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Pedestrian Crosswalk Audit

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The Office of the City Auditor conducted this
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*International Standards for the
Professional Practice of Internal Auditing*

Pedestrian Crosswalk Audit

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Executive Summary

The City of Edmonton is committed to provide a safe city for citizens to work, play and live; however, each year there are a number of pedestrian fatalities and hundreds of pedestrian injuries. Pedestrian crosswalk devices, including painted crosswalks and traffic signals, are intended to help protect people when they cross the street. Traffic Safety within the Parks and Roads Services Branch, City of Edmonton is responsible for the implementation and maintenance of an effective pedestrian crosswalk program.

The objective for this audit was to ensure that the City of Edmonton's pedestrian crosswalk program is managed effectively. We conclude that the pedestrian crosswalk program is being effectively managed and improving pedestrian safety. However, we identified four opportunities to improve the overall effectiveness of this program which have been accepted.

These recommendations include:

1. Develop a process for documenting decision-making for pedestrian crosswalk devices selection where professional judgment is used in accordance with the guidelines.
2. Develop and implement new guidelines to address new pedestrian crosswalk device types.
3. Develop guidelines to incorporate aesthetic pedestrian crosswalk treatments.
4. Develop and implement a risk-based process to monitor and evaluate the effectiveness of pedestrian crosswalks both at a program and individual level.

Pedestrian Crosswalk Audit

1 Introduction

The City of Edmonton is committed to provide a safe city for citizens to work, play and live through City Council’s approved Road Safety Strategy, Vision Zero. The City of Edmonton has a pedestrian crosswalk program in place to manage the City’s current crosswalks and plan for future crosswalks. Pedestrian crosswalk devices are installed to improve safety and walkability for Edmontonians; however, each year there are a number of pedestrian fatalities and injuries.

The Office of the City Auditor (OCA) included a review of the City of Edmonton’s pedestrian crosswalk program in its approved *2017 Annual Work Plan*. The audit objective for this review was to ensure that the City of Edmonton’s pedestrian crosswalk program is being effectively managed.

2 Background

2.1 Pedestrian Crosswalk Program

Pedestrian crosswalks are vital in ensuring that Edmonton is a vibrant, safe, and walkable city that promotes the health of the community, and where citizens of all ages can enjoy walking in their neighborhoods, on trails, and in the business districts. The environment must be safe in order for people to walk to destinations, which starts with pedestrian crosswalks. In 2015, the City of Edmonton adopted Vision Zero as a long term goal of zero traffic fatalities and serious injuries through the approval of Edmonton’s Road Safety Strategy 2016-2020.

Figures 1 and 2 illustrate pedestrian injuries and fatalities in the City of Edmonton from 2001 to 2016. Pedestrian injuries show a downward trend in the past 15 years, a period in which the City’s population has increased from 657,350 to 932,546 (42 percent). Pedestrian fatalities vary year-to-year, with no fatalities in 2006 and a high of 13 in 2007.

Figure 1: City of Edmonton Pedestrian Injuries 2001 - 2016

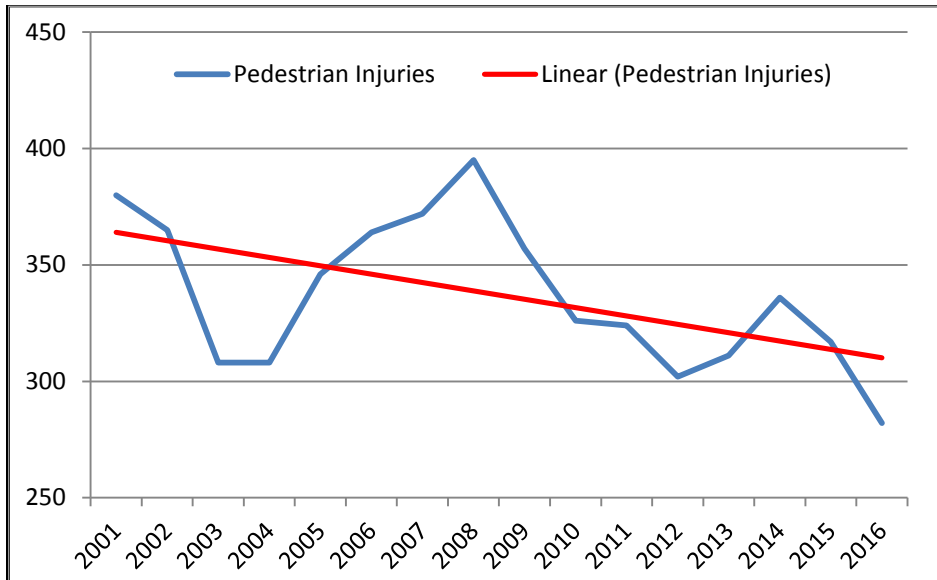
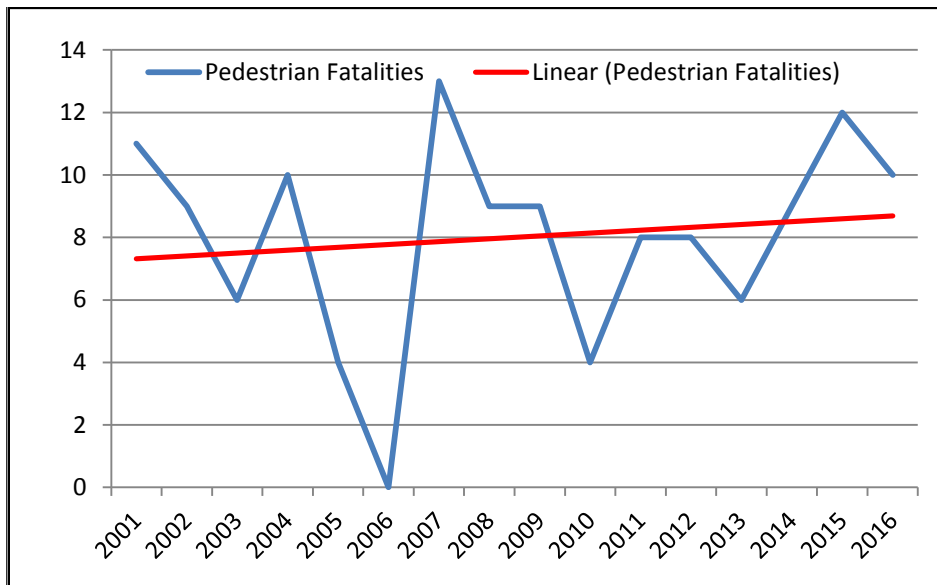


