bug	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	Bug	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	Enhancement	Users logged into the Ubuntu operating system on the CountServer are logged out automatically after 5 minutes of inactivity.
SW-12303	ClearCount	Bug	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-12417	ClearCast, ClearCount	Enhancement	All Cast Vote Records produced by ClearCast are digitally signed with a private key.
SW-12418	ClearCast, ClearCount	Enhancement	All ballot images produced by ClearCast are digitally signed with a private key.

Table 1-1 Submitted Modifications *(continued)*

Unique ID	Component(s)	Type of Change	Description
SW-12422	ClearCast	Enhancement	Each ClearCast unit has a unique public/private key pair used for digitally signing ballot images and Cast Vote Records.
SW-12423	ClearCast	Enhancement	The public key fingerprint of the ClearCast unit is printed on all result reports and the Power On report.
SW-12425	ClearCast	Enhancement	The election_state.txt file now stores the public key value corresponding to each private key that is used to sign election data.
SW-12466	ClearCount	Enhancement	Added functionality to detect whether system logging is running and to display an error message if it has been disabled.
SW-12467	ClearCast	Enhancement	The voting_sigs.txt file now includes the digital signature of the archive.tar file.
SW-12469	ClearCast	Enhancement	Creates an interface for regenerating private keys when an election is not loaded in ClearCast
SW-12648	ClearCast	Enhancement	"Active Directory" value added to the Election Management screen, and metadata inconsistency errors no longer halt normal operation.
SW-13204	ClearDesign	Bug	Fix issue with not displaying the party separator '.' between parties when multiple parties endorse a choice.
SW-13207	ClearCast	Enhancement	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-13208	ClearCast, ClearMark	Enhancement	The ClearCast Go operating system has been upgraded to Ubuntu 20.04.5.
SW-13210	ClearDesign	Enhancement	The ClearDesign operating system has been upgraded to Ubuntu 20.04.5.

Table 1-1 Submitted Modifications *(continued)*

Unique ID	Component(s)	Type of Change	Description
SW-13211	ClearCount	Enhancement	The ClearCount operating system has been upgraded to Ubuntu 20.04.5.
SW-13263	ClearDesign	Bug	Resolves an issue that could cause HTML ballots to not layout properly due to the VoterGroupID to not being set properly.
SW-13388	ClearCast	Bug	Resolves an issue that could cause ClearCast to not properly delete an election
SW-13520	ClearCount	Enhancement	Increase the maximum length of ballot supported for scanning from 28 to 30 inches
SW-13526	ClearCast	Bug	Resolves an issue that would let FolderScanner continue to scan ballots even after the USB stick is full.
SW-13545	ClearCount, ClearDesign	Bug	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	Bug	Enhance the message displayed when ovals overlap front to back (coincide) to include the candidate and contest names cause the issue.
SW-13575	ClearAccess, PrintNow	Enhancement	Updates the ClearAccess software to allow it to run on all needed hardware configurations and associated operating systems.
SW-13760	ClearDesign	Enhancement	Allows a user to save name and sort seq changes to an image without requiring a change of the image itself.
SW-13877	ClearCast, ClearMark	Enhancement	Expands the ClearMark hardware offering to include a tabletop variation.
SW-14012	ClearDesign	Enhancement	SW-14012. Added support for ranked-choice voting tabulation rulesets and ranked-choice voting contest type.

Table 1-1 Submitted Modifications *(continued)*

Unique ID	Component(s)	Type of Change	Description
SW-14062	ClearDesign	Enhancement	This allows ClearDesign to layout a paper ballot that includes a 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	Enhancement	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-14241	ClearCast, ClearCount, ClearDesign, ClearMark	Enhancement	ClearMark and ClearCast are now compatible with BDFs and ADFs that include RCV contest and ruleset data.
SW-14253	ClearDesign	Enhancement	This allows for the creation and editing of a RCV ruleset with specific tabulation and layout rules. The ruleset can then be associated to a RCV contest, where some of the rules can be overwritten.
SW-14397	ClearCast	Enhancement	Adds 'Protected Card Cont' to the vote and administrative screens.
SW-14459	ClearCount	Enhancement	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	Enhancement	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.
SW-14471	ClearCast, ClearCount, ClearMark	Enhancement	Updated ballot tabulation functionality in ClearCount, ClearCast, and ClearMark to be able to adjudicate ranked-choice contests.

Table 1-1 Submitted Modifications *(continued)*

Unique ID	Component(s)	Type of Change	Description
SW-14549	ClearCount	Enhancement	Upgrades the ClearCount database to MySql 8 and InnoDB
SW-14567	ClearMark	Bug	Resolves an issue when exporting logs that caused the CSV to have an extra column.
SW-14572	ClearAccess, ClearMark	Bug	Resolves an issue that caused an extra column in the CSV when exporting logs.
SW-14573	ClearAccess	Bug	Exported csv files now have double quotes around all strings
SW-14639	ClearCast	Enhancement	ClearCast database upgraded to MySQL 8.
SW-14684	ClearMark	Bug	Resolves an issue that would show no information about an attached Smart Card Reader on the ClearMark Setup page
SW-14710	ClearCount	Bug	Resolves an issue that caused Ballot Tabulator to fail to start properly.
SW-14711	ClearAccess	Enhancement	Allows for Windows IoT OS to run on all required versions of ClearAccess hardware.
SW-14727	ClearCount	Enhancement	Provides more specificity of which ClearCount build/version number is being used.
SW-14743	ClearCount	Enhancement	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	Enhancement	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.

Table 1-1 Submitted Modifications *(continued)*

Unique ID	Component(s)	Type of Change	Description
SW-14754	ClearDesign	Enhancement	This allows for the RCV Ruleset functionality to be disabled or enabled for a given user.
SW-14758	ClearCount	Enhancement	Added a new report "Statement of Votes Cast by Rank' which is available in the report menu if the election contains RCV contests. This report displays the votes grouped by Contest and Rank.
SW-14806	ClearCount	Enhancement	Updates to ClearCount to ensure core functionality remains intact after the database upgrades.
SW-14817	ClearCount	Enhancement	Updates requirements in order to reach mysql database to prevent any unintentional access.
SW-14818	ClearDesign	Enhancement	Updates the BDF/ADF to allow for contests with no candidates, or with Label Only candidates, to be used throughout ClearVote
SW-14822	ClearCount	Enhancement	Updates user creation to validate user names in order to prevent errors with logging.
SW-14825	ClearAccess	Enhancement	Updates hardening scripts to more thoroughly protect software and OS.
SW-14830	ClearAccess, ClearMark	Enhancement	Updates battery status indicators/messaging to remove confusion that could result from some hardware configurations.
SW-14831	ClearCast	Enhancement	Updates older versions of ClearCast to be compatible with changes made to other ClearVote components
SW-14864	ClearDesign	Enhancement	Updates the Text Editor translation tool to hide a Google Translator overlay which made it difficult to click the Save button
SW-14877	ClearCount	Enhancement	Updates the XML functionality to accommodate RCV contest data.

