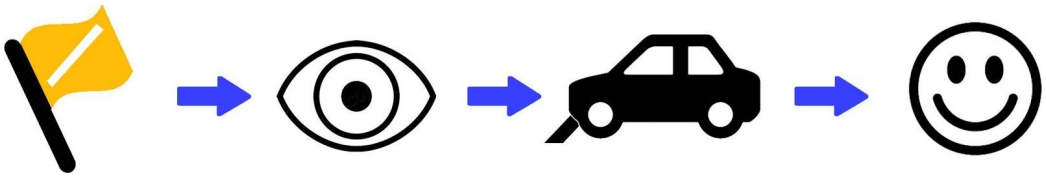
The Effectiveness of Crosswalk Flags: A Review of the Evidence



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Introduction

The Crosswalk Safety Society of Nova Scotia has been responsible for the installation of approximately 150 crosswalk flag locations in the Halifax Regional Municipality (HRM) since 2014. It has also facilitated a total of 77 installations in 21 other communities (18 in Nova Scotia).

Of the 150+ installations in HRM, approximately 100 are at marked crosswalks, either mid-block or uncontrolled intersections, with the remaining installed at crosswalks that also have RA-5 overhead amber lights. To date, installations in HRM have not been allowed at intersections with all way stop signs or traffic lights.

In June 2016 HRM staff were tasked with drafting an administrative order (AO) for crosswalk flags to provide clear guidelines for their installation. The Crosswalk Safety Society supported the drafting of an AO and further believed it was the right time to expand the program to include all-way stops and signalized intersections, as does Salt Lake City which has the longest-standing and largest such program in North America.

In May 2017 staff presented a draft AO to Regional Council along with a report which included observational data collected in 2016. As opposed to expansion, staff recommended the program be curtailed to no longer allow flags at marked crosswalks with RA-5 overhead amber lights.

Council did not accept the recommendation at that time with some councillors stating they were not satisfied with the quality of evidence presented. Council requested a staff report to examine treatments to enhance pedestrian visibility and safety, including crosswalk flags. Council requested an update by the end of December 2017 and suspended all new flag installations, pending the update.

In response to Regional Council's desire for a clearer picture of the value of crosswalk flags, and to clarify any misconceptions about the available evidence, the Crosswalk Safety Society of Nova Scotia has prepared this report which reviews existing evidence and also presents the results of a new study related to crosswalk flag efficacy in HRM.

Summary

The following summarizes the content of the balance of this report.

- Due to the challenges with measuring crosswalk flags' direct impact on vehicle-pedestrian collisions, a contribution analysis is useful in evaluating their effectiveness.
- The use of crosswalk flags is meant to improve driver yielding behaviour which is a contributing factor in pedestrian safety.
- In a single-location, 200-crossing study conducted by the Crosswalk Safety Society of Nova Scotia in October 2017, driver yielding behaviour improved by over 20% in daylight and over 100% after dark, when the pedestrian was using a crosswalk flag.
- A review of vehicle-pedestrian collision data by HRM police district from January 2014 to September 2017 suggest districts with more flag installations are doing relatively better in reducing collisions than other districts.
- HRM staff reports that "*flag usage was most common among young children and seniors*". Literature indicates young children and seniors are the two most vulnerable types of pedestrians.
- Qualitative first-person reports from the HRM experience with crosswalk flags indicate that many drivers and pedestrians feel the flags improve safety, even when they are not in use.
- A jurisdictional scan for related studies identified a number of reports that conclude crosswalk flags increase driver yielding behaviour.
- No evidence was discovered to indicate crosswalk flags pose any risk to pedestrians.

Preface

As noted in *Safety Effects and Guideline Development for Uncontrolled Mid-Block Crosswalks*, a conference paper published in 2008, crosswalk flags belong to a group of interventions that are not conducive to studying their direct impact on vehicle-pedestrian collisions,

> *"It is infeasible to evaluate their safety effects through localized before-and-after studies because it takes many years to observe actual collisions. It is also infeasible to evaluate their safety effects through large-scale cross-sectional studies because these treatments have not been widely implemented in any single metropolitan area."*

In such cases, a contribution analysis can provide valuable empirical evidence for a particular intervention.