Figure 2: City of Edmonton Pedestrian Fatalities 2001 - 2016



Source: City of Edmonton, Office of Traffic Safety

Alberta’s provincial legislation (Traffic Safety Act) provides a definition for intersections and crosswalks and mandates that pedestrians have the right-of-way at crosswalks, unless the pedestrian crossing is specifically banned. A pedestrian crosswalk at an intersection is

defined as the extension of the sidewalk across the intersection regardless of whether or not it is specifically marked as a crosswalk (such as corner to corner). However, as indicated in the Alberta Traffic Safety Act, “nothing relieves the pedestrian from exercising due care for the pedestrian’s own safety.”

The City has the authority to decide where to install marked crosswalks, and to select the appropriate type of pedestrian crosswalk device. Providing marked and signed crosswalks and pedestrian-activated devices for crossing points has several intents, including:

- Enhancing driver awareness of pedestrian activity;
- Guiding pedestrians to crossing locations where drivers expect to encounter pedestrians;
- In some cases, creating a legal point of crossing where none would otherwise exist, such as mid-block crossings; and,
- Creating continuity and linkages for pedestrian facilities including sidewalks, shared-use paths and multi-use trails.

2.2 Pedestrian Crosswalk Guidelines

The use of devices for pedestrian crosswalks relating to new crosswalks or where existing crosswalks need to be retrofitted is directed by the City’s Pedestrian Control Guidelines.

The development of these guidelines has been as follows:

- In 2002, the City of Edmonton adopted the Pedestrian Control Guidelines published through Transportation Association of Canada (TAC). TAC is the primary transportation industry source for the selection, installation, and management of pedestrian crosswalk devices.
- In 2012, TAC updated its Pedestrian Control Guidelines based on ongoing research. In response, the City of Edmonton developed internal guidelines, which align to the TAC Guidelines.
- In September of 2013, the City revised its Pedestrian Control Guidelines to align with 2012 TAC Guidelines.

- In 2016, the City updated its own “Enhanced Pedestrian Controls Guidelines” which go beyond the TAC Guidelines and are intended to be more a holistic and proactive approach to decision-making in the selection of pedestrian crosswalk devices.

2.3 City of Edmonton Pedestrian Crosswalk Devices by Type

There are various types of pedestrian crosswalk devices that the City can select to install to address specific circumstances such as pedestrian volume, traffic volume, and lines of sight. Each of these device types has varying costs to install, operate, and maintain. The following is a description on each of the pedestrian crosswalk types which are also shown in Figure 3. To date, through its pedestrian crosswalk program, the City of Edmonton has installed approximately 2,300 crosswalk devices.

Signed and Marked Crosswalks

Signed and marked crosswalks are used at intersections where there are no traffic lights. This type of crosswalk provides the lowest level of protection and is typically installed as an initial level of pedestrian protection. A standard crosswalk is comprised of crosswalk signs and pavement markings defining the crossing area for pedestrians. Zebra crosswalks are a form of signed and marked crosswalk that is mainly installed at mid-block locations and at schools. The Zebra crosswalk is more visible than the painted crosswalks and provides more protection as drivers have more visibility of this type of crosswalk.