Table 1-1 Submitted Modifications *(continued)*

Unique ID	Component(s)	Type of Change	Description
SW-14888	ClearAccess	Bug	Resolves an issue that caused a timeout when using the "Save System Info" feature as a maintenance user
SW-14913	ClearCount	Enhancement	Provides more specificity of which ClearDesign build/version number is being used.
SW-14929	ClearCast	Enhancement	This allows ClearCast to scan and tabulate a paper ballot with a RCV contest, provide warnings to the voter for the RCV contest, and store the tabulated ballot on a USB stick that will be loaded into ClearCount.
SW-14930	ClearCast	Enhancement	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-14992	ClearMark	Enhancement	Provides more specificity of which ClearMark build/version number is being used.
SW-14993	ClearAccess	Enhancement	Provides more specificity of which ClearAccess build/version number is being used.
SW-15116	ClearMark	Bug	Resolves an issue that caused unnecessary and repetitive system logs during scanner calibration
SW-15142	ClearMark	Bug	Resolves an issue that could sometimes cause paper jam error messages to not be displayed at the correct time
SW-15168	ClearMark	Enhancement	This enables voter ballot verification to work with a RCV contest
SW-15242	ClearDesign	Enhancement	Updates the way that ballot PDFs are named by ClearDesign to they can be more easiliy identified and organized.

Table 1-1 Submitted Modifications *(continued)*

Unique ID	Component(s)	Type of Change	Description
SW-15280	ClearDesign	Enhancement	Updates the BlankBallotFileName value in the BDF to match the updates made to ballot PDF naming in SW-15242
SW-15395	ClearCount	Bug	Resolves an issue that could cause XML exports to have inconsistent count of Ballots Cast when using multi-card ballots.
SW-15441	ClearCast	Enhancement	Adds a total count of duplicate/double votes to each rank in the RCV contest report on ClearCast
SW-15583	ClearDesign	Bug	Previous versions did not include the audio that was recorded in ClearDeisgn in the file created using the Export Audio function. This version now includes them.
SW-15587	ClearDesign	Bug	Resolves an issue on very large elections/ballot sets that could cause Printing of ballots to result in an internal server error.
SW-15634	ClearCount	Enhancement	RCV contest exports are created more efficiently, so that files can be ready for download more quickly
SW-15917	ClearDesign	Bug	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."
SW-16037	ClearCount	Bug	Resolves the issue in the previous ClearCount 2.5 version that did not correctly handle duplicate boxes
SW-7916	ClearCount	Bug	The SOVC by Choice report no longer includes withdrawn candidates.
SW-8069	ClearDesign	Enhancement	The DesignStation operating system has been upgraded to Windows 10 IoT Enterprise LTSC 2021.
SW-8070	ClearCount	Enhancement	The CountStation operating system has been upgraded to Windows 10 IoT Enterprise LTSC 2021.
SW-8071	ClearCount	Enhancement	The ScanStation operating system has been upgraded to Windows 10 IoT Enterprise LTSC 2021.

Table 1-1 Submitted Modifications *(continued)*

Unique ID	Component(s)	Type of Change	Description
SW-8164	ClearMark	Enhancement	The ClearMark code has been updated to Python 3.
SW-8166	ClearCount	Enhancement	The ClearCount code has been updated to Python 3.
SW-8167	ClearCast	Enhancement	The ClearCast code has been updated to Python 3.
SW-8168	ClearDesign	Enhancement	The ClearDesign code has been updated to Python 3.
SW-9194	ClearCount	Enhancement	"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-9523	ClearCast	Bug	Changing the time zone setting in ClearCast now also updates the current time accordingly.
SW-9597	ClearCast	Enhancement	Updates logging to record any time that a low battery warning is presented.
SW-9689	ClearCast	Bug	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-9892	ClearMark	Enhancement	The ClearAccess software was ported to run on Ubuntu for ClearMark.

1.1.3 System Modification Evaluation

The submitted modifications to the ClearVote 2.5 System consist 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 as a ScanStation and a Brother HL-L2460DW printer to Clear Design and to ClearCount as a report printer, and the addition of the two ClearMark component configurations. To verify the modifications are successfully addressed throughout the test campaign, each modification will be tracked and verified during the execution of the relevant test area.

For example, source code changes will be verified during the source code review. Modifications requiring functional test verification will be evaluated by executing the standard Accuracy Test, the System Integration Test, or during performance of the FCA. Modifications that are not adequately evaluated during the performance of these tests will be subjected to specifically designed test cases.

1.1.4 Initial Assessment

An initial assessment on the submitted modifications was performed to determine the scope of testing. Testing from the previous test campaign was used to establish the baseline. Based on the assessment, it was determined the following tasks would be required to verify compliance of the modifications:

- Source Code Review, Compliance Build, Trusted Build, and Build Document Review
- Physical Configuration Audit (PCA)
- System Level Testing
    - System Integration
    - Accuracy
    - Volume & Stress
- Technical Documentation Package (TDP) Review
- Functional Configuration Audit (FCA), including Regression Testing
- Usability & Accessibility *(ClearMark)*
- Security
- Hardware Testing *(ClearMark, ClearCount)*

1.1.5 Regression Test

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 is to establish assurance that the modifications have no adverse impact on the compliance, integrity, or performance of the system.

Regression testing for this test campaign will consist of the execution of the System Integration and Accuracy Tests.

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 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
- Pro V&V Test Report No. TR-01-01-CBG-006-01.03, *Test Report for EAC 2005 VVSG Certification Testing Clear Ballot Group ClearVote 2.3 Voting System*
- EAC Requests for Interpretation (RFI) and Notices of Clarification (NOC) (listed on www.eac.gov)
- Clear Ballot Group's Technical Data Package *(A listing of the ClearVote 2.5 documents submitted for this test campaign is listed in Section 4.5.1 of this Test Plan)*

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

"TDP" – Technical Data Package

"UPS" – Uninterruptible Power Supply

"VSTL" – Voting System Test Laboratory

"VVSG" – Voluntary Voting System Guidelines

1.4 Project Schedule

The Project Schedule for the test campaign is located in Attachment A. The dates on the schedule are not firm dates but planned estimates based on the anticipated project work flow.

1.5 Scope of Testing

The scope of testing focused on evaluating the modifications detailed in Section 1.1.3 of this Test Plan. Primarily, these modifications focused on upgrades to the components of the previously certified ClearVote 2.3. 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. A breakdown of the areas and associated tests is listed below:

- EAC VVSG 1.0 Volume 1, 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 & Accessibiliy
  - Usability & Accessibility Testing (ClearMark)
  - Technical Documentation Package (TDP) Review
- EAC VVSG 1.0 Volume 1, Section 4: Hardware Requirements
  - Environmental Requirements
    - Electrical Tests (ClearMark)
    - Environmental Tests (ClearMark, ClearCount)
  - Technical Documentation Package (TDP) Review
- EAC VVSG 1.0 Volume 1, 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 2.3 and was therefore not included in 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.

1.5.1 VVSG

The ClearVote 2.5 shall be 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.

1.5.2 RFIs

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

1.5.3 NOCs

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

1.6 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 tables below detail the submitted ClearVote 2.5 equipment.

Table 1-2. ClearVote 2.5 Voting System Equipment

Component	Model	Description
ClearDesign Components		
Dell Latitude Laptop	5580, 5590, 5500, 5511, 5521, 5540, 5550	ClearDesign DesignStation.
Lenovo ThinkPad	E14 G4	ClearDesign DesignStation.
Dell OptiPlex (client)	XE3 SFF, XE4 SFF	ClearDesign DesignStation.
Dell PowerEdge Server	T130, T140, T150, R440, R450, T440, T630	ClearDesign DesignServer.
Brother Laser Printer	HL-L2350DW, HL-L2460DW	Duplex laser report printer.
ClearAccess Components		
ELO 15 inch EloPOS	EPS15E2	All-in-One touchscreen.
ELO 15 inch AIO	E-Series (ESY15E2)	All-in-One touchscreen.
ELO 15 inch AIO	X-Series (ESY20X2)	All-in-One touchscreen.

