

Chapter 1

INTRODUCTION

Roadway safety is a key element of transportation. Identifying dangerous situations on roadways, determining what factors affect safety, and looking for appropriate solutions to ultimately improve overall roadway safety are essential tasks of transportation professionals. Many factors have been identified as critical contributing elements to roadway safety incidents including driving errors, poor roadway conditions, or bad weather.

Ensuring safety on all kind of roads must be a priority for engineers. One strategy to prevent the occurrence of crashes or reduce their severity is adopting the practice of auditing new or existing roads for the specific purpose of crash prevention. This practice is known as a road safety audit. Road safety audits have been widely used in Australia and Britain, and its practice is gaining support in the United States as a useful tool for engineers to assist in the fight against needless roadway fatalities.

One of the most critical factors in roadway safety is speed gradient. The US Department of Transportation (US DOT, 2000) defines speeding as driving too fast for conditions or in excess of the posted speed limit. Speeding occurs nearly every day on almost every road, however, on certain roads, speeding has more severe consequences than others. Despite their low traffic volumes, almost half of all speeding fatalities occur on local and collector roads.

1.1 PROBLEM STATEMENT

Traffic safety on existing roads is admittedly less than optimal as more than one million people are killed annually worldwide in traffic crashes representing the tenth leading cause of death in the world (World Health Organization, 2003). The National Highway Traffic Safety Administration (NHTSA, 2002) reported that over 40,000 people are killed and three million injured annually in traffic crashes in the United States.

Safety is a relevant component in the job of highway designers and traffic engineers, who have developed guidelines and standards for good practice with an emphasis on designing safer roads. The difficulty appears when theory is implemented in the real world, as theory does not always cover reality and following scrupulously the guidelines is not straightforward. That safety issue seems to be more severe on local roads, where town engineers must also accommodate local traditions, practices and public opinion to the road design.

Local engineers need tools to facilitate their decision-making process and do their job more effectively. Such tools include realistic published standards for local roads, methods to inventory roads in a more simple way, and the means to access these tools simply and quickly (Isaacs-Wassall, 1999).

The emphasis in road safety design engineering has been so far on crash reduction through the development of remedial measures at high frequency sites. However, in response to the imperative need of reducing road crashes and their economic and social cost, road and traffic authorities in some nations are now turning towards a crash prevention approach. It is in this proactive approach when the road safety audit is useful.

A road safety audit (RSA) is a proactive and thorough process to complete a traffic safety study. The Australian road transport and traffic authority, Austroads, defines a RSA as “a formal examination of a future road or traffic project, an existing road, or any project which interacts with road users, in which an independent, qualified team assesses the crash potential and safety performance” (Austroads, 2002). While road safety audits are intended mainly for new roads, they may be applied for existing roads. When the audit process is applied to an existing road it is called a road safety review (RSR).

The main objectives of both road safety audits and reviews are to identify features of the road-operating environment that could be potentially dangerous to all road users and others affected by a road project. Additionally, RSA and RSR attempt to ensure that measures to eliminate or reduce the problems are considered to the fullest extent possible.

Road safety reviews have not traditionally been a major component of road safety audit programs currently in place, although the guidelines in use allow the inclusion of this stage. The Institute of Transportation Engineers (ITE) considers that the reason of this low-key approach to the safety review is that it is sometimes argued that attention to safety problems on the existing network is more cost-effectively directed at treating sites with a demonstrated safety problem as revealed by accident data (Ogden et al., 1995). However, it is certainly possible to complement these crash studies with a comprehensive safety analysis of the road. This concept describes the specific aim of road safety reviews: to determine any existing safety deficiencies of design, layout, and street furniture that are not consistent with the road’s function and user’s perception to assist safer behavior (Austroads, 2002).

Recently, a new improvement to road safety audits, known as thematic audits, has been introduced to focus on specific problematic issues. Thematic audits are an element of road safety audits that examine a particular aspect, facility, or user in the road environment. The purpose of these audits is to address individual areas of concern in the roadway network (Brisbane-Yee, 2002).

Of the multitude of elements which contribute to decrease road safety, speed is arguably the most critical. Vehicle speed affects the risk of involvement in an injury crash and increases the severity of consequences when a crash occurs. Speeding is recognized to be a contributing factor in approximately one-third of all fatal traffic crashes. NHTSA defines a speed-related crash as any crash in which the police indicate that one or more drivers involved was exceeding the speed limit or driving too fast for conditions (Blincoe et al., 2002). Moreover, 85 percent of these speed-related fatalities took place on roads that were not interstate highways and more than 20 percent occurred on roads posted at or below 35 mph (NHTSA, 2002).

During the year 2001, a total of 477 traffic fatalities occurred in the Commonwealth of Massachusetts, of which 144 (30 percent) were speed-related. Furthermore, 70 of these 144 traffic fatalities, almost 50 percent, occurred on roads with speed limits at or below 35 mph (NHTSA, 2002). As a result, managing traffic speeds on local roads is a significant safety concern.

The purpose of this research is to develop and implement road safety reviews at the local level and supplement it with a crash study of the site and a focus on any observed speed problems.

1.2 RESEARCH OBJECTIVES

The objective of this research is to provide a methodology to conduct appropriate road safety reviews on existing local roads with documented speeding problems. The procedure includes both the safety audit and the study of crash records to provide a more complete picture than is available from either a safety audit or crash study alone.

The method presented in this research is based on the published road safety audit procedures and checklists. Elements have been adapted to make the process more suitable for use at the local level and to focus on specific speed issues. A final objective of this research effort is to implement the improved road safety review process on six roadways in the Town of Natick, Massachusetts.

1.3 RESEARCH METHODOLOGY

1.3.1 Task 1: Literature Review

The initial task of this research was to conduct a comprehensive literature review. The first component of the literature review focuses on the origin and development of road safety audits, published guidelines and significant international practices. Additionally, literature regarding road safety reviews and the introduction of thematic audits was also considered. The second component of the literature review provides an overview of speed and speed limit issues; providing current statistics of speeding on different types of roadways, analyzing the relationship of speed and crash causation, discussing the 85th percentile speed as a speed limit, providing 85th percentile speed recommendations, evaluating the consequences of changing posted speed limits, and speed on urban roads.

1.3.2 Task 2: Road Safety Review Methodology

The second task was identifying the appropriate components of the road safety review methodology. The basic requirements of the procedure were initially given including who, where and when a road safety review should be done. The process could be broken in three phases including office review, field review, and final report.

The office review began with a general description of the site and characterization of the selected roadways. The second part of the office review consists of analyzing the crashes along the specified roads. The crash analysis was undertaken to help reveal high crash locations and definable crash patterns that may be corrected through changes in roadway geometry, speed limits or the use of traffic control devices.

In the field review phase the engineer conducts a complete road survey, observing and recording data on a variety of traffic-related categories including roadway characteristics, geometry, speed limits, sight distance, signing, and other traffic devices. The purpose of this survey is to help identifying any potential safety issues. To facilitate collecting this data and determining the critical issues, some checklists were provided. Ideally, it is necessary to inspect the site both daylight and nighttime, and under dry and wet road conditions to cover all possible situations. To complete the field review, speed data must be obtained and analyzed. The speed data could be collected by different procedures such as radar meter or traffic counters.

In the final report, all the data were analyzed, the potential safety problems identified and the recommendations given. The report should be concise, giving clear identification of the problems and recommendations, and illustrative, each problem identified should be referenced on a location plan.

1.3.3 Task 3: Road Safety Review Implementation

The established procedure was applied to six roadways in the Town of Natick, Massachusetts. The results obtained were discussed and the appropriate recommendations given.