A contribution analysis uses a Theory of Change, which isolates a factor (i.e. increased driver yielding behaviour) that is *known to contribute to the desired result* (i.e. a reduction in vehicle-pedestrian collisions). It then seeks to demonstrate if an individual intervention (i.e. using crosswalk flags) has an impact on the factor being considered.

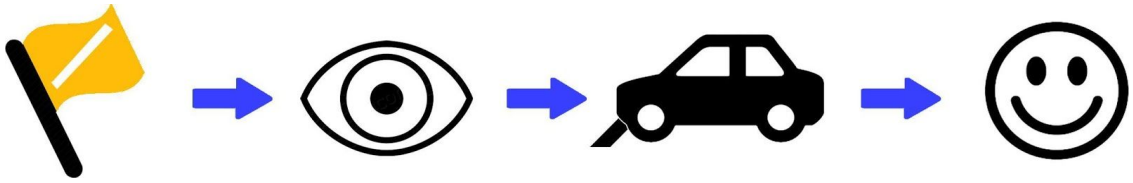
Theory of Change for Crosswalk Flags

Crosswalk flags are intended to contribute to a *reduction in vehicle-pedestrian collision*s.

Using a crosswalk flag is believed to *increase the visibility of the pedestrian*.

Increased pedestrian visibility is understood to *improve driving yielding behaviour*.

Improved driver yielding behaviour is understood to *reduce vehicle-pedestrian collisions*.



It should be noted that using crosswalk flags is a choice for the pedestrian to make each time they cross. Based on a number of factors, people may choose to use a flag, or not.

Several people have identified a number of such factors, including:

- how light or dark it is outside;
- weather conditions;
- snow banks or other obstructions such as parked vehicles;
- traffic levels; and
- vulnerability of the pedestrian (for example, children, seniors, and people with disabilities).

Besides increasing the visibility of pedestrians who are using flags while crossing, it has been reported the installations provide additional benefits that can contribute to overall safety:

- Drivers widely report the flags increase the visibility of the crosswalk itself; and
- Whether they use a flag or not, pedestrians are more engaged by having to make a conscious decision, increasing the likelihood the pedestrian assesses the situation to a greater degree than they otherwise would have.

Crosswalk Safety Society of Nova Scotia Driver Yielding Study

In October 2017, the Crosswalk Safety Society of Nova Scotia conducted a study at the marked crosswalk across Lady Hammond Road at Memorial Drive in Halifax, a heavily travelled location with over 12,000 vehicles per day.

The intent of the study was to determine if using a crosswalk flag led to increased driver yielding behaviour.

The study involved:

- 200 staged crossings with approaching vehicles, ensuring each attempt was as similar to the others as possible.
- Crossings during daylight hours and after dark, with and without flags.

Driver yielding behaviour was observed to improve with the use of a crosswalk flag by over 20% in daylight and over 100% after dark.

Driver yielding behaviour at the marked crosswalk at Lady Hammond Road and Memorial Drive, Halifax, with and without crosswalk flags				
	Daylight		**After Dark**	
	No flag	**With flag**	No flag	**With flag**
% of vehicles that yielded	65 %	**79 %**	27 %	**56 %**

Methodology

On October 20, 2017 between 4pm and 5:30pm, 80 crossings were made during daylight hours without the use of flags. Between 7pm and 8pm (after dark), 20 crossings were made with flags and 20 crossings were made without flags.

On October 26, 2017, 80 crossings were made between 4pm and 5:30pm, using crosswalk flags.

An equal number of crossings were made from both sides of the street.

The weather on both days was mild and clear.

The street-crosser was the same for every crossing and wore the same clothing throughout. They approached the crosswalk in the same way each time and used the same reference points for the vehicle's distance from the crosswalk at the time of approach.

Observations

Using a crosswalk flag significantly increased driver yielding behaviour. Also:

- Driver yielding was better in the daylight than after dark, with or without a flag;
- The improvement in driver yielding with a flag was much greater after dark than during the day; and
- Driver yielding behaviour was worse for cars heading west (down the hill) than cars heading east (up the hill).

This further supports the premise that **increased pedestrian visibility is a key factor in driver yielding behaviour.**

It was also noted during the study a total of 176 drivers did not yield, in violation of the Motor Vehicle Act. Compare this to the 150 SOTs (tickets) issued throughout HRM *in all of 2016* for not yielding to a pedestrian at a crosswalk (marked and unmarked) without a median (MVA 125(1)(a)).

