

CHAPTER 12: RANKED CHOICE VOTING

12.1 Introduction

Ranked choice voting (RCV) allows voters to rank their candidates in order of preference from first to last ranking, which is different compared to traditional forms of voting where the voter can only express equal preference for one or more candidates by marking their voting box. This additional information that the ranking provides can be processed using different ways to declare one or more winner in a way to ensure elected candidates receive a majority of the vote. What most of these methods have in common is that they process the results in rounds. In the initial round only the first ranked candidates are evaluated, if any candidate achieves the majority of the votes these are elected. Otherwise, another round starts and candidates with the lowest amount of votes are eliminated. Those ballots get redistributed according to their subsequent rankings, and votes are evaluated to determine winners. This process avoids the need to do run-off elections, while still ensuring candidates receive a majority of the vote.

There are various forms of RCV supported in EMS and each variation has a number of settings which are managed through Ranked Profiles.

12.2 RCV Profile

12.2.1 General Management of Profiles and Purpose

Settings that control Ranked Choice Voting (RCV) tabulation are managed through RCV profiles from the Ranked Profiles screen in Result Tally and Reporting (RTR). You can view existing profiles by clicking Search and edit them by selecting a profile and clicking the Edit button or by double clicking a profile. You can delete existing profiles or create new ones.

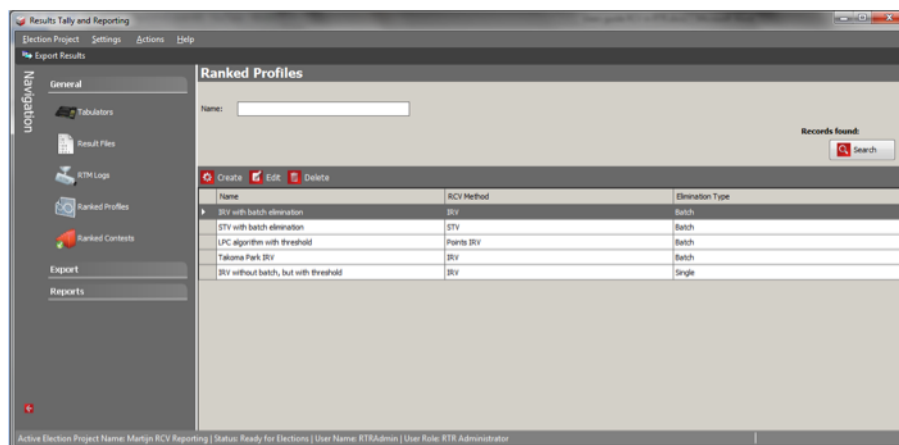


Figure 12-1: Ranked Profiles main screen

12.2.2 Settings

The RCV profile screen shows all settings associated with RCV tabulation.

The screenshot shows the 'Rcv Profile' window with the following settings:

- Name:** Weighted Inclusive Gregory Method
- RCV Method:** STV
- Previous Round Evaluation Method:** Backwards from previous round
- Elimination Type:** Batch
- Votes To Include In Threshold Calculation:** Continuing Ballots Per Round
- Fixed Precision Decimals:** 1
- Use Previous Tie Break Decision
- Exclude Unresolved Write-ins
- Declare Winners By Threshold
- Uses Precincts
- Pause After Round
- Perform Elimination Transfer In Last Round
- Skip Overvoted Rankings
- Assign Skipped Rankings to the set of Exhausted Ballots
- Use First Round Suspension

Figure 12-2: RCV Profile screen

- **Name:** Each profile can be named descriptively, so it can be quickly selected at the start of a tabulation session from a list.
- **RCV Method:** This will select the specific method of tabulating RCV votes to elect a winner, the following methods are supported:
 - **IRV:** Instant Runoff-Voting.
 - **STV:** Single Transferable Voting, more specifically the Weighted Inclusive Gregory Method, which implements fractional surplus transfer of elected candidates.
 - **Points IRV:** a modified form of Instant Run-off Voting where ranked choice voting results are evaluated on a district per district basis and each district has a set number of points (100). Elimination and declaration of winners is done on basis of points, not votes.

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Figure 12-3: RCV Profile screen

- **Previous Round Evaluation Method:** The system has the option to try and break a tie by looking at the vote totals in previous rounds. The following options are available:
 - **None:** ties are broken manually.
 - **Backwards:** the system attempts to break ties using vote totals in previous rounds going backwards from round preceding the current round to the first round.
 - **Forwards:** the system will attempt to break ties using vote totals in previous rounds going forward from first round to the round preceding the current round.

