

CRT-DWF Draft 20060317

4.6 Casting

These functional capabilities include all operations conducted at the polling place by [voters](#) and officials while polls are open, including the generation of status messages.

STS: Audit record stuff from [2] I.4.4.3 (in-process audit records) deferred until STS and CRT can synchronize on audit records. See [PREFACE](#).

4.6.1 Ballot activation

- R** 4.6-1 DRE and EBP, ballot activation
[DREs](#) and [EBPs](#) shall support ballot activation.

Source: [2] I.2.4.

Applies to: DRE, EBP

- R** 4.6-1.1 DRE and EBP, at most one cast ballot per session
[DREs](#) and [EBPs](#) shall enable [poll workers](#) either to initiate, or to provide the [voter](#) with the credentials necessary to initiate, a [voting session](#) in which the [voter](#) may cast at most one ballot.

Source: [2] I.2.4.2.d, rewritten to respect the limits of what the system can do.

DISCUSSION

See also [Requirement VI.1.1-4](#).

- R** 4.6-2 DRE and EBP, control ballot format
[DREs](#) and [EBPs](#) shall enable [poll workers](#) to control the ballot format(s) made available to the [voter](#), whether presented in printed form or electronic display, such that each [voter](#) is permitted to record votes only in contests in which that [voter](#) is authorized to vote.

Source: [2] I.2.4.2.a.

Applies to: DRE, EBP

DISCUSSION

See also [Requirement III.4.2-1.2](#), [Requirement III.4.2-1.3](#), and [Requirement VI.1.1-5](#). More than one ballot format may be available in the case of open primaries ([Requirement III.4.6-2.4](#)).

- R** 4.6-2.1 DRE and EBP, enable all applicable contests
[DREs](#) and [EBPs](#) shall activate all portions of the ballot upon which the [voter](#) is entitled to vote.

Source: [\[2\]](#) I.2.4.2.g.

- R** 4.6-2.2 DRE and EBP, disable all non-applicable contests
[DREs](#) and [EBPs](#) shall disable all portions of the ballot upon which the [voter](#) is not entitled to vote.

Source: [\[2\]](#) I.2.4.2.h.

- R** 4.6-2.3 DRE and EBP, select ballot format for party in primary elections
[DREs](#) and [EBPs](#) of the *Primary elections device* class shall enable the selection of the ballot format that is appropriate to the party affiliation declared by the [voter](#) in a primary election.

Source: [\[2\]](#) I.2.4.2.f.

Applies to: DRE ^ Primary elections device, EBP ^ Primary elections device

DISCUSSION

In paper-based systems, open primaries have sometimes been handled by printing a single ballot format that merges the contests from all parties, instructing the voter to vote only in the contests applicable to a single party, and rejecting or discarding votes that violate this instruction. To use that approach on a [DRE](#) or [EBP](#) would violate [Requirement III.4.6-2.2](#).

- R** 4.6-2.4 DRE and EBP, open primaries, party selection should be private
In an [open primary](#) on a [DRE](#) or [EBP](#), the [voter](#) should be allowed to choose a party affiliation at the start of the voting session and vote the appropriate ballot format in privacy (i.e., the choice of affiliation should be private as well as the selection of votes on the ballot).

Source: New requirement.

Applies to: DRE ^ Open primaries device, EBP ^ Open primaries device

Test reference: [Test 8](#)

4.6.2 General voting functionality

R 4.6-3 Align voting targets with candidate names

All [vote-capture devices](#) shall ensure that vote response fields, selection buttons, or switches properly align with the specific candidate names and/or issues.

Source: [\[2\]](#) I.2.3.1.1.1.f.

Applies to: Vote-capture device

DISCUSSION

See also [Requirement VI.1.1-1](#). Devices may be unable to meet this requirement if paper ballots are not produced correctly.

HFP: Does this belong in [\[5\]](#) I.3.1.6 (Interaction Issues)?

R 4.6-4 Support required languages

All [vote-capture devices](#) shall be capable of rendering an image of the ballot in any of the languages required by 42 USC 1973aa-1a.

Source: [\[2\]](#) I.2.3.1.3.1.a.

Applies to: Vote-capture device

DISCUSSION

42 USC 1973aa-1a is the Voting Rights Act of 1965, as amended.

HFP: Does this belong in [\[5\]](#) I.3.2.7 (English Proficiency)?

R 4.6-5 No advertising

The ballot presented to the [voter](#) shall not display or link to any advertising or commercial logos of any kind, whether public service, commercial, or political, unless added by [central election officials](#) using the functionality described in [Requirement III.4.2-1.5](#).

Source: Clarification of [2] I.2.3.1.3.1.b.

Applies to: *Vote-capture device*

R 4.6-6 Capture votes

All vote-capture devices shall record the selection and non-selection of individual vote choices for each contest and ballot measure.

Source: [2] I.2.4.3.1.c.

Applies to: *Vote-capture device*

R 4.6-6.1 Voter interaction with DREs and EBMs

DREs and EBMs shall

- a. enable the voter to easily identify the selection button, switch, or active area of the ballot display that is associated with each candidate or ballot measure response;
- b. allow the voter to select his or her preferences on the ballot in any legal number and combination;
- c. indicate that a selection has been made or canceled;
- d. indicate to the voter when no selection, or an insufficient number of selections, has been made in a contest;
- e. notify the voter when the selection of candidates and measures is completed; and
- f. provide responses to each voter entry in no more than three seconds.

Source: [2] I.2.4.3.3.b through e, g, and l.

Applies to: *DRE, EBM*

Impact: Deleted [2] I.2.4.3.3.a, redundant with STS requirements.

HFP: Some or all of these belong in [5] I.3.1? (Undervoting already in I.3.1.2.a.)

R 4.6-6.2 DRE and EBM, prevent overvoting

DREs and EBMs shall prevent the voter from overvoting.

Source: [\[2\]](#) I.2.4.3.3.f.

Applies to: DRE, EBM

Test reference: [Test 39](#), [Test 40](#)

DISCUSSION

Preventing overvotes avoids the unintentional loss of votes from voters who overvote accidentally. For those who would overvote deliberately, a protest vote is more validly communicated through undervoting (vote for none). The effect on the candidate totals is identical.

Impact: Retained requirement per resolutions of Issue #2323 and #2715. [\[5\]](#) did the opposite and allowed overvoting on DREs—rationale unknown.

HFP: Overlap with [\[5\]](#) I.3.1.2.

4.6.3 Voting variations

R 4.6-7 Vote-capture device, voting variations

All [vote-capture devices](#) shall support the gathering of votes using all voting variations indicated in the [implementation statement](#).

Source: Extrapolated from [\[2\]](#) I.2.2.8.2 and I.2.4.

Applies to: *Vote-capture device*

R 4.6-7.1 Vote-capture device, 1-of-M

All [vote-capture devices](#) shall be capable of gathering and recording votes in contests where the [voter](#) is allowed to choose at most one candidate from a list of candidates.

Source: [\[2\]](#) I.2.4. Extended [\[2\]](#) I.2.4.2.e to all systems.

Test reference: [Test 2](#), [Test 3](#), [Test 19](#), [Test 22](#)

R 4.6-7.2 Vote-capture device, indicate party endorsements

All [vote-capture devices](#) shall be capable of indicating the political parties (if any) that endorsed each candidate.

Source: Added precision.

R 4.6-7.3 Vote-capture device, closed primaries

Vote-capture devices of the *Closed primaries device* class shall be capable of gathering and recording votes within a voting process that assigns different ballot formats depending on the registered political party affiliation of the voter and supports both partisan and nonpartisan contests.

Source: Added precision, based on [2] I.2.2.8.2 and glossary.

Applies to: *Vote-capture device* ^ *Closed primaries device*

Test reference: [Test 7](#)

R 4.6-7.4 Vote-capture device, open primaries

Vote-capture devices of the *Open primaries device* class shall be capable of gathering and recording votes within a voting process that assigns different ballot formats depending on the political party chosen by the voter at the time of voting and supports both partisan and nonpartisan contests.

Source: Added precision, based on [2] I.2.2.8.2 and glossary.

Applies to: *Vote-capture device* ^ *Open primaries device*

DISCUSSION

In paper-based systems, open primaries have sometimes been handled by printing a single ballot format that merges the contests from all parties, instructing the voter to vote only in the contests applicable to a single party, and rejecting or discarding votes that violate this instruction. To satisfy the requirements for *Open primaries device*, the vote-capture device must be *capable* of handling the case where different ballot configurations are associated with different political parties.

Test reference: [Test 8](#)

R 4.6-7.5 Vote-capture device, write-ins

Vote-capture devices of the *Write-ins device* class shall record the voter's selection of candidates whose names do not appear on the ballot and record as many write-in votes as the voter is allowed, per the definition of N(r) in [Volume III Section 5.3](#).

Source: [\[2\]](#) I.2.4.3.1.d.