Table 1-2. ClearVote 2.5 Voting System Equipment *(continued)*

Component	Model	Description
Dell OptiPlex	5250	All-in-One touchscreen.
Oki Data Laser Printer	B432dn	Duplex laser ballot printer.
Lexmark Laser Printer	MS521dn	Duplex laser ballot printer.
CyberPower Smart App UPS	PR1500RT2U	External uninterruptible power supply.
APC Smart UPS	SRT1500RMXLA	External uninterruptible power supply.
Storm EZ Access Keypad	EZ08-22201	Accessible keypad input device.
Storm EZ Access Keypad	EZ08-22000	Accessible keypad input device.
Zebra Technologies Barcode Scanner	DS457-SR	Barcode Scanner
ELO Barcode Scanner	UM600149	Barcode Scanner
ClearAccess Transportation and Setup Case	62311-1-1, 62312-1-1	Case for ClearAccess ELO touchscreen computer, Lexmark printer, headphones, keypad, and associated cables.
ClearCount Components		
Dell PowerEdge Server	T130, T140, T150, T330, T440, R440, R450	ClearCount CountServer.
Lenovo ThinkServer	TS140	ClearCount CountServer.
Dell OptiPlex	XE3 SFF, XE4 SFF	ClearCount CountStation.
Dell Latitude Laptop	5580, 5590, 5500, 5511, 5520, 5540, 5550	ClearCount CountStation.
Lenovo ThinkPad	E14 G4	ClearCount CountStation.
Dell Latitude Laptop	5580, 5590, 5500, 5511, 5520, 5540, 5550	ClearCount ScanStation.
Lenovo ThinkPad	E14 G4	ClearCount ScanStation.
Fujitsu/Ricoh Scanner	fi-7180	Central-count scanner.
Fujitsu/Ricoh Scanner	fi-6800	Central-count scanner.
Fujitsu/Ricoh Scanner	fi-6400	Central-count scanner.
Fujitsu/Ricoh Scanner	fi-7600	Central-count scanner.
Fujitsu/Ricoh Scanner	fi-7800	Central-count scanner.
Fujitsu/Ricoh Scanner	fi-7900	Central-count scanner.
Fujitsu/Ricoh Scanner	fi-8950	Central-count scanner.
Brother Laser Printer	HL-L2350DW, HL-L2460DW	Duplex laser report printer.

Table 1-2. ClearVote 2.5 Voting System Equipment *(continued)*

Component	Model	Description
APC Smart-UPS	SMT-1500C	External uninterruptible power supply.
ClearCast Components		
ClearCast	Model D Revision 5	Precinct scanner.
ClearCast Go	Model E	Precinct scanner.
Corsair Flash Padlock 3 32 GB	CMFPLA3B-32G	Secure USB 3.0 Flash Drive.
Corsair Flash Voyager GTX	CMFVYGTX3C-128GB	3.1 USB Drive.
SanDisk Extreme Go 64 GB USB	SDCZ800-064G-G46	3.0 USB Drive.
SanDisk Extreme Pro 128 GB USB	SDCZ880-1284G-G46	3.0 USB Drive.
SanDisk Ultra Flair 32 GB USB	SDCZ73-032G-A46/G46	3.0 USB Drive.
Ballot Bag	1032-1.5, 1032-2.0	Collapsible ballot bag.
Ballot Box	1033-1.5, 1033-2.0	Collapsible ballot box.
Transport Ballot Box	61211-1-3	Transportation ballot box.
ClearCast Go Collapsible Ballot Box Products	Standard (14148) Long (14156)	ClearCast Go Component: Soft Collapsible Ballot Receptacle Configurations
ClearCast Go Collapsible Ballot Box Products	Standard (14452) Long (14460)	Soft Insert Collapsible Ballot Receptacle, Configurations
ClearMark Components		
ClearMark AIO Touchscreen	46100-1-1	Precinct scanner.
ClearMark Thermal Printer	46200-1-1	Thermal printer.
Lexmark Laser Printer	MS521dn	Duplex laser ballot printer.
Ballot Scanner	46300-1-1	Ballot verification scanner.
CyberPower Smart App UPS	PR1500RT2U	External uninterruptible power supply.
Transportation and Setup Case	62321-1-2, 62322-1-2	Case for ClearMark All-in-One, Lexmark printer, scanner module, headphones, keypad, and associated cables.

1.6.1 System Diagram

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

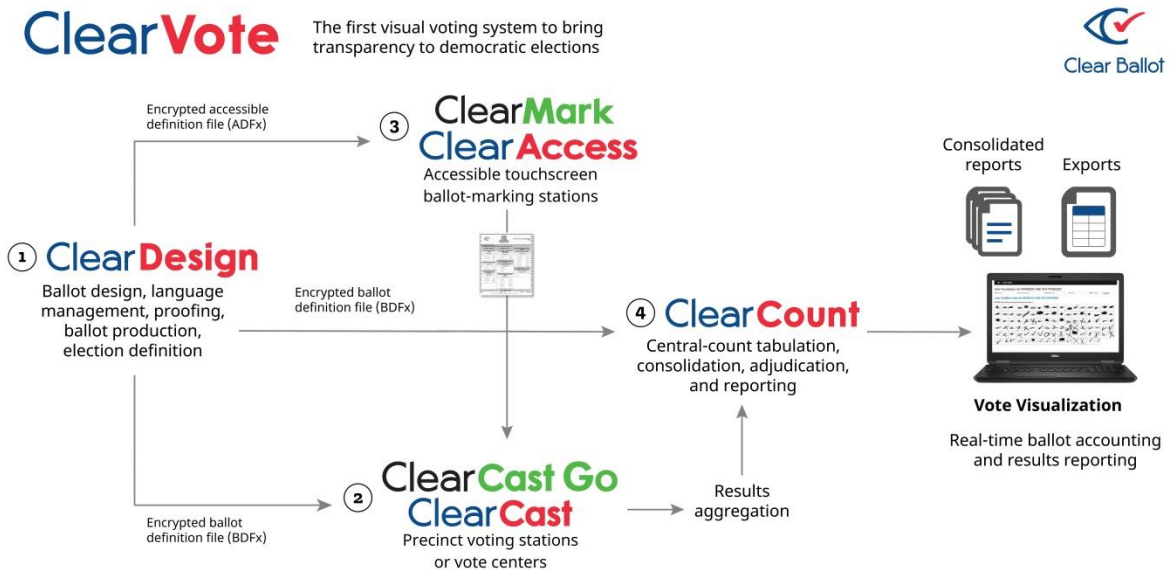

Figure 1-1. ClearVote 2.5 Product Relationship

1.6.2 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 1-3 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
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

Table 1-3 ClearVote System Limits

Characteristic	Limit
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

1.6.3 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 will be cast during the performance of functional testing. Additionally, one character based language (Chinese) will be tested during System Integration Testing.

For the character based language, the ballot will be 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 will be created using a readily available online translation tool. The translated language text will be entered into the ClearDesign Application. A ballot preview will be generated in the ClearDesign application. The Chinese characters displayed in the ballot preview will be compared to the characters generated by the online translation tool, to ensure that the characters match. The ballots will then be 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 will be compared to the original Chinese Characters generated by the online translation tool to verify that the characters match.

1.6.4 Supported Functionality

The ClearVote 2.5 is designed 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
- Ranked Choice Voting (RCV)

2.0 PRE-CERTIFICATION TESTING AND ISSUES

The following pre-certification testing has been performed on an "At-Risk" basis:

Technical Data Package (TDP) Review

An initial TDP review was performed on the documents submitted for this test campaign. The initial review is an abbreviated review performed in order to determine if the documents contain sufficient information.

