NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

VVSG 2.0 draft requirements:
Improving the accessibility and usability of voting systems

Part 2: Updates to best practices and new technologies for voting systems

The National Institute of Standards and Technology and the Center for Civic Design, hosted by the Center for Technology and Civic Life

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Hello, there!

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National Institute of Standards and Technology
U.S. Department of Commerce

The 2002 Help America Vote Act has given NIST a key role in helping to realize nationwide improvements in voting systems, including assisting the Election Assistance Commission with the development of voluntary voting system guidelines.

vote.nist.gov
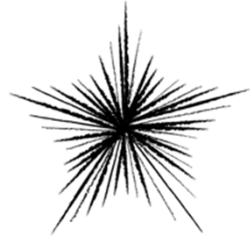
The Center for Technology and Civic Life

Using technology to improve how local government and communities interact

@helloCTCL
www.techandciviclife.org

The Center for Civic Design

Democracy is a design problem! We work to ensure voter intent through design.

@CivicDesign

www.civicdesign.org
civicdesign.org/projects/roadmap/

Housekeeping

- Use chat to communicate
- Update your screen name
- Mute your audio if you aren't speaking

What we will cover in these webinars

An introduction to the VVSG 2.0 draft requirements to improve the accessibility and usability of voting systems.

Part 1: Introducing the human factors requirements and the process used to create them

Part 2: Updates to best practices and new technologies for voting systems with examples of why and how the requirements were updated

About the Voluntary Voting System Guidelines (VVSG)

The Help America Vote Act directs the Election Assistance Commission to create voting system guidelines and defines the process.

HAVA includes basic requirements for accessibility

HAVA includes requirements that voting systems:

- **Are accessible for individuals with disabilities** with same opportunity for participation (including **privacy and independence**) as other voters.

- Provide voters an opportunity to **verify their choices**, and **change the ballot** or **correct any error** before the ballot is cast and counted, in a **private and independent** manner.

- Provide **alternative language accessibility** pursuant to Section 203 of the Voting Rights Act.

Section 301 (3) and (4)

VVSG 2.0 Principles for accessibility and usability

1: High quality design

2: High quality implementation

3: Transparent

4: Interoperable

5: Equivalent and consistent voter access

6: Voter privacy

7: Marked, verified, and cast as intended

8: Robust, safe, usable, and accessible

9: Auditable

10: Ballot secrecy

11: Access control

12: Physical security

13: Data protection

14: System integrity

15: Detection and monitoring

Goals for the accessibility and usability updates

- Address issues that voters still encounter with accessible voting systems

- Catch up to current best practices in election systems

- Catch up to best practices in user interface design and usability

- Cover new technologies now in common use

- Match updated laws and standards

- Write clear, testable requirements

What we will cover in the this webinar

Part 2: Examples of updates to best practices and new technologies for voting systems

1. Addressing Federal accessibility regulations
2. Text size and contrast
3. Plain language requirements
4. Gestures and scrolling
5. Ballot selections review
6. Voter control of ballot selection

Examples of updated requirements

1.
Addressing federal accessibility regulations

Goals for the update

- Match updated laws and standards
- Cover new technologies now in common use

Why the requirements needed updating

Federal accessibility guidelines in "Section 508" have changed since VVSG 1.1

- New rules accommodate larger motorized wheelchairs
- Rules for web and other documents incorporate the international Web Content Accessibility Guidelines (WCAG 2.1)

Voting systems often include functions beyond a polling place marking device

- Web pages to check if a ballot was counted
- Remote accessible voting systems
- Pre-marking systems

Updating guidelines for voters using wheelchairs
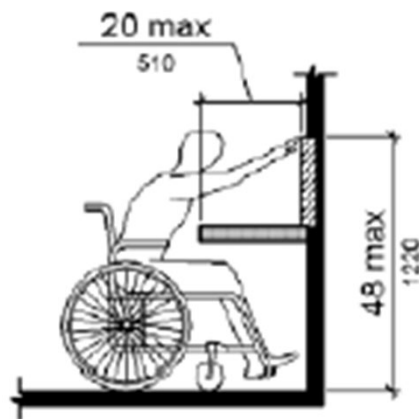
Sample "reach and touch" diagram

Federal regulations cover:

- Floor space needed for physical access
- Room for a personal attendant
- Distance a voter can reach to touch a control on the voting system

Updated requirements:

- Reference the federal standards
- Link to U. S. Access Board guidance
- Add guidance notes on use in voting systems

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Updating the VVSG to include federal accessibility laws

Federal regulations cover:
- Any information or computer technology (ICT)
- Section 508 was "refreshed" in 2008

Updated requirements:
- Added tags to identify requirements based on a source in Section 508/WCAG
- Added specific references where needed
- Added a requirement to explicitly include the full Section 508 for the entire voting system

2.
Text size and contrast

Goals for the update

- Address issues reported by voters and research evidence

- Make ballots and other materials easier for voters to read

Why the requirements needed updating

There was strong evidence that the text sizes available in current voting systems were not large enough in either the default or large size ranges.