Applies to: *Vote-capture device* ^ *Write-ins device*

Test reference: [Test 9](#), [Test 15](#), [Test 28](#), [Test 29](#), [Test 32](#), [Test 33](#)

Impact: Removed untestable reference to state law.

R 4.6-7.6 Vote-capture device, ballot rotation

[Vote-capture devices](#) of the *Ballot rotation device* class shall be capable of gathering and recording votes when the ordering of candidates in ballot positions within each contest is variable.

Source: Added precision, based on [\[2\]](#) I.2.2.8.2 and glossary.

Applies to: *Vote-capture device* ^ *Ballot rotation device*

Test reference: [Test 10](#)

R 4.6-7.7 Ballot rotation, equal time for each candidate

Programmed [vote-capture devices](#) that enable ballot rotation in a given contest shall alter the ordering of candidates or choices in such a manner that no candidate or choice shall ever have appeared in any particular ballot position two or more times more often than any other.

Source: Clarification or extension of existing requirements.

Applies to: *Vote-capture device* ^ *Programmed device* ^ *Ballot rotation device*

DISCUSSION

This is less restrictive than requiring sequential rotation. For a contest of M candidates, the order may be shuffled randomly after each batch of M ballots and rotated sequentially within each batch.

Test reference: [Test 10](#)

R 4.6-7.8 Vote-capture device, straight party voting

[Vote-capture devices](#) of the *Straight party voting device* class shall be capable of gathering and recording votes for a special contest in which the selection of a political party implies votes for the candidates endorsed by that party in all straight-party-votable contests on the ballot.

Source: Added precision, based on [\[2\]](#) I.2.2.8.2 and glossary.

Applies to: *Vote-capture device* ^ *Straight party voting device*

Test reference: [Test 11](#), [Test 30](#)

R 4.6-7.9 Vote-capture device, cross-party endorsement

Vote-capture devices of the *Cross-party endorsement device* class shall be capable of gathering and recording straight-party votes when a given candidate is endorsed by two or more different political parties.

Source: Clarification or extension of existing requirements.

Applies to: *Vote-capture device* ^ *Cross-party endorsement device*

Test reference: [Test 12](#)

R 4.6-7.10 Vote-capture device, split precincts

Vote-capture devices of the *Split precincts device* class shall be capable of gathering and recording votes in a *precinct* where there are distinct ballot formats for *voters* from two or more *election districts*.

Source: Added precision, based on [\[2\]](#) I.2.2.8.2 and glossary.

Applies to: *Vote-capture device* ^ *Split precincts device*

Test reference: [Test 13](#)

R 4.6-7.11 Vote-capture device, N of M voting

Vote-capture devices of the *N of M voting device* class shall be capable of gathering and recording votes in contests where the *voter* is allowed to choose up to a specified number of candidates ($N(r) > 1$, per [Volume III Section 5.3](#)) from a list of candidates.

Source: Added precision, based on [\[2\]](#) I.2.2.8.2 and glossary.

Applies to: *Vote-capture device* ^ *N of M voting device*

Test reference: [Test 14](#), [Test 15](#), [Test 21](#), [Test 31](#), [Test 32](#), [Test 33](#)

R 4.6-7.12 Vote-capture device, cumulative voting

Vote-capture devices of the *Cumulative voting device* class shall be capable of gathering and

recording votes in contests where the [voter](#) is allowed to allocate up to a specified number of votes ($N(r) > 1$, per [Volume III Section 5.3](#)) over a list of candidates however he or she chooses, possibly giving more than one vote to a given candidate.

Source: Added precision, based on [\[2\]](#) I.2.2.8.2 and glossary.

Applies to: *Vote-capture device* ^ *Cumulative voting device*

Test reference: [Test 16](#), [Test 34](#)

R 4.6-7.13 Vote-capture device, ranked order voting

[Vote-capture devices](#) of the *Ranked order voting device* class shall be capable of gathering and recording votes in contests where the [voter](#) is allowed to rank candidates in a contest in order of preference, as first choice, second choice, etc.

Source: Added precision, based on [\[2\]](#) I.2.2.8.2 and glossary.

Applies to: *Vote-capture device* ^ *Ranked order voting device*

Test reference: [Test 17](#)

R 4.6-7.14 Vote-capture device, provisional / challenged ballots

[Vote-capture devices](#) of the *Provisional / challenged ballots device* class shall be capable of gathering and recording votes within a [voting process](#) that allows the decision whether to count a particular ballot to be deferred until after election day.

Source: Added precision, based on [\[2\]](#) I.2.2.8.2 and glossary.

Applies to: *Vote-capture device* ^ *Provisional / challenged ballots device*

DISCUSSION

Unique identification of each provisional/[challenged ballot](#) is required. See [Requirement III.4.8-4.4](#).

Test reference: [Test 18](#), [Test 35](#)

R 4.6-7.15 DRE, categorize provisional ballots

[DREs](#) of the *Provisional / challenged ballots device* class shall provide the capability to categorize each provisional/[challenged ballot](#).

Source: [3] 5.6.5.2.s.2.⁷

Applies to: DRE ^ Provisional / challenged ballots device

DISCUSSION

Categories (e.g., "regular provisional," "extended hours provisional," "regular extended hours") would be jurisdiction-dependent.

R 4.6-7.16 Vote-capture device, review-required ballots

Vote-capture devices of the Review-required ballots device class shall be capable of gathering and recording votes within a voting process that requires certain ballots to be flagged or separated for review.

Source: Extrapolated from [2] I.2.5.2.

Applies to: Vote-capture device ^ Review-required ballots device

DISCUSSION

In some systems and jurisdictions, all ballots containing write-in votes might require flagging or separation for review. Support for the class indicates that the system can flag or separate ballots in this manner and include the results of the review in the reported totals (see Volume III Section 2.6.3.1). The reasons for which ballots are flagged or separated are jurisdiction-dependent. It is assumed that ballot presentation is unchanged for review-required ballots.

STS and HFP: Consider fraud/privacy issues related to ballot separation.

4.6.4 Recording votes

R 4.6-8 Record votes as voted

Vote-capture devices shall record each vote precisely as indicated by the voter.

Source: [2] I.2.2.2.1.c / [5] I.2.1.2.c.

Applies to: Vote-capture device

DISCUSSION

This is an accuracy requirement.

R 4.6-9 DRE, confirm votes recorded

DREs shall verify (i.e., actively check and confirm) the correct addition of voter selections to the memory components or persistent storage of the device.

Source: [\[2\]](#) I.3.2.4.3.3.c, expanded to include persistent storage.

Applies to: DRE

DISCUSSION

"Memory components or persistent storage" includes on-board RAM, nonvolatile memory, hard disks, optical disks, etc. See also [Requirement III.4.6-10](#) and [Requirement III.4.6-16](#).

R 4.6-10 DRE, recording accuracy

For DREs, the acceptable voting system error rate ([Requirement III.3.4-1](#)) applies to recording the voter selections of candidates and contests into voting data storage.

Source: [\[2\]](#) I.3.2.1.b.1.

Applies to: DRE

Test reference: [Volume V Section 4.2.2.2](#)

R 4.6-11 Power supply failure, retain no half-finished ballots

In the event of a failure of both main and backup power supply, any stored data associated with a ballot in progress, other than audit log data, shall not be retained.

Source: [\[3\]](#) 5.4.4.b,⁷ adjusted to resolve conflicts.

Applies to: Vote-capture device ^ Programmed device

DISCUSSION

The goals are to preserve voter secrecy and prevent tabulation of a duplicate ballot. See also [Requirement III.4.6-13.3](#).

R 4.6-12 EBM, review before print

EBMs shall

- a. allow the [voter](#), before the ballot is marked, to review his or her choices and, if the [voter](#) desires, to delete or change his or her choices before the ballot is marked;
- b. prompt the [voter](#) to confirm the [voter](#)'s choices before marking his or her ballot; and
- c. notify the [voter](#) after the ballot has been marked successfully that the ballot is ready to be cast.

Source: [\[2\]](#) I.2.4.3.3.h through j, modified for EBMs.

Applies to: *EBM*

HFP: Some or all of these belong in [\[5\]](#) I.3.1?

R 4.6-13 Casting

All systems shall support the casting of a ballot.

Source: [\[2\]](#) I.2.4. Extended [\[2\]](#) I.2.4.2.e to all systems.

Applies to: *Voting system*

DISCUSSION

This does not entail retaining a [ballot image](#). [DREs](#) are required to retain [ballot images](#) (see [Requirement III.4.11-1.4](#)) but other devices might not.

R 4.6-13.1 Every voter gets to vote

All systems shall make it possible for each eligible [voter](#) to cast a ballot, provided that the limits declared in the [implementation statement](#) for each device are not exceeded.

Source: [\[2\]](#) I.2.4.2.b, generalized to all systems.