Physical Configuration Audit (PCA)

An initial PCA has been performed to baseline the system prior to test campaign commencement. The PCA was performed by documenting each hardware and software component of the voting system by name, model, serial number, major component, and any other relevant information needed for identification.

Hardware Testing

As of the release of this Test Plan, hardware testing on the ClearMark component has been successfully completed for a state-level effort. The results of this testing will be submitted to the EAC for evaluation and consideration for re-use to satisfy this test effort.

2.1 Evaluation of Prior VSTL Testing

Pro V&V evaluated to the published Final Test Report for the baseline system (ClearVote 2.3) in order to baseline the current system under test.

2.2 Evaluation of Prior Non-VSTL Testing

No prior non-VSTL testing of the ClearVote 2.5 modifications were considered for this test campaign

2.3 Known Field Issues

The ClearVote 2.5 is a modification to a previously certified system and has not been fielded for use.

3.0 MATERIALS REQUIRED FOR TESTING

The following sections list all materials needed to enable the test engagement to occur.

The materials required for testing of the ClearVote 2.5 Voting System include all materials to enable the test campaign to occur. This includes the applicable hardware and software as well as the TDP, test support materials, and deliverable materials, as described in the following subsections.

3.1 Software

This subsection lists the proprietary and COTS software to be provided by the manufacturer as part of the test campaign.

All software submitted for testing is identified in Table 3-1. Pro V&V will perform a comparison on the submitted source code against the previously certified versions. Pro V&V will review the

submitted modified source code to the EAC VVSG 1.0 and the manufacturer-submitted coding standards.

Table 3-1. Software

Material	Version	Description
ClearDesign	2.5.0	EMS Software
ClearAccess	2.5.0	BMD software
ClearCount	2.5.0	Central Count and Tabulation Software
ClearCast	2.5.0	Precinct Count Software
ClearCast Go	2.5.0	Precinct Count Software
ClearMark	2.5.0	BMD Software

3.2 Equipment

This subsection lists the proprietary and COTS equipment provided by the manufacturer as part of the test campaign.

All proprietary and COTS equipment provided for testing was inspected as part of the PCA and is identified in Section 4.5.3 of this test plan. For COTS equipment, every effort was made to verify that the COTS equipment has not been modified for use. This was accomplished by performing research using the COTS equipment manufacturer's websites based on the serial numbers and service tag numbers for each piece of equipment. Assigned test personnel will evaluate COTS hardware, system software and communications components for proven performance in commercial applications other than voting. For PCs, laptops, and servers, the service tag information will be compared to the system information found on each machine.

Physical external and internal examination will also be performed when the equipment is easily accessible without the possibility of damage. Hard drives, RAM memory, and other components will be examined to verify that the components match the information found on the COTS equipment manufacturer's websites.

3.3 Test Materials

This subsection lists the test materials required to execute the required tests throughout the test campaign.

The following materials are expected to be supplied by Clear Ballot to facilitate testing:

- USB flash drives
- test decks, 3 in. thermal paper, 24 lb. bond or similar paper for results reports
- ballot paper (60 lb. cover stock, 65 lb. cover stock, 90 lb. index stock, thermal paper)
- power cords, monitor cables, USB cables, and Ethernet cables
- security seals, security ties, and ballot marking devices.
- Other materials and equipment as required

3.4 Proprietary Data

All data and documentation considered by the manufacturer to be proprietary will be identified and documented in an independent submission along with a Notice of Protected Information.

4.0 TEST SPECIFICATIONS

Certification testing of the Clear Ballot Group ClearVote 2.5 Voting System submitted for evaluation will be performed to ensure the applicable requirements of the EAC 2005 VVSG and the EAC Testing and Certification Program Manual, Version 3.0, are met. Additionally, all EAC Requests for Interpretation (RFI) and Notices of Clarification (NOC) relevant to the system under test will be incorporated in the test campaign. A complete listing of the EAC RFIs and NOCs is available on the EAC website.

4.1 Requirements (Strategy of Evaluation)

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. Based on this assessment, it was determined the following evaluations would be required to verify compliance of the modifications:

Section 1: Technical Documentation Package (TDP) Review

A TDP Review will be performed to ensure that all submitted modifications are accurately documented and that the documents meet the requirements of the EAC VVSG 1.0. The preliminary TDP review is performed to gather information concerning the system under test and its capabilities or design intentions. Additionally, a TDP review will be performed throughout the test campaign. The TDP Review includes the Initial Review, the Regulatory/Compliance Review, and the Final Review. This review is conducted to determine if the submitted technical documentation meets the regulatory, customer-stated, or end-user requirements and includes reviewing the documents for stated functionality and verification.

Section 2: Functional Requirements

The requirements in this section shall be tested during the FCA, Accuracy Test, and System Integration Test. This evaluation will utilize baseline test cases as well as specifically designed test cases and will include predefined election definitions for the input data.

The FCA targets the specific functionality claimed by the manufacturer to ensure the product functions as documented. This testing uses both positive and negative test data to test the robustness of the system. The FCA encompasses an examination of manufacturer 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 (such as system operations, voter manual, maintenance, and diagnostic testing manuals). It includes a test of system operations in the sequence in which they would normally be performed. These system operations and functional capabilities are categorized as follows by the phase of election activity in which they are required:

- Overall System Capabilities: These functional capabilities apply throughout the election process. They include security, accuracy, integrity, system audit ability, election management system, vote tabulation, ballot counters, telecommunications, and data retention.

- 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.

- Maintenance, Transportation and Storage Capabilities: These capabilities are necessary to maintain, transport, and store voting system equipment.

The system integration testing addresses the integration of the hardware and software. This testing focuses on the compatibility of the voting system software components and subsystems with one another and with other components of the voting system. During test performance, the system is configured as would be for normal field use.

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.

Section 3: Usability and Accessibility Requirements

The requirements in this section shall be tested during the Usability and Accessibility Testing. This evaluation will utilize baseline test cases as well as specifically designed test cases and will include predefined election definitions for the input data.

The usability testing focuses on the usability of the system being tested. Usability is defined generally as a measure of the effectiveness, efficiency, and satisfaction achieved by a specified set of users with a given product in the performance of specified tasks. In the context of voting, the primary user is the voter, the product is the voting system, and the task is the correct recording of the voter ballot selections. Additional requirements for task performance are independence and privacy: the voter should normally be able to complete the voting task without assistance from others, and the voter selections should be private. Accessibility evaluates the requirements for accessibility. These requirements are intended to address HAVA 301 (a) (3) (B).

Section 4: Hardware Requirements

Hardware modifications include the addition of a Ricoh fi-7600 scanner and Ricoh fi-8950 scanner to ClearCount as a ScanStation and a Brother HL-L2460DW printer to Clear Design and to ClearCount as a report printer, and the addition of the two ClearMark component configurations.

The full suite of hardware electrical and environmental tests for the ClearMark was successfully performed as part of a previous state level test campaign. The associated hardware test reports of this testing will be submitted to the EAC for evaluation and approval for reuse to satisfy the hardware test requirements in this test campaign.

Pro V&V utilized third-party testing during the performance of hardware testing. All hardware testing was performed at the NTS/Element Longmont facility located in Longmont, Colorado. All testing was witnessed on-site by Pro V&V personnel, with the exception of the Temperature/Power variation Test in which Pro V&V qualified staff executed all testing at the NTS/Element Longmont facility.