Rapid Flashing Beacons

Rapid Flashing Beacons is a new technology that the City started introducing in 2015 that uses LED flashing lights. This type of device is installed where locations have a combination of higher traffic volumes, speeds and number of travel lanes being crossed than where marked and signed crosswalks would be applied and where amber flashers and pedestrian signals would not be used. School areas are also considered for this type

of device at key crossing points for children coming and going from school. These devices are activated by pedestrians before crossing the street.

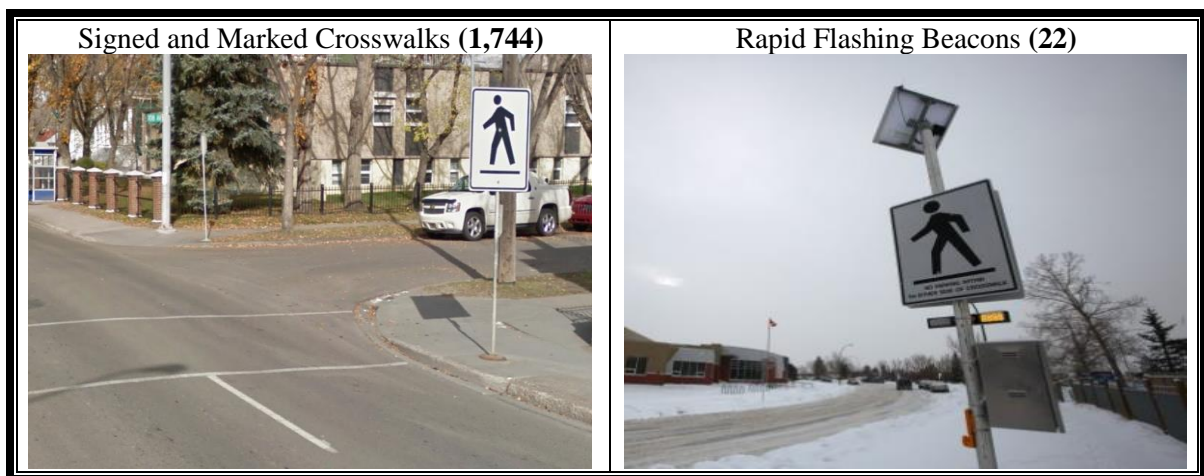
Amber Flashers

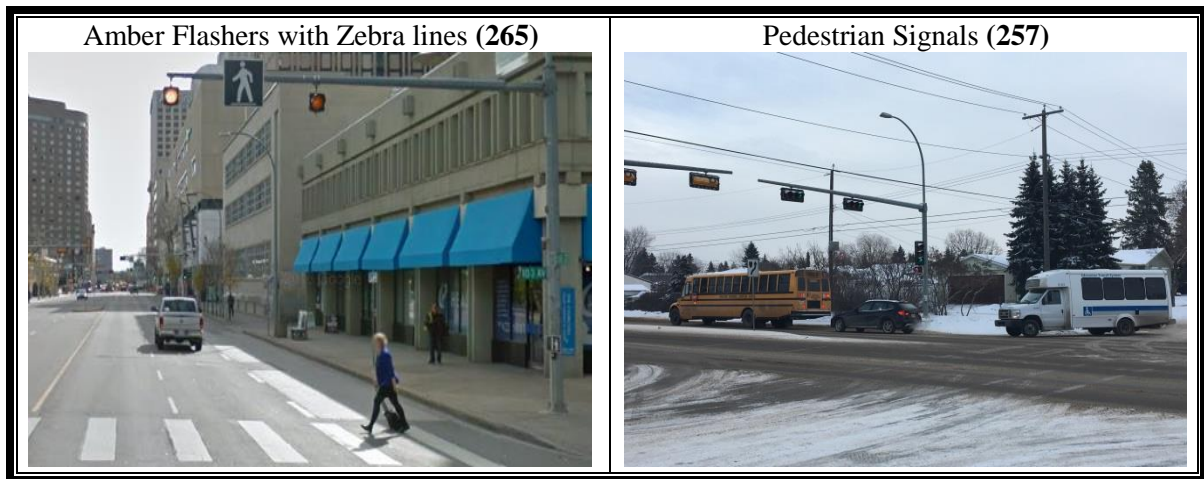
Amber Flashers are overhead-mounted signs with pedestrian activated alternating flashing amber lights, in addition to side mounted pedestrian signs and pavement markings. These installations also have a “30 km/h Speed Limit When Flashing” designation and are signed accordingly. This type of crosswalk is installed where locations have a combination of higher traffic volumes, traffic speeds and number of travel lanes being crossed than where rapid flashing beacons would be applied and where pedestrian signals would not be used.