DISCUSSION

See also [Requirement VI.1.1-3](#), [Requirement VI.1.1-4](#) and [Requirement VI.1.1-5](#).

R 4.6-13.2 Paper-based, must have secure ballot boxes

Systems that include paper-based [vote-capture devices](#) shall include secure receptacles for holding voted ballots.

Source: [2] I.2.4.1.2.1.c.

Applies to: *Paper-based device ^ Vote-capture device*

R 4.6-13.3 DRE, review and cast ballot

DREs shall

- a. allow the voter, before the ballot is cast, to review his or her choices and, if the voter desires, to delete or change his or her choices before the ballot is cast;
- b. prompt the voter to confirm the voter's choices before casting his or her ballot, signifying to the voter that casting the ballot is irrevocable and directing the voter to confirm the voter's intention to cast the ballot;
- c. notify the voter after the vote has been stored successfully that the ballot has been cast; and
- d. notify the voter that the ballot has not been cast successfully if it is not stored successfully, including storage of the ballot image, and provide clear instruction as to the steps the voter should take to cast his or her ballot should this event occur.

Source: [2] I.2.4.3.3.h through k.

Applies to: *DRE*

HFP: Some or all of these belong in [5] I.3.1?

DISCUSSION

If a DRE fails at the point of casting a ballot, it must clearly indicate to the voter and to election judges responding to the failure whether or not the ballot was cast. The following behavior would be non-conforming: "106 voting units experienced screen freezes. In staff opinion this is the most serious of errors. Election judges and technical staff reported that many of these units froze when the voter pressed the Cast Ballot button. This leads to great confusion for judges and voters. The voter leaves the polling place with little or no confidence that their vote was counted. In many cases, the election judges are unable to provide substantial confirmation that the vote was, in fact, counted." [16]

R 4.6-14 DRE, cast is committed

DREs shall prevent modification of the voter's vote after the ballot is cast.

Source: [\[2\]](#) I.2.4.3.3.n.

Applies to: DRE

DISCUSSION

See also [Requirement VI.1.1-6, cast ballot](#).

4.6.5 Redundant records

This section contains design requirements to enhance the recoverability of [DRE](#) devices. This is usually separable from auditability, which is addressed by Independent Verification ([\[15\]](#) I.C / [Dangling ref: FutureIV](#)). However, in some systems, the same records might satisfy both these requirements and Independent Verification.

- R** 4.6-15 DRE, at least two separate copies of CVR

[DREs shall record and retain at least two machine-countable copies of each \[cast vote record\]\(#\)](#).

Source: [\[2\]](#) I.2.2.2.2, I.2.2.4.2 and I.3.2.4.3.2.c.

Applies to: DRE

DISCUSSION

Besides data stored in electronic memory, a paper record with barcodes or EBM-style markings would qualify as machine-countable.

- R** 4.6-15.1 DRE, redundant CVRs on physically separate media

[These redundant records shall be written to media that are physically separate from one another \(e.g., two separate memory cards or one electronic record and one paper record\)](#).

Source: [\[2\]](#) I.2.2.4.2 and I.3.2.4.3.2.c.

Impact: Ambiguous requirements [\[5\]](#) I.4.1.4.3.b.iii and iv punted to IV, where the question of what constitutes a "separate path" or "separate process" has been taken to its logical conclusion. See also [Volume I Section 1.6](#).

- R** 4.6-16 DRE, redundant CVRs, accuracy

[For DREs, the acceptable voting system error rate \(Requirement III.3.4-1\) applies to recording voter selections of candidates and contests into each of these records](#).

Source: [\[2\]](#) I.3.2.1.b.2.

Applies to: DRE

Test reference: [Volume V Section 4.2.2.2](#)

4.6.6 Respecting limits

R 4.6-17 Tabulator, prevent counter overflow

When a [tabulator](#) can no longer accept another ballot without the potential of overflowing a vote counter or otherwise compromising the integrity of the counts, it shall notify the user or operator and cease to accept new ballots.

Source: Clarification of [\[2\]](#) II.5.4.2.g.

Applies to: Tabulator

DISCUSSION

Assuming that the counter size is large enough such that the value will never be reached is not adequate. Vendors are required to state specific limits, and systems are required to react when those limits are reached. Even if the system could fit in more ballots than the documented limit, it is more important that the behavior of the system agree with the documentation and be predictable.

Impact: This closes the loophole where a vendor might include such controls but leave them in a disabled or inactive state.

Test reference: [Test 36](#), [Test 37](#), [Test 38](#), [Test 41](#)

R 4.6-17.1 DRE, stop when full

When a [DRE](#) can no longer accept another ballot without the potential of overflowing a vote counter or otherwise compromising the integrity of the counts, it shall emit appropriate warnings and audit events and cease to enable new ballots.

Source: Clarification of [\[2\]](#) II.5.4.2.g.

Applies to: DRE

DISCUSSION

A [DRE](#) must not initiate a voting session if there is the possibility that the next ballot could not be properly cast and recorded. If there exists a way of voting the ballot that would exceed one of the limits, then the ballot must not be enabled.

Test reference: [Test 36](#), [Test 37](#), [Test 41](#)

4.7 Closing polls

R 4.7-1 DRE, no CVRs before close of polls

[DREs](#) shall prevent access to [cast vote records](#) until after the close of polls.

Source: [\[2\]](#) I.2.4.3.3.r.

Applies to: DRE

DISCUSSION

This does not apply to paper-based devices because the ballot is subject to handling beyond their control; however, a locked ballot box (per [Requirement III.4.6-13.2](#) and [Requirement III.3.1-10](#)) serves the same purpose. See also [Requirement VI.1.1-7](#).

R 4.7-2 Programmed vote-capture devices, poll-closing function

[Programmed vote-capture devices](#) shall provide designated functions for closing the polls.

Source: Reworded from [\[2\]](#) I.2.5.

Applies to: *Vote-capture device ^ Programmed device*

R 4.7-2.1 Programmed vote-capture devices, no voting when polls are closed

[Programmed vote-capture devices](#) shall prevent the further enabling or marking of ballots once the polls have closed.

Source: Reworded from [\[2\]](#) I.2.5.1.a.

R 4.7-2.2 DRE, no ballot casting when polls are closed

[DREs](#) shall prevent the further casting of ballots once the polls have closed.

Source: Reworded from [\[2\]](#) I.2.5.1.a.

Applies to: DRE

- R** 4.7-2.3 Programmed vote-capture devices, poll closing integrity check
Programmed [vote-capture devices](#) shall provide an internal test that verifies that the prescribed closing procedure has been followed and that the device status is normal.

Source: Reworded from [\[2\]](#) I.2.5.1.b.

- R** 4.7-2.4 Programmed vote-capture devices, report on poll closing process
Programmed [vote-capture devices](#) shall provide a means to produce a diagnostic test [record](#) that verifies the sequence of events and indicates that the poll closing process has been activated.

Source: Reworded from [\[2\]](#) I.2.5.1.d.

- R** 4.7-2.5 Programmed vote-capture devices, prevent reopening polls
Programmed [vote-capture devices](#) shall prevent reopening of the polls once the poll closing has been completed for that election.

Source: Revised from [\[2\]](#) I.2.5.1.e.

Impact: Changed from "preclude the unauthorized reopening of polls."

- R** 4.7-3 Precinct EMS, post-election reports
Precinct [EMSs](#) shall provide designated functions for generating precinct post-election [reports](#).

Source: Reworded from [\[2\]](#) I.2.5.

Applies to: Precinct tabulator ^ EMS

4.8 Counting

4.8.1 Voting variations

- R** 4.8-1 Write-ins, system must include supporting tabulators
Voting systems conforming to the *Write-ins* class shall count all [write-in](#) votes using [tabulators](#) of the *Write-ins device* class.

Source: Added precision.

DISCUSSION

If the [voting system](#) requires that [write-in](#) votes be counted manually, then it does not conform to the *Write-ins* class. However, it may conform to the *Review-required ballots* class.

R 4.8-2 Absentee, system must include supporting tabulators

Voting systems conforming to the *Absentee voting* class shall count all [absentee ballots](#) using [tabulators](#) of the *Absentee voting device* class.

Source: Added precision.

DISCUSSION

If the [voting system](#) requires that [absentee ballots](#) be counted manually, then it does not conform to the *Absentee voting* class. However, it may conform to the *Review-required ballots* class.

R 4.8-3 Provisional, system must include supporting tabulators

Voting systems conforming to the *Provisional / challenged ballots* class shall count all [provisional / challenged ballots](#) using [tabulators](#) of the *Provisional / challenged ballots device* class.

Source: Added precision.

DISCUSSION

If the [voting system](#) requires that [provisional/challenged ballots](#) be counted manually, then it does not conform to the *Provisional / challenged ballots* class. However, it may conform to the *Review-required ballots* class.