Evidence included:

- Anecdotal evidence from voter feedback
- Research at the University of Baltimore with voters with low literacy
- Research from an EAC Accessible Voting Technology Initiative grant showing that voting systems were not including the largest text sizes in the VVSG 1.1 ranges
- Usability testing from other voting system research

Making the text presentation more helpful to all voters

Updated requirements for text size:

- Increase the default text size to 4.8mm

- Added for discrete text sizes

- Allowed continuous text scaling as an option

- Allowed horizontal scrolling or panning at text sizes over 200% (7.1mm)

Updated requirements for text color and contrast:

- Specified the options more precisely

- Added colors for those who need low contrast

Comparing the text sizes in 1.1 and 2.0

The two sizes in 1.1 left a gap in the middle that included the most useful text sizes for many voters

VVSG 1.0	MM	Points	Sample text
Small	3.0 – 4.5	8.5 - 12	Official Ballot - Vote for One ← Official Ballot - Vote for One
Large	6.3 – 9.0	17.75 – 25.5	Official Ballot - Vote for One **Official Ballot - Vote for One**

VVSG 2.0	MM	Points	Sample text
1	3.5- 4.2	10 - 12	Official Ballot - Vote for One Official Ballot - Vote for One
2	4.8 – 5.6	14-16	Official Ballot - Vote for One ← Official Ballot - Vote for One
3	6.4 – 7.1	18 - 20	Official Ballot - Vote for One Official Ballot - Vote for One
4	8.5 – 9.0	24-25.5	**Official Ballot - Vote for One** **Official Ballot - Vote for One**

1.0 and 1.1 have 2 text size ranges:
- 3.0-4.5 mm - default
- 6.3-9.0mm

2.0 has 4 text size ranges:
- 3.5-4.2 mm
- 4.5-5.6 mm – default
- 6.4-7.1 mm
- 8.5-9.0 mm

Sample color contrast settings

Contrast samples included in guidance notes to show combinations that meet the requirements

3:1 Contrast	4.5:1 Contrast	7:1 Contrast	10:1 Contrast	15:1 Contrast	20:1 Contrast	21:1 Contrast
3:1 Contrast	4.5:1 Contrast	7:1 Contrast	10:1 Contrast	15:1 Contrast	20:1 Contrast	21:1 Contrast

Grey scale samples at 3:1 to 21:1

#FFFF00 19.55:1	#FFFF99 20.01:1	#00FFFF 16.7:1	#64FFFD 17.26:1	#FAFAFA 20.1:1	#FFFFFF 21:1

High contrast examples at 16.1:1 to 21:1

#888888 on #222222 4.48:1	#6C6C6C on White 5.25:1	#97967E on Black 6.97:1	#BB99CC on White 7.86:1	Black on #BB9966 7.86:1

Low contrast examples at 4.8:1 to 7.86:1

3.
Plain language requirements
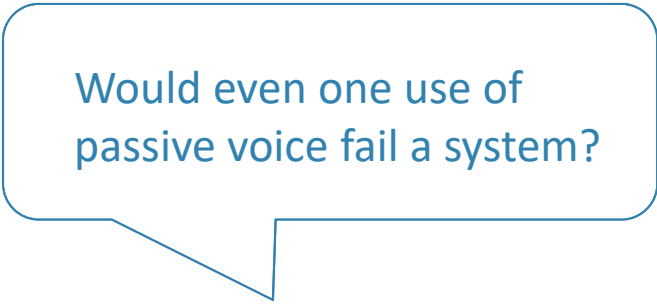
Goal for the update

- Write clear, testable requirements

Why the requirements needed updating

The core requirement remains the same, but we changed the approach to how it was written to:

- Make it more testable, even with requirements that are hard to measure
- Give manufacturers and testers better tools to meet the requirement
- Make it easier to apply to all requirements for instructions, notices, messages and general usability for voters

Would even one use of passive voice fail a system?

What we learned in the gap analysis

7.3-P
Information and instructions for voters and election workers must be written clearly, following the best practices for plain language.

