



## memorandum

C 2  
COMMUNICATION

FAA- Nov 23/17

ITEM - 1

**DATE:** November 23, 2017

**TO:** Mayor and Members of Council

**FROM:** Stephen Collins, Deputy City Manager, Public Works

**RE:** Communication: Finance, Administration and Audit, November 23, 2017,  
Installation of Traffic Control Signals at Teston Road and Mosque Gate  
Ward 1

---

### Purpose

This communication responds to Item 1 of the November 13, 2017 meeting of the Finance, Administration and Audit Committee, specifically the request from Committee to provide information on the costs related to the installation of traffic control signals at Teston Road and Mosque Gate.

### Economic Impact

York Region has estimated the cost for the installation and operation of Traffic Control Signals (TCS) at Teston Road and Mosque Gate at:

Capital Cost: \$180,000 (includes design, construction and related soft costs)  
Operating Cost: \$78,000 (\$7,800 per year for ten years, includes power, monitoring and maintenance activities)

Current York Region policy for Traffic and Pedestrian Signals (*see attachment 1*) does not allow for the installation of unwarranted TCS, even if the local municipality agrees to fund the capital and operating costs. However, York Region Council's recent practice has been to make exceptions to the policy in circumstances where a local municipality has asked York Region to install the TCS and fully fund the capital and operating costs.

Funding sources for the estimated capital and operating costs have been reviewed by staff.

The capital cost for the installation of the TCS could be funded from City Wide development charges. The capital cost of the project, estimated at \$180,000, would likely be payable to York Region in early 2019.

The annual operating costs for the TCS would need to be funded from the Tax Levy. The annual operating cost is estimated at \$7,800, therefore \$78,000 for the ten-year operating period. York Region has advised that ten years of operating costs would need to be paid in the first year of operation, likely in 2019.

York Region confirmed the City would not be reimbursed for the capital cost, even if in the future the TCS satisfies York Region's policy criteria. However, in the event the TCS becomes warranted within the ten-year operating period, York Region would reimburse the City for the unused portion of the prepaid operating costs.

## **Communications Plan**

Staff have consulted with York Region Transportation Services staff on the potential to install a TCS at the intersection of Teston Road and Mosque Gate.

## **Background Analysis and Options**

### **Regional Council received and referred to staff a request to install traffic control signals at Teston Road and Mosque Gate**

On October 5, 2017, York Region Committee of the Whole received a deputation on behalf of Ahmadiyya Muslim Jama'at Canada, regarding a request to install traffic signals at Mosque Gate and Teston Road. This request was received and referred to staff and ratified by York Region Council at their meeting on October 19, 2017.

### **In 2015 York Region Council adopted a revised Traffic Signal and Pedestrian Crossing Policy**

Prior to 2015, York Region had separate policies guiding the decision making on when TCS and Pedestrian Crossing Signals should be installed. The Policies reflected the 2001 Ontario Traffic Manual, industry best practices and customized criteria specifically developed for York Region.

In 2015 York Region decided to align their criteria with current Ministry of Transportation Ontario (MTO) traffic and pedestrian signal criteria. This was done to provide a consistent approach across the Province for justification of signals and align their criteria with that which is widely used by Ontario municipalities.

### **The 2015 Traffic and Pedestrian Signal Policy eliminated the Municipal Warrant criteria**

Prior to 2015 the policy included an option for a municipal warrant. A municipal warrant reflects criteria that York Region developed which allows municipalities to “fast track” an unwarranted traffic signal at their own cost. When the full warrant is met, the Region will reimburse the municipality who funded advance installation under the municipal warrant.

The 2015 Traffic and Pedestrian Signal Policy removed the municipal warrant criteria. Therefore, the opportunity for a local municipality to advance the installation of an unwarranted TCS was eliminated.

### **York Region staff have advised that the TCS at Teston Road and Mosque is not warranted now based on the 2015 York Region policy**

In early November 2017, York Region staff completed the TCS warrant analysis. They concluded that the intersection does not meet the Regional criteria and installation of a TCS is not recommended. York Region staff will be reporting to Regional Council in early 2018, presenting the results of their review and recommending the TCS not be installed.