R 4.8-4 Tabulator, voting variations

All [tabulators](#) shall support all voting variations indicated in the [implementation statement](#).

Source: [\[2\]](#) I.2.2.8.1 plus I.2.2.8.2.

Applies to: *Tabulator*

R 4.8-4.1 Tabulator, 1-of-M

All [tabulators](#) shall be capable of tabulating votes, overvotes, and undervotes in contests where

the [voter](#) is allowed to choose at most one candidate from a list of candidates.

Source: Implicit in [\[2\]](#).

Test reference: [Test 2](#), [Test 3](#), [Test 19](#), [Test 22](#)

R 4.8-4.2 Tabulator, absentee voting

[Tabulators](#) of the *Absentee voting device* class shall be capable of tabulating votes, overvotes, and undervotes from [absentee ballots](#).

Source: Added precision, based on [\[2\]](#) I.2.2.8.1, I.2.2.8.2 and glossary.

Applies to: *Tabulator ^ Absentee voting device*

R 4.8-4.3 Tabulator, provisional / challenged ballots

[Tabulators](#) of the *Provisional / challenged ballots device* class shall be capable of tabulating votes, overvotes, and undervotes in contests where the decision whether to count a particular ballot is deferred until after election day.

Source: Added precision, based on [\[2\]](#) I.2.2.8.1, I.2.2.8.2 and glossary.

Applies to: *Tabulator ^ Provisional / challenged ballots device*

Test reference: [Test 18](#), [Test 35](#)

R 4.8-4.4 Tabulator, accept or reject provisional / challenged ballots individually

[Tabulators](#) of the *Provisional / challenged ballots device* class shall support the independent acceptance and rejection of individual provisional/[challenged ballots](#).

Source: Added precision, based on [\[2\]](#) I.2.2.8.1, I.2.2.8.2 and glossary.

Applies to: *Tabulator ^ Provisional / challenged ballots device*

DISCUSSION

This is meant to rule out the mode of failure in which the IDs assigned to provisional ballots fail to be unique, rendering the system incapable of accepting one without also accepting the others with the same ID.

Test reference: [Test 18](#), [Test 35](#)

- R** 4.8-4.5 Tabulator, accept or reject provisional / challenged ballots by category
Tabulators of the Provisional / challenged ballots device class shall support the acceptance and rejection of provisional/challenged ballots by category.

Source: [3] 5.6.5.2.s.3.⁷

Applies to: Tabulator ^ Provisional / challenged ballots device

DISCUSSION

For "category," see [Requirement III.4.6-7.15](#). The behavior when an individual acceptance/rejection conflicts with a categorical acceptance/rejection is system-dependent and should be documented by the vendor.

- R** 4.8-4.6 Tabulator, review-required ballots
Tabulators of the Review-required ballots device class shall be capable of tabulating votes, overvotes, and undervotes from ballots that were flagged or separated for review.

Source: Extrapolated from [2] I.2.5.2.

Applies to: Tabulator ^ Review-required ballots device

DISCUSSION

In some systems and jurisdictions, all ballots containing [write-in](#) votes might require flagging or separation for review. Support for the class indicates that the system can flag or separate ballots in this manner and include the results of the review in the reported totals (see [Volume III Section 2.6.3.1](#)). The reasons for which ballots are flagged or separated are jurisdiction-dependent. It is assumed that ballot presentation is unchanged for review-required ballots.

- R** 4.8-4.7 Tabulator, primary elections
Tabulators of the Primary elections device class shall be capable of keeping separate totals for each political party for the number of ballots read and counted.

Source: Added precision, based on [2] reporting requirements.

Applies to: Tabulator ^ Primary elections device

DISCUSSION

In paper-based systems, open primaries have sometimes been handled by printing a single

ballot format that merges the contests from all parties and instructing the voter to vote only in the contests applicable to a single party. This approach requires additional logic in the [tabulator](#) to support the rejection or discarding of votes that violate these special instructions, while the approach of assigning different ballot formats to different parties does not. Support for the merged ballot approach is not required for a [tabulator](#) to satisfy the requirements for *Primary elections device*. See [Volume I Section 2.1](#).

This requirement to separate by party applies only to the number of [read ballots](#) and [counted ballots](#). It does not apply to candidate and measure vote totals.

Test reference: [Test 7](#), [Test 8](#)

R 4.8-4.8 Tabulator, write-ins

[Tabulators](#) of the *Write-ins device* class shall be capable of tabulating votes for [write-in candidates](#), with separate totals for each candidate.

Source: Added precision, based on [\[2\]](#) I.2.2.8.1, I.2.2.8.2 and glossary.

Applies to: *Tabulator ^ Write-ins device*

Test reference: [Test 9](#), [Test 15](#), [Test 28](#), [Test 29](#), [Test 32](#), [Test 33](#)

R 4.8-4.9 Tabulator, ballot rotation

[Tabulators](#) of the *Ballot rotation device* class shall be capable of tabulating votes when the ordering of candidates in ballot positions within each contest is variable.

Source: Added precision, based on [\[2\]](#) I.2.2.8.1, I.2.2.8.2 and glossary.

Applies to: *Tabulator ^ Ballot rotation device*

DISCUSSION

This just means that ballot rotation must not impact the correctness of the count. A mode of failure would be getting confused about the mapping from ballot positions to candidates.

Test reference: [Test 10](#)

R 4.8-4.10 Tabulator, straight party voting

[Tabulators](#) of the *Straight party voting device* class shall be capable of tabulating straight party votes.

Source: Added precision, based on [\[2\]](#) I.2.2.8.1, I.2.2.8.2 and glossary.

Applies to: *Tabulator ^ Straight party voting device*

Test reference: [Test 11](#), [Test 30](#)

R 4.8-4.11 Tabulating straight party votes

A straight party vote shall be counted as a vote in favor of all candidates endorsed by the chosen party in each straight-party-votable contest in which the [voter](#) does not cast an explicit vote.

Source: Added precision, based on [\[2\]](#) I.2.2.8.1, I.2.2.8.2 and glossary.

Applies to: *Tabulator ^ Straight party voting device*

DISCUSSION

This requirement intentionally says nothing about what happens when there is both a straight party endorsed candidate and an explicit vote in a given contest (a [scratch vote](#)).

Although it seems obvious that a [scratch vote](#) in a 1-of-M race should take precedence over a straight party vote, it is less obvious after considering the generalized case of an N-of-M race in which the number of candidates endorsed by the selected party might be less than *N*.

Approaches supported by commercially available technology include (1) all straight party selections are cancelled when an explicit selection exists; (2) both straight party and explicit selections are counted; (3) both straight party and explicit selections are counted unless this exceeds *N*, in which case only the explicit selections are counted; (4) both straight party and explicit selections are counted unless this exceeds *N*, in which case straight party selections from the bottom of the list are dropped until the number of selections is reduced to *N*.

These Guidelines do not specify any particular approach to resolving [scratch votes](#), but the approach(es) supported are required to be described in the Voting Equipment User Documentation. See [Requirement IV.2.4-12](#).

Fix tests containing scratch votes

Test reference: [Test 11](#), [Test 30](#)

R 4.8-4.12 Tabulator, cross-party endorsement

[Tabulators](#) of the *Cross-party endorsement device* class shall be capable of tabulating straight-party votes when a given candidate is endorsed by two or more different political parties.

Source: Added precision, based on [\[2\]](#) I.2.2.8.1, I.2.2.8.2 and glossary.

Applies to: *Tabulator ^ Cross-party endorsement device*

Test reference: [Test 12](#)

R 4.8-4.13 Tabulator, split precincts

[Tabulators](#) of the *Split precincts device* class shall be capable of tabulating votes for two or more election districts within the same [precinct](#).

Source: Added precision, based on [\[2\]](#) I.2.2.8.1, I.2.2.8.2 and glossary.

Applies to: *Tabulator ^ Split precincts device*

Test reference: [Test 13](#)

R 4.8-4.14 Tabulator, N of M voting

[Tabulators](#) of the *N of M voting device* class shall be capable of tabulating votes, overvotes, and undervotes in contests where the [voter](#) is allowed to choose up to a specified number of candidates ($N(r) > 1$, per [Volume III Section 5.3](#)) from a list of candidates.

Source: Added precision, based on [\[2\]](#) I.2.2.8.1, I.2.2.8.2 and glossary.

Applies to: *Tabulator ^ N of M voting device*

Test reference: [Test 14](#), [Test 15](#), [Test 21](#), [Test 31](#), [Test 32](#), [Test 33](#)

R 4.8-4.15 Tabulator, cumulative voting

[Tabulators](#) of the *Cumulative voting device* class shall be capable of tabulating votes, overvotes, and undervotes in contests where the [voter](#) is allowed to allocate up to a specified number of votes ($N(r) > 1$, per [Volume III Section 5.3](#)) over a list of candidates however he or she chooses, possibly giving more than one vote to a given candidate.

