

Purpose

This document sets out Elections Markham’s procedures for administering online voting in a Markham municipal or school board election.

Application

These procedures apply to candidates, voters, scrutineers, election officials, and other interested parties in a Markham municipal or school board election.

Legislative authority

Section 42 of the MEA authorizes the council of a municipality to pass a by-law permitting the use of alternative voting methods and vote counting equipment for municipal and school board elections. Under this authority, Markham City Council has enacted By-law 2017-20, which authorizes the Markham City Clerk to implement online voting in Markham municipal and school board elections.

Section 42 of the MEA also directs that, where a by-law authorizing alternative voting methods or vote counting equipment has been passed, the clerk of the municipality will establish procedures and forms for the use of the methods and/or equipment, which if consistent with the principles of the MEA, prevail over anything prescribed in the *MEA* and any regulations made under it.

Section 12 of the MEA further authorizes Markham’s City Clerk to establish and/or clarify any matter of the election process that is not prescribed by law and is necessary or advisable for conducting the election.

Definitions

Term	Definition
Candidate	A person who has registered to run for elected office in a municipal or school board election.
City	The City of Markham.
City Clerk	The City Clerk and chief election official of the City (or their delegate).
Decryption	The process of decoding an encrypted ballot and rendering it readable using a protected private key.

Term	Definition
Digital certificate	A unique cryptographic proof applied to each online ballot verifying that the ballot has been cast by an authorized voter.
Digital signature	A unique cryptographic proof applied to each online ballot verifying that the ballot has not been altered since the time it was encrypted and sent over the internet from the voter's device.
Early voting days	The time period established by Elections Markham before final voting day when voters can vote in the election (also known as 'advance voting').
Election official	A person appointed by Elections Markham to assist in delivering the election.
Eligibility statement	A statement completed by each voter before proceeding to their online ballot confirming their eligibility and acknowledging the rules for voting under the MEA.
Encryption	The process of converting the contents of an online ballot into a secret code and rendering it unreadable by anyone without the private key to decrypt it.
Encryption keyholders	An oversight body appointed by the City Clerk to safeguard and scrutinize the integrity of Elections Markham's online voting system and the administrative processes around it.
Final voting day	The last day on which voting takes place in the election.
MEA	Ontario's Municipal Elections Act, 1996 and any regulations or policies enacted under its authority.
Mixing	The process of shuffling and re-encrypting cast online ballots one or more times to produce an anonymous list of vote selections dissociated from the voters who cast them.
Online voting	The process by which a voter casts their ballot over the internet using a secure web-based application.

Term	Definition
Online voting system	The process by which a voter casts their ballot over the internet using a secure web-based application.
Overvote	Where a voter makes more selections than is allowed for a particular contest on the ballot.
Private key	<p>A cryptographic key that decrypts one or more cast ballots. There are two types of private keys for an online voting system:</p> <ul style="list-style-type: none"> (a) a key generated by the encryption keyholders before the start of the election and reconstituted after the close of voting on final voting day to decrypt all online ballots and tabulate the online vote totals; and, (b) a key generated by each voter upon casting their online ballot. Each voter maintains a unique private key that can be used to decrypt their own ballot and verify their selections through Elections Markham’s online ballot verification application.
Public key	<p>A cryptographic key generated by the encryption keyholders at the start of an election to:</p> <ul style="list-style-type: none"> (a) encrypt each ballot cast directly from the individual voter’s device; and, (b) verify that the ballot was cast by an authorized voter.
Undervote	Where a voter makes fewer selections than is allowed for a particular contest on the ballot.
Voter	A person who is eligible to vote in a Markham municipal or school board election.
Voter information letter	A letter sent to registered voters containing information about when and how to vote, including the web address to the online voting portal and a unique voting PIN assigned to them.
Voters’ list	The list of registered voters in a Markham municipal or school board election.

Term	Definition
Voting days	The full timeframe in which votes are cast in an election, inclusive of both early voting days and final voting day.
Voting PIN	A unique code assigned to each voter to authenticate in order to access the online voting portal.
Voting place	A place designated by Elections Markham for in-person voting.

Policy statements

1. General

- 1.1 Elections Markham's online voting system and the administrative processes around it are developed and implemented according to the following principles:
- (a) Integrity: the integrity of the voting process is maintained at all times
 - (b) Ballot secrecy: the confidentiality of the link between a voter's identity and their selections is paramount
 - (c) Accessibility: every voter has the means and opportunity to participate in the election
 - (d) Fairness: candidates and voters are treated fairly and consistently
 - (e) Certainty: the results of the election accurately reflect the votes cast
 - (f) Transparency: election processes are open and accountable to all interested parties

2. Integrity and security

- 2.1 Access to and use of the online voting system is monitored and controlled through a series of technical and process safeguards.
- 2.2 The online voting system has no single point of failure. All servers are replicated and all network applications, databases, and other components are duplicated to support continuous and responsive service.
- 2.3 Every action performed through the online voting system is recorded in immutable audit logs. The audit logs do not record any personal information capable of revealing the identity of any voter.