Staff reviewed the analysis and, based on York Region's warrant criteria, agree that TCS at Teston Road and Mosque Gate are not warranted and this time. On this basis, the City should consider recovering the Operating costs of the unwarranted TCS from the requestor, in this case Ahmadiyya Muslim Jama'at Canada.

### **Conclusion**

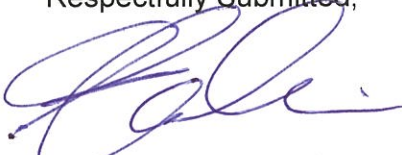
In October 2017, the Ahmadiyya Muslim Jama'at Canada asked York Region to install TCS at Teston Road and Mosque Gate. Regional staff have advised that TCS are not warranted now and will be reporting to Regional Council in early 2018 recommending TCS not be installed.

The estimated Capital Cost of the TCS is \$180,000 and the estimated annual Operating cost of the TCS is \$7,800. York Region has advised that ten years of Operating costs, \$78,000, are payable in the first year of operation.

York Region Council has recently approved unwarranted signals that have been requested by a local municipality and with the understanding the local municipality will be fully responsible for the Capital and Operating costs.

Report prepared by:  
Stephen Collins, DCM Public Works

Respectfully Submitted,

A handwritten signature in blue ink, appearing to read 'S. Collins', with a stylized flourish at the end.

Stephen Collins, P.Eng.  
Deputy City Manager, Public Works

Attachment #1: York Region Traffic and Pedestrian Signal Policy

Clause 3 in Report No. 11 of Committee of the Whole was adopted, without amendment, by the Council of The Regional Municipality of York at its meeting held on June 25, 2015.

### **3**

## **Traffic and Pedestrian Signal Policy**

Committee of the Whole recommends adoption of the following recommendations contained in the report dated May 21, 2015 from the Commissioner of Transportation Services:

### **1. Recommendations**

It is recommended that:

1. The Region's current traffic and pedestrian signal policies be replaced with a revised policy, which directly references the Ontario Traffic Manual Book 12.
2. The Regional Clerk circulate this report to the local municipalities.

### **2. Purpose**

This report recommends a revised policy to determine when it is appropriate to install traffic or pedestrian signals (Attachment 1) which directly references Ontario Traffic Manual Book 12.

### **3. Background**

#### **As traffic continues to increase, requests to consider new traffic and pedestrian signals also grow**

As traffic continues to grow across the Region, traffic signals are increasingly required to balance movements on major corridors and facilitate access to local communities. The Region has more than 2,000 intersections on Regional roads, of which more than 800 are controlled with traffic signals. The Region receives approximately 100 requests annually from residents and other stakeholders for signal installation at intersections to improve safety or manage congestion.

While the benefits of traffic signals are understood, there are trade-offs that need to be considered prior to installation of new signals. The installation of traffic signals increases delays to traffic on major streets and increases the number of rear-end collisions. Traffic signals cost over \$200,000 to install and have ongoing operation and maintenance costs. It is important that the Region's policy include a signal warrant to determine when a signal installation is beneficial.

#### **The Region has policies in place to determine whether or not traffic or pedestrian signals are required**

Council endorsed a Traffic Signal Policy in October 2002 (Attachment 2) and a Pedestrian Crossing Warrant Criteria in June 2007 (Attachment 3). These policies consist of:

- 2001 Ontario Traffic Manual Book 12 traffic signal criteria
- Best practices criteria in the industry
- Customized criteria developed exclusively for York Region.

Regional policies should be consistent with current Ministry of Transportation Ontario (MTO) traffic and pedestrian signal criteria, as outlined in Ontario Traffic Manual Book 12 entitled Traffic Signals.

