

ADVANCED METHODOLOGIES FOR ACCIDENT REDUCTION AT UNSIGNALIZED INTERSECTION

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ABSTRACT

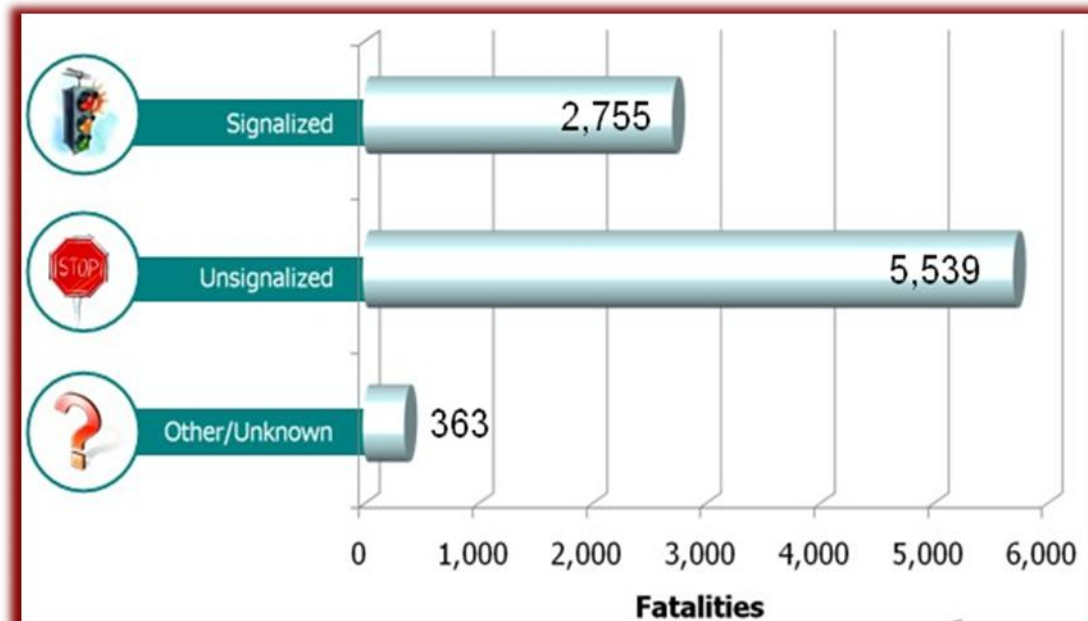
About half of all crashes and half of all injury crashes occur at intersections. With the rapid growth of the number of various vehicles, the ratio of the traffic accidents to vehicle number is increasing greatly. The road accident results in serious social problem and economic problem. Traffic safety is becoming more and more important for both drivers and the whole society . Crashes often occur at intersections because these are the locations where two or more roads cross each other and activities such as turning left, crossing over, and turning right have the potential for conflicts. The drivers were divided into three categories: normal, negative and positive. Finally, special warning method was used to remind different kinds of drivers to avoid accidents. The results illustrated that the system should warn the negative drivers earlier and a delay warning measure should be taken for positive drivers. Even though intersections constitute only a small proportion of the entire roadway system, a significantly large proportion of crashes occur at intersections. The crossing and turning manoeuvres that occur at intersections create opportunities for vehicle-vehicle, vehicle-pedestrian, and vehicle-bicycle conflicts, which may result in traffic crashes. Thus, intersections are likely points for concentrations of traffic crashes.

Keywords: *Injury, intersections, locations, Crossing, Traffic crashes, safety, problem.*

I. INTRODUCTION

Unsignalized intersections are of particular concern because some experience sufficient numbers of particular crash types to indicate a need to improve safety. Also number of crashes is undoubtedly much higher at unsignalized intersections nationwide than at signalized intersections [2]. Intersections are critical components of highway network and are used by all road users-passenger cars, heavy trucks, motorcycles, bicycles, and pedestrians. They are among the greatest safety challenges because they are some of the most common highway features, each having numerous conflict opportunities [6]. Unsignalized intersections with yield control or stop signs on the minor roads are one of the most common intersection types in the street system. Good intersection design will promote traffic safety and efficient traffic operation. A poorly-operated unsignalized intersection may also cause serious traffic safety problems [12]. Unsignalized intersections are of particular concern because there are so many of them on the highway system and because some experience sufficient number of particular crash types to indicate a need to improve safety. Good geometric design combined with good traffic control can

result in an intersection that operates efficiently and safety [3]. Unsignalized intersections represent potential hazards not present signalized intersections because of the priority of movement on the main road.