Previous Rounds Evaluation Method example:

The example below demonstrates how different previous round evaluation methods affect the handling of ties.

Candidates	Vote Totals in Round 1	Vote Totals in Round 2	Vote Totals in Round 3
A	4	6	6 (Tied)
B	5	5	6 (Tied)
C	6	6	8
D	3	3 (Eliminated)	0
E	2 (Eliminated)	0	0

Table 12-1: Previous Rounds Evaluation Method Example

Previous Rounds Evaluation Method

Candidates A and B are tied for elimination in round 3, below each method treats the tie break differently:

- **None:** The system would require the tie to be broken manually by the user.
- **Backwards:** The system looks at the votes for candidate A and B in round 2, and picks candidate B for elimination, since candidate B has less votes than candidate A in that round. If the votes would have been tied as well in round 2 for those candidates, the system would go another round backwards, until the tie is resolved, or until it runs out of rounds, in which case it will resolve the tie manually.

- **Forwards:** The system looks at the votes for candidate A and B in round 1, and picks candidate A for elimination, since that candidate has less votes than candidate B in that round. If the votes would have been tied as well in round 1, the system would go a round forwards, until the tie is resolved, or until the current round is reached, in which case the tie will be resolved manually.
- **Elimination Type:** The system can be configured to eliminate single candidates or multiple candidate each round through the Elimination type setting, the following options are available:
 - **Single:** only one candidate per round is eliminated.
 - **Single and Tied:** the candidate with the lowest vote total and any candidates tied with that candidate is eliminated. This only occurs if the following conditions apply, otherwise it will fall back to single elimination type behavior:
 - The vote total sum for all the tied candidates is less than the vote total for the next continuing candidate with the fewest votes.
 - The number of continuing candidates is at least one more than the remaining number of positions to elect.
 - **Batch:** all candidates that are certain to be eliminated in subsequent rounds are eliminated in a single round. Batch elimination will try to eliminate the largest possible amount of candidates from the list of remaining candidates ordered by vote total in ascending order for which the following conditions apply.
 - The vote total sum for all candidates to be eliminated is less than the vote total for the next continuing candidate with the fewest votes.
 - The number of continuing candidates should be at least one more than the remaining number of positions to elect.

If the number of candidates that would be eliminated due to batch elimination is less than two the system will fall back to single elimination type behavior.

NOTE: All forms of candidate elimination including batch elimination take place after all surplus has been transferred. This means that at the moment of batch elimination, the surplus has already been transferred, and is already included in the vote totals used for determining batch elimination.

Elimination Type example 1:

The example below shows the vote totals for a single seat contest per candidate in ascending order (the candidates names follow that order alphabetically). The maximum column contains the maximum number of votes a specific candidate would receive if the votes of candidates with less votes are transferred to that specific candidate.

Candidates	Vote Totals	Maximum Possible
A	10	10
B	10	20
C	30	50
D	40	90
E	400	490
F	600	1090
G	800	1890

Table 12-2: Elimination Type example 1

- **Single:** the system will detect that candidates A and B are tied for elimination and it will have to be resolved through previous round evaluation or through manual tie breaking.
- **Single and Tied:** the system will detect that candidate A and B are tied for last place and that their vote total sum of 20 is less than the vote total of the subsequent continuing candidate with 30 votes. Also at least two candidates are left to continue (there are five continuing candidates). So candidates A and B will be eliminated.
- **Batch Elimination:** the largest set of candidates for which the summed vote total is smaller than the next continuing candidate, and which still leave at least two candidates to continue in the next round, is the set of candidates A, B, C, D and E (maximum possible is 490 for this set, and next vote total is 600), so these candidates will be eliminated.

Elimination Type example 2:

The example below shows the vote totals for a single seat contest per candidate ordered in ascending order (the candidates names follow that order alphabetically for simplicity's sake). The maximum column contains the maximum number of votes a specific candidate would receive if the votes of candidates with less votes are transferred to that specific candidate.