## **Traffic and Pedestrian Signal Policy**

### **The MTO signal criteria provides for a consistent approach across the Province for justification of signals**

The MTO signal criteria provides for a consistent approach used across the province to determine whether the installation of signals would be beneficial. The signal criterion provides thresholds for vehicle and pedestrian volumes and accounts for delay and safety. A brief description of each Ontario Traffic Manual Book 12 signal criteria is outlined in Attachment 4.

### **The MTO traffic and pedestrian signal criteria is widely-used by Ontario municipalities**

Ontario Traffic Manual Book 12 signal criteria for traffic and pedestrian signals are exclusively used by Ottawa, Toronto, Halton and Waterloo, as well as all local municipalities in York Region.

## **4. Analysis and Options**

### **The Region's signal policies should be updated to directly reference Ontario Traffic Manual Book 12**

Ontario Traffic Manual Book 12 signal criteria was updated in 2012 to include criteria that recognizes the critical four peak traffic hours of the day as well as projected traffic volumes. The current Regional policy is based on eight hours for existing traffic only. The four-hour vehicle volume criteria is more responsive to commuter corridors, which experience high volumes in the morning and evening peak periods, with considerably reduced volumes for the remainder of the day. The projected traffic volume criteria will assist in determining traffic signal requirements as part of new developments. The four-hour vehicle volume and projected traffic volume criteria ensure that the policy is responsive to a wide variety of scenarios which may benefit from traffic or pedestrian signals.



## Traffic and Pedestrian Signal Policy

### **The proposed traffic and pedestrian signal policy does not include the municipal warrant**

The current policy includes an option for a municipal warrant. A municipal warrant reflects criteria that York Region developed which allows municipalities to “fast track” a traffic signal at their own cost. To be eligible for the municipal warrant, an intersection is required to meet at least 90 per cent of the Region’s traffic signal warrant. When the full warrant is met, the Region will reimburse the municipality who funded advance installation under the municipal warrant. It is expected that the more responsive four-hour vehicle volume and projected traffic volume criteria of the recommended revised policy will eliminate the need for this municipal warrant.

### **The revised policy recognizes the need for signalization at intersections that are busy primarily during peak periods**

To illustrate the increased responsiveness of the proposed traffic signal policy, Table 1 shows how the various criteria are applied to the intersection of Rutherford Road and Pine Valley Drive.

**Table 1**  
**Traffic Signal Warrant Analysis**

Criteria	Threshold	Compliance (Need to meet or exceed threshold)	Signals Justified (Y/N)
1. Minimum Volume	100%	48%	No
2. Delay to Cross Traffic	100%	51%	No
3. Volume/Delay Combination	80%	48%	No
4. Four-hour Vehicle Volume *	100%	100%	Yes
5. Collision Experience	100%	27	No
6. Pedestrian Volume Delay	100%	0	No
7. Projected Volume *	150%	N/A	N/A
8. Municipal Warrant	70%	48%	No

\* Not included in current policy

As summarized in Table 1, the intersection of Rutherford Road and Pine Valley Drive satisfies traffic signals based on the four-hour vehicle volume criteria under the proposed policy, but not the municipal warrant in the current policy.

## **Traffic and Pedestrian Signal Policy**

Over the next three years, seven intersections across the Region will satisfy the proposed policy for the installation of traffic signals based on the four-hour vehicle volume or projected traffic volume criteria, which would not have otherwise been warranted. Table 2 lists these intersections by municipality.

**Table 2**  
**Additional Traffic Signals Based on Revised Policy**

Municipality	Intersection
City of Markham	16 <sup>th</sup> Avenue at Williamson Road
City of Vaughan	Dufferin Street at Maurier Boulevard
City of Vaughan	Pine Valley Drive at Rutherford Road
City of Vaughan	Teston Road at St. Joan of Arc Avenue
Town of Georgina	The Queensway South at Richmond Park Drive
Town of Richmond Hill	Bathurst Street at Augustine Avenue
Township of King	King Road and Parker Avenue

### **Traffic and pedestrian signal warrants are now included in a combined policy**

A combined policy emphasizes the importance of balancing the needs of all intersection users. The proposed policy will continue to evaluate the need for pedestrian signals based on pedestrian volume and crossing opportunity or delay.