Vehicles stopping or slowing to turn create speed differentials between vehicles travelling in the same direction. This is particularly problematic on two-lane highways. The intersections along low- to moderate volume roads in rural and suburban areas are usually unsignalized. These roadways are generally associated with high-speed travel and relatively lower geometrics than those in more developed suburban and urban areas [2].

II.OBJECTIVE AND SCOPE OF PRESENT STUDY

The primary objective of this work is to improve safety at unsignalized intersections. Major emphasis area are explained below. Most of the objectives concern the physical improvement of unsignalized intersections and their approaches, while others relate to driver compliance. The strategies considered go across the full range of engineering, enforcement, and education. The physical improvements considered include both geometric design modifications and changes to traffic control devices.

III. METHODOLOGY

For intersection safety diagnostic process, field surveys are necessary. Field engineers use the survey forms in the fields to perform diagnostic process by filling the survey forms (also called safety diagnostic forms) with information collected from each intersection. The basic information (elements) in the form covers intersection existing conditions that have direct relationships to traffic safety at intersections. Typical elements for unsignalized intersection include, but not limited to, geometric, channelization, sight distance, and pavement surface conditions, lighting, and approaching speed. Field engineers with check these elements at each intersection and they will give two scores to each element based on their personal judgments. One score is under the category of "significance" and the other one is under the category of "severity". The category of "significance" indicates whether the particular condition (such as lighting) at the intersection has significant safety problem with a score of "0" indicating not significant and "5" very significant, and the category of

"severity" indicates whether the particular safety problem associated with the particular condition (such as lighting) would result in a severe traffic crash with a score of "0" indicating not severe and "5" very severe. **Table 1** presents the field survey form (safety diagnostic forms) with most existing conditions (elements) included. Field engineers need to fill scores for each element under the categories of "significance" and "severity". This form is relatively easy to be used in fields by an "average" field engineer [4, 10, and 13].

