

Date: 2023-05-17

Subject: **Timing of Traffic Signals and Pedestrian Crossings at Intersections (RM 43/2022)**

Contact: Shane Loftus, Manager, Transportation Right of Way & Safety, Road Maintenance, Operations and Fleet, Public Works and Engineering Department, 905-874-2579

Report Number: Public Works & Engineering-2023-460

Recommendations:

1. That the report from Shane Loftus, Manager Transportation Right of Way & Safety, Road Maintenance, Operations and Fleet, Council Meeting of May 24th, 2023, re: **Timing of Traffic Signals and Pedestrian Crossings at Intersections (RM 43/2022)**, be received.

Overview:

- **This report responds to a Referred Matter regarding the timing of the City's Traffic Signal and Pedestrian Signals.**
- **On November 23, 2022, Committee of Council received a delegation from a resident concerned with the signal timing at City intersections.**
- **On November 28, 2022, City staff from Public Works & Engineering and Councillor Vicente had an on-site meeting with the resident at the intersection of Steeles Avenue and Hurontario Street.**
- **Public Works & Engineering calculates traffic and pedestrian signal timings according to the Ontario Traffic Manual (OTM), the City's Traffic Management Plan and in support of Vision Zero, which prioritizes pedestrian safety.**
- **Changes to traffic and pedestrian timing must consider several factors such as the complexity of the intersection, traffic and pedestrian flows, and coordination with the wider signal corridor.**

- **Public Works & Engineering will continue to be responsive to resident concerns, and review opportunities for signal enhancements.**

Background:

The timing of traffic signals and pedestrian crossings is complex, and a singular intersection cannot be looked at in isolation as it has a significant impact on intersection up and downstream along the coordinated traffic signal corridor. Although residents may notice issues with the progression of signals within a corridor, or that additional vehicular volume requires an intersection to be reviewed and possibly re-timed, it is not as simple as updating programming at one location. Signal timing changes at one intersection may not only affect progression within that traffic signal's coordinated corridor and may also cascade to intersecting corridors.

Traffic signal timings which include pedestrian crossing times are calculated based on traffic volumes, intersection geometrics, and signal capacity analysis results as well as how many traffic signal phases are needed at each intersection. The more complex an intersection is the more difficult it is to program signal timings that allow for traffic signal coordination across the entire traffic signal corridor.

As part of the 2023 budget, the Traffic Signals team plans to implement new software, with more automated features that will allow for more proactive monitoring of existing signal timings. The new software will also allow staff to conduct speed and delay measurements to ensure optimal system efficiency.

Current Situation:

Traffic Signal Timing (New Installations):

In order to ensure that newly installed traffic signals are timed properly, the following steps are taken:

- Turning movement counts are performed to obtain latest volumes,
- Vehicle and pedestrian clearance measurements are performed,
- Vehicle and pedestrian clearance calculations are performed,
- Verified volumes, lane configuration and verified clearances are used in traffic modeling software,
- Signal timings are optimized in traffic modeling software,
- New developed signal timings are tested in the traffic cabinet assembly shop, and
- Signal timings and field measurements are re-verified during traffic signal activation.

These steps ensure that the newly constructed intersection is optimized for efficiency at not only its location but as part of a coordinated traffic signal corridor and the larger advanced traffic management system (ATMS).

Traffic Signal Timing (Re-Timing):

Once an intersection has been constructed and is part of the larger traffic network, the timing can be reviewed when it is suspected that the timing for different phases (protected turns, green, yellow, etc.) may need to be adjusted. The requirement to revise signal timings at signalized intersections may be due to increased vehicular or pedestrian traffic volumes from new developments in the area, excessive queuing and turning movement delays, general population growth, and revised road geometry.

The main objective of signal re-timing projects is to reduce corridor travel times as well as the number of stops and delays while improving the use of the available green time at each intersection. Reducing overall corridor delays has positive societal benefits such as reducing delays on transit routes and lowering harmful vehicle emissions.