- 2.4 If a cybersecurity event occurs (or is believed to have occurred) at any point involving the online voting system, Elections Markham will direct that an investigation be initiated to identify and resolve the threat in a manner that maintains the integrity of the election.

3. Ballot secrecy and non-interference

- 3.1 No one will interfere or try to interfere with a voter who is in the process of accessing or using the online voting system, unless expressly requested and authorized by the voter.
- 3.2 No person will try to obtain a voter information letter or voting PIN where:
- (a) The person is not eligible to vote in the election; or,
 - (b) The voter information letter or voting PIN has been assigned to another voter.
- 3.3 No person will obtain or try to obtain information about how a voter has voted or how they intend to vote.
- 3.4 An election official who is asked to help a voter vote does so as directed by the voter, and maintains the secrecy of the voter's selections.

4. Offences and prohibited activities

- 4.1 Under the MEA, it is illegal for a person to do any of the following:
- (a) Vote when they are not an eligible voter;
 - (b) Vote with more than one ballot;
 - (c) Give or sell their voter information letter, voting PIN or ballot to someone else;
 - (d) Take someone else's voter information letter, voting PIN, or ballot;
 - (e) Vote with someone else's voting PIN or ballot;
 - (f) Force someone to vote or not vote in any way;
 - (g) Bribe someone to vote or not vote in any way;
 - (h) Accept a bribe to vote or not vote in any way;
 - (i) Invade the privacy of someone who is voting;
 - (j) Intentionally reveal how someone else has voted;

- (k) Stop someone from voting;
 - (l) Lie to or mislead an election official; or,
 - (m) Try to do any of the above.'
- 4.2 A person found guilty of any of the above acts is subject to a fine of up to \$25,000 and/or up to 6 months in jail.
- 4.3 Under the *Criminal Code of Canada*, it is illegal to intercept, take, steal, or otherwise tamper with mail address to another person. A person suspected of any of these acts will be reported to law enforcement and, if found guilty, subject to a penalty of up to 10 years in prison.
- 4.4 Candidates and people acting under the direction or in service of candidates will not:
- (a) Help a voter cast their ballot using the online voting system;
 - (b) Supply a voter with a device for voting purposes;
 - (c) Ask a voter for their voter information letter or voting PIN;
 - (d) Take a voter's voter information letter or voting PIN;
 - (e) Publish or share the web address for the online voting system.

5. Proxy voting

- 5.1 Proxy voting is not permitted in a municipal or school board election where ballots are cast through online voting.

6. Accessibility

- 6.1 Elections Markham's online voting system is designed and presented according to the W3G Web Content Accessibility Guidelines (WCAG) 2.1 Level AA standard in compliance with the *Accessibility for Ontarians with Disabilities Act*.

Pre-election procedures

7. Voter information letters

- 7.1 Elections Markham prepares a voter information letter for each registered voter on the voters' list, which includes:
- (a) The web address to Elections Markham's online voting system;

- (b) A unique voting PIN assigned to the specific voter.
- 7.2 Before the start of voting days, Elections Markham sends a voter information letter by postal mail to every voter on the voters' list as of the date the voter information letter is printed.
- 7.3 Any undeliverable voter information letters are returned to Elections Markham and are securely stored for the defined record retention period.
- 7.4 If a voter contacts the Elections Markham about an unreceived or lost voter information letter, the following process is followed:
- (a) Elections Markham authenticates the voter's identity and their status on the voters' list.
 - (b) Elections Markham determines whether a voter information letter was issued to the voter.
 - (c) Where a voter information letter was previously issued to the voter:
 - i. If the voter is not recorded as having already voted in the election, the voting PIN assigned to the voter is deactivated; or,
 - ii. If the voter is recorded as having already voted in the election, they are required to complete a sworn statement that they have not already voted in the election. The cast ballot corresponding to the initial voting PIN is invalidated and excluded from the final count.
 - (d) If Elections Markham believes that a voter's request for a new voting PIN is made in good faith, a new voter information letter with a new voting PIN is issued to the voter.
 - (e) If a voter information letter was not previously issued to the voter, the voter may ask to be added to the voter's list online or in-person at a voting place.
 - (f) If a voter notifies Elections Markham that they are unable to access the online voting system and this is determined to be a result of incorrect information on the voters' list, they may request a correction to the voters' list online, by phone, or in-person at a voting place.
 - (g) If Elections Markham determines that it is unfeasible to deliver a voter information letter to a voter by postal mail in a timely manner, the

voter information letter is delivered to the voter electronically or by other means.