Source: Added precision, based on [\[2\]](#) I.2.2.8.1, I.2.2.8.2 and glossary.

Applies to: *Tabulator ^ Cumulative voting device*

Test reference: [Test 16](#), [Test 34](#)

R 4.8-4.16 Tabulator, ranked order voting

[Tabulators](#) of the *Ranked order voting device* class shall be capable of determining the results

of a ranked order contest for each round of voting.

Source: [\[2\]](#) I.2.2.8.1 plus I.2.2.8.2.

Applies to: Tabulator ^ Ranked order voting device

DISCUSSION

This requirement is minimal. Since ranked order voting is not currently in wide use, it is not clear what, other than the final result, must be computed.

Test reference: [Test 17](#)

4.8.2 Ballot separation and rejection

R 4.8-5 Central paper tabulator, ballot separation or rejection

In response to designated conditions, central paper-based [tabulators](#) shall (a) outstack the ballot, (b) stop the ballot reader and display a message prompting the election official or designee to remove the ballot, or (c) mark the ballot with an identifying mark to facilitate its later identification.

Source: [\[2\]](#) I.3.2.5.1.2.

Applies to: Central tabulator ^ Paper-based device

R 4.8-5.1 Central paper tabulator, unreadable ballots and write-ins

All paper-based [central tabulators](#) shall perform this action in response to an unreadable ballot or (if applicable) a manually-marked paper ballot containing [write-in](#) votes.

Source: [\[2\]](#) I.3.2.5.1.2.

DISCUSSION

An [EBM](#)-produced ballot might encode [write-in](#) text in machine-readable form, obviating the need to segregate such ballots.

R 4.8-5.2 Central paper tabulator, overvotes, undervotes, blank ballots

All paper-based [central tabulators](#) shall provide a capability that can be activated by [central election officials](#) to perform this action in response to ballots containing overvotes, blank ballots, and ballots containing undervotes in a designated race.

Source: [\[2\]](#) I.3.2.5.1.2.

R 4.8-6 Precinct paper tabulator, reject unreadable ballots

In response to an unreadable ballot, all paper-based [precinct tabulators](#) shall return the ballot and provide a message prompting the [voter](#) to examine the ballot.

Source: [\[2\]](#) I.3.2.5.1.3.a.

Applies to: Precinct tabulator ^ Paper-based device

DISCUSSION

The option to submit the ballot as-is is not required for unreadable ballots because a damaged ballot might be impossible to handle mechanically. See also [Requirement III.4.8-11](#).

Impact: Blank ballots moved to [Requirement III.4.8-9](#).

R 4.8-7 Precinct tabulator, separate or mark write-ins

All [precinct tabulators](#) that process manually-marked paper ballots shall, in response to a manually-marked paper ballot with a [write-in](#) vote, segregate the ballot or mark the ballot with an identifying mark to facilitate its later identification.

Source: [\[2\]](#) I.3.2.5.1.3.b.

Applies to: Precinct tabulator ^ Paper-based device

DISCUSSION

An [EBM](#)-produced ballot might encode [write-in](#) text in machine-readable form, obviating the need to segregate such ballots.

R 4.8-8 Precinct tabulator, overvotes and undervotes

All [precinct tabulators](#) shall provide a capability to

- a. Identify an over- or undervoted ballot;
- b. Return the ballot to the [voter](#) (if paper ballots are used);
- c. Provide feedback to the [voter](#) that identifies specific contests or ballot issues for which an over- or undervote is detected;
- d. Allow the [voter](#), at the [voter](#)'s choice, to correct the ballot or submit the ballot

"as is" without correction.

Source: Merged overlapping requirements in [2] I.2.4.3.2.2 (paper), I.2.4.3.3.e (DRE), I.3.2.5.1.3.c and d (paper). In [5], the analogous requirements are I.2.3.3.2.e through h (paper), I.2.3.3.3.e through h (DRE), I.3.1.2.a through e (all systems), I.4.1.5.1.d.iii and iv (paper). Significant differences in [5] are (1) added requirement for the *system* to "Notify the voter before the ballot is cast and counted of the effect of making more than the allowable number of selections for a contest" (42 USC 15481 a.1.A.iii.II) and (2) DREs do not prevent overvoting. N.B., 42 USC 15481 a.1.B states that the notification need not be done by the *system* in all cases.

Applies to: Precinct tabulator

DISCUSSION

In paper-based systems, correcting an overvoted ballot means spoiling it and voting a new one. Erasures are to be avoided. Overvotes do not apply in the cases of [DREs](#) and [EBMs](#) ([Requirement III.4.6-6.2](#)).

"Voter's choice" is a topic needing discussion. The language of the requirement derives from [2] I.2.4.3.2.2.b (there applying to overvotes and undervotes). There are deployed systems that require poll worker intervention to override a ballot rejection. BW says in practice the voter is startled by a ballot rejection and needs the poll worker to explain what happened. OTOH perhaps this is a usability issue that can be solved by providing better feedback to the voter. (HFP)

R 4.8-8.1 Turn off second chance voting for undervotes only

It shall be possible for [central election officials](#) to turn off this function entirely or by contest for undervotes while leaving it enabled for overvotes.

Source: Clarification of [2] requirements per CRT advice.

Impact: [5] I.2.3.3.2 removed the requirement for the ability to turn off second-chance voting, perhaps because HAVA requires second-chance voting to be enabled, in some systems, for overvotes. However, parallel changes were *not* made in I.4.1.5.1.d.iii and iv. Advice from CRT is that enabling second-chance voting for ordinary undervotes causes a train wreck in the [precincts](#) as nearly every ballot deliberately undervotes some contest in which the voter had no interest. Resolved consistent with CRT advice.

R 4.8-9 Precinct paper tabulators, reject blank ballots

All paper-based [precinct tabulators](#) shall provide a capability to

- a. Identify a blank ballot;
- b. Return the ballot to the [voter](#);
- c. Provide feedback to the [voter](#) that the ballot appears to be blank;
- d. Allow the [voter](#), at the [voter](#)'s choice, to correct the ballot or submit the ballot "as is" without correction.

Source: [2] I.3.2.5.1.3.a and d, clarifying for the case of blank ballots.

Applies to: *Precinct tabulator ^ Paper-based device*

DISCUSSION

Special case of [Requirement III.4.8-8](#) for blank paper ballots.

"[Voter's choice](#)" issue from [Requirement III.4.8-8](#) repeated here (HFP).

- R** 4.8-9.1 Can reject blank ballots without rejecting all undervotes

It shall be possible for [central election officials](#) to enable this function for blank ballots without enabling it for ballots that only undervote some contests.

Source: Clarification.

- R** 4.8-10 Ballots only blank on one side

[Paper-based precinct tabulators](#) should provide a capability analogous to that of [Requirement III.4.8-9](#) to reject two-sided ballots that are blank on one side.

Source: New requirement.

Applies to: *Precinct tabulator ^ Paper-based device*

DISCUSSION

Failing to notice the second side of a two-sided ballot is reportedly a common cause of unintentional undervotes.

- R** 4.8-11 Precinct paper tabulator, capability to reject marginal marks

All [paper-based precinct tabulators](#) should provide a capability to

- a. Identify a ballot containing marks or punches that do not conform to vendor

specifications;

- b. Return the ballot to the [voter](#);
- c. Provide feedback to the [voter](#) that identifies specific contests or ballot issues for which a marginal mark or hanging chad is detected;
- d. Allow the [voter](#), at the [voter's](#) choice, to correct the ballot or submit the ballot "as is" without correction.

Source: New requirement.

Applies to: *Precinct tabulator ^ Paper-based device*

DISCUSSION

This capability would be useful even when [EBMs](#) are used as it could assist in detecting a malfunctioning [EBM](#). In many cases, correcting a ballot means spoiling it and voting a new one. Erasures are to be avoided.

"[Voter's choice](#)" issue from [Requirement III.4.8-8](#) repeated here (HFP).

4.8.3 Paper jams

R 4.8-12 Paper-based tabulator, ability to clear misfeed

If multiple feed or misfeed (jamming) occurs, a paper-based [tabulator](#) shall halt in a manner that permits the operator to remove the ballot(s) causing the error and reinsert them in the input hopper (if unread) or insert them in the ballot box (if read).

Source: [\[2\]](#) I.3.2.5.1.4.a, expanded to include jamming and ballots that were read.

Applies to: *Paper-based device ^ Tabulator*

DISCUSSION

See also [Requirement III.4.8-13](#) and [Requirement VI.1.1-8](#).

Impact: Tightened language from "if multiple feed is detected" to "if multiple feed occurs." Failure to detect is still a failure. Changed "card" to "ballot."

R 4.8-13 Paper-based tabulator, indicate status of misfed ballot

If multiple feed or misfeed (jamming) occurs, a paper-based [tabulator](#) shall clearly indicate

whether or not the ballot(s) causing the error have been read.