### **Council will continue to have the authority to approve signals that do not meet the policy criteria under the revised policy**

Under the revised policy, Council retains the option to approve any new traffic and pedestrian signals. Since implementation of the Region's policy in 2002, traffic or pedestrian signals have been installed at 19 locations where the warrant was not satisfied. In these cases, the need for signals was justified based on specific needs that were proposed by staff and approved by Council on a case-by-case basis.

### **Link to key Council-approved plans**

This report supports Vision 2051, which responds to the needs of our residents and promotes safety on York Region roads through effective policing, education and context-sensitive design.



## **Traffic and Pedestrian Signal Policy**

### **5. Financial Implications**

The installation of traffic and pedestrian signals are funded through the Transportation Services Capital budget. Each signal costs between \$200,000 and \$350,000 to install, and \$7,000 annually for operating and maintenance. The costs associated with additional intersection warranting signals under the proposed policy are not significant and can be accommodated within the funding included in the outlook years of the approved 2015 budget.

Funding of traffic or pedestrian signals at private entrances, whether warranted or unwarranted, would remain at the expense of the property owner. In addition, property owners are required to pay a one-time up-front fee which represents the net present value of ten years of operating and maintenance costs for the traffic or pedestrian signal.

### **6. Local Municipal Impact**

Local municipalities have the ability to establish their own policy for traffic and pedestrian signals at intersections under their jurisdiction. The local municipalities, in consultation with Regional staff, will aid in the assessment of the need to install signals on Regional roads. Local municipal staff have been consulted on the proposed changes within this report and have indicated their support.

### **7. Conclusion**

Staff recommends updating the current Traffic and Pedestrian Signal policies to directly reference the Ontario Traffic Manual Book 12, which reflects industry best practices in determining the need for the installation of new traffic or pedestrian signals on Regional roads. The increased responsiveness of the proposed policy will eliminate the need for the municipal warrant. Council will continue to have authority to approve signals that do not meet the warrants of the policy on a case-by-case basis.

For more information on this report, please contact Brian Titherington, Director, Roads and Traffic Operations at ext. 75901.

## **Traffic and Pedestrian Signal Policy**

The Senior Management Group has reviewed this report.

May 21, 2015

Attachments (4)

6126261

Accessible formats or communication supports are available upon request

## Attachment 1



STATUS: Draft  
Council Approved: No  
CAO Approved: No

<b>TITLE: TRAFFIC AND PEDESTRIAN SIGNAL POLICY</b>	<b>Edocs No.: 5980367</b> <b>Original Approval Date: October 17, 2002</b> <b>Policy Last Updated: June 25, 2015</b> <b>Posted on Intranet: (date)</b>
--	--

### POLICY STATEMENT:

This policy provides guidelines for the installation of traffic and pedestrian signals within the Regional road network.

### APPLICATION:

The Traffic and Pedestrian Signal Policy will be used by staff in determining acceptable locations for the installation of traffic and pedestrian signals within the Regional road network.

### PURPOSE:

This policy is meant to provide a technically sound and consistent method of determining appropriate locations for the installation of traffic and pedestrian signals within Regional road network.

### DEFINITIONS

**Traffic Signals:** Electronic signalling devices positioned at road intersections to alternate right-of-way for all road users.

**Traffic Signal Warrant:** A set of criteria used to determine the relative need for and appropriateness of traffic signals. Warrants are usually expressed in the form of numerical requirements such as the volume of vehicular or pedestrian traffic, delay to cross traffic, or collisions.



## **Traffic and Pedestrian Signal Policy**

**Local Municipality:** Municipalities located within the Regional Municipality of York: Town of Aurora, Town of East Gwillimbury, Town of Georgina, Town of King, City of Markham, Town of Newmarket, Town of Richmond Hill, City of Vaughan and Town of Whitchurch-Stouffville.

**Pedestrian Signals:** Electronic signaling devices positioned at road intersections and pedestrian crossings to specifically control pedestrian movements versus competing traffic flows.

