Center for Civic Design

Best Practices
Accessible Ranked Choice Voting Ballots

Guidelines for accessible ranked choice voting ballot design.

September 2024

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Introduction

For the Center for Civic Design, a successful RCV vote means that:

- Voters understand how to mark the ballot to express their intent.
- Voters make their own decision about ranking.
- Voters feel confident that their voice will be heard.

In the past, the RCV space has ignored accessibility, so we set out to understand more about it. These ballot design best practices are based on research with the Ranked Choice Voting Resource Center about accessible RCV systems. Our goal was to create a universal design for a Ranked Choice Voting ballot that would work for the most voters without special settings needed. We designed to the interaction modes identified in the Voluntary Voting System Guidelines 2.0 requirements.

Who are these guidelines for?

These guidelines explain how a successful accessible RCV ballot works for voters with disabilities. Many are being adopted for new accessible RCV systems.

- RCV advocates can use these guidelines to guide conversations with election officials in their jurisdictions, and advocate for system vendors to improve their designs.
- Election officials can use the guidelines to evaluate voting systems and ask system vendors for improvements to their designs.
- Voting system vendors can use the guidelines for inspiration.

Why follow these guidelines?

Poorly designed ballots lead to

- Barriers for voters with disabilities
- Voters not voting in a way that reflects their intent.
- Higher overvote and undervote rates.
- Voter confusion about how RCV works.

What's included in these best practices?

- Audio and visual principles for accessible RCV voting.
- Guidelines for understanding and evaluating accessible RCV voting systems.

What are these guidelines based on?

- Our research on what works for voters. (See Page 15)
- The experience of elections offices and other groups in successful campaigns.
- Built on the Anywhere Ballot (See Page 17)

Best Practices
Accessible RCV Ballots

Look for these best practices and abilities when evaluating accessible RCV ballots:

- **Pick an accessible RCV ballot design tested with voters with a range of disabilities**. Accessible RCV voting systems must be universally accessible for all interaction modes. Page 4
- **There is a 1:1 relationship between visual and audio interactions.** The audio script is in sync with the on-screen information including status information and instructions. Page 7
- **Voters have an easy way to rank candidates in their preferred order.** Page 8
- **Voters control all interactions.** Actions and accessibility controls are perceivable in all interaction modes. Page 9
- **Audio uses consistent syntax and clear clues for efficient listening.** Instructions use a consistent syntax that puts actions the voter is listening for first, followed by how to accomplish that action. Pauses intentionally break audio into meaningful chunks. Page 11
- **The review screen presents candidates in ranked order.** The review screen shows selections and is an opportunity to inform voters about undervotes (skipping a contest) and under-ranking (additional opportunities to rank candidates). Page 13

Read more about our research and best practices for Ranked Choice Voting at **civicdesign.org**

Pick an accessible RCV ballot tested with voters with a range of disabilities (1/3)

When deciding on a voting machine or an accessible RCV ballot, ask to see results from usability testing.

Accessible RCV voting systems must be universally accessible for all interaction modes. No matter what interaction mode is used, all voters must be able to perform the following actions:

- Proceed through candidates and contests
- Change candidates' rank
- Arrange candidates in ranking order
- Do a final review of their selections (rankings) and make changes

The design challenge of a universally accessible RCV ballot is creating an interaction that is both possible and reasonable in all interaction modes. When a design is universally accessible in all modes, voters have easy access to the settings they need for their mode, or a system that can detect the mode in use and respond appropriately. Most importantly, the design has to avoid conflicts between interaction modes.

The **Voluntary Voting System Guidelines 2.0** include requirements and definitions that we used as a starting point for designing and testing an accessible RCV ballot:

- **VVSG Principle 5 - Equivalent and Consistent Voter Access** requires that "All voters can access and use the voting system regardless of their abilities."

CCD's goal was to meet these requirements in a voting interface that is both accessible and usable for all voters. We wanted a default interaction design for RCV that would work for the most voters without special settings needed.

Pick an accessible RCV ballot tested with voters with a range of disabilities (2/3)

How do voters use an accessible RCV ballot?

Voluntary Voting System Guidelines 2.0 Requirement 5.1-A – Voting methods and interaction modes defines a series of interaction modes*:*

- **Display formats:**
  - Visual
  - Enhanced visual (including preferences for text size and color contrast)
  - Audio
- **Interaction modes:**
  - Touch screen
  - Tactile controls
  - Specialized controls for limited dexterity

It also requires that within any mode of voting any combination of display formats and interaction modes have the same functionality, along with equivalent information and options in all modes of voting.

Typical combinations of accessible voting interaction modes include:

Visual + Touch

Read information and voting options from the screen while using a touch screen to navigate and make selections.