This suggests a significant opportunity for increased enforcement.

Data

Driver yielding behaviour at the marked crosswalk at Lady Hammond Road and Memorial Drive, Halifax, with and without crosswalk flags								
		Light			Dark			Total
	Notes	No flag	With flag	Total	No flag	With flag	Total	
Number of crossings	1	80	80	160	20	20	40	200
Number of vehicle approaches (from both directions)								
Maximum	2	160	160	320	40	40	80	400
Actual	3	109	115	224	24	28	52	276
Total vehicles including multiple non-yielding vehicles	4	168	145	313	89	50	139	452
Number approaches 1st vehicle yielded	5	92	98	190	13	22	35	225
% times first vehicle yielded	6	84%	85%	85%	54%	79%	67%	82%
Number of times multiple vehicles did not yield	7	17	4	21	12	4	16	37
Number of vehicles not yielding	8	59	30	89	65	22	87	176
% of vehicles that yielded	**9**	**65%**	**79%**	**72%**	**27%**	**56%**	**37%**	**61%**

1 times road crossed
2 maximum opportunities for a vehicle to approach
3 actual vehicle approaches - in some cases vehicles approached from both directions; in some cases only one; in all cases crossing was not started until at least one vehicle approached
4 total number of vehicles that approached - all that yielded and all that did not yield, including multiple vehicles that did not yield on some crossings
5 number of approaches (3) where the first vehicle yielded
6 percentage of times the first vehicle yielded
7 number of times multiple vehicles did not yield
8 total number of vehicles that did not yield
9 percentage of vehicles that yielded (1-(8)/(4))

HRM May 2017 Staff Report

In 2016 HRM staff collected data on crosswalk flag usage which they presented in a report to Regional Council in May 2017.

A limited amount of observational data was collected about the frequency of flag usage and driver yielding behaviour regardless of flag usage. It did not study the impact of crosswalk flag use on driver yielding behaviour.

While the data set is small, the frequency of observed **flag usage at crosswalks equipped with RA-5 overhead lights was more than three times higher than crosswalks without lights**. This may be due to pedestrians sensing a higher risk at those crosswalks.

This would support the availability of crosswalk flags at RA-5 crossings, as well as other control types. Data indicates significantly more vehicle-pedestrian collisions occur at signalized intersections than any other control type.

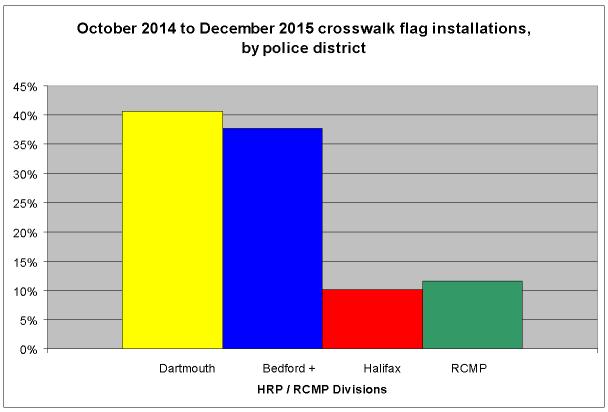
An observation was also made in the staff report that "*flag usage was most common among young children and seniors".*

According to *Pedestrian Safety and the Built Environment: A Review of the Risk Factors*, published in the Journal of Planning Literature in 2015, among all types of pedestrians, young children and seniors are the most vulnerable.

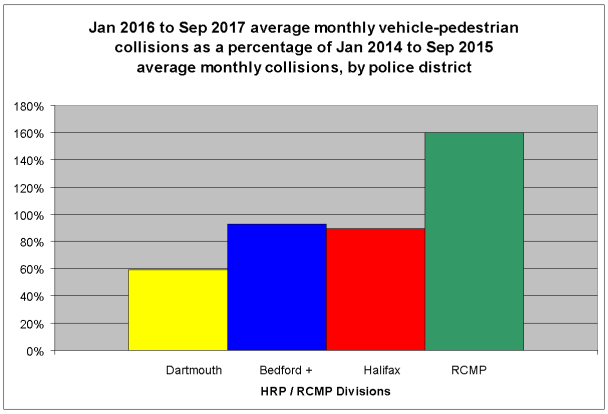
Vehicle-pedestrian Collision Data by HRM Police District

In examining the data, there is emerging evidence that the crosswalk flags may be contributing to a reduction in vehicle-pedestrian collisions in HRM.