The current signal re-timing goal is to re-time six (6) traffic signal corridors each year in order to keep up with traffic growth generated by new developments and changing traffic patterns across the City. The corridors are carefully selected based on the following justifications:

- Traffic growth due to development,
- Changes in volumes and traffic patterns as identified volumes,
- Collision statistics,
- Service requests related to traffic congestion and signal progression, and
- Travel time and delay data collected by staff.

Pedestrian Crossing Timing:

The City proactively prioritizes pedestrian safety in support of Vision Zero and active transportation. Pedestrian crossing times are the basic building blocks of intersection signal timings and determine the rest of the traffic signal phasing. The need to build intersection signal timings around pedestrian crossing times stems from the fact that they are the most critical and longest intervals.

The City's standard exceeds the Ontario Traffic Manual (OTM) Book 12 recommendation and have implemented the use on 0.9 m/s at locations with high senior citizens, school children and pedestrians with disabilities volumes. Pedestrian crossing requirements are based on OTM Book 12 recommended guidelines and calculations. These guidelines provide a calculation methodology and most importantly recommend walking speeds used in the calculation of pedestrian crossing times.

According to OTM Book 12 pedestrian walking speeds are typically between 1.0 m/s and 1.25 m/s based on industry standards. The use of 1.0 m/s is recommended for locations with heavy senior citizen, school children and pedestrian with disabilities volumes.

New Software:

The use of modern intelligent transportation systems can help increase the ability to review traffic signal operation and to re-time a larger percentage of the signal network annually. These technologies can also automate the process of identifying traffic signal corridors in need of signal retiming, which is achieved by continuously monitoring traffic signals and reduce the need for field data collection and give staff access to traffic data in real-time which fast tracks a number of signal retiming steps and procedures.

In 2021, the software used for these re-timing changes have become obsolete and is no longer vendor supported which prevents staff from measuring delays and modelling the impact of proposed signal timing changes. This makes the re-timing of intersections a manually laborious process and the City's re-timing efforts have fallen behind.

Traffic Signals staff are currently in the process of procuring a new travel time and delay system software that utilizes both manually collected data and high-resolution travel time data collected from crowdsourcing and fleet data. The advantage of this type of system is that the data is available in real-time, and look at historical patterns. With 24/7 real-time data the Traffic Signals group will have access to far more granular and accurate traffic data.

Finally, Traffic Signals staff is also in the process of procuring a new Advanced Traffic Management System (ATMS) central software which will have the ability to leverage traffic signal performance metrics already collected by traffic signal controllers. This data will be used by the new ATMS software to look for patterns that may indicate the need to correct signal timing issues and/or equipment faults. The system will create system reports that will enable staff to identify problems and generate signal timing solutions in a timelier manner.

Corporate Implications:

Financial Implications:

There are no financial implications resulting from recommendation in this report as funds for new software have already been approved in previous budgets.

Other Implications:

N/A

Term of Council Priorities:

The actions and initiatives described in this report supports Term of Council Priority to ensure Brampton is a Well-run City.

Conclusion:

The Traffic Signals team will continue to review and respond to resident enquiries regarding signal or pedestrian crossing timings. Changes to traffic and pedestrian signals are complex and impact the larger traffic signals network, which may not be feasible. The expected addition of new software packages in 2023 will provide staff with more streamlined and proactive ability to identify and update changes with more accurate data.

Authored by:

Shane Loftus
Manager, Transportation Right of
Way & Safety,
Road Maintenance, Operations and
Fleet
Public Works and Engineering

Approved by:

Marlon Kallideen,
Interim Commissioner
Public Works and Engineering

Reviewed by:

Rob Gasper,
Director,
Road Maintenance, Operations and Fleet
Public Works and Engineering

Submitted by:

Marlon Kallideen,
Chief Administrative Officer