Audio + Tactile keys

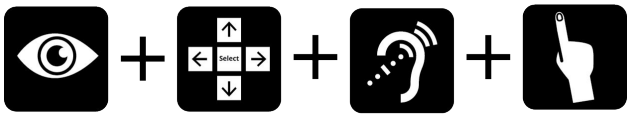
Used by blind and low vision voters who use audio to hear information and voting options while using a tactile keyboard to navigate and make selections.

Visual + Tactile keys

Used by people with vision, but limited or no use of their hands. This mode is also helpful for voters who cannot reach the screen.

Visual + Touch + Audio

Used by voters who listen to audio while looking at the screen to help with language access or reading comprehension.



Visual + Tactile keys + Audio + Touch

Some voters may use all of the options simultaneously, using touch or gestures along with the tactile keys to navigate and make selections.

Pick an accessible RCV ballot tested with voters with a range of disabilities (3/3)

How do voters use tactile keys?

Tactile keys may be used differently by voters depending on their capabilities. Each voting system has its own tactile collection of buttons and unique layout of the controls, but most include at least 5 buttons. Under VVSG 2.0, voting systems may allow a voter to plug in their own tactile keyboard equivalent to use custom controls.

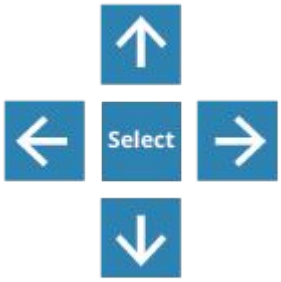
Many voting systems use the following convention for a 5-button tactile control:

- **Up / Down** arrows to move within the contest
- **Left / Right** arrows to move between contests
- **Enter** to select/deselect a choice

In our accessible RCV design, the left and right arrows are used to adjust ranking:

- **Up / Down** arrows move within the contest
- **Left / Right** arrows adjust the candidate rank of a selected candidate
- **Enter** selects/deselects a choice

Voters with limited use of their hands may use only 2 or 3 buttons. In the most limited 2-button option, one button is used for selection, the other for navigation between all controls and information. In a 3-button option, there are separate buttons for both Next and Back.



5 switch navigation

The standard tactile keypad for voting systems has 5 primary keys: Up, Down, Left, Right and Select

3 switch navigation

Next / Back / Select

2 switch navigation

Next / Select

There is a 1:1 relationship between visual and audio instructions

The audio voices information and navigation options displayed on the screen

The audio does more than just voice on-screen text. It uses timing, sequence of information, and pauses to communicate structure and meaning. The audio interface needs to know what mode of interaction is being used, and provide audio instructions that match.

Sighted voters see **focus**, **status**, and possible **actions** on-screen. Audio cues provide the same information.

- **Focus** is the item that the cursor is on. This may be a block of text, contest options, or a button.
- **Status** communicates changes based on voter's actions, like whether a candidate's name is selected.
- **Actions** are what happens when a key on the tactile keyboard is pressed, given the current focus and status.
- **Outcome** is what changes because of an action, like if a candidate is selected, or where the focus moves to (if it moves).

For all contests, the audio should include:

- The contest title
- How many selections are allowed
- Instructions for voting the contest using the tactile keyboard
- How to move between candidates
- How to to select and unselect a candidate
- Warnings or messages (and how to continue after voicing them)
- How many candidates there are
- A voter's selection progress

Additional information needed for RCV contests:

- How to rank a candidate
- How to un-rank a candidate
- How to change the rank of a ranked candidate
- When the maximum number of candidates have been ranked

Audio when voter arrives on new contest screen:

The start of a contest tells the voter what the contest is for. A voter viewing the screen will read this information.

The audio needs to voice that information as well as information the voter will pick up visually and instructions relevant to using the tactile controller.

There are 6 candidates. To navigate through candidates, use the up and down keys.

[.]