Pedestrian Signals

Pedestrian Signals are considered the highest level of protection and uses pedestrian activated traffic lights to signal to drivers to stop. This type of crosswalk is installed where locations have higher traffic volumes, traffic speeds and number of travel lanes being crossed than where amber flashers would be used.

Figure 3: Pedestrian Crosswalk Devices (with Number Installed)





Source: Google

Table 1 illustrates the inventory growth in pedestrian crosswalk devices over the past 5 years. Since 2012, the City has added 290 new devices to the inventory.

Table 1: Inventory Growth of Pedestrian Crosswalk Devices

Type / Year	2012	2013	2014	2015	2016
Signed and Marked Crosswalks	1535	1558	1660	1690	1744
Rapid Flashing Beacon	0	0	1	4	22
Amber Flashers	245	252	256	260	265
Pedestrian Signals	218	224	228	234	257
Total	1998	2034	2145	2188	2288

Full Traffic Signals

Note that the inventory shown in Table 1 does not include full traffic signals. Full traffic signals are installed at intersections with traffic lights in all directions (See Figure 4).

They serve a dual purpose of managing automotive and pedestrian traffic and therefore were not reviewed as part of this audit.

Figure 4: Full Traffic Signal



Source: OCA

2.4 Program Resources

The scope of our audit included reviewing pedestrian crosswalk devices from 2012 to 2016. During this time period the pedestrian crosswalk program was managed by Traffic Operations within the Transportation Department. Effective March 6, 2017, Traffic Safety within the Parks and Roads Services Branch, City Operations Department became responsible for pedestrian crosswalks.

Working with City staff from the various business areas previously responsible for pedestrian crosswalks, we identified pedestrian crosswalk inventory and costs associated with managing this inventory (see Table 2). There is a significant capital cost increase in 2016 as the City added 23 new pedestrian activated signals at an average cost of approximately \$150,000 per unit. Inventory growth of pedestrian crosswalk devices has grown by 14 percent since 2012, while management and operating costs have only increased by 4 percent.

Table 2: Pedestrian Crosswalk Costs

	2012	2013	2014	2015	2016
Estimated Capital Costs of Installations	1,409,600	1,618,400	1,101,600	1,384,000	4,353,200
Direct Operating Costs					
Pedestrian Signals Maintenance Costs	373,081	361,669	354,875	326,407	371,763
Estimated Pavement Markings Maintenance Costs	101,081	104,197	106,399	107,899	110,000
Estimated Evaluation Personnel Costs	211,352	217,866	222,471	225,607	230,000
Total Direct Operating Costs	685,514	683,732	683,745	659,913	711,763

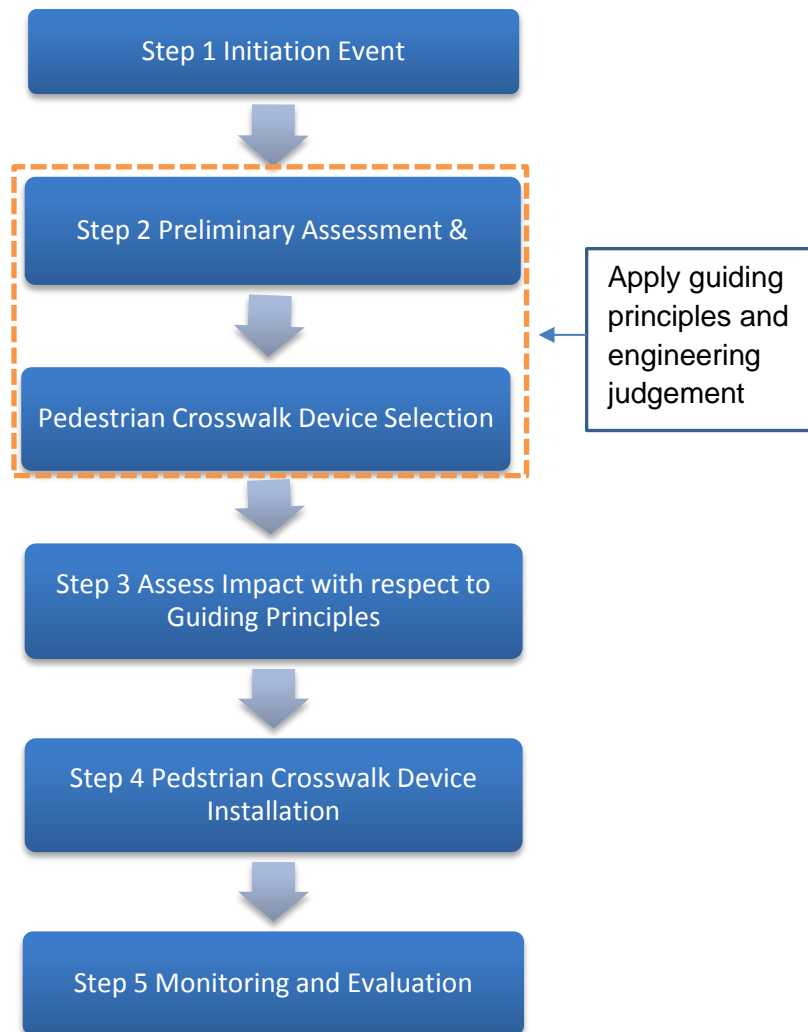
3 Observations and Recommendations

The objective of this audit was to ensure that the City of Edmonton’s pedestrian crosswalk program is being effectively managed. Based on our assessment of the processes and program results, we conclude that the pedestrian crosswalk program is being effectively managed.