8. Encryption keyholders

- 8.1 The City Clerk appoints 5 people to serve as the encryption keyholders for the online voting system, which is responsible for safeguarding, scrutinizing, and validating the integrity of the online voting process.
- 8.2 Before the election, the encryption keyholders convene to generate a voting PIN and digital certificate for each voter on the voters' list, as well as additional voting PINs and digital certificates to be assigned to new and updated voters during voting days.
- 8.3 At the start of voting days, the encryption keyholders convene to generate:
 - (a) The public key to encrypt all ballots cast through the online voting system; and,
 - (b) A private key to decrypt all ballots cast through the online voting system at the close of voting on final voting day. This private key is divided into partial shares among the encryption keyholders, and each share is protected by a secret passcode chosen by the individual encryption keyholder.
- 8.4 All critical actions involving the online voting system require authorization from at least 3 encryption keyholders and occur under the supervision of an auditor appointed by the City Clerk.
- 8.5 At the end of the election, each encryption keyholder completes a sworn statement as to the integrity with which the online voting system and administrative processes around it was executed.

9. Testing and auditing

- 9.1 Before and during voting days, the online voting system undergoes several levels of testing and auditing to validate its proper functioning.
- 9.2 The tests conducted on the online voting system include (but are not limited to):
 - (a) Functional testing;
 - (b) Integration testing;

- (c) Configuration testing;
- (d) Load, stress, and performance testing;
- (e) Failover and recovery testing;
- (f) Cybersecurity testing, including access control testing, penetration testing, distributed denial of service (DDoS) attack protection testing, web application security architecture reviews, internal and external network vulnerability assessments, and application layer testing;
- (g) Reviews of the physical, operational, and administrative security protocols in place at the system's data centres;
- (h) Privacy impact assessment;
- (i) Threat risk assessment;
- (j) Logic and accuracy testing;
- (k) Multiple end-to-end simulated election exercises; and,
- (l) Casting and validating test ballots.
- (m) A comprehensive cybersecurity assessment of the online voting system is performed by an independent third party auditor. Any issues or potential issues identified during testing are promptly remediated and re-tested to the City Clerk and auditor's satisfaction.

10. Opening the online voting system

- 10.1 At the start of voting days, the encryption keyholders convene under the direction of the City Clerk to:
- (a) Generate the election's public key and private key;
 - (b) Confirm zero vote totals for all ballot contests; and,
 - (c) Open the online voting system to receive ballots from voters.

Voting procedures

11. Voting

- 11.1 Once the encryption keyholders open the election, the online voting system is accessible to voters at any time between the start of voting on the first early voting day until the close of voting on final voting day.
- 11.2 A voter who is in the process of an active voting session after the legislated close of voting on final voting day is able to complete the voting process and cast their ballot for a period of up to 20 minutes.
- 11.3 If a voting session times out after this period of time following the legislated close of voting on final voting day, the voter is not able to re-access the online voting system.
- 11.4 The online voting system is accessible using the web address contained in the voter's voter information letter.
- 11.5 A voter accesses the online voting system by authenticating as following:
 - (a) Enters their assigned voting PIN;
 - (b) Confirms a shared secret;
 - (c) Confirms that the voting PIN is assigned to them; and,
 - (d) Completes a statement of eligibility.
- 11.6 A voting PIN used in a pre-defined number of failed login attempts is deactivated. Elections Markham may reactivate a deactivated voting PIN on the voter's request where Elections Markham is satisfied that the request is made in good faith.
- 11.7 After logging into the online voting system, the voter is presented with instructions for completing the ballot.
- 11.8 The voter is prompted to view each contest and the full list of candidates based on their qualifying address and school board support (as captured on the voters' list) before advancing to the next part of the ballot.
- 11.9 If a voting session is inactive for a pre-defined amount of time, the voter is automatically logged out of the session, and is required to re-authenticate and start from the beginning of the ballot in order to continue voting.