Section 5: Software Requirements

The requirements in this section shall be tested utilizing a combination of review and functional testing during the source code review, TDP review, and FCA.

To perform the source code review, Pro V&V will review the submitted source code to the EAC VVSG 1.0 and the manufacturer-submitted coding standards. Prior to initiating the software review, Pro V&V shall verify that the submitted documentation is sufficient to enable: (1) a review of the source code and (2) Pro V&V to design and conduct tests at every level of the software structure to verify that design specifications and performance guidelines are met. The source code review includes a compliance build and a trusted build of the submitted source code.

Section 7: Security Requirements

The requirements in this section shall be tested during the source code review, security tests, and FCA.

To evaluate the integrity of the system, Pro V&V will develop specifically designed test cases in an attempt to defeat the access controls and security measures documented in the system TDP as well as verifying compliance to EAC RFI 2012-05. During the security testing, the system shall be inspected for various controls and measures that are in place to meet the objectives of the security standards which include: protection of the critical elements of the voting system; establishing and maintaining controls to minimize errors; protection from intentional manipulation, fraud and malicious mischief; identifying fraudulent or erroneous changes to the voting system; and protecting the secrecy in the voting process.

The threat matrix identifying the system's risks and vulnerabilities shall be 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, source code review, and static code analyzers. All findings will be reported to the EAC and CBG.

4.1.1 Rationale for 'Not Applicable' Requirements

All requirements that were excluded from the previous test campaign (ClearVote 2.3) were also deemed not applicable to this test campaign due to the submitted modifications not impacting the specific requirements.

4.2 Hardware Configuration and Design

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

ClearCast – The ClearCast and ClearCast Go components were previously subjected to hardware testing. Both components will be subjected to Usability, Security, Maintainability, Availability, and Accuracy Testing.

ClearAccess – The ClearAccess component was previously subjected to hardware testing. Both components will be subjected to Usability, Security, Maintainability, Availability, and Accuracy Testing.

ClearCount – The ClearCount component is unmodified COTS equipment and is exempt from non-operational hardware testing. ClearCount was previously subjected to Temperature/Power Variation Testing in conjunction with the ClearCast and ClearAccess in addition to being utilized in functional and system level testing such as accuracy, volume and stress, and system integration during the baseline test campaign, the results of which are contained in the final certification test report for the baselined system.

ClearDesign – The ClearDesign component is unmodified COTS equipment and is exempt from non-operational hardware testing.

ClearMark – The ClearMark component was previously subjected to hardware testing. Both components will be subjected to Usability, Security, Maintainability, Availability, and Accuracy Testing.

4.3 Software System Functions

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 ClearDesign and ClearCount.

4.4 Test Case Design

Test cases are designed based on the manufacturer's design specifications and the relevant technical requirements set forth by the VVSG. Test cases shall be based on the following aspects of the voting system: software module test case design and data, software functional test case design, and system level test case design.

Test cases shall provide information regarding the sequence of actions to be performed for the execution of a test, the requirements being met, the test objective, test configuration, equipment needed, special requirements, assumptions, and pass/fail criteria. Once the test cases are finalized, they will be validated and published for use in the test campaign. The validation of the test case will be accomplished by technical review and approval. This validation will include the following: confirmation of adequate test coverage of all requirements; confirmation that test case results are not ambiguous and gave objective pass/fail criteria; and confirmation that any automated test suites will produce valid results.

4.4.1 Hardware Qualitative Examination Design

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 has been conducted on a parallel state certification effort and will be petitioned for reuse for this campaign.

Previous hardware examinations were performed on the certified baseline system (ClearVote 2.3). Hardware modifications to the baseline system require 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

4.4.2 Hardware Environmental Test Case Design

Previous hardware examinations were performed on certified versions of the baseline system (ClearVote 2.3). The updates to the modified system (ClearVote 2.5) require the tests specified in Section 4.4.1 to be performed. The full suite of hardware electrical testing and operational environmental testing were successfully performed to meet state level test campaign requirements. The Pro V&V test report and associated hardware test reports of this testing will be submitted to the EAC for evaluation and consideration for reuse in this test campaign.

Testing was performed by personnel verified by Pro V&V to be qualified to perform the test. Pro V&V utilized NTS Longmont for the performance of the electrical and environmental tests. All pre/post-tests were conducted by Pro V&V personnel.

4.4.3 Software Module Test Case Design and Data

Pro V&V shall review the manufacturer's program analysis, documentation, and module test case design and shall evaluate the test cases for each module with respect to flow control parameters and entry/exit data. As needed, Pro V&V shall design additional test cases to satisfy the coverage criteria specified in Volume II, Section 7.2.1.

Component Level Testing will be implemented during the FCA for each component and subcomponent. During the Source Code Review and Compliance Builds, Pro V&V will utilize limited structural-based techniques (white-box testing). Additionally, specification-based techniques (black-box testing) will be utilized for the individual software components.

Pro V&V shall define the expected result for each test and the ACCEPT/REJECT criteria for certification. If the system performs as expected, the results will be accepted. If the system does not perform as expected, an analysis will be performed to determine the cause. The test will be repeated in an attempt to reproduce the results. If the failure can be reproduced and the expected results are not met, the system will have failed the test. If the results cannot be reproduced, the test will continue. All errors encountered will be documented and tracked through resolution.

4.4.4 Software Functional Test Case Design and Data

Pro V&V shall review the manufacturer-submitted test plans and data to verify that the individual performance requirements specified in the EAC 2005 VVSG and the TDP are reflected in the software. As part of this process, Pro V&V shall review the manufacturer's test case design and prepare a detailed matrix of system functions and the test cases that exercise them. During this review, emphasis shall be placed on those functions where the manufacturer data on module development reflects significant debugging problems, and on functional tests that resulted in high error rates.

Pro V&V shall also prepare a test procedure describing all test ballots, operator procedures, and the data content of output reports. Pro V&V shall define abnormal input data and operator actions and then design test cases to verify that the system is able to handle and recover from these abnormal conditions. Pro V&V shall define the expected result for each test and the ACCEPT/REJECT criteria for certification. If the system performs as expected, the results will be

accepted. If the system does not perform as expected, an analysis will be performed to determine the cause. The test will be repeated in an attempt to reproduce the results. If the failure can be reproduced and the expected results are not met, the system will have failed the test. If the results cannot be reproduced, the test will continue. All errors encountered will be documented and tracked through resolution.

4.4.5 System-Level Test Case Design

System Level testing will be implemented to evaluate the complete system. This testing will include all proprietary components (software, hardware, and peripherals) and COTS components (software, hardware, and peripherals) in a configuration of the system's intended use.

For software system tests, the tests shall be designed according to the stated design objective without consideration of its functional specification. The system level hardware and software test cases shall be prepared independently to assess the response of the hardware and software to a range of conditions.

4.5 Test Specifications

Descriptions of the tests required to evaluate the ClearVote 2.5 to the scope defined in Section 1.5 are provided in the subsections below.

4.5.1 TDP Evaluation

In order to determine compliance of the modified TDP documents with the EAC 2005 VVSG, a limited TDP review shall be conducted. This review will focus on TDP documents that have been modified since the certification of the baseline system. The review will consist of a compliance review to determine if each regulatory, state, or manufacturer-stated requirement has been met based on the context of each requirement. Results of the review of each document will be entered on the TDP Review Checklist and reported to the manufacturer for disposition of any anomalies. This process will be ongoing until all anomalies are resolved. Any revised documents during the TDP review process will be compared with the previous document revision to determine changes made, and the document will be re-reviewed to determine whether subject requirements have been met.