3.1 Pedestrian Crossing Risk Model

As indicated earlier, the City of Edmonton’s pedestrian crosswalk program is based on the “Pedestrian Crossing Control Guide” prepared by TAC (TAC Guidelines). Figure 5 illustrates the recommended approach for the implementation of pedestrian crosswalk devices. In this report, we have used this model to present our assessment of the City’s program.

Figure 5: Pedestrian Crossing Control Approach



Source: Transportation Association of Canada – Pedestrian Crossing Control Guide

We compared the City’s pedestrian crosswalk processes to the TAC Guidelines and found that the City’s Pedestrian Crossing Guidelines generally align. We also observed that the City is generally complying with its own guidelines; however, we have identified opportunities for improvement. Table 3 summarizes our observations from this audit.

Table 3: Alignment with Transportation Association of Canada Guidelines

Pedestrian Crossing Approach Steps	City Guidelines align to TAC	Compliance to City Guidelines	Report Section
1. Initiation Event	Full	Full	3.2
2. Preliminary Assessment & Crosswalk Device Selection	Full	Partial	3.3 Rec. 1 & 2
3. Assess Impact with respect to Guiding Principles	Partial	Partial	3.4 Rec.1
4. Pedestrian Crosswalk Installation	Full	Full	3.5 Rec. 3
5. Monitoring and Evaluation	Partial	Partial	3.6 Rec 4

3.2 Step 1 - Initiation Event

An initiation event is the event that triggers the evaluation process for the potential need of a pedestrian crosswalk device or re-evaluation of an existing crosswalk. Examples of initiation events include requests from citizens, Councillors, or pedestrian-vehicle collisions. We assessed the City’s current initiation event process and observed that it aligns to TAC Guidelines and that the City is complying with its own guidelines. TAC Guidelines indicates that the “Initiation Event” step will include both reactive processes as well as proactive processes to identify potential pedestrian crosswalk sites.

3.2.1 Reactive Initiation

The City of Edmonton receives concerns on pedestrian crosswalks directly from residents and Councillors. The primary input source of concerns is through the City’s 311 Call Centre. In 2016, the City received 1,478 calls relating to pedestrian crosswalks. As well, Traffic Safety will also review collision reports involving pedestrians and use this as an initiation event to evaluate the need for new crosswalks or re-evaluate an existing one.

3.2.2 Proactive Initiation

The City proactively identifies potential locations for pedestrian crosswalk devices through school zone reviews or neighbourhood renewal consultation. In 2016, there were 13 school zone reviews with 24 planned for 2017 and 2018. There are 6 neighbourhood renewals planned for 2017. Traffic Safety also participates in plan review of

rehabilitation and reconstruction projects. Finally, traffic area studies are also performed and used to assess the need for pedestrian crosswalk devices.

Recently, Traffic Safety and other areas with the City Operations Department created a committee to proactively review potential locations of increased pedestrian traffic safety concern.

3.3 Step 2 - Preliminary Assessment and Crosswalk Device Selection

Once an initiation event has identified the potential need for an assessment of a site, the next step is to evaluate and determine the type of pedestrian crosswalk device needed. We evaluated the City's preliminary assessment and pedestrian crosswalk device selection process by comparing them to TAC Guidelines and testing compliance with the City's own guidelines. We observed that the City's Guidelines align to TAC Guidelines and that for the most part the City follows its own City guidelines but in some cases professional judgement is used.

3.3.1 City's Assessment Process

The City's assessment process includes a transportation technician conducting an on-site survey in which the technician assesses on-site conditions and monitors both pedestrian and vehicle activities. This information is documented in a standardized survey form which is retained in the completed pedestrian crosswalk file.

The City's Guidelines are used to assess the need for a crosswalk and are based on TAC Guidelines and other research. We sampled 120 of these pedestrian crosswalk files out of 290 new pedestrian crosswalk installations from 2012 to 2016 and tested them against the City's Guidelines. We found that 12 percent (14/120) of the crosswalks installed were inconsistent with City Guidelines as they did not meet the minimum pedestrian volume thresholds. Management indicated that these installations were based on professional judgement, which although is consistent with TAC Guidelines, was not documented in the project file.