Candidates	Vote Totals	Maximum Possible
A	15	15
B	10	30
C	30	60
D	40	100
E	400	500
F	600	1100
G	800	1900

Table 12-3: Elimination Type example 2

- **Single:** the system will detect that candidates A and B are tied for elimination and will resolve this through previous round evaluation or through manual tie breaking.
- **Single and Tied:** the system will detect that candidate A and B are tied for last place and that their vote total sum of 30 is equal to the vote total of the subsequent continuing candidate with 30 votes. This means that it cannot eliminate these candidates together, so it will fall back to Single elimination logic that requires a manual tie break.
- **Batch Elimination:** the largest set of candidates for which the summed vote total is smaller than the next continuing candidate, and which still leaves at least two candidates to continue in the next round, is the set of candidates A, B, C, D and E (maximum possible is 500 for this set, and next vote total is 600), so these candidates will be eliminated.
- **Use previous tie break decision:** If this option has been checked, the system will remember any manual tie breaks that were resolved for contests tabulated under this profile. The next time that you tabulate this contest with the same option selected, the system automatically resolves the ties in the same manner.

- **Exclude Unresolved Write-Ins:** If this option has been selected, any rankings for write-ins that were left unresolved will be ignored. If the ranking containing an unresolved write-in was over-voted because of that unresolved write-in, the ranking will still be considered over-voted even when this option is used.
- **Declare Winner by Threshold:** If this option has been selected, the system will declare winners by threshold. The threshold is the number of votes sufficient for a candidate to be elected. The threshold is calculated in each round by taking the number of continuing ballots (see 8), divided by the number of positions to elect plus one, then adding one to the quotient, disregarding any fractions. If this option is left unselected the system will not use the threshold to elect candidates but will continue eliminating candidates each round until the number of continuing candidates is equal to the number of positions left to be elected plus one. It will then eliminate the candidate with the least amount of votes and declare the remaining candidates as elected.
- **Votes to include in threshold calculation:** This option will determine the number of ballots used in the threshold calculation. Continuing ballots per round: Each round the threshold will be re-calculated using the number of continuing ballots in that round; this is the sum of all candidate vote totals for that round. Continuing ballots 1st round: the threshold will be based on the number of continuing ballots in the first round; this is the sum of all candidate vote totals for that round. The same threshold will apply to all rounds.

NOTE: If first round suspension option is used, the suspended will not be included in the threshold calculation.

- **Uses Districts/Precinct:** If this option is checked, the system will perform all calculations per precinct and allow for reporting to report each precinct separately. By leaving it unchecked all results will not be separated per precinct. This option is relevant for STV, because calculating surplus transfer for each precinct separately will create a higher total surplus transfer remainder than when surplus transfer is not separated per precinct.
- **Pause After Round:** When this option is selected the tabulation session will pause the tabulation session after each round. If it is not selected the session will continue until the end or until a manual tie break is required.
- **Fixed Precision Decimals:** This option allows you to specify how many decimals the votes should be represented during calculation, this is relevant only for the STV and Points IRV methods where votes and points are expressed as fractional values.
- **Skip Overvoted Rankings:** This option allows the algorithm to skip over-voted rankings and proceed to the next ranking. No over-votes will be recorded if this option is used and consequently not be shown in RCV reports.

- **Votes to include in threshold calculation:** The user has the option between two variations of calculating the threshold value used to elect candidates:
 - **Continuing Ballots Per Round:** Each round the total number of ballots assigned to candidates is calculated and used in the division that calculates the threshold. This means the threshold will lower as an increasing amount of ballots are exhausted in subsequent rounds.
 - **Continuing Ballots 1st round:** Each round will re-use the total number of ballots assigned to candidates in the first round for each subsequent round. Therefore the threshold will remain the same throughout the tabulation.
- **Perform Elimination Transfer in Last round:** The tabulation system will stop early if it detects that the number of continuing candidates is equal to the number of positions left to be elected plus one. For example, if the number of positions to elect is one, and if the system detects that only two candidates remain at the start of the round, the candidate with the least amount of votes is eliminated and the remaining candidate is elected without going into another round. This option allows the algorithm to perform the elimination transfer for the elimination transfer to the winning candidate if that winning candidate did not yet reach the threshold. Note: This option only applies the IRV or Points IRV methods.
- **Assign Skipped Rankings to the set of Exhausted Ballots:** This option allows the algorithm to assign Skipped Rankings to the set of Exhausted Ballots.
- **Use First Round Suspension:** This option adds one more round at the start of results tabulation where only 1st rankings are evaluated in the algorithm. All the other results are suspended until the start of the second round. Using this option automatically adds a suspended category in the RCV reporting.
- **Include Disabled Candidates Ranks In Overvote:** If set to true marks for disabled candidates will still be included in the evaluation whether the ranking is overvoted, by default overvote evaluation will not include marks for disabled candidates.

12.3 Ranked Contests

Ranked Contests functionality is used to export results for ranked choice contests.