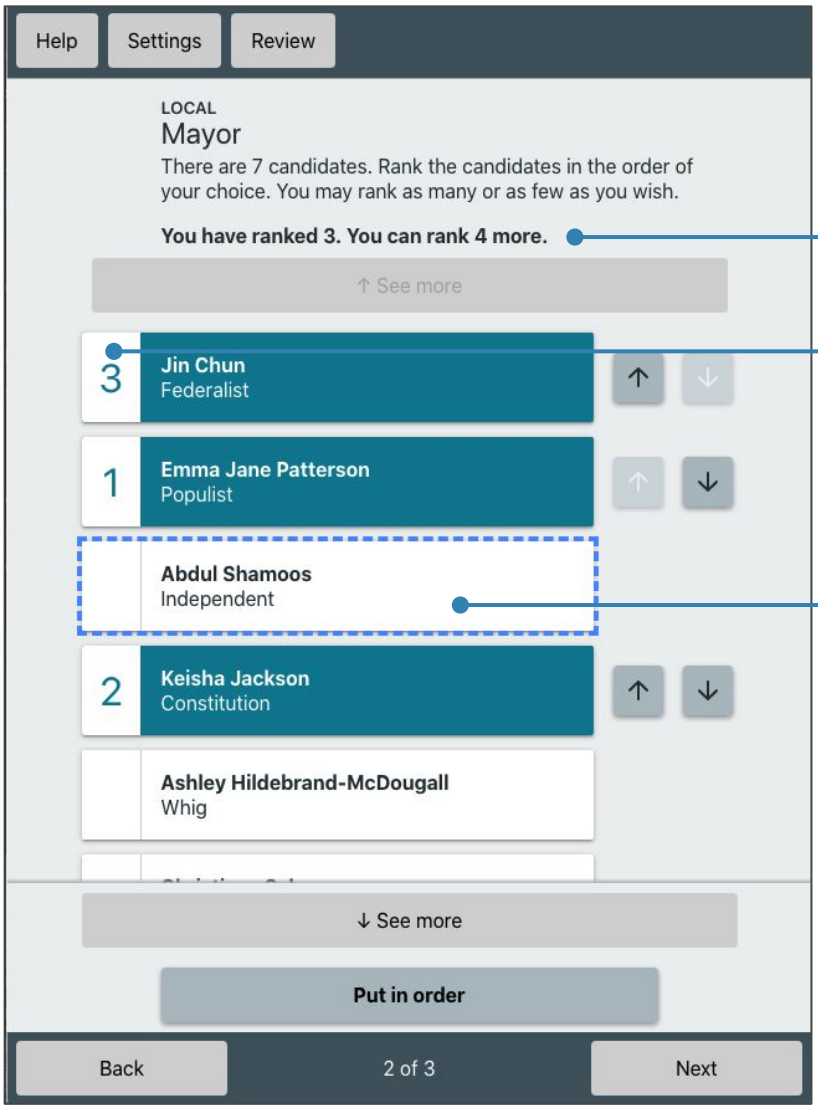
To select or unselect a candidate as your vote, use the select key.

Voters have an easy way to rank candidates in their preferred order

Voters select candidates in the order they want to rank them and can change their rankings.

Voters find and select their 1st choice candidate, then find and select their 2nd choice candidate, and so on until they are done ranking. Participants had no problems understanding this interaction. But, the process is easier for some interaction modes. It was easiest for participants with vision, especially using touch or both up and down keys.

Depending on the voting system setup, voters might be able to mark the same candidate in more than one rank (overranking or bullet voting). Our design prevents this error.



Focus is the term for the button the screen reader is currently on. It is visualized by a blue dotted line.

Shows ranking progress.

When a candidate is selected, the rank number changes.

Audio if focus is on unranked candidate:

[Abdul Shamoos Independent] is not ranked.

*To rank candidate, press **select**.*

*To continue, press **down**.*

Voters control all interactions (1/2)

Show what actions are possible, and make controls for accessibility perceivable in all interaction modes.

Up/Down arrows move within the contest to every screen element.

Left/Right arrows move to adjust the candidate rank after a candidate is selected.

Select key activates the button currently in focus (blue dotted box), and completes the action the button represents.

Navigate to **Help**, **Settings**, and **Review** screen.

Scroll up to see **more candidates**

Increase or decrease **candidate rank**

Scroll down to see more candidates

Move to **previous or next contests**

Voters control all interactions (2/2)

Candidates are only reordered into voter chosen rank order when the Put in Order button is selected, or after a voter leaves the contest.

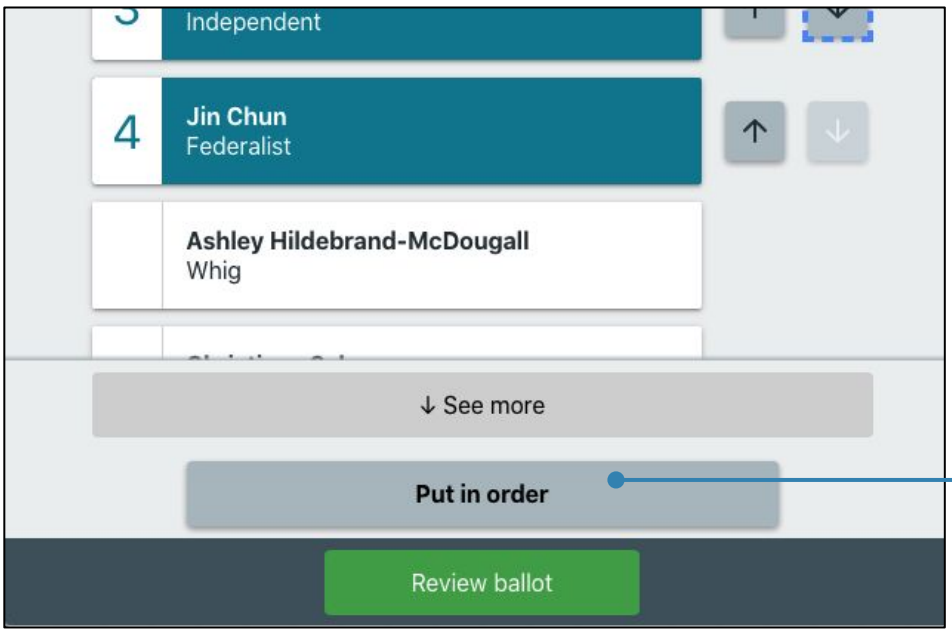
This interaction balances two voter needs that especially affect low vision/blind voters and voters with cognitive disorders:

- Reading out of order numbers requires more work. In our research, actively selecting the Put in Order button helped voters discover how ranking works and encouraged many to rank more candidates.
- Moving candidates around automatically without the voter initiating the reorder as a result of ranking is disorienting. In our research, participants trusted the system less when it seemed like it was making decisions for them.

A **Put in Order** button reorders candidates into rank order. This removes extra cognitive work, and gives the voter full control over the interaction.

This is an important accessibility feature for voters with visual and cognitive disabilities because it confirms their ranking as they make choices in each contest.

The Put in Order function is a new feature that may need to be added to RCV ballot standards.



Audio if focus on Put in Order button:

*To put candidates in order and review your rankings, press **select**.*

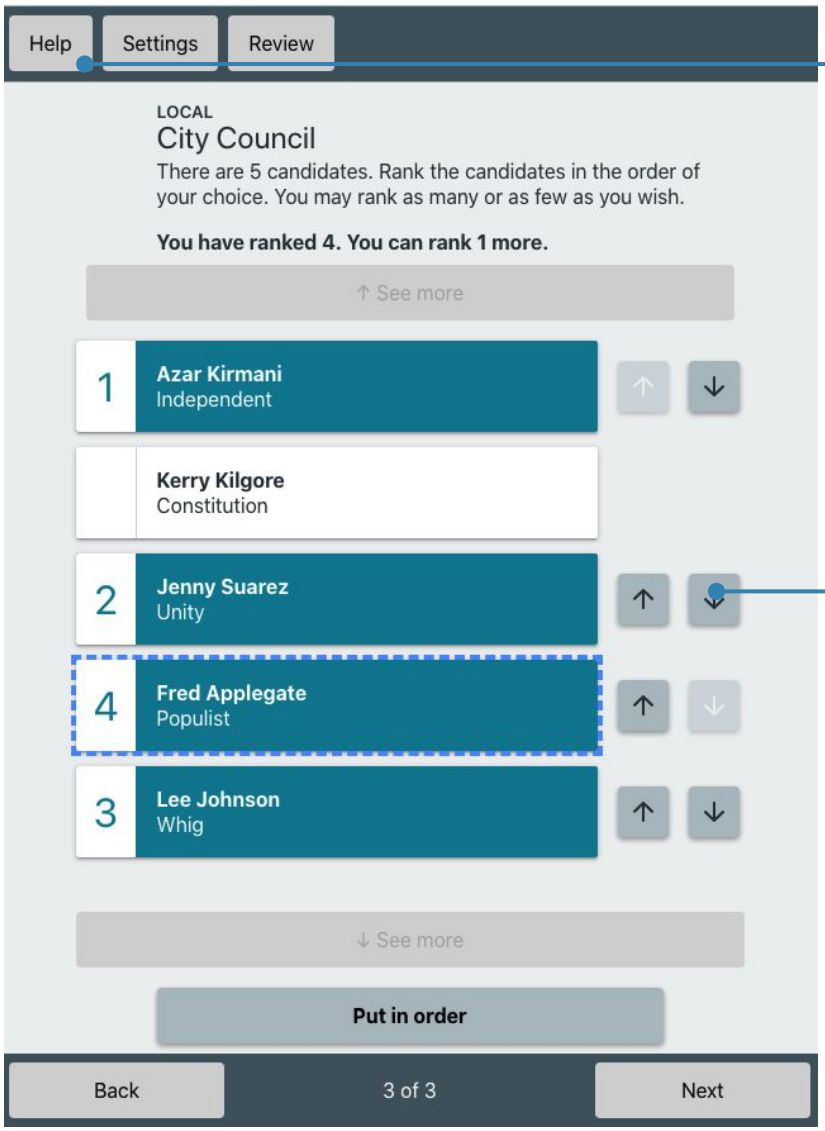
*To continue, press **down**.*

Audio uses consistent syntax and clear clues for efficient listening (1/2)

Instructions are in consistent syntax: "To *[do something]* press *[key name]*."