3.3.2 Pedestrian Crosswalk Device Selection

The pedestrian crosswalk device type selected is also based on the City's Guidelines which we found to align with TAC Guidelines. In reviewing the City's pedestrian crosswalk files, we found that 15 percent (18/120) of the pedestrian crosswalk devices installed did not comply with the City Guidelines and the decision was based on professional judgement which was not documented. The recommended pedestrian crosswalk device type is based on the speed limit, vehicle volume and number of lanes. We found that 15 of the 18 crosswalk locations had a higher level of pedestrian crosswalk devices installed than was recommended by City Guidelines. For example, if City Guidelines indicated that the location qualified for amber flashers, the City installed a traffic signal instead. The installation of a level of pedestrian crosswalk device that exceeds recommended City Guidelines may increase the level of pedestrian safety. However, there is a risk that resources are not used in an efficient manner.

We also found that for the remaining 3 of the 18 pedestrian crosswalk files a lower level of control was installed. For example, if City Guidelines suggested that a traffic signal should be installed, the City installed an overhead flasher instead. The installation of a level of device that is lower than recommended by guidelines may reduce the level of pedestrian safety but decisions are also made based on funding availability.

3.3.3 Professional Judgement

Engineering practice in accordance with TAC (national guidelines) requires that some level of professional judgement is necessary when determining:

- 1) Whether a crosswalk location qualifies for protection (Section 3.3.1) and
- 2) Type of pedestrian crosswalk device to install (Section 3.3.2).

However, we believe that the justification of installing a pedestrian crosswalk device and the type of device should be documented in cases where professional judgement is

applied. This allows for independent validation of the decisions made and will ensure that crosswalk installations add value to the City.

Recommendation 1 – Documentation of Pedestrian Crosswalk Selection
We recommend that the Branch Manager, Parks and Roads Services, develop a process for documenting decision-making for pedestrian crosswalk device selection and location including where professional judgement is used in accordance with established guidelines and how the guiding principles are supported.
Management Response
Accepted Action Plan: The City’s current pedestrian control guidelines and accompanying pedestrian crosswalk evaluation program will be updated to include a component that identifies any decision making and engineering judgement that may be used in the determination of a pedestrian control device. The decision making component will be documented and form part of the selection process data that is maintained for each pedestrian crossing device that is installed. Planned Implementation Date: End of 4th Quarter, 2017 Responsible Party: Branch Manager, Parks and Roads Services

3.3.4 New Pedestrian Crosswalk Device Types

There are many new types of pedestrian crosswalk devices currently emerging such as Rapid Flashing Beacons, as shown in Figure 6. Currently, there is no TAC guideline to address this new technology. As such, the City has developed draft documentation to guide its application and use. Flashing beacon installations were based on US research and previous work done by the City of Calgary. These studies found that driver compliance rate increased up to 90 percent after the installation of flashing beacons.

The use of Rapid Flashing Beacons was expanded to City schools in 2016 as part of the School Safety Improvement Program. TAC is developing guidelines for flashing beacons and this study is scheduled to be completed by the end of this year.

Figure 6: Rapid Flashing Beacons



Source: Google

We believe that the City should document the justifications for using new technologies, and approve the draft guidelines for Rapid Flashing Beacons as to when and where to use them. We believe this is a necessary step to ensure that resources are being effectively and efficiently used.

Recommendation 2 – Guidelines for New Types of Pedestrian Crosswalk Devices

The OCA recommends that the Branch Manager, Parks and Roads Services, develop and implement new guidelines to address new pedestrian crosswalk device types.

Management Response
<p>Accepted</p> <p>Action: The City’s current pedestrian control guidelines and accompanying pedestrian crosswalk evaluation program will be updated to include a process for the evaluation of new pedestrian control devices. The evaluation process will include a component that identifies any industry scans/best practices reviews as well as a mechanism to link the new devices to national standards where applicable. In situations where a new device type is adopted for use in Edmonton an accompanying application guideline and technical specification will be developed.</p> <p>Planned Implementation Date: End of 4th Quarter, 2017</p> <p>Responsible Party: Branch Manager, Parks and Roads Services</p>

3.4 Step 3 - Assess Impact with Respect to Guiding Principle

After a pedestrian crosswalk device has been selected for potential implementation, the next step is to assess the impact of the selection relative to seven guiding principles included in the TAC Guidelines (See Appendix 2). The guiding principles help to ensure that a holistic and integrated approach to addressing specific conditions is used. We observed that the City does not formally exercise the step of formally assessing guiding principles within its current practices.

3.4.1 Guiding Principles

The TAC Guidelines present a set of principles to guide professionals during the decision-making process associated with the provision of a pedestrian crosswalk device. The goal is that the professional will choose the device that meets all or most of these guiding principles. The seven guiding principles are safety, pedestrian delay,

demographic equity, driver expectancy, consistency, connectivity, and pragmatism. See Appendix 2 for full descriptions of the guiding principles.