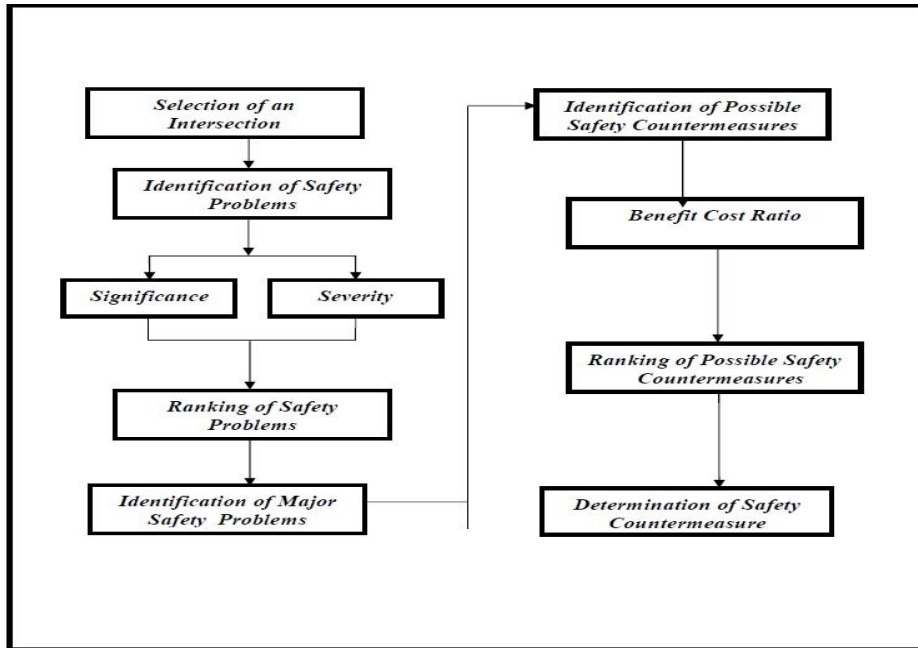


Fig: Flow Process of Evaluation Method

Table -Survey Form for the Diagnostic Approach

Survey List	Significance					Severity				
	Low ↔ High					Low ↔ High				
	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5
1- Inadequate Lane Width										
2- Insufficient Intersection Sight Distance										
3- Complex Intersection Design										
4- Improper Traffic Signs as to Number, Size, Message, Placement, and Visibility										
5- Pavement Marking Faded and Poor Visibility										
6- Inadequate Curb Radius for Turning Vehicle										

7- Improper Pedestrian Crosswalk Placement and Design										
8- Vehicle Speed too High for Existing Condition										
9- Poor Pavement Skid Resistance										
10- Insufficient Lighting										

IV. RESULTS AND DISCUSSIONS

This document has primarily focused on specialized treatments that may be considered to reduce crashes at unsignalized intersections on multi-lane, high speed roadways. It should be emphasized and as is illustrated in the case studies in Chapter 5, the consideration of proven common treatments should be given the first priority after the contributing causes of the crashes have been identified. The best solution may be a combination of both common treatments and specialized treatments. Many of the specialized treatments presented in this document have not had extensive use thereby providing only limited information regarding the expected crash reduction.

Intersections are important connections between two or more roadways and the resulting conflicting traffic movements make intersections crash-prone locations. The safety condition of unsignalized intersections has a great influence on the traffic safety of the road net, and decrease the number of traffic accidents.

Crash-based safety analysis is unpredictable and randomly happens and it is limited by locations and analysis time period. Thus, it needs a long time period to accumulate sufficient crash data and it is difficult to obtain these data and reliability of past data. Conflict-based safety analysis can be applied to quantitatively evaluate highway intersection traffic safety. The judgment and determination of traffic conflicts are more subjective nature. Different observers may give different traffic conflict judgments. In the research presented in this paper, another approach called diagnostic approach was attempted. In order to evaluate the safety performance of highway intersections more objectively, efficiently, and fast, the existing conditions at Unsignalized intersection could be used as the basis for intersection safety performance evaluation. Non-crash and non-conflict based evaluation method can give a safety evaluation to roadway facility with a relatively short time period and are relatively easy to be implemented in real applications. This type of approach can be better used by field safety engineers to find potential safety problems and corresponding countermeasures can be achieved with short time period. This research analyzes safety problem and present information on suggest effective, low-cost intersection countermeasures improvement at unsignalized intersections. These low-cost countermeasures can be applied to a large number of unsignalized intersections with a high frequency of crashes.

As specialized treatments are implemented, it is recommended that before and after studies be conducted to document the crash results and this information be shared. This will provide future users additional information in the evaluation of potential treatments to be considered at high crash, unsignalized intersections.

V. CONCLUSION

The results from this study from the different methodological approaches for analyzing safety at unsignalized intersections can be applicable to diagnose some safety deficiencies identified. As a traffic application for alleviating crashes at intersections with only one stop sign, installing another stop sign on the left side of the minor road at those stop-controlled intersections might be useful. Also, in order to increase drivers' awareness of the existence of stop signs, rumble strips can be installed at intersection approaches in order to call their attention. Rumble strips are usually recommended for application when measures such as pavement markings or flashers were tried and showed failure to alleviate high crash occurrence. Moreover, rumble strips can be coordinated with a "STOP AHEAD" device, i.e. when the driver crosses the rumble strip, this control device starts flashing.

Additionally, maintenance of stop signs should be performed at a high standard to ensure that their effectiveness is obtained. According to guidelines, stop signs should be kept clean, and visible at all times (at day and night). Improper signs should be replaced without delay. Special care should be taken to make sure that trees, shrubs, and other vegetations do not block stop signs. .

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