**Safety:** Implies the minimum hazard to vehicles, pedestrians and other road users.

## **DESCRIPTION:**

### **Regional Intersections**

Traffic and pedestrian signals are required to balance alternating right-of-way between all road users and to facilitate access to local communities. The Region receives numerous requests annually from residents and other stakeholders to install signals to manage congestion or improve safety.

Unwarranted installation of traffic signals increases overall delay on the major street; negatively impacting the flow of traffic and potentially increasing the incidences of collisions. It is important that the Region's policy include a traffic signal warrant to determine when a traffic signal installation is beneficial.

The Ministry of Transportation Ontario's traffic signal criteria, as per Ontario Traffic Manual Book 12 is widely used by Ontario municipalities. Ontario Traffic Manual Book 12 outlines criteria that includes traffic/pedestrian volumes, conditions and characteristics of an intersection and peak traffic hours to determine the technical need for the installation of new signals. Regional staff are to directly reference Ontario Traffic Manual Book 12 in determining the need for the installation of new traffic and pedestrian signals on Regional roads. In cases where the policy is not satisfied, Council will continue to have the authority to approve signals at those intersections.

The Region will be responsible for all costs for installation, operation and maintenance of traffic and pedestrian signals at Regional intersections.

### **Private Entrances**

Funding of traffic and pedestrian signals for private entrances remains at the expense of the property owner. Property owners are required to pay a one-time fee, valued at the net present value of 10 years of the Region's traffic signal operating and maintenance costs at the time of application, to offset operating and maintenance costs. Traffic and pedestrian signals associated with development applications will be subject to the Development Charge Bylaw.

## Traffic and Pedestrian Signal Policy

### RESPONSIBILITIES:

#### York Region:

- The Region shall assess the need for the installation of traffic and pedestrian signals on the Regional road network based on the criteria set out in Ontario Traffic Manual Book 12
- Council continues to have the authority to approve the installation of traffic and pedestrian signals whether they satisfy the criteria or not

#### Local Municipalities:

- The local municipalities, in consultation with Regional staff, shall aid in the assessment of the need to install traffic and pedestrian signals

### REFERENCE:

On October 17, 2002, Regional Council adopted the current Traffic Signal Installation Policy, which is comprised of criteria from the Ontario Traffic Manual, industry best practices and a custom warrant to reflect municipal desires in developing areas of the Region.

On June 21, 2007, Regional Council amended the Pedestrian Signal Installation Policy adopted on February 21, 2002 to permit the use of mid-block pedestrian signals on Regional roads. The current policy is comprised of a custom procedure based on a combination of the 2002 Pedestrian Signal Installation Policy and industry best practices.

### CONTACT:

Brian Titherington, Director Roads and Traffic Operations, Transportation Services Department.

<b><u>APPROVAL INFORMATION</u></b> <i>[complete the details from the approved policy report]</i>		
<b>CAO Approval Date:</b> N/A		
<b>Committee:</b> Transportation Services	<b>Clause No.:</b>	<b>Report No.</b> Edocs. No. 5980367
<b>Council Approval:</b> Minute No.	<b>Page:</b>	<b>Date:</b> June 25, 2015



STATUS	Final
Council Approved	Y
CAO Approved:	Y

<b>TITLE: Traffic Signal Warrants</b>	<b>Edocs No.: 32922</b> <b>Original Approval Date: October 17, 2002</b> <b>Policy Last Updated: December 18, 2008</b> <b>Posted on Intranet: April 21, 2010</b>
---------------------------------------	--

**POLICY STATEMENT:**

The Traffic Signal Warrant policy is a policy providing a warrant process for the installation of traffic signals at locations along The Regional Municipality of York road network.

**APPLICATION:**

The Traffic Signal Warrant policy will be used by all Regional Employees, in particular Transportation and Works Employees who are involved in determining the locations for the installation of traffic signals along the Regional road network.