Source: [\[13\]](#) 14.2.5.3 (page 46).

Applies to: Paper-based device ^ Tabulator

DISCUSSION

A similar issue arises with [DREs](#) that hang just as the voter presses the "cast ballot" button. See [Requirement III.4.6-13.3](#). See also [Requirement III.4.8-12](#) and [Requirement VI.1.1-8](#).

R 4.8-14 Paper-based tabulators, rate of misfeeds

The rate of multiple feeds, misfeeds (jamming), and rejection of ballots that meet all vendor specifications shall not exceed 1 ballot in 10,000.

Source: Merge of [\[2\]](#) I.3.2.5.1.4.b and I.3.2.5.2.c, harmonized to 1 in 10,000 benchmark.

Applies to: Paper-based device ^ Tabulator

Impact: Original requirement in I.3.2.5.2.c: Paper-based tabulators shall reject ballots that meet all vendor specifications at a rate not to exceed 2 %.

4.8.4 Accuracy

[Requirement III.3.4-1](#) applies to all [voting systems](#) and need not be repeated here. The following requirements elaborate the general requirement with respect to issues that are unique to paper-based systems.

R 4.8-15 Paper-based tabulator accuracy

For paper-based [tabulators](#), the acceptable voting system [error rate](#) ([Requirement III.3.4-1](#)) applies to scanning paper ballots to detect selections for individual candidates and contests and converting them into digital data.

Source: From [\[2\]](#) I.3.2.1.a.1, I.3.2.1.a.2 and I.3.2.6.1.1.

Applies to: Paper-based device ^ Tabulator

Test reference: [Volume V Section 4.2.2.2](#)

R 4.8-15.1 Punchcard reader accuracy

[Punchcard readers](#) shall detect punches that conform to vendor specifications with an [error rate](#).

satisfying [Requirement III.3.4-1](#).

Source: Narrowed from [\[2\]](#) I.3.2.5.2.a and I.3.2.6.1.1.

Applies to: Punchcard reader

Test reference: [Volume V Section 4.2.2.2](#)

R 4.8-15.2 Optical scanner, EBM, accuracy

[Optical scanners](#) that read [EMPBs](#) shall detect [EBM](#)-generated vote indications with an [error rate](#) satisfying [Requirement III.3.4-1](#).

Source: Narrowed from [\[2\]](#) I.3.2.5.2.a and I.3.2.6.1.1.

Applies to: Optical scanner

Test reference: [Volume V Section 4.2.2.2](#)

DISCUSSION

Reading of marginal marks should be a non-issue if [EBMs](#) are used. The requirement applies equally regardless of whether the [EMPB](#) contains a bar code, traditional marksense ovals, or what have you.

R 4.8-15.3 Optical scanner, MMPB, accurately detect perfect marks

[Optical scanners](#) that read manually-marked paper ballots shall detect marks that conform to vendor specifications with an [error rate](#) satisfying [Requirement III.3.4-1](#).

Source: [\[2\]](#) I.3.2.5.2.a and I.3.2.6.1.1.

Applies to: Optical scanner

R 4.8-15.4 Optical scanner, MMPB, accurately detect imperfect marks

[Optical scanners](#) that read manually-marked paper ballots shall detect a 1 mm thick line that is made with a #2 pencil, that crosses the entirety of the voting target on its long axis, that is centered on the voting target, and that is as dark as can practically be made with a #2 pencil, with an [error rate](#) satisfying [Requirement III.3.4-1](#).

Source: Many issues and public comments. Specification of mark originated with recommendation in Issue #1322, changed to reduce ambiguity.

Applies to: Optical scanner

DISCUSSION

Different optical scanning technologies will register imperfect marks in different ways. Variables include the size, shape, orientation, and darkness of the mark, the location of the mark within the voting target, the wavelength of light used by the scanner, the size and shape of the scanner's aperture, the color of the ink, the sensed background-white and maximum-dark levels, and of course the calibration of the scanner. The mark specified in this requirement is intended to be less than 100 % perfect, but reliably detectable, i.e., not so marginal as to bring the uncontrolled variables to the forefront. In plain English: scanning technologies may vary, but as a minimum requirement, all of them should be capable of reliably reading *this* mark.

R 4.8-15.5 Paper-based tabulators, ignore extraneous outside voting targets

Paper-based [tabulators](#) shall not record as votes any marks, perforations, smudges, or folds appearing outside the boundaries of voting targets.

Source: Clarified from [\[2\]](#) I.3.2.5.2.b.

DISCUSSION

In previous iterations of these Guidelines it was unclear whether "extraneous perforations, smudges, and folds" included perforations, smudges and folds appearing *within* voting targets. Those appearing within voting targets are now discussed in [Requirement III.4.8-15.6](#) and [Requirement III.4.8-15.7](#). Those other requirements are "should" not "shall"—technology in wide use as of 2006 cannot reliably distinguish extraneous marks within voting targets from deliberate marks.

R 4.8-15.6 Optical scanner, ignore extraneous inside voting targets

[Optical scanners](#) should not record as votes imperfections in the ballot stock and similar insignificant marks appearing inside voting targets.

Source: Clarified from [\[2\]](#) I.3.2.5.2.b.

Applies to: Optical scanner

DISCUSSION

With technology that is in wide use as of 2006, insignificant marks appearing inside voting targets can be detected as votes. This problem should be minimized as much as possible.

R 4.8-15.7 Optical scanner, MMPB, ignore hesitation marks

Optical scanners that read manually-marked paper ballots should not record as votes hesitation marks and similar insignificant marks.

Source: Clarified from [2] I.3.2.5.2.b.

Applies to: Optical scanner

DISCUSSION

With technology that is in wide use as of 2006, it may be possible to reliably detect reasonable marks and reliably ignore hesitation marks if the scanner is calibrated to a specific marking utensil. Unfortunately, in practice, optical scanners are required to tolerate the variations caused by the use of unapproved marking utensils. Thus, lighter marks of a significant size are detected at the cost of possibly detecting especially dark hesitation marks. Emerging technologies for context-sensitive ballot scanning may solve this problem. It is also solvable through procedures that ensure that all voters use only the approved marking utensil.

R 4.8-15.8 Optical scanner, marginal marks, not position-dependent

The detection of marginal marks from manually-marked paper ballots shall be independent of the ballot position in which those marks occur.

Source: New requirement.

Applies to: Optical scanner

DISCUSSION

The behavior on marginal marks is generally indeterminate, but if marginal marks in position 1 are more likely to count as votes than equivalent marginal marks in position 2, then the election is skewed in favor of the candidate in position 1.

R 4.8-15.9 Optical scanner, marginal marks, repeatability

The detection of marginal marks from manually-marked paper ballots should be repeatable.

Source: New requirement.

Applies to: Optical scanner

DISCUSSION

It is difficult to have confidence in the equipment if consecutive readings of the same ballots on the same equipment yield dramatically different results. However, it is technically impossible to achieve repeatable reading of ballots containing many marks that fall precisely on the sensing threshold. This requirement cannot be made mandatory unless and until a testable and fair benchmark for repeatability of optical scanning is determined.

4.8.5 Consolidation

R 4.8-16 Precinct EMS consolidation

Precinct [EMSs](#) shall consolidate the data contained in each unit into a single [report](#) for the polling place when more than one [vote-capture device](#) or [precinct tabulator](#) is used.

Source: Reworded from [\[2\]](#) I.2.5.3.2.

Applies to: *Precinct tabulator ^ EMS*

DISCUSSION

For requirements on [report](#) content see [Volume III Section 4.9](#).

R 4.8-16.1 DRE, consolidate in 5 minutes

[DREs](#) shall, if the consolidation of polling place data is done locally, perform this consolidation in a time not to exceed 5 minutes per [DRE](#).

Source: Reworded from [\[2\]](#) I.3.2.6.2.1.

Applies to: *Precinct tabulator ^ EMS ^ DRE*

DISCUSSION

This requirement assumes that the [precinct](#) is operating using [DREs](#) exclusively and that one of those [DREs](#) fills the role of [EMS](#).

R 4.8-17 Consolidation accuracy

The acceptable voting system [error rate](#) ([Requirement III.3.4-1](#)) applies to the consolidation of vote selection data from multiple [tabulators](#) to generate jurisdiction-wide vote counts, including storage and reporting of the consolidated vote data.

Source: Reworded from [\[2\]](#) I.3.2.1.

Applies to: Voting system

Test reference: [Volume V Section 4.2.2.2](#)

4.9 Reporting

Although reporting is typically an [EMS](#) function, most of the requirements in this section are scoped to the entire system because any given [EMS](#) might not generate all of the specified information. For example, the [precinct](#)- and jurisdiction-level [reports](#) are likely to be generated by different [EMS](#)s located in the [precinct](#) and central location, respectively. The precinct [EMS](#)s need not have the capability to generate jurisdiction-level [reports](#) and vice-versa.