We reviewed the City Guidelines and processes and found that the guiding principles were partially incorporated into the City Guidelines. The City has no formal step in which the guiding principles are assessed relative to the selection of a pedestrian crosswalk device.

We also observed that no documentation exists within the pedestrian crosswalk files to demonstrate that this step occurred as part of the City's process. However, in discussion with Traffic Safety staff we learned that following on-site surveys, staff will meet with supervisors in a team setting and review decisions. During these team meetings pedestrian crosswalk device selection is discussed, as well as site conditions and guiding principles.

We believe that this is an important step to ensuring that City decisions are supported and also that a holistic approach is applied in the decision-making process, and therefore the process of reviewing guiding principles should be documented. (Recommendation 1 made earlier addresses this concern.)

3.5 Step 4 – Pedestrian Crosswalk Device Installation

The next step in the process is to install the pedestrian crosswalk device following standard industry construction guidelines. We observed that the City of Edmonton is currently following outdated construction specifications for pedestrian crosswalk line markings. Also, we observed that the City has no approved guidance related to the use of aesthetic pedestrian crosswalks.

3.5.1 Compliance with Guidelines

We assessed the City's crosswalk design standards in comparison with the TAC Guidelines. The latest TAC guideline identifies the width of crosswalk lines be 20 to 30

centimeters. The Manual of Uniform Traffic Control Devices for Canada (2014), which TAC Guidelines are based on, identifies crosswalk lines to be 20 to 30 centimeters and also identifies lines can be 10 to 20 centimeters. The City's current standard (City of Edmonton, Design and Construction Standards, Volume 8 Pavement Markings, 2012) is to install 10 centimeter line. Management indicated that they are considering transitioning to the wider 20 to 30 centimeter crosswalk lines.

Figure 7: Use of 10 Centimeter Pedestrian Crosswalk Line



Source: Google

3.5.2 Aesthetic Pedestrian Crosswalks

The City and outside Developers currently install aesthetically pleasing crosswalks. These pedestrian crosswalks use brick, paving stone or decorative material combined with concrete channels or lighter-colored bricks to mark the outer boundaries of the crosswalk without any white paint or other reflective material. We believe this practice compromises several of the guiding principles including driver expectancy, consistency, and safety. Based upon information available, we noted that there are at least 79 aesthetic crosswalks in the City.

The City currently does not have design and usage guidelines for aesthetically pleasing crosswalks, nor does the TAC Guidelines. Figure 8 illustrates the use of an aesthetic crosswalk where it is difficult to distinguish the crosswalk from the roadway.

Figure 8: Use of Aesthetic Crosswalk



Source: Google

From our research we learned that other municipalities in North America and the US Department of Transportation either disallow or specify the use of white lines on aesthetically pleasing crosswalks. In discussion with staff managing the program, they also expressed safety concerns regarding the current use of aesthetically pleasing pedestrian crosswalks.

Based on these observations related to aesthetic pedestrian crosswalks we have recommended the following:

Recommendation 3 – Pedestrian Crosswalks Construction Standards
The OCA recommends that the Branch Manager, Parks and Roads Services, in collaboration with Sustainable Development Department, develop guidelines to incorporate aesthetic pedestrian crosswalk treatments.
Management Response
<p>Accepted</p> <p>Action Plan:</p> <p>The City’s current pedestrian control guidelines and construction standards will be updated to include application guidelines, material specifications and installation practices for aesthetic pedestrian crosswalk treatments. This work will be carried out in consultation with the Sustainable Development and Integrated Infrastructure Services Departments.</p> <p>Planned Implementation Date: End of 2nd Quarter, 2018</p> <p>Responsible Party: Branch Manager, Parks and Roads Services</p>

3.6 Step 5 - Monitoring and Evaluation

Following the installation of a pedestrian crosswalk device, the next step is to ensure that the pedestrian crosswalk device is monitored and evaluated for performance. We found that Traffic Safety is effectively monitoring and reporting on key performance measures at a program level but not for each individual pedestrian crosswalk device.

TAC Guidelines indicate that local authorities should develop performance indicators, which can be monitored and evaluated with respect to established targets. At a program level the City is currently reporting program measures such as “number of collisions per year” and “number of conflicts between pedestrians and vehicular traffic” which are recommended by TAC guidelines.

The TAC Guidelines state that once the individual pedestrian crosswalk device has been installed, it is recommended to monitor and evaluate its performance. As pedestrian crosswalk devices are installed within the context of the broader transportation system, which is constantly changing, their effectiveness is also dynamic. At the individual pedestrian crosswalk device level, we found that the City conducts limited proactive monitoring and evaluation to determine if the device is effective. However, the City does use reactive feedback from citizens to assess pedestrian crosswalk effectiveness.