Predictable audio patterns minimize the effort needed to decipher meaning. A consistent syntax helps voters focus on voting, not on understanding instructions. Voters are listening for outcomes. Voicing the outcome first lets voters identify the one they want before being told how to achieve it.

Audio goes from specific to general. Start with voicing the current focus, primary outcomes for that focus and status, and then continue to more general or secondary outcomes.



Audio if focus on help:
For help, press select. For more options, press down.

If focus on settings:
For settings, press select. For more options, press down.

Audio if focus on up arrow:

To move [candidate] down in rank, press select.

[...]

To continue to next candidate, press down.

Audio uses consistent syntax and clear clues for efficient listening (2/2)

Use short and long pauses intentionally to break audio into meaningful chunks.

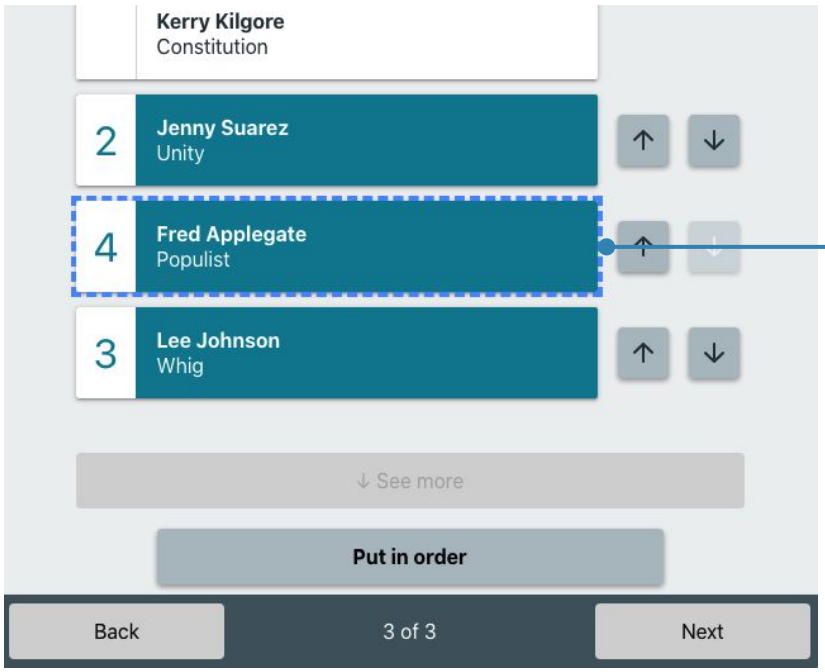
Strategic pauses give voters time to digest information and make decisions. The pauses serve the same purpose as commas, periods, and line breaks in written text. They provide a moment in which a voter can take action without interrupting the voicing.

In our research, as voters gained experience with the system over a single session, they learned what pauses meant. Consistently placed short and long pauses reduce the total time it takes for voters to cast their ballot using an audio system.

Use **short pauses** to separate pieces of related information, like multiple pieces of audio about additional possible actions.

Use **longer pauses** when the contest-specific audio is done, and the "routine" audio (additional possible actions) is about to begin.

In our research, we used pauses of 1 and 3 seconds, represented in our script by "[.]" and "[...]" respectively.



Audio instructions for tactile keys when focus is on ranked candidate:

Fred Applegate Populist is ranked number 4.

[.]

To make ranking adjustments, press RIGHT. To remove ranking, press ENTER.

[...]

To continue, press DOWN."

