CRISP
CAPITAL REGION INTERSECTION SAFETY PARTNERSHIP

MONASH University
Accident Research Centre

TECHNICAL SUMMARY

March 2013

An Application of Safe System Approach to Intersections in the Capital Region Progress Report

The Capital Region Intersection Partnership (CRISP) engaged the Monash University Accident Research Centre (MUARC) to apply the Safe Systems approach to intersections in Edmonton's Capital Region. The intent was to conduct a practical, evidence-based research project of selected 'poorly performing' intersections in the City of Edmonton, Strathcona County and City of St. Albert.

Safe Systems challenge the common belief that death and serious injury are an unavoidable part of road-transport systems. It recognizes that there are limits to the forces that the human body can withstand and seeks to ensure that no road user is subject to forces which will result in death or serious injury. Safe System acknowledges that human error is part of the road transport system and while much can be done to reduce human error, it cannot be eliminated.

There were five tasks for the project. The first two tasks were to analyse crash statistics then find the five most poorly performing intersections within each municipality. The emphasis was on fatal and serious injury crashes, not necessarily the total crashes. These tended to be intersections with left-turn-across-path and right angle impact crashes, as well as pedestrian and cyclist crashes.

MUARC conducted the third task – a targeted literature review to identify Safe System compliant intersection designs. The literature pointed to both alternative intersection designs and technology as potential solutions. Roundabouts, turbo roundabouts, and grade-separated interchanges, along with their variations, are more commonly accepted alternative intersection designs. They reduce impact speeds or the number of points of conflict or, alternatively, improving impact angles. The literature recognizes that speed is fundamental to the outcome of most collisions and places significant emphasis on reduced and enforced lower speeds at junctions.

There is increased emphasis on technology solutions because discovery of innovative intersection design is tapering. Such technologies are being developed to enable vehicles to communicate with each other and vulnerable road users, to reduce the likelihood of collision. Gap assist technologies and dynamic/variable signs are showing promise in their ability to reduce intersection speeds. However, most of these technologies are still in their trial phases and unlikely to be widely available in the near future.

For the fourth task MUARC conducted a workshop in Edmonton with traffic safety stakeholders to consider a number of Safe System intersection designs for the poor performing intersections.

The fifth task was a key to the project. MUARC assessed the relative risks of the selected poor performing intersections in each jurisdiction and a selected number of intersection designs. The assessment was in terms of their likelihood of preventing death or severe injury in the event of a crash.

The kinetic energy generated by the motion of vehicles in a collision is directly associated with the risk of serious injury and death. The extent to which kinetic energy is tolerated by both the vehicles (crashworthiness) and people (biomechanical tolerances) involved in a crash can increase or reduce the chance of serious injury and death.

In response, MUARC developed the Kinetic Energy Management Model for Intersections (KEMM-X) to estimate the safety level of individual intersections. KEMM-X uses factors other than crashworthiness or biomechanical tolerances to estimate impact energy. These factors include speed and angle of impact.

In this study, MUARC used KEMM-X to calculate the probability of a fatality and of a serious injury for a given intersection. A fatality value of 0.1 and probability of a serious injury of 0.31 are the thresholds below which a crash were considered as Safe System compliant. MURAC used KEMM-X to calculate probabilities at both the posted speed limit and at an enforcement tolerance speed of 15 km/h greater than the posted speed limit. The enforcement tolerance speed demonstrates the increased risk of death and serious injury that is present at higher speeds. It does not assume that all drivers exceed the posted speed limit by this amount.

With the exception of the one traffic circle intersection in this study, most of the signal controlled intersections exceeded these thresholds at the posted speed limit and all exceeded them at an enforcement tolerance speed.

To view the Safe System full report, visit drivetolive.ca