The ongoing assessment of the large number of pedestrian crosswalks devices within the City would require significant resources. However, we believe that a risk based process where crosswalks are evaluated on an ongoing basis would improve the pedestrian crosswalk program effectiveness and therefore recommend the following.

Recommendation 4 – Pedestrian Crosswalk Monitoring and Evaluation
The OCA recommends the Branch Manager, Parks and Roads Services develop and implement a risk-based process to monitor and evaluate the effectiveness of individual pedestrian crosswalks in addition to program level monitoring.
Management Response
Accepted
Action Plan:
The City’s current pedestrian control guidelines and accompanying pedestrian crosswalk evaluation program will be updated to include a component that identifies a risk-based evaluation process to monitor and evaluate the effectiveness of individual pedestrian crosswalks in additional to program level monitoring. This effectiveness data will be documented and form part of the selection process data that is maintained for each pedestrian crossing device that is installed. Program effectiveness data will also form part of the annual reporting Vision Zero metrics, targets and outcomes.
Planned Implementation Date: End of 4th Quarter, 2017
Responsible Party: Branch Manager, Parks and Roads Services

4 Conclusions and Recommendations

Based on our review, we conclude that the City is managing an effective pedestrian crosswalk program. In this audit, we compared the City’s pedestrian crosswalk processes to the TAC Guidelines and found that the City’s pedestrian crosswalk guidelines generally align. We also observed that the City is generally complying with its own guidelines. However, we have made four recommendations to improve program effectiveness.

We evaluated the City’s initiation processes for new pedestrian crosswalks and found this process to be citizen driven and in some cases reactive, but in line with industry practices. We evaluated the City’s assessment process for new pedestrian crosswalks and found that it complied with industry practices. However, we have recommended that documentation be provided to support decisions when professional judgement is used and how the guiding principles are supported.

We observed the emergence in the use of new technologies (Rapid Flashing Beacons) for pedestrian crosswalk devices. We recommend that the City document the justifications for using new technologies, as well as when and where to use them.

We identified several risks related to aesthetic pedestrian crosswalks and have recommended the City Guidelines be updated.

We observed that the City is monitoring and evaluating pedestrian crosswalks at a program level but could do more at an individual pedestrian crosswalk level.

The Office of the City Auditor would like to thank the management and staff of the Parks and Roads Services Branch for their cooperation and assistance during this audit.

Appendix 1: Scope and Methodology

Scope

The purpose of this audit was to review the current City of Edmonton guidance and processes related to the management of the pedestrian crosswalk program. Our analysis included historical data over a ten-year period. Detailed testing included reviewing records over the past five years (2012-2016), which aligns to the City's adoption of recent Transportation Association of Canada Guidelines (2012). During this audit, we worked with management previously responsible for this program as well management from Traffic Safety now responsible for this program.

The “Elephant Feet” crosswalk is a new form of crosswalks used to permit cyclists to ride through the crosswalk. This crosswalk was not considered within the scope of this audit.

Methodology

We used the following methods to gather evidence to conclude on the audit objective:

- Identified and documented City processes relating to traffic shortcutting.
- Discussions with management and supervisory employees.
- Analysis of data relating to pedestrian crosswalk selection.
- Performed site visits.
- Tested sample crosswalks for compliance with applicable policies and procedures.
- Identified the City's resources relating to pedestrian crosswalk operating and capital programs.
- Reviewed the pedestrian crosswalk evaluation process and assessed its compliance with the City's current pedestrian crosswalk process and available criteria.
- Surveyed other municipalities on their pedestrian crosswalk processes.
- Conducted industry research on pedestrian crosswalk best practices.

Appendix 2: TAC Guiding Principles

The TAC Guidelines also presents a set of principles to guide professionals during the decision-making process associated with the provision of a pedestrian crosswalk device. The goal is that the professional will choose the device that meets all or most of these guiding principles. The important seven guiding principles are:

- 1. Safety:** This is the key objective in providing pedestrian crosswalk device.
- 2. Delay:** Delay experienced by pedestrians attempting to cross the road should be considered.
- 3. Equity:** The demographics of the pedestrian population including accessibility including visual, mental, and physical capabilities should be considered.
- 4. Expectancy:** The presence of the pedestrian crossing system should not violate driver expectancy, i.e., the crossing location and pedestrian should be *clearly visible* for drivers.
- 5. Consistency:** The approach to pedestrian crossing facilities and control should be consistent and uniform across the transportation system. Consistency helps ensure that installations *are recognized, comprehended, and used effectively* by all road users.
- 6. Connectivity:** Effective crossing opportunities should be provided to ensure system connectivity. This includes facilitating connectivity between crosswalks and sidewalks, trail networks, parklands, and other pedestrian attractions.
- 7. Pragmatism:** The transportation professional should consider the practical issues or consequences associated with the provision of a pedestrian crosswalk device. This includes consideration of costs, effectiveness, ease of installation and maintenance considering year round conditions.