- There is better appreciation of plain language as important for voting systems.
- NIST research still useful for voting systems.
- There are tools that can help guide writing.
- It's important for cognitive disabilities and low literacy or English proficiency

Updated requirements:
- Single broad requirement
- Specifically includes administrative interfaces
- Specific elements listed in discussion notes

We reviewed plain language evaluation tools

Sample review results from 3 tools

We reviewed tools that can evaluate short texts against plain language practices such as:

- Sentence and word length
- Passive verbs and hidden verbs
- Words easily misused
- Complex phrases or jargon
- Duplicate or unnecessary words

We found several free or low-cost programs that are useful for both writing and evaluation

Plain language of the requirements

One of our long-time goals has been plain language of the requirements. Practicing what we preach, we also worked on making the requirements themselves clear.

The new requirements (for all principles) include

- "Must" (not "shall") following guidance in Federal Register

- Active voice that establishes what aspects of a voting system are responsible

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Gestures and scrolling

Goal for the update

- Cover new technologies in common use

Why the requirements needed updating

VVSG 1.1 did not allow scrolling within a contest because of concerns about the digital divide and accessibility of conventional scroll bars.

- A contest may not fit on a single screen because:
  - The list of candidates or ballot question text is long
  - The voting system or marking device has a small screen
  - The voter has increased the text size
- Using separate pages adds navigational complexity and reliance on voters understanding the boundaries of the contest.
- Voting system logic had problems handling the interaction accurately.

There are alternatives to scroll bars
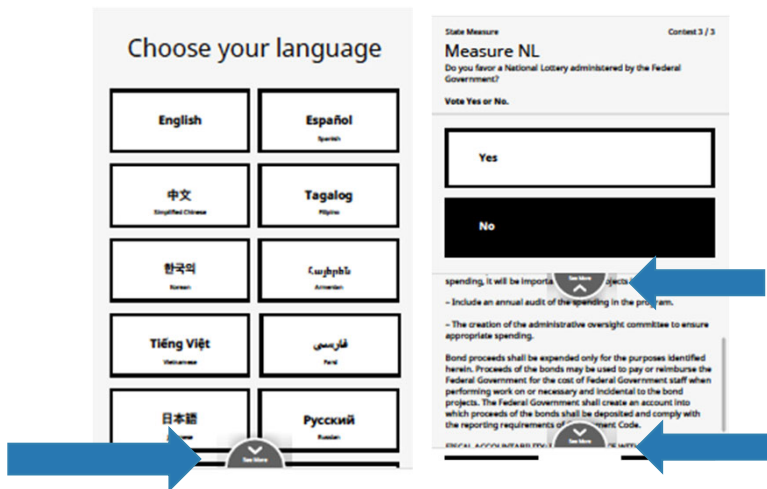
Single-touch buttons can be used to move within a long list or text.

Scroll bars are just one way to move within a list, so other designs can be allowed as an alternative.

Updated requirements:
- Allow pagination or scrolling with
  - Fixed header/footer for orientation
  - Cues that there are more items
  - Option to sync audio and visual
- Works in all interaction modes

Allowing simple gesture meets voter expectations

What's a simple, common gesture?

- Tap
- Pinch or spread fingers to zoom
- Swipe to scroll
- Press and hold to drag

- analysis of style guides for commercial platforms

Voters often expect to be able to swipe to scroll

Updated requirements allow common gestures as an optional alternative that:

- Does not allow navigation off the current contest
- Does not create accidental activation
- Work consistently across the entire voting session
- Do not require sequential, timed, or simultaneous actions

5.
Ballot selections review

Goals for the update

- Catch up to best practices in election systems

- Address issues that voters still encounter with accessible voting systems

- Cover new technologies now in common use

Why the requirements needed updating

HAVA requires an opportunity to:

- Review selections before printing or casting

- Be notified of overvotes

- Make changes

All current voting systems include a review screen

- Bring current practice and common features into the VVSG as a baseline

- Leave room for innovation and design

There are a lot of small variations in design

- We don't have a lot of evidence about what works better
- The interactions between design elements is complex
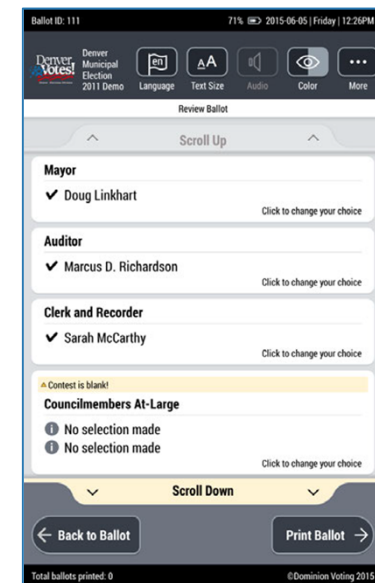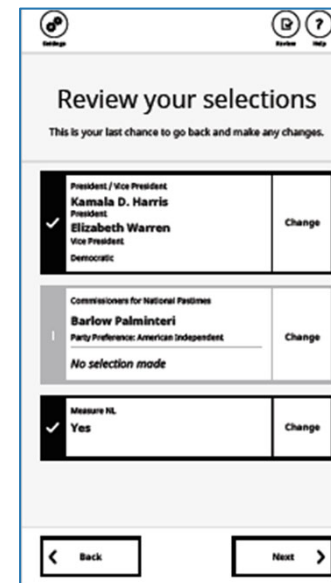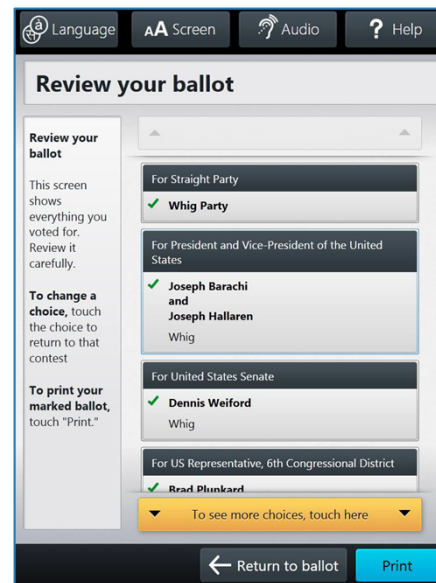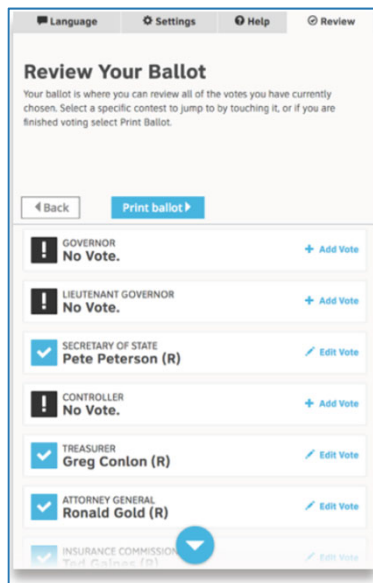
Collection of review screen images

6.
Voter control of ballot selections

Goals for the update

- Catch up to best practices in election systems
- Address issues that voters still encounter with accessible voting systems

Why the requirements needed updating

The voting system should not take control of selections away from voters.

- When a contest does not fit on one screen, system actions may not be visible on the screen.
- Clear feedback helps voters understand the rules for each contest

Voter control is especially important for accessibility.

- Feedback in the audio format helps voters understand the current status, and what will happen as a result of their answer
- Large text modes are more likely to have some candidates out of sight

The draft requirement puts the voter in control

An electronic ballot interface must give voters direct control over making or changing vote selections within a contest.

It allows

- Vote-for-one: An immediate change from one choice to another
- Vote-for-multiple: No automatic deselections, notification to voter of their options if they attempt to select more than allowed
- Re-ordering candidates in preferential voting only when requested
- Clear feedback for group selections, such as straight-party voting

Updating to modern technology conventions

Technology has changed a lot since 2004-2009, when the current voting system standards were written.

Guidance papers with the research evidence and rationale for the changes will help everyone understand how to design and implement voting systems using the new requirements.

The goal

Voting systems that meet the principles in the VVSG and are designed, implemented, and evaluated using best practices for user-centered design, usability, and accessibility.

Group discussion questions

What resonated with you today?

What did we cover that you have questions about?

Is there some thing we didn't discuss today that you're curious about?

Resources

Human Factors Public Working Group
https://collaborate.nist.gov/voting/bin/view/Voting/HumanFactors

VVSG 2.0 Draft Requirements
https://collaborate.nist.gov/voting/bin/view/Voting/VVSG20DraftRequirements

NIST and the Help America Vote Act
https://vote.nist.gov

A Roadmap for Usability and Accessibility of Elections
https://civicdesign.org/projects/roadmap/

Find these webinars online?

VVSG 2.0 draft requirements:
Improving the accessibility and usability of voting systems

Part 1: Introducing the human factors requirements

Part 2: Updates to best practices and new technologies for voting systems

We will post the webinars when they are captioned and approved by NIST