**PURPOSE:**

This policy is meant to provide a credible, technically sound and consistent method of determining warranted locations for the installation of traffic signals on Regional roads.

**DESCRIPTION:**

Traffic signals alternate the right-of-way between conflicting streams of vehicular traffic, or vehicular traffic and pedestrians crossing a roadway, with maximum efficiency and safety. Maximum efficiency implies the minimum delay to traffic. Safety requires that the traffic signals operate at the minimum hazard to vehicles and pedestrians.

The following warrants are to be used to determine whether or not traffic signals are justified at a location.

1. **Traffic Control Signal Warrants as Outlined in Book 12 of the Ontario Traffic Manual**



These warrants are currently used within The Regional Municipality of York. They are comprised of the following:

Warrant 1 – Minimum Vehicle Volumes

Warrant 2 - Delay To Cross Traffic

Warrant 3 – Collision Experience

If any one warrant is satisfied by 100% or if any two warrants are satisfied by 80% or more, the installation of traffic signals is considered to be justified.

## **2. Safety Warrant**

The safety warrant is an analysis based upon the safety performance of an intersection, compared to other intersections with similar characteristics. These characteristics are summarized into safety performance functions (SPFs). In simple terms, the existing safety performance of an unsignalized intersection can be determined and then compared to a projected safety performance, if traffic signals were installed.

If the rate of equivalent collisions is substantially lower with the installation traffic control signals than as an unsignalized intersection, then the installation of traffic control signals is considered to be justified.

## **3. “T” Type Intersections Warrant**

The threshold volumes for side street traffic shall not be increased by 50% when evaluating "T" type intersections because the side street traffic still faces the same traffic flows on the major street.

## **4. Peak Hour Delay For Entering onto the Major Street from the Side Street**

A Peak Hour Delay warrant is met when:

- The total delay experienced by the traffic on one minor-street approach (one direction only) controlled by a stop sign equals or exceeds four vehicle-hours for a one lane approach and five vehicle-hours for a two lane approach; and
- The volume on the same minor street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes; and
- The total entering volume during the hour equals or exceeds 800 vehicles per hour for intersections with four or more approaches or 650 vehicles per hour for intersections with three approaches.

**5. Installation of Unwarranted Traffic Signals Paid by Local Municipalities**

Area municipalities shall be permitted to pay for the installation of unwarranted traffic signals subject to a number of conditions being met.

- The Transportation and Works Department have no technical objections to the installation of traffic signals at the location requested.
- Warrant 1 and Warrant 2 are satisfied by at least 70%.
- All installation costs are incurred by the local municipality. Installation costs are estimated at \$120,000 per location, permanent installation, \$60,000, temporary installation.
- All on-going maintenance costs are incurred by the local municipality, until such time as the traffic signals become warranted. On-going maintenance costs are estimated at \$4,000 per location/annually. Actual costs will be charged to the municipality.
- When the traffic signal becomes warranted, the Region will reimburse the local municipalities 100% of the original installation cost of permanent signals. Temporary installation will be done in areas where road improvements are planned within five years. For temporary installation, the Region will reimburse the local municipality, the value of the material that is recoverable.

**RESPONSIBILITIES:****Transportation and Works Department:**

- The Transportation and Works Department shall assess the need for the installation of traffic signals on the Regional Road system.

**Area Municipalities:**

- The Area Municipalities, in consultation with Regional staff, shall aid in the assessment of the need to install traffic signals.

**REFERENCES:**

Report 10(7), Transportation and Works Committee, adopted by Council December 18, 2008

**CONTACT:**

Director of Roads Transportation, Transportation and Works Department

**APPROVAL INFORMATION**

**CAO Approval Date:** September 20, 2002

**Committee:** Transportation and Works

**Clause:** 8

**Report No:** 9

**Council Approval:**

**Minute No.** 156 **Page:** **Date:** October 17, 2002

32922 P01/5/1  
822254 P06 2008 Extract





STATUS	Final
Council Approved	Y
CAO Approved:	Y

<b>TITLE:</b> Pedestrian Crossing Warrant	<b>Edocs No.:</b> 1818446 <b>Original Approval Date:</b> June 21, 2007 <b>Policy Last Updated:</b> June 21, 2007 <b>Posted on Intranet:</b> April 16, 2010
---	---

**POLICY STATEMENT:**

This policy provides a warrant process for setting pedestrian crossing facilities along York Region road system.