A listing of all documents contained in the ClearVote 2.5 TDP is provided in Table 4-1.

Table 4-1. TDP Documents

Document Number	Description	Version
ClearVote Documents		
100101	ClearVote 2.5 Approved Parts List	2.5.6
100067	ClearVote 2.5 Ballot Stock and Printing Specification	2.5.3
100057	ClearVote 2.5 Configuration Management Plan	2.5.2

Table 4-1. TDP Documents *(continued)*

Document Number	Description	Version
100151	ClearVote 2.5 ClearVote Disc Content and Compilation Procedures	2.5.5
100069	ClearVote 2.5 Glossary	2.5.4
100058	ClearVote 2.5 Personnel Deployment and Training Plan	2.5.2
100059	ClearVote 2.5 Quality Assurance Program	2.5.4
100086	ClearVote 2.5 Security Policy	2.5.3
100071	ClearVote 2.5 System Overview	2.5.4
100073	ClearVote 2.5 Test and Verification Specification	2.5.2
100132	ClearVote 2.5 Change Notes	---
ClearDesign Documents		
100011	ClearDesign 2.5 Acceptance Test Checklist	2.5.1
100062	ClearDesign 2.5 Administration Guide	2.5.3
100083	ClearDesign 2.5 Build Procedures	2.5.2
100103	ClearDesign 2.5 Database Specification	2.5.1
100046	ClearDesign 2.5 Functionality Description	2.5.2
100098	ClearDesign 2.5 Hardware Specification	2.5.2
100063	ClearDesign 2.5 Installation Guide	2.5.5
100082	ClearDesign 2.5 Maintenance Guide	2.5.2
100045	ClearDesign 2.5 Security Specification	2.5.2
100072	ClearVote 2.5 ClearDesign Software Design and Specification	2.5.3
100043	ClearDesign 2.5 System Overview	2.5.3
100133	ClearDesign 2.5 Accessible Definition File Guide	2.5.2
100131	ClearDesign 2.5 Ballot Definition File Guide	2.5.2
100074	ClearDesign 2.5 System Identification Guide	2.5.0
100041	ClearDesign 2.5 User Guide	2.5.3
100121	ClearVote 2.5 ClearDesign DesignServer SCAP Checklist Ubuntu 20.04	2.5.0
100122	ClearVote 2.5 ClearDesign DesignStation SCAP Checklist	2.5.0
---	ClearDesign Election Model	---
---	ClearDesign 2.5 System Model	---
---	CBG Web Model	---

Table 4-1. TDP Documents *(continued)*

Document Number	Description	Version
ClearCount Documents		
100102	ClearCount 2.5 Acceptance Test Checklist	2.5.1
100009	ClearCount 2.5 Build Procedures	2.5.2
100005	ClearCount 2.5 Database Specification	2.5.1
100004	ClearCount 2.5 Election Administration Guide	2.5.3
100006	ClearCount 2.5 Installation Guide	2.5.6
100021	ClearCount 2.5 Functionality Description	2.5.1
100022	ClearCount 2.5 Hardware Specification	2.5.2
100023	ClearCount 2.5 Maintenance Guide	2.5.1
100070	ClearCount 2.5 Reporting Guide	2.5.3
100013	ClearCount 2.5 Scanner Operator Guide	2.5.3
100026	ClearCount 2.5 Security Specification	2.5.2
100019	ClearCount 2.5 Software Design and Specification	2.5.2
100024	ClearCount 2.5 System Operations Procedures	2.5.1
100025	ClearCount 2.5 System Overview	2.5.2
---	ClearCount 2.5 Quick Guide XML Report Conversion Tool	---
100047	ClearCount 2.5 System Identification Guide	2.5.2
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	2.5.1
100156	"ClearVote 2.5 ClearCount ScanStation SCAP Checklist Windows 10 loT LTSC"	2.5.1
ClearCast Documents		
100134	ClearCast 2.5 Hardware Acceptance Test Checklist	2.5.1
100135	ClearCast 2.5 Software Acceptance Test Checklist	2.5.1
100097	ClearCast 2.5 System Identification Guide	2.5.1
100094	ClearCast 2.5 Build Procedures	2.5.2
100079	ClearCast 2.5 Functionality Description	2.5.1
100080	ClearCast 2.5 Installation Guide	2.5.2
100081	ClearCast 2.5 Hardware Specification	2.5.1
100089	ClearCast 2.5 Maintenance Guide	2.5.5

Table 4-1. TDP Documents *(continued)*

Document Number	Description	Version
100090	ClearCast 2.5 Poll Worker Guide	2.5.5
100084	ClearCast 2.5 Security Specification	2.5.1
100093	ClearCast 2.5 Software Design and Specification	2.5.2
100100	ClearCast 2.5 Supervisor Guide	2.5.5
100078	ClearCast 2.5 System Overview	2.5.3
100148	ClearVote 2.5 ClearCast Go System Identification Guide	2.5.1
100142	ClearVote 2.5 ClearCast Go Maintenance Guide	2.5.4
100143	ClearVote 2.5 ClearCast Go Poll Worker Guide	2.5.6
100144	ClearVote 2.5 ClearCast Go Supervisor Guide	2.5.6
100147	ClearCast Go 2.5 Hardware Acceptance Test Checklist	2.5.1
100146	ClearVote 2.5 ClearCast Go Installation Guide	2.5.1
100145	ClearVote 2.5 ClearCast Go Build Procedures	2.5.3
100176	ClearVote 2.5 ClearCast Go System Overview	2.5.1
100149	ClearCast Go 2.5 SCAP Checklist Ubuntu 20.04	2.5.1
100123	ClearVote 2.5 ClearCast SCAP Checklist Ubuntu 20.04	2.5.2
ClearAccess Documents		
100109	ClearAccess 2.5 Acceptance Test Checklist	2.5.1
100051	ClearAccess 2.5 Build Procedures	2.5.4
100049	ClearAccess 2.5 Functionality Description	2.5.2
100085	ClearAccess 2.5 Hardware Specification	2.5.2
100053	ClearAccess 2.5 Installation Guide	2.5.4
100052	ClearAccess 2.5 Maintenance Guide	2.5.4
100054	ClearAccess 2.5 Poll Worker Guide	2.5.4
100050	ClearAccess 2.5 Security Specification	2.5.2
100099	ClearAccess 2.5 Software Design and Specification	2.5.3
100055	ClearAccess 2.5 Supervisor Guide	2.5.4
100044	ClearAccess 2.5 System Overview	2.5.3
100056	ClearAccess 2.5 Voter Guide	2.5.1
100038	ClearAccess 2.5 System Identification Guide	2.5.2
100120	ClearVote 2.5 ClearAccess SCAP Checklist Windows 10 loT LTSC	2.5.2

Table 4-1. TDP Documents *(continued)*

Document Number	Description	Version
---	Perkins Prior Test Addendum	---
ClearMark Documents		
100159	ClearMark 2.5 Build Procedures	2.5.3
100172	ClearMark 2.5 Functionality Description	2.5.2
100165	ClearMark 2.5 Hardware Acceptance Test Checklist	2.5.1
100161	ClearMark 2.5 Hardware Specification	2.5.2
100160	ClearMark 2.5 Installation Guide	2.5.3
100162	ClearMark 2.5 Maintenance Guide	2.5.2
100163	ClearMark 2.5 Poll Worker Guide	2.5.2
100169	ClearMark 2.5 Security Specification	2.5.2
100166	ClearMark 2.5 Software Acceptance Test Checklist	2.5.1
100170	ClearMark 2.5 Software Design and Specification	2.5.4
100164	ClearMark 2.5 Supervisor Guide	2.5.2
100168	ClearMark 2.5 System Identification Guide	2.5.2
100171	ClearMark 2.5 System Overview	2.5.3
100167	ClearMark 2.5 SCAP Checklist Ubuntu 20.04	2.5.1
---	Usability Test Report ClearMark Ballot Marking System	n/a

4.5.2 Source Code Review

Pro V&V will review the submitted source code to the EAC 2005 VVSG and the manufacturer-submitted coding standards. Prior to initiating the software review, Pro V&V shall verify that the submitted documentation is sufficient to enable: (1) A review of the source code and (2) Pro V&V to design and conduct tests at every level of the software structure to verify that design specifications and performance guidelines are met.