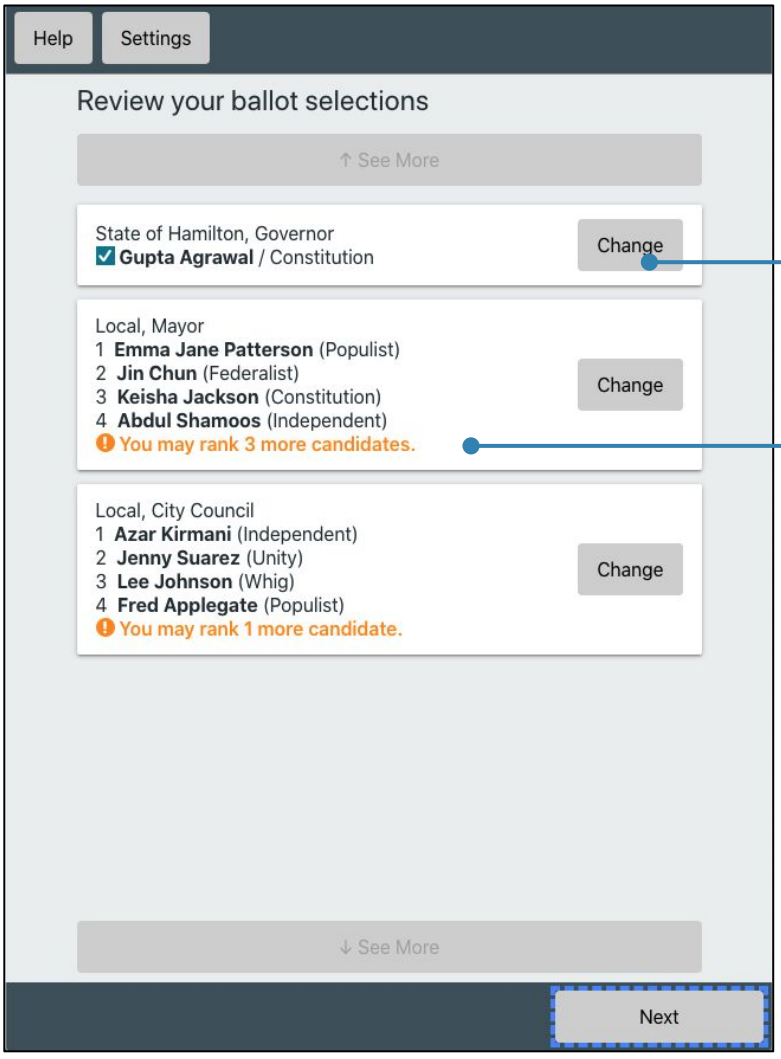
The review screen presents candidates in ranked order (1/2)

The review screen tells voters how their ballot will be counted.

For RCV contests, this includes the order in which their ranked selections will be used.

It's also an opportunity to inform voters about both undervotes and under-ranking. The system should notify the voter when an RCV contest is **undervoted** (a contest was skipped) or **under-ranked** (a voter could choose to rank more candidates if desired).

Note: Ballot marking devices do not allow overvoting.



Review Screen

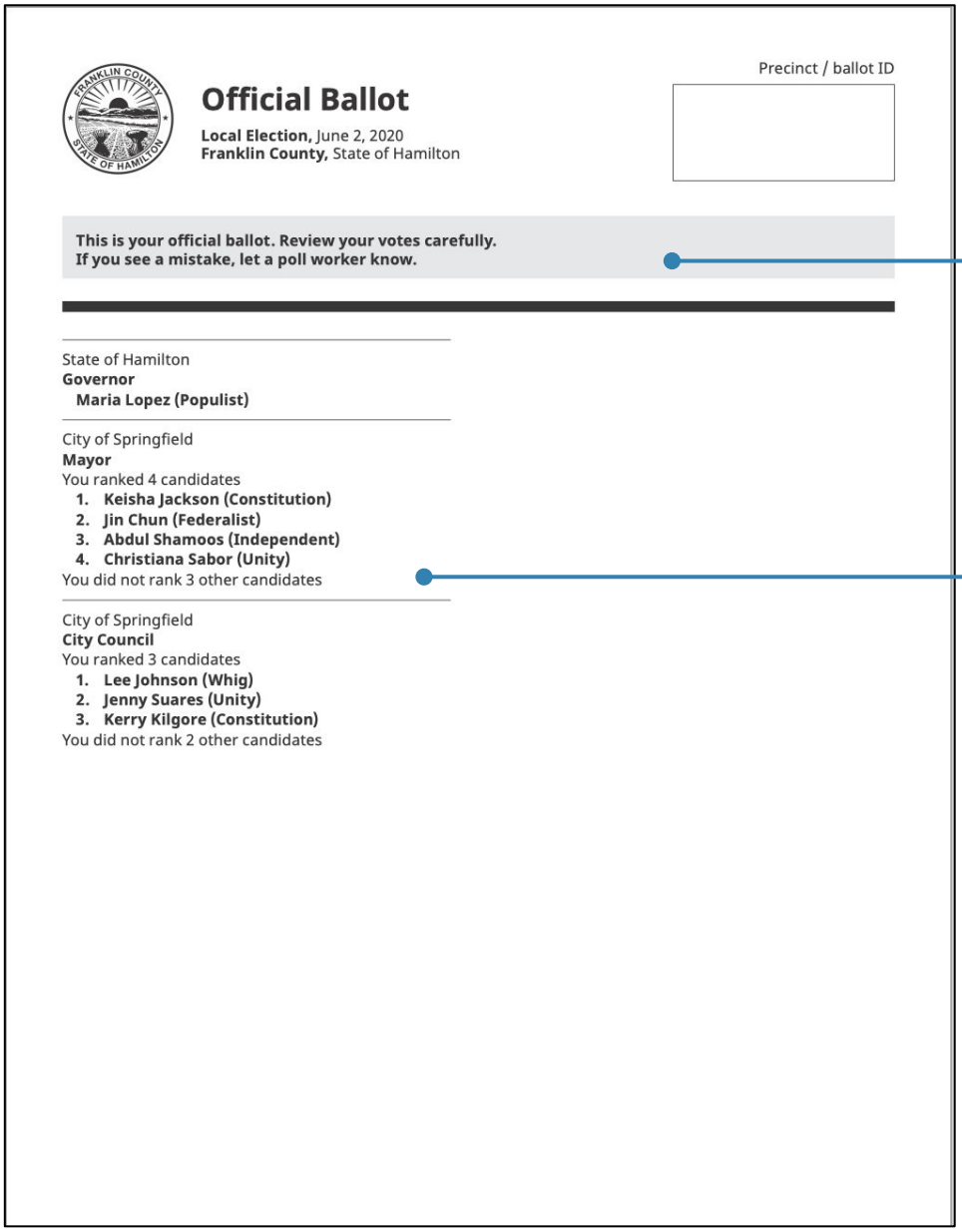
On the review screen, voters can easily return and change their selections.