**APPLICATION:**

The pedestrian crossing warrant criteria provide a consistent approach to determine appropriate location for the installation of pedestrian facilities within the York Region.

**PURPOSE:**

The purpose of this policy is to provide guidelines for the installation of Intersection Pedestrian Signal and Mid-block Pedestrian Signal on roads in York Region in such manner to increase the safety of all road users and encourage pedestrian and cyclist traffic in accordance with the concepts of a mobility and walk-able community.

**DESCRIPTION:**

This policy contains separate guidelines for implementing pedestrian crossing signals at intersections and mid-block locations.

**Warrants**

An IPS or an MPS is warranted when ALL of the following conditions apply:

1. If during any **4 hours** of a day the *pedestrian crossing demand (PCD)* exceeds 50 AND the number of *pedestrian crossing opportunities (PCO)* during the worst hour is less than 60.

OR

If during any **2 hours** of a day the *pedestrian crossing demand (PCD)* exceeds 25 AND the number of *pedestrian crossing opportunities (PCO)* during the worst hour is less than 60.

2. The distance to the closest signalized intersection exceeds 200 metres
3. Adequate sight distance is available for both pedestrians and vehicles for the operating speed of the roadway.
4. At proposed IPS locations fewer than 5,000 vehicles per day must be present on the intersecting side street approaches
5. There is adequate street lighting to illuminate the crossing and the approaches to the crossing

#### **i. Pedestrian Crossing Demand (PCD)**

Pedestrian crossing demand is the expected number of pedestrians that will utilize a pedestrian crossing after its signalization and will not necessarily be the same as the actual number of pedestrian counted using an unsignalized crossing. To account for this potential discrepancy the formula to estimate the PCD includes an adjustment factor (*f*). This factor represents the expected increase in pedestrian crossing volumes after the signalization of the pedestrian crossing.

$$PCD = f(A + 3 * E + 3 * C + 3 * PD)$$

f = Adjustment factor (Default = 1.2)

A = Observed number of pedestrians older than 12 years and less than 60 years

E = Observed number of pedestrians older than 60 years

C = Observed number of pedestrians less than 12 years old

PD = Observed number of pedestrians with physical disabilities

The adjustment factor (*f*) should be ideally estimated from an assessment of:

- The size and type of pedestrian generators. (e.g. the number of occupants in a senior citizen facility).
- The size and nature of pedestrian attractions (e.g. community centres, medical facilities, shopping malls etc.).
- The number of pedestrians avoiding the uncontrolled pedestrian crossing to use alternative routes or modes of transport

In some cases after a preliminary assessment it may be so evident that the PCD will exceed the threshold values of *Warrant 1* that a detailed pedestrian survey and/or an estimation of *PCD* may not be required.

## ii. Pedestrian Crossing Opportunities (PCO)

The PCO index provides a measure of how difficult it is for a pedestrian to cross a uncontrolled pedestrian crossing, considering the existing roadway width and traffic volumes.

The PCO Index can be estimated from the following formula:

$$PCO = fQ * \left( \frac{e^{-fqG}}{1 - e^{-fqG}} \right)$$

The factor  $f$  accounts for the impact of arterial signal progression on gap availability. A worst case scenario is represented by  $f = 1$  i.e. no arterial progression.