The submitted source code will be compared to the previously certified ClearVote 2.3 voting system versions to determine the changes, if any. A combination of Automated Source Code Review and Manual Source Code Review methods will then be used to review the changes in the source code. A compliance review of all modified source code will be performed. Once the compliance review is performed and the source is deemed stable enough to proceed with testing, the source code and all additional packages will be compiled into a Compliance Build. Following successful completion of the FCA, a Trusted Build will be performed. The trusted build consists of inspecting the submitted source code, COTS, and third-party software products and combining them to create the executable code following the documented process from the "United States

Election Assistance Commission Voting System Test Laboratory Program Manual" Section 5.5 – 5.7. Performance of the trusted build includes the build documentation review.

The Automated Source Code Review will be performed during the Compliance and Trusted Builds. In addition, 10% of the source code comments will be manually reviewed.

4.5.3 Physical Configuration Audit (PCA)

The Physical Configuration Audit (PCA) 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, Pro V&V shall 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.

The initial PCA for this campaign has been completed. The tables below detail the model and serial number of the ClearVote 2.5 components submitted for evaluation.

Table 4-2. ClearVote 2.5 PCA

Component	Model	Serial Number
ClearDesign Components		
Dell Latitude Laptop	5580, 5590, 5500, 5511, 5521, 5540	2F3L3G2, 9W5DIN2, JV3WXY2, 13KWY33, JM3WSG3, 31XXYW3
Lenovo ThinkPad	E14 G4	PF-48B509
Dell OptiPlex (client)	XE3 SFF, XE4 SFF	93VDB03, D36DDZ3
Dell PowerEdge Server	T130, T140, T150, R440, R450	5G0YLN2, 8BFH3W2, 30318V3, 55BGB03, 9LHGDZ3

Table 4-2. ClearVote 2.5 PCA

Component	Model	Serial Number
ClearAccess Components		
ELO 15 inch EloPOS	EPS15E2	J193011873, K193008678
ELO 15 inch AIO	E-Series (ESY15E2)	K17C012858
ELO 15 inch AIO	X-Series (ESY20X2)	B18Q001601
Oki Data Laser Printer	B432dn	BW0107753CD
Lexmark Laser Printer	MS521dn	4600952318T35
CyberPower Smart App UPS	PR1500RT2U	PY3JT2000004
APC Smart UPS	SRT1500RMXLA	AS2155292757
Storm EZ Access Keypad	EZ08-22000	20010073, 20010615, 20011230
Origin Instruments Sip/Puff Breeze with Headset	BZ2	0500
Origin Instruments Sip/Puff Breeze with Headset	BZ2U	0748
Samson Over-Ear Stereo Headphones	SASR350	SR350J8G390 & SR350J8G396
ClearAccess Transportation and Setup Case	62311-1-1, 62312-1-1	CBG-001, CBG-002
ClearCount Components		
Dell PowerEdge Server (CountServer)	T130, T140, T330, R440, R450	5G0ZLN2, 8BFJ3W2, FHV9RD2, 55FDB03, DZZY7V3
Lenovo ThinkServer (CountServer)	TS140	MJ0472UV
Dell OptiPlex (CountStation)	XE3 SFF, XE4 SFF	93XDB03, 6461SY3
Dell Latitude Laptop (CountStation, ScanStation)	5590, 5500, 5511, 5521, 5540	DP5D1N2, 76YL9Y2,13KWY33, JM3WSG3, 31XXYW3
Lenovo ThinkPad Laptop (CountStation, ScanStation)	E14 G4	PF-48B509
Fujitsu/Ricoh Scanner	fi-7180	A20DC10301
Fujitsu/Ricoh Scanner	fi-6800	100295
Fujitsu/Ricoh Scanner	fi-6400	AKHCC00609
Fujitsu/Ricoh Scanner	fi-7800	C39C000034
Fujitsu/Ricoh Scanner	fi-7900	C30C000270
APC Smart-UPS	SMT-1500C	3S1831X12280
ClearCast Components		
ClearCast	Model D Revision 5	CCD041904024, D-041902179
ClearCast Go	Model E	4410003224, 4410003729

Table 4-2. ClearVote 2.5 PCA

Component	Model	Serial Number
SanDisk Extreme Go 64 GB USB	3.0 USB Drive	SDCZ800-064G-G46
SanDisk Extreme Pro 64 GB USB	3.0 USB Drive	SDCZ880-128G-G46
SanDisk Ultra Flair 32 GB USB	3.0 USB Drive	SDCZ73-032G-A46, SDCZ73-032G-G46
Ballot Bag	CV-1032-1.5, CV-1032-2.0	bag001, bag002
Ballot Box	CV-1033-1.5, CV-1033-2.0	box001, box002
ClearCast Go Soft Collapsible Ballot Box	Standard (14148) Long (14156)	SCBB001, SCBB002
ClearMark Components		
ClearMark AIO Touchscreen	46100-1-1	4610001015, 4610001016, 46100010001, 4610001010
ClearMark Thermal Printer	46200-1-1	4620001281, 462001445
Lexmark Laser Printer	MS521dn	4600203423T1B, 4600203423NMC
Ballot Scanner	46300-1-1	4630001368, 4630001418
CyberPower Smart App UPS	PR1500RT2U	PVVLKP2000885
Transportation and Setup Case	62321-1-2, 62322-1-2	case001, case002

4.5.4 System Level Testing

System Level Testing will be implemented to evaluate the complete system. This testing will include all proprietary components and COTS components (software, hardware, and peripherals) in a configuration of the system's intended use. System Level Testing for this campaign includes the evaluations of the following test areas: FCA, Accuracy Testing, Volume & Stress, System Integration Testing, and Regression Testing.

For software system tests, the tests will be designed according to the stated design objective without consideration of its functional specification. The system level hardware and software test cases will be prepared independently to assess the response of the hardware and software to a range of conditions. Pro V&V will review the manufacturer's program analysis, documentation, and module test case design and evaluate the test cases for each module with respect to flow control parameters and entry/exit data.

Pro V&V defines the expected result for each test and the ACCEPT/REJECT criteria for certification. If the system performs as expected, the results will be accepted. If the system does not perform as expected, an analysis was performed to determine the cause. If needed, the test will be repeated in an attempt to reproduce the results. If the failure can't be reproduced and the expected results are not met, the system will be determined to have failed the test. If the results

can't be reproduced, the test will continue. All errors encountered will be documented and tracked through resolution.

4.5.4.1 Functional Configuration Audit (FCA)

The Functional Configuration Audit (FCA) targets the specific functionality claimed by the manufacturer to ensure the product functions as documented. This testing uses both positive and negative test data to test the robustness of the system. The FCA encompasses an examination of manufacturer 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 (such as system operations, voter manual, maintenance, and diagnostic testing manuals). It includes a test of system operations in the sequence in which they would normally be performed. These system operations and functional capabilities are categorized as follows by the phase of election activity in which they are required:

- Overall System Capabilities: These functional capabilities apply throughout the election process. They include security, accuracy, integrity, system auditability, election management system, vote tabulation, ballot counters, telecommunications, and data retention.