You may rank # more candidate(s). An alert tells voters that they can rank more candidates, if they want to.

The review screen presents candidates in ranked order (2/2)

Candidates are also presented in ranked order on the Official Ballot printout.

The Official Ballot printout is another opportunity for voters to see the candidates in their ranked order.



Official Ballot

Local Election, June 2, 2020
Franklin County, State of Hamilton

Precinct / ballot ID

This is your official ballot. Review your votes carefully.
If you see a mistake, let a poll worker know.

State of Hamilton
Governor
Maria Lopez (Populist)

City of Springfield
Mayor
You ranked 4 candidates
1. **Keisha Jackson (Constitution)**
2. **Jin Chun (Federalist)**
3. **Abdul Shamoos (Independent)**
4. **Christiana Sabor (Unity)**

You did not rank 3 other candidates

City of Springfield
City Council
You ranked 3 candidates
1. **Lee Johnson (Whig)**
2. **Jenny Suares (Unity)**
3. **Kerry Kilgore (Constitution)**

You did not rank 2 other candidates

Includes bite-sized instructions for what to do if the voter made a mistake.

Notifies the voter that they did not use all ranks.

Official Ballot Printout

Checklist
Choosing an Accessible RCV Ballot system

- ❏ The accessible RCV ballot system has been tested with voters with a range of disabilities

Audio script

- ❏ What elements of the system are fixed/unchangeable vs. what can be adjusted by the election office? E.g. How much control do election officials have over the audio? Can you edit help instructions if needed?
- ❏ Audio and visuals have a 1:1 relationship
- ❏ Instructions use consistent syntax of "To [do something] press [key name]"
- ❏ Short and long pauses are used to separate information and instructions

Buttons and controls

- ❏ All controls are perceivable in all interaction modes, both visual and audio
- ❏ Voters can easily put the list of candidates in their rank order
- ❏ Candidate order only changes when the voter selects a Put in Order button, or when the voter leaves the contest
- ❏ Voters can easily edit rankings
- ❏ Voters select candidates in the order they want to rank them

Review screen and official printed ballot

- ❏ The review screen and official printed ballot list candidates in rank order and allow the voter to make changes
- ❏ The review screen includes both undervote and under-rank notifications

The research behind these best practices

Designing an accessible ranked choice ballot

Building on our Best Practices for Designing Ranked Choice Voting Ballots, the RCV Resource Center asked CCD to design an accessible ballot for a ballot marking device.

We used the Anywhere Ballot as the starting point. One of our goals was to explore whether the complexity of ranking could be designed to be usable for voters using assistive technology or a non-visual audio ballot. We also had a goal of creating a universal design, where one design worked for all interaction and presentation modes.

In the design, we focused on accessibility for voters with disabilities most affected by the requirements of ranked choice voting, such as keeping track of progress in ranking candidates in each contest, the complexities of changing ranks in a simple interaction, and the additional information that must be communicated during the voting process.

Watch a video of the interface with audio here: Designing an Accessible RCV Ballot

Designing and testing voting system audio

This paper summarizes the principles for audio design, with examples for different types of voting systems. It also includes a method for testing the audio ballot design with voters with disabilities. The method uses an approach called “Wizard of Oz” that enables testing a prototype without programming the audio. It starts with a visual prototype and an audio script. One researcher drives the prototype interface as instructed by the participant, while a second researcher voices the audio live during the interaction. This approach was inspired by multi-language testing conducted by IDEO for Los Angeles County’s Voting System for All People.