$Q$  is the peak traffic flow (vehicle per hour)

$$q = \frac{Q}{3600}$$

$G$  is the minimum gap required in the traffic stream for a pedestrian to perform an uninterrupted crossing:

$$G = \frac{W}{s}$$

$W$  = Width of the roadway (metres)

$s$  = Walking speed (Default = 1 m/s)

## iii. Check Warrants

The need for a traffic control signal at an intersection or mid-block crossing shall be considered if an engineering study finds that **ALL** the following criteria are met:

A. Pedestrian Crossing Demand (PCD)  $\geq$  50 per 4 hours

Or

B. PCD  $\geq$  25 per 2 hours

And



**C. Pedestrian Crossing Opportunities (PCO)  $\leq 60$** **GLOSSARY:**

**Acceptable Gap** - The time needed to cross the travelled lanes of a roadway at a walking speed of 1.2 m per second plus three seconds of perception and reaction time.

**Controlled location** – intersection or mid-block location with signal or stop sign.

**Crossing Opportunities** – the number of times a pedestrian can cross the roadway over a given period of time (e.g. one hour)

**Crosswalks** – portion of the roadway where pedestrian are permitted to cross the street; may be marked or unmarked.

**Gap** – the time a crosswalk is unoccupied by successive vehicles.

**Mid-block crossing** – a crossing point located between the intersections.

**Sight Distance** – the length of a roadway visible to the driver, bicyclist or pedestrian with an unobstructed line of sight.

**Travel arrival patterns** – the manner in which traffic arrives at the study location (e.g. random, platoon). A time space can be used to determine the traffic arrival pattern at a location between signalized intersections.

**REFERENCE:**

Replaces previous policy “Intersection Pedestrian Signal (IPS) Warrant Criteria” adopted by Council February 21, 2002, Report 2(1), Transportation and Works Committee

**CONTACT:**

Director, Operations, Roads Branch, Transportation and Works Department

**APPROVAL INFORMATION**

**CAO Approval Date:** May 31, 2007

**Committee:** Transportation and Works

**Clause:** 4

**Report No:** 6

Edocs No. 429995

---

<b>Council Approval:</b>	<b>Minute No. 124</b>	<b>Page: 7</b>	<b>Date: June 21, 2007</b>
--------------------------	-----------------------	----------------	----------------------------

1818446 P01/5/1

## Ontario Traffic Manual Book 12

### Traffic and Pedestrian Signal Warrant Justifications

Criteria	Description
1. Minimum Volume (8 peak hour volumes)	<ul style="list-style-type: none"> <li>• Considers cumulative volume on minor and major street and volume of intersecting traffic</li> <li>• Minimum Volume warrant at 100% fulfillment</li> </ul>
2. Delay to Cross Traffic (8 peak hour volumes)	<ul style="list-style-type: none"> <li>• Applied where heavy major street volume results in excessive minor street delay or hazardous crossing conditions</li> <li>• Delay to Cross Traffic warrant at 100% fulfillment</li> </ul>
3. Volume/Delay Combination (8 peak hour volumes)	<ul style="list-style-type: none"> <li>• Volume/Delay Combination warrant where both Minimum Volume and Delay to Cross Traffic warrant at 80% fulfillment</li> </ul>
4. Minimum Four- hour Vehicle Volume	<ul style="list-style-type: none"> <li>• Intended for intersections with excessive peak hour delays</li> <li>• Not to be applied in combination with other justifications</li> <li>• Minimum Four-hour Vehicle Volume warrant at 100% fulfillment</li> <li>• <b>New Criteria, not included in current Policy</b></li> </ul>
5. Collision Experience	<ul style="list-style-type: none"> <li>• Signals may be considered at intersections with unusually high collision history</li> <li>• Collision Experience warrant at an average of five or more collisions susceptible to correction per 12-month period</li> </ul>
6. Pedestrian Volume Delay	<ul style="list-style-type: none"> <li>• Applicable where pedestrians experience excessive delays or hazard due to heavy traffic volume</li> <li>• Applicable for high pedestrian crossing volumes</li> </ul>
7. Projected Volume	<ul style="list-style-type: none"> <li>• Identifying traffic signal requirements as a result of development</li> <li>• Average hourly volume applied to Criteria 1 and 2</li> <li>• Project Volume warrant at 150% fulfillment</li> <li>• <b>New Criteria, not included in current Policy</b></li> </ul>