Between October 2014 and December 2015, the distribution of crosswalk flag installations was highest in the East (Dartmouth) police district, followed closely by the West (Bedford +) district.



The ratio of vehicle-pedestrian collisions from January 2016 to September 2017 compared to those from January 2014 to September 2015 is significantly lower in the East (Dartmouth) district, the area that has had the most crosswalk flags for the longest time, as compared to any other district.



Based on this evidence it is reasonable to surmise the districts with more flag installations are experiencing relatively better results in reducing collisions than other districts at least partly due to the prevalence of crosswalk flags.

Qualitative Evidence

Over the years, members of the Crosswalk Safety Society of Nova Scotia have received lots of feedback from drivers and pedestrians.

Countless comments relate to improved visibility, such as:

“I see (crosswalk flags) before the crosswalks which slows me down and cautions me that there is a crosswalk and to slow down.”

“I walk to work in the early morning, often in the dark. These flags are extremely useful and appreciated.”

“Flags are great way to notice pedestrians, especially kids.”

“I remember the first time I saw a resident use one of the flags. It served not only as a visible caution for the moment, but also as an educating service for the future.”

“My good neighbour raised funds to put up crossing flags at the crosswalk at Caldwell Road corner Wexford Street. It helped my children and many pedestrians”

Sometimes they are stories of particular incidents, such as:

“It was at two lanes approaching a crosswalk, he stopped, he saw the resident has a flag in their hand. The second car was coming, he looked and said ‘my gosh it’s going to hit that person’, and then the flag was right there and he said in his view that’s what prevented that person from getting hit.”

"I was a few cars back when I saw a mother and her son crossing Chebucto Road at Phillip St while I was driving towards the rotary on my way home from work. (Sometimes it’s hard to see at that time of day because of the sun.) They were already several steps onto the road when I noticed them. The child was waving a crossing flag, which is what caught my eye, and not the overhead lights which I only noticed were flashing after the fact. The flag definitely made them more visible.”

Jurisdictional Scan and Literature Review

Crosswalk flags are known to be used to some degree in approximately 100 communities across North America. The largest and best-known being Salt Lake City, Utah which has more than 200 installations.

As previously noted, crosswalk flags belong to a group of interventions that are not conducive to studying their direct impact on vehicle-pedestrian collisions.

However, a number of studies have shown crosswalk flags improve driver yielding behaviour, which is understood to improve pedestrian safety:

- Report 562 'Improving Pedestrian Safety at Unsignalized Crossings' from the Transit Cooperative Research Program of the Transportation Research Board;
- Toolbox on Intersection Safety and Design – An Informational Report of the Institute of Transportation Engineers DC 20006-3438;
- a small scale pedestrian safety study conducted by Michael Baker Associates in Chevy Chase, Maryland as reported by the DC Department of Transportation;
- a small scale study conducted in Madison, Wisconsin; and
- a small scale Social Psychology project/study in Salt Lake City, Utah.

Furthermore, after extensive searching and a direct inquiry to the Division of Transportation of Salt Lake City, we are unable to locate any evidence to suggest crosswalk flags are unsafe whether in isolation or in conjunction with RA-5 installations, all-way stops or signalized intersections.

Conclusion

The purpose of this report is to examine the effectiveness of crosswalk flags.

We have presented the findings of a jurisdictional scan and literature review, along with the results of a study at Lady Hammond Road and Memorial Drive in Halifax, all of which indicate crosswalk flags increase driver yielding behaviour.

Since the introduction of crosswalk flags to HRM, early vehicle-pedestrian collision data shows positive signs and will continued to be monitored. Qualitative reports from pedestrians and drivers also demonstrate an appreciation for crosswalk flags. Drivers have also told us the crosswalk flags are beneficial even when they are not being used by a pedestrian – because they increase the visibility of the crosswalk 24/7.

No evidence was discovered to indicate crosswalk flags pose any risk to pedestrians.