See: **Designing Usable Audio for Voting Systems**

Testing with voters with disabilities

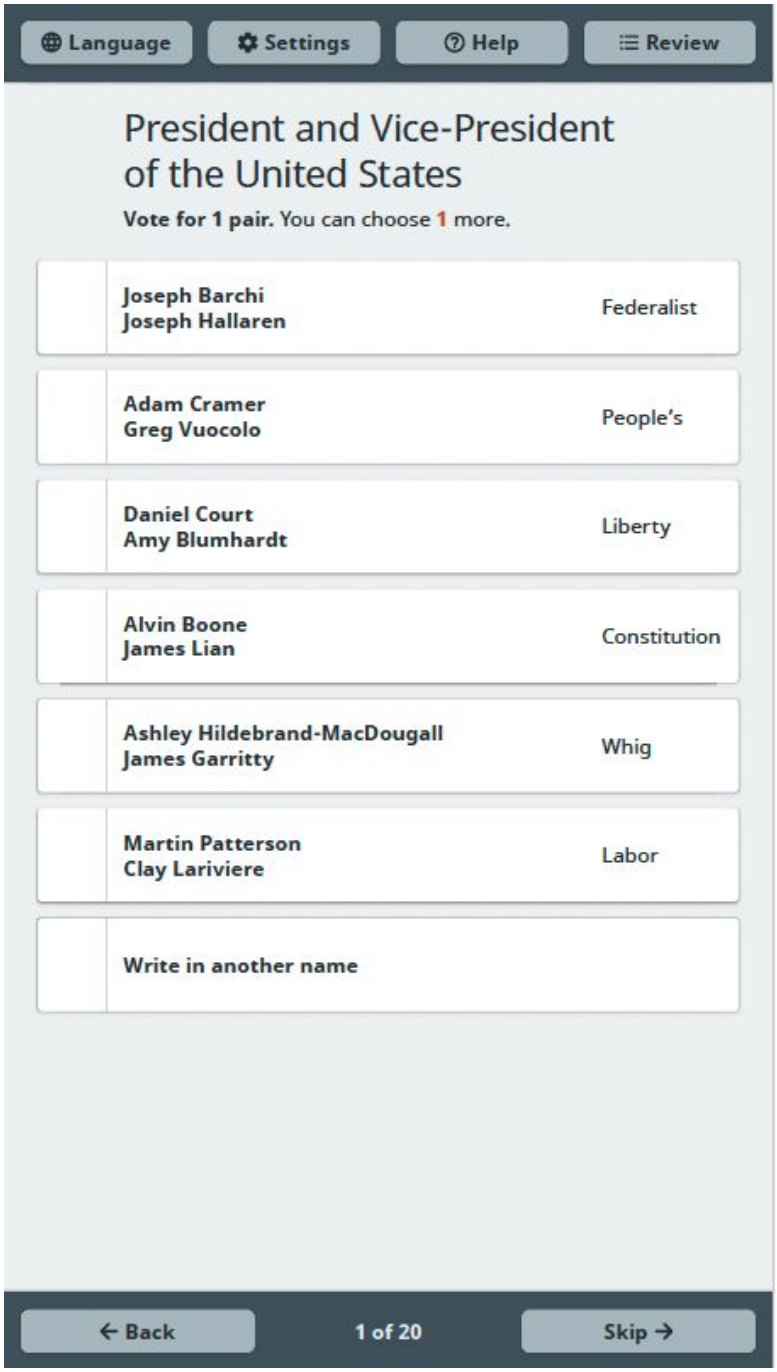
The **Handbook for VVSG 2.0 Usability and Accessibility Test Strategies** provides guidance and resources for testing voting systems, including general information for how to work with voters with disabilities as test participants.

A protocol for usable accessibility testing for voting systems is a detailed protocol for combining an expert review of accessibility features with usability testing. The ballot and test activities can be adjusted for ranked choice voting.

Read more about our research for Ranked Choice Voting at **civicdesign.org**

The original Anywhere Ballot design

The Anywhere Ballot was the starting point for the accessible RCV design. We kept the basics of the interface, adding controls to manage ranking and additional instructions.



Anywhere Ballot contest screen

Additional Resources

Learn from our Civic Design Skills resources at **civicdesign.org**

Plain Language

Field Guide Vol 1 Writing instructions voters understand

Field Guide Vol 4 Effective poll worker materials

Information Design

Workbook Designing a voter guide to an election

- Using colors effectively
- Planning for multiple languages

Toolkit Civic icons and images

Toolkit Election materials color palette (accessible colors in 4 shades)

Usability Testing

Field Guide Vol 3 Testing ballots for usability

Toolkit Usability testing kit

Language Access

Workbook Planning language access

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