- (a) A voter whose voting session is about to time out due to inactivity is presented with prompts to extend their session if they want to continue voting.
 - (b) If a voting session is timed out due to inactivity after the legislated close of voting on final voting day, the voter is not able to re-access the online voting system.
- 11.10 The online voting system does not allow overvotes. A voter who makes more selections than allowed for a particular contest is alerted to the overvote and is prompted to correct it before proceeding to the next part of the ballot.
- 11.11 The online voting system allows for under-votes. A voter who makes fewer selections than allowed for a particular contest is alerted to any under-votes and is able to correct them before proceeding to the next part of the ballot.
- 11.12 Once the voter has proceeded through all contests on the ballot, they are prompted to review and confirm their selections. The voter can change their selections at any point before casting their ballot.
- 11.13 The online voting system allows a voter to decline their ballot. A voter who chooses to decline their ballot will be prompted to review and confirm their intention to not make a selection for any contest. A voter who declines their ballot is immediately struck off the voters' list and is not eligible to receive another ballot in the election.
- 11.14 After confirming their selections, the voter casts their ballot by selecting the cast ballot button. The ballot is digitally signed and encrypted on the voter's device using their unique private key, transmitted over the internet through an encrypted transport layer, and recorded in the digital ballot box.
- 11.15 The digital ballot box remains locked and inaccessible to anyone but the encryption keyholders until the close of voting on final voting day.
- 11.16 Once a ballot is cast, the corresponding voting PIN is deactivated, and the voter is struck off the voters' list.

12. Voters' list

- 12.1 The online voting system is integrated with a web-based version of the voters' list. This integration enables real-time updates while maintaining the secrecy and integrity of the voting process.
- 12.2 The voters' list updates in real-time based on voting activity.
- (a) A voter who casts their ballot using the online voting system is automatically struck off the voters' list and their voting PIN is deactivated.
 - (b) A voter who votes using a paper ballot at one of Elections Markham's voting places is struck off the voters' list by the ballot-issuing election official. Once a paper ballot is issued, any voting PIN previously assigned to the voter is instantly deactivated.
- 12.3 At a pre-defined time set by Elections Markham after each voting day, Elections Markham prepares and distributes to each candidate a list of voters registered within the candidate's electoral district(s) who voted on that day. Elections Markham does not provide candidates with a list of voters who vote on final voting day.
- 12.4 If a voter is marked as having voted and this is disputed by the voter, they may be issued a ballot upon completing a declaration.
- (a) If the previous ballot registered to the voter was cast online, it will be invalidated through the application of a unique digital signature and excluded from the decryption and tabulation process.

Post-vote procedures

13. Tabulation of online votes

- 13.1 Online voting results are tabulated after the legislated close of voting on final voting day, and after all voters at a voting place or in an active online voting session have cast their ballot.
- 13.2 Once all votes have been cast, the encryption keyholders:
- (a) Closes the online voting system;

- (b) Inspects the public key and digital certificate hashes of each individually encrypted ballot to verify that each was cast by an authorized voter;
 - (c) Inspects the digital signature of each individually encrypted ballot to verify that the contents have not been altered after being cast from the voter's device;
 - (d) Initiates a mixing process to separate each ballot from the digital signature of the voter who cast it and anonymize the vote selections;
 - (e) Reconstructs the private key to decrypt the anonymized ballots; and,
 - (f) Initiates the vote tabulation process.
- 13.3 The process of tabulating the online voting results takes place on an air-gapped computer isolated from external networks.
- 13.4 Once the online voting results are tabulated and verified, they are consolidated with any paper ballot voting results.

14. Election results

- 14.1 Vote totals from Elections Markham's online voting system are combined with the vote totals recorded through Elections Markham's vote tabulators to produce the overall election results.
- 14.2 The City Clerk reviews, validates, and publishes the unofficial results for each ballot contest on the Elections Markham's official information website and any other appropriate channels as soon as possible after the close of voting in the election.
- 14.3 The City Clerk certifies and publishes the official results for each ballot contest as soon as possible after final voting day.

15. Recount

- 15.1 A recount of ballots cast online is conducted in the same manner as outlined in these procedures.
- 15.2 The online voting system maintains a record of all encrypted ballots cast in the election to facilitate a recount, where required.

16. Records

- 16.1 Elections Markham retains all election records in a secure manner for 120 days after the election results are declared. This includes any data generated and stored by the online voting system.
- 16.2 If a recount is ordered under the MEA, the election records will be maintained until the recount has been properly executed and the election results have been confirmed.
- 16.3 All data related to online voting are secured offline for the required duration and are deleted after that date passes at the direction of the City Clerk.

Roles and responsibilities

Elections Markham periodically reviews and updates this policy to support legislative compliance as well as the principles of transparency, consistency, and accessibility. Updates made during an election period will be communicated to candidates and the public.

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