4.9.1 General reporting functionality

R 4.9-1 Reports are timestamped

All [reports](#) shall include the date and time of the [report](#)'s generation, including hours, minutes, and seconds.

Source: New requirement.

Applies to: Voting system

DISCUSSION

Even if the clock's accuracy leaves something to be desired, second precision is useful to have if two [reports](#) are generated in quick succession.

R 4.9-2 Timestamps should be ISO 8601 compliant

Timestamps in [reports](#) should comply with ISO 8601 [\[10\]](#), provide all four digits of the year and include the time zone.

Source: Recommendation to avoid ambiguous timestamps.

Applies to: Voting system

R 4.9-3 Reporting is non-destructive

All [programmed devices](#) shall prevent data, including data in transportable memory, from being altered or destroyed by [report](#) generation.

Source: From [2] I.2.2.6.h, I.2.5.3.1.g, and I.2.5.3.2.d.

Applies to: Programmed device

DISCUSSION

The appending of an audit record reflecting the fact that a [report](#) has been generated is not considered an alteration.

4.9.2 Audit, status, and readiness reports

R 4.9-4 Audit reports

All systems shall be capable of producing [reports](#) of all of the pre-election audit [records](#), system readiness audit [records](#), and in-process audit [records](#) defined in [Volume III Section 3.2.2](#).

Applies to: Voting system

Source: From [2] I.2.2.6.i, I.2.3.6 and I.2.5.3.1.f.

R 4.9-5 Status reports

All [programmed devices](#) shall provide the capabilities to obtain status and equipment readiness [reports](#).

Source: Reworded from [2] I.2.3.4.1.b.

Applies to: Programmed device

DISCUSSION

These [reports](#) typically are generated during pre-voting logic and accuracy testing; see [Volume III Section 4.4.1](#).

R 4.9-6 Readiness reports, per polling place

[Readiness reports](#) shall include at least the following information for each polling place:

- a. The election's identification data;
- b. The identification of the [precinct](#) and polling place;

- c. The identification of all voting devices deployed in the [precinct](#);
- d. The identification of all ballot formats used in that [precinct](#);
- e. Confirmation that no hardware or software failures were detected during setup and testing, or a record of those that occurred; and
- f. Confirmation that all [vote-capture devices](#) are ready for the opening of polls, or identification of those that are not.

Source: [2] I.2.3.5, separated generic precinct vs. [precinct tabulator](#) reqs, modified to deal with failures.

Applies to: *In-person voting*

DISCUSSION

In jurisdictions where there are no [programmed devices](#) in the precincts, confirmation of equipment readiness could occur through a manual check and signoff by election judges. These readiness [reports](#) could take the form of checklists, fill-in forms and signature sheets supplied to the precincts by a central authority.

R 4.9-7 Readiness reports, precinct tabulator

Readiness [reports](#) shall include the following information for each [precinct tabulator](#):

- a. The election's identification data;
- b. The identification of the [precinct](#) and polling place;
- c. The identification of the [tabulator](#);
- d. The contents of each active candidate register by office and of each active measure register at all storage locations;
- e. Confirmation that no hardware or software failures were detected during setup and testing, or a record of those that occurred; and
- f. Any other information needed to confirm the readiness of the equipment and to accommodate administrative reporting requirements.

Source: [2] I.2.3.5, separated generic precinct vs. [precinct tabulator](#) reqs, harmonized with [Requirement III.4.9-8](#), modified to deal with failures, deleted "special voting options."

Applies to: Precinct tabulator

R 4.9-8 Readiness reports, central tabulator

Readiness [reports](#) shall include the following information for each [central tabulator](#):

- a. The election's identification data;
- b. The identification of the [tabulator](#);
- c. The identification of all ballot formats used in the jurisdiction;
- d. The contents of each active candidate register by office and of each active measure register at all storage locations;
- e. Confirmation that no hardware or software failures were detected during setup and testing, or a record of those that occurred; and
- f. Any other information needed to confirm the readiness of the equipment and to accommodate administrative reporting requirements.

Source: [\[2\]](#) I.2.3.6, harmonized with [Requirement III.4.9-7](#), modified to deal with failures, deleted "special voting options."

Applies to: Central tabulator

4.9.3 Vote data reports

4.9.3.1 General functionality

R 4.9-9 Reporting, ability to produce text

All devices used to produce [reports](#) of the vote count shall be capable of producing:

- a. Alphanumeric headers;
- b. Election, office and issue labels; and
- c. Alphanumeric entries generated as part of the audit record.

Source: [\[2\]](#) I.3.2.7.2 / [\[5\]](#) I.4.1.7.2

Applies to: Voting system

Impact: Original requirement was scoped to printers. Generalized to allow for paperless reporting.

R 4.9-10 Report all votes cast

All systems shall be able to produce an accurate, human-readable [report](#) of all votes cast.

Source: [\[2\]](#) I.2.2.2.1.c as expanded by [\[3\]](#) 5.2.1.1.c.⁷

Applies to: Voting system

AG: need HFP input (human-readable)

R 4.9-11 Account for all cast ballots and all valid votes

All systems shall produce vote data [reports](#) that account for all cast ballots and all valid votes.

Applies to: Voting system

R 4.9-12 Vote data reports, discrepancies can't happen

Vote data [reports](#) shall be completely consistent, with no discrepancy among [reports](#) of voting device data at any level.

Source: Reworded from [\[2\]](#) I.3.2.6.2.2, extended to all systems.

Applies to: Voting system

Test reference: [Test 1](#), [Test 24](#) and all other tests.

Impact: Removed "error-free" language, which has caused confusion with respect to apparent conflict with general accuracy requirements. [\[2\]](#) I.3.2.6.2.2 is restricted to DREs and talks about consolidation and reporting. In Issue #2349, EAC interpretation was "3.2.1 refers to ballot position accuracy and 3.2.6.2.2 refers to accuracy of tabulation." Error-freeness is still the standard in logic verification and in the handling of votes that are attributed to the wrong contests or candidates (see [Requirement V.4.2-8](#)).

R 4.9-12.1 Discrepancies that happen anyway must be flagged

Any discrepancy that is detectable by the system shall be flagged by the system by an annotation or error message in the affected [report\(s\)](#) and/or a separate discrepancy [report](#).

Source: New requirement in response to Issue #1366.

DISCUSSION

If this requirement is applicable, then the system has failed to satisfy [Requirement III.4.9-12](#) and is therefore non-conforming. Nevertheless, in practice it is essential that discrepancies be flagged by the system as much as possible so that they are not overlooked by election judges. The system cannot detect discrepancies if no single voting device is ever in possession of a sufficient set of data.

R 4.9-12.2 Discrepancies that happen anyway must be explainable

Any discrepancy in [reports](#), regardless of source, shall be resolvable to a specific cause.

Source: Reworded and generalized from [\[2\]](#) I.3.2.6.2.2.

DISCUSSION

If this requirement is applicable, then the system has failed to satisfy [Requirement III.4.9-12](#) and is therefore non-conforming. Nevertheless, in practice it is essential that a specific cause be determinable.

R 4.9-13 Reporting, combined precincts

All systems should be capable of generating [reports](#) that consolidate vote data from selected [precincts](#).

Source: Derived from [\[13\]](#) 14.3.2.3, [\[14\]](#) 5.04.05.g and [\[15\]](#) Requirement 23.

Applies to: Voting system

DISCUSSION

Jurisdictions in which more than one [precinct](#) may vote at the same location on either the same ballot format or a different ballot format may desire [reports](#) that consolidate the voting location.

R 4.9-14 Precinct tabulators, no tallies before close of polls

[Precinct tabulators](#) shall prevent the printing of vote data [reports](#) and the extraction of vote tally data prior to the official close of polls.

Source: Revised from [\[2\]](#) I.2.5.3.2.

Applies to: Precinct tabulator

DISCUSSION

Providing ballot counts does not violate this requirement. The prohibition is against providing vote totals. Ballot counts are required for ballot accounting, but early extraction of vote totals is an enabler of election fraud.

Impact: Changed from "prevent the printing of reports and the unauthorized extraction of data."

4.9.3.2 Ballot counts

General statement for Requirement III.4.9-15 through Requirement III.4.9-27

The following compliance points were distilled, refactored, and clarified from overlapping, subtly differing requirements appearing several places in Chapters 2 and 4 of [2], including: I.2.2.2.1.c (produce an accurate report of all votes cast), I.2.2.6.h (printed report of everything in I.2.5), I.2.2.9 (ballot counter), I.2.5.2 (means to consolidate vote data), I.2.5.3.1.a (geographic reporting), I.2.5.3.1.b (printed report of number of ballots counted by each tabulator), I.2.5.3.1.c (contest results, overvotes, and undervotes for each tabulator), I.2.5.3.1.d (consolidated reports including other data sources), I.4.4.4.a (number of ballots cast, using each ballot configuration, by tabulator, precinct, and political subdivision), I.4.4.4.b (candidate and measure totals for each contest, by tabulator), I.4.4.4.c (number of ballots read within each precinct and for additional jurisdictional levels, by configuration, including separate totals for each party in primary elections), I.4.4.4.d (separate accumulation of overvotes and undervotes for each contest, by tabulator, precinct, and additional jurisdictional levels), and I.4.4.4.e (for paper-based systems, the total number of ballots both processed and unprocessable, and the total number of cards read).