- 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.

- Maintenance, Transportation and Storage Capabilities: These capabilities are necessary to maintain, transport, and store voting system equipment.

In addition to functioning according to the manufacturer's documentation, tests will be conducted to insure all applicable EAC 2005 VVSG requirements are met.

4.5.4.2 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 the conversion of those selections detected on the paper ballot converted into digital data.

The accuracy requirements for ClearCount will be 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, and BMD ballots produced by ClearAccess and ClearMark. ClearCount and ClearCast will be tested by utilizing a combination of hand marked (70%) and pre-marked (30%) ballots.

4.5.4.3 System Integration

The System Integration area of testing is a system level test that evaluates the integrated operation of both hardware and software. Compatibility of the voting system software components or subsystems with one another, and with other components of the voting system environment, shall be determined through functional tests integrating the voting system software with the remainder of the system. Additionally, the system shall be configured exactly as it would for normal field use per the procedures detailed in the ClearVote 2.5 voting system technical documentation. This includes connecting all supporting equipment and peripherals including ballot boxes, voting booths (regular and accessible), and any physical security equipment such as locks and ties.

To accomplish the test objective, two General Elections and two Primary Elections will be 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 contest spread across the four precincts.

- General Election GEN-02: A General Election held in three precincts. This election contains fifteen contests, including one Ranked Choice Voting contest, compiled into three ballot styles. Ten of the contests are in all three ballot styles with the other five contests split across the three precincts. This election was designed to functionally test the handling of multiple ballot styles, support for Ranked Choice Voting, support for two languages, support for complex voting variations and ADA Audio capability for multiple.

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.

4.5.4.4 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 will be utilized to ensure the system can achieve the manufacturer's TDP claims of what the system can support. Testing will be performed by exercising multiple election definitions developed specifically to test for volume and stress conditions of the system being tested.

4.5.4.5 Regression Testing

Regression testing will be conducted on the ClearVote 2.5 to establish assurance that the modifications have no adverse impact on the compliance, integrity, or performance of the system.

4.5.5 Usability & Accessibility Testing

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

4.5.6 Security Testing

The objective of the Security Testing is 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 shall develop 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 shall be 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 the 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.

5.0 TEST DATA

The following subsections provide information concerning test data recording, criteria, and reduction.

5.1 Data Recording

All equipment utilized for test data recording shall be identified in the test data package. The output test data shall be recorded in an appropriate manner as to allow for data analysis. For source code and TDP reviews, results shall be compiled in reports and submitted to Clear Ballot Group for resolution.

5.2 Test Data Criteria

The ClearVote 2.5 Voting System shall be evaluated against all applicable requirements contained in the EAC 2005 VVSG. The acceptable range for system performance and the expected results for each test case shall be derived from the manufacturer-submitted technical documentation and the EAC 2005 VVSG.

6.0 TEST PROCEDURE AND CONDITIONS

The following subsections detail the facility requirements, test setup conditions, and sequence of testing.

6.1 Facility Requirements

Unless otherwise annotated, all testing shall be conducted at the Pro V&V test facility located in Huntsville, AL, by personnel verified by Pro V&V to be qualified to perform the test. Unless otherwise specified herein, testing shall be performed at the following standard ambient conditions and tolerances:

- Temperature: 68-75◦ F (±4◦F)
- Relative Humidity: Local Site Humidity
- Atmospheric Pressure: Local Site Pressure
- Time Allowable Tolerance: ±5%

Testing performed at third-party laboratories will be subject to the test parameters and tolerances defined by VVSG. If not specified in VVSG, the test facilities' standard parameters and tolerances will be used. These will be reported in the final Test Report.

6.2 Test Set-up

All voting system equipment shall be received and documented using Pro V&V proper QA procedures. Upon receipt of all hardware, an inspection will be performed to verify that the equipment received is free from obvious signs of damage and/or degradation that may have occurred during transit. If present, this damage shall be recorded, photographed, and reported to the Clear Ballot Group Representative. Additionally, a comparison shall be made between the recorded serial numbers/part numbers and those listed on shipper's manifest and any discrepancies shall be reported to the Clear Ballot Group Representative. TDP items and all source code received shall be inventoried and maintained by Pro V&V during the test campaign.

During test performance, the system shall be configured as it would be for normal field use. This includes connecting all supporting equipment and peripherals.

6.3 Test Sequence

The ClearVote 2.5 Voting System will be evaluated against all applicable requirements in the EAC 2005 VVSG. There is no required sequence for test performance.

6.4 Test Operations Procedure

Pro V&V will identify PASS/FAIL criteria for each executed test case. The PASS/FAIL criteria will be based on the specific expected results of the system. In the case of an unexpected result that deviates from what is considered standard, normal, or expected, a root cause analysis will be performed.

Pro V&V will evaluate every applicable EAC 2005 VVSG requirement. Any deficiencies noted will be reported to the EAC and the manufacturer. If it is determined that there is insufficient data to determine compliance, this test plan will be altered and additional testing will be performed.

ATTACHMENT A
PROJECT SCHEDULE

Task Name	Start Date	End Date
EAC Application & TRR	**08/21/23**	**03/11/24**
Application Submitted to EAC	08/21/23	08/21/23
TRR	09/05/23	09/21/23
Pen Testing	09/22/23	03/07/24
Application Approval from EAC	03/08/24	03/11/24
TDP	**08/22/23**	**05/15/24**
Initial Review	08/22/23	08/23/23
Compliance Review	08/24/23	05/13/24
Final review	05/14/24	05/15/24
Test Plan	03/29/24	08/09/24
Test Plan Creation	03/29/24	06/21/24
Vendor Review & Comments	06/24/24	06/25/24
EAC Submission and Review	06/26/24	07/23/24
VSTL Comment Review & Update	07/24/24	07/25/24
EAC Submission & Review of Revision	07/26/24	08/08/24
EAC Approved Test Plan	08/09/24	08/09/24
Source Code	**03/08/24**	**04/30/24**
Automated Review	03/08/24	04/19/24
Source Code Review	03/08/24	04/19/24
Source Code Re-Review	04/22/24	04/25/24
Document Review	04/26/24	04/26/24
Compliance Build	04/29/24	04/30/24
System Delivery & Setup	**03/08/24**	**07/10/24**
PCA	03/08/24	04/19/24
System Setup	05/01/24	07/03/24
System Loads & Hardening	07/04/24	07/10/24
System Level Testing	**07/11/24**	**11/06/24**
FCA	07/11/24	10/02/24
Security	10/03/24	10/04/24
Usability	10/07/24	10/09/24
Accessibility	10/07/24	10/08/24
Volume and Stress	10/09/24	10/14/24
Accuracy	10/15/24	10/21/24
Regression Testing	10/22/24	10/23/24
Trusted Build	10/24/24	10/28/24
System Loads & Hardening	10/29/24	10/30/24
System Integration	10/31/24	11/06/24
Test Report	**11/07/24**	**01/08/25**
Test Report Creation	11/07/24	11/20/24
Vendor Review & Comments	11/21/24	11/22/24
EAC Submission & Review	11/25/24	12/20/24
VSTL Comment Review & Update	12/23/24	12/24/24
EAC Submission & Review of Revision	12/25/24	01/07/25
EAC Approved Test Report	01/08/25	01/08/25