R 4.9-15 Report cast ballots

All systems shall report the total number of cast ballots at the precinct, election district, and jurisdiction reporting levels, by configuration.

Applies to: Voting system

DISCUSSION

In the case of 100 % DRE systems, it would suffice to provide a single total that is noted to represent both the number of cast ballots and the number of read ballots, since these are necessarily equal. Only when there is a tangible (paper) ballot is it possible to cast a ballot that is never read. There is no sub-requirement for separate reporting of provisional cast ballots because the system is unlikely to know whether a ballot is provisional until it is successfully

read.

R 4.9-16 Report read ballots

All systems shall report the total number of [read ballots](#) at each reporting level ([tabulator](#), [precinct](#), [election district](#), and jurisdiction), by configuration.

Applies to: Voting system

R 4.9-16.1 Report read ballots, multi-page

Systems that include paper-based devices shall, if there are multiple card/page ballots, report the total number of cards/pages read at the [precinct](#), [election district](#), and jurisdiction reporting levels, by configuration.

R 4.9-16.2 Report read ballots by party

Systems conforming to the *Primary elections* class shall report separate totals for each party in primary elections.

Applies to: Primary elections

Test reference: [Test 7](#), [Test 8](#)

DISCUSSION

This requirement to report by party applies only to the number of [read ballots](#). It does not apply to candidate and measure vote totals.

R 4.9-16.3 Report read provisional ballots

Systems conforming to the *Provisional / challenged ballots* class shall report the total number of provisional/challenged [read ballots](#) at each reporting level ([tabulator](#), [precinct](#), [election district](#), and jurisdiction), by configuration.

Applies to: Provisional / challenged ballots

Test reference: [Test 18](#), [Test 35](#)

R 4.9-17 Report counted ballots

All systems shall report the total number of [counted ballots](#) at each reporting level ([tabulator](#), [precinct](#), [election district](#), and jurisdiction), by configuration.

Applies to: Voting system

DISCUSSION

See also [Requirement III.4.9-18](#), which breaks down [counted ballots](#) by contest.

R 4.9-17.1 Report counted ballots by party

Systems conforming to the *Primary elections* class shall report separate ballot counts for each party in primary elections.

Applies to: Primary elections

Test reference: [Test 7](#), [Test 8](#)

DISCUSSION

This requirement to report by party applies only to the number of [counted ballots](#). It does not apply to candidate and measure vote totals.

R 4.9-17.2 Report counted provisional ballots

Systems conforming to the *Provisional / challenged ballots* class shall report the total number of provisional/challenged [counted ballots](#) at each reporting level ([tabulator](#), [precinct](#), [election district](#), and jurisdiction), by configuration.

Applies to: Provisional / challenged ballots

Test reference: [Test 18](#), [Test 35](#)

R 4.9-17.3 Report blank ballots

All systems should report the number of blank ballots (ballots containing no votes) that were counted at each reporting level ([tabulator](#), [precinct](#), [election district](#), and jurisdiction), by configuration.

DISCUSSION

Some jurisdictions find this information to be useful. Blank ballots sometimes represent a protest vote.

R 4.9-18 Report counted ballots by contest

All systems shall report the number of [counted ballots](#) for each N-of-M or cumulative voting contest, at each reporting level ([tabulator](#), [precinct](#), [election district](#), and jurisdiction), per the

definition of $K(j,r,t_E)$ in [Volume III Section 5.3](#).

Applies to: Voting system

DISCUSSION

This is by contest, while [Requirement III.4.9-17](#) is the overall count. N-of-M in this context includes the most common type of contest, 1-of-M.

4.9.3.3 Vote totals

R 4.9-19 Report votes for each contest

All systems shall report the candidate and measure vote totals for each N-of-M or cumulative voting contest, at each reporting level ([tabulator](#), [precinct](#), [election district](#), and [jurisdiction](#)), per the definition of $T(c,j,r,t_E)$ in [Volume III Section 5.3](#).

Applies to: Voting system

DISCUSSION

N-of-M in this context includes the most common type of contest, 1-of-M.

Test reference: [Test 24](#) and all other tests.

R 4.9-20 Report overvotes for each contest

All systems shall report the number of overvotes for each N-of-M or cumulative voting contest, at each reporting level ([tabulator](#), [precinct](#), [election district](#), and [jurisdiction](#)), per the definition of $O(j,r,t_E)$ in [Table 4](#).

Applies to: Voting system

DISCUSSION

N-of-M in this context includes the most common type of contest, 1-of-M. [\[2\]](#) required the reporting of overvotes even on 100 % [DRE](#) systems where overvoting is prevented ([Requirement III.4.6-6.2](#)); that requirement is retained here, though it may be redundant.

Overvotes are defined in [Table 4](#). Consistent with the definition of undervotes (see [Requirement III.4.9-21](#)), the count is of votes lost to overvoting, not of ballots containing overvotes. This means that a ballot that overvotes an N-of-M contest would contribute N to

the count of overvotes for that contest.

Test reference: [Test 6](#), [Test 20](#), [Test 27](#)

R 4.9-20.1 Reporting overvotes, ad hoc queries

All systems shall be capable of producing a consolidated [report](#) of the combination of overvotes for any contest that is selected by an authorized official (e.g.; the number of overvotes in a given contest combining candidate A and candidate B, combining candidate A and candidate C, etc.).

Source: From [\[2\]](#) I.2.2.6.h and I.2.5.3.1.e.

Test reference: [Test 6](#)

R 4.9-21 Report undervotes for each contest

All systems shall report the number of undervotes for each N-of-M or cumulative voting contest, at each reporting level ([tabulator](#), [precinct](#), [election district](#), and jurisdiction), per the definition of $U(j,r,t_E)$ in [Table 4](#).

Applies to: *Voting system*

DISCUSSION

N-of-M in this context includes the most common type of contest, 1-of-M.

Undervotes are defined in [Table 4](#) as needed to enable accounting for every vote as described in [Volume III Section 5.3.3](#). Counting ballots containing undervotes instead of votes lost to undervoting is insufficient.

Test reference: [Test 25](#), [Test 26](#) and other tests with undervotes.

R 4.9-22 Ranked order voting, report results

Systems conforming to the *Ranked order voting* class shall report the candidate and measure vote totals for each ranked order contest for each round of voting/counting at the jurisdiction level.

Applies to: *Ranked order voting*

DISCUSSION

This requirement is minimal. Since ranked order voting is not currently in wide use, it is not

clear whether a count must be reported for each permutation of choices, how bogus orderings are reported, or how it would be done at multiple reporting levels.

Test reference: [Test 17](#)

R 4.9-23 Include in-person votes

Systems conforming to the *In-person voting* class shall include votes collected from [in-person voting in the consolidated reports](#).

Applies to: *In-person voting*

DISCUSSION

"Include" simply means that the final totals must reflect them. It does not entail separate totals for the different kinds of votes.

R 4.9-24 Include absentee votes

Systems conforming to the *Absentee voting* class shall include votes from [absentee ballots in the consolidated reports](#).

Applies to: *Absentee voting*

DISCUSSION

"Include" simply means that the final totals must reflect them. It does not entail separate totals for the different kinds of votes.

R 4.9-25 Include write-in votes

Systems conforming to the *Write-ins* class shall include [write-in](#) votes in the consolidated reports.

Applies to: *Write-ins*

DISCUSSION

"Include" simply means that the final totals must reflect them. It does not entail separate totals for the different kinds of votes.

R 4.9-26 Include accepted provisional / challenged votes

Systems conforming to the *Provisional / challenged ballots* class shall include votes from

accepted provisional/[challenged ballots](#) in the consolidated [reports](#).

Applies to: Provisional / challenged ballots

DISCUSSION

"Include" simply means that the final totals must reflect them. It does not entail separate totals for the different kinds of votes. See also [Requirement III.4.8-4.3](#), [Requirement III.4.9-16.3](#) and [Requirement III.4.9-17.2](#).

Test reference: [Test 18](#), [Test 35](#)

R 4.9-27 Include accepted reviewed votes

Systems conforming to the *Review-required ballots* class shall include votes from accepted reviewed ballots in the consolidated [reports](#).

Applies to: Review-required ballots

DISCUSSION

"Include" simply means that the final totals must reflect them. It does not entail separate totals for the different kinds of votes.