

Road Safety Audits

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Application of Road Safety Audits in Rural Areas
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1.0 Introduction

This paper first presents an overview of road safety audits (RSA) and describes the key elements and processes involved in an RSA. The materials included in the overview are not original, but are pulled from a variety of sources. Wherever possible, appropriate references are provided that can assist the reader in obtaining more detailed information. Finally, the paper delves into the application of RSAs for rural roads and highlights ways in which the RSA process may veer from the process outlined for major highway projects.

1.1 Overview

A road safety audit is a formalized and standardized procedure to independently judge the potential safety effects of road schemes. A safety audit differs from a safety inspection in that an audit is much more highly focused on addressing potential safety problems during the design process of a defined road project. The primary output of a safety audit is recommendations to resolve identified likely problems. A safety audit therefore aims at crash prevention rather than responding to those crashes that have already happened. (OECD, 1998) The national association of road transport and traffic authorities in Australasia (AUSTROADS) has defined a road safety audit as follows:

A road safety audit is 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 examiner reports on the project's accident potential and safety performance. (AUSTROADS, 1994)

Road safety audits began the late 1980s in the United Kingdom and quickly spread to other countries such as Australia, New Zealand, a number of Northern European countries and North America. Many countries have today developed specific detailed manuals for applying road safety audits, though the best known are the publications by AUSTROADS (1994) and the Institution of Highways and Transportation (1997) of the United Kingdom.

1.2 Why a Road Safety Audit?

One of the main reasons that a jurisdiction may choose to perform a road safety audit (RSA) is to address shortfalls in current standards being used on new roads – i.e. the standards may not adequately address safety – or to improve existing roads that may have been built many years earlier to standards that are no longer appropriate given our improved knowledge about road safety. In a similar vein, RSAs can identify safety lapses that could emerge as a result of striving to meet capacity goals. In all of these cases, an RSA can bring to bear a comprehensive safety perspective to ensure that safety is fairly and completely considered in any road project.

In addition to the above, road safety audits have been shown to save money and lives. Given that RSAs can be carried out at a relatively low cost -- estimated to be between 1 and 4% of the total project cost for new designs -- safety audits seem to be cost effective in the majority of cases. For example, in Denmark, a benefit-cost analysis on 13 different schemes comparing all costs involved in the application of an audit (extra time investment, changes in construction

costs) with the savings due to expected crash reduction, showed an average first year rate of return of 146%, making the audit a highly profitable instrument (OECD, 1998).

Finally, RSAs can address changes that are made during construction that may not complement the original design and therefore compromise safety. In this instance, an appropriately timed RSA can result in a final product that will perform significantly better from a safety perspective than it ordinarily would. The bottom line is that an RSA can facilitate the integration of safety considerations for all road users -- i.e. pedestrians, bicyclists, older drivers, etc. -- into road facilities from start to finish by introducing practical safety experience into all aspects of project planning, design, construction and operation. By doing so, the rate of crashes can be reduced and the total life costs of a project can be lowered.

2.0 Elements of a Road Safety Audit

When discussing the details of a road safety audit, there are several things to be considered, such as: i) when RSAs are performed; ii) who performs an RSA; and iii) how it is performed. Before proceeding to the next sections that describe each of these items separately, it may be useful to consider the difference between a formal RSA and a safety review. Pieples (Kansas State University, 1999) suggests the comparison presented in Table 1.

Table 1: Comparison between safety reviews and safety audits.

Safety Review	Safety Audit
Team has design background	Team is multi disciplinary
Cooperative	Independent
2 reviews	early reviews and monitoring
0 field reviews	1 to 5 field reviews
Compliance to standards	Comprehensive checklist is used
Human factors not emphasized	Consider human factors (expectations, speed, elderly, etc.)
Multimodal not emphasized	Multimodal (pedestrians, bicycles)
Considers crash clusters - reactive	Anticipates crashes - proactive

2.1 When to Perform an Audit

Road safety audits can be conducted at five different stages of a project as follows:

- the feasibility stage;
- the draft design stage;
- the detailed design stage;
- the pre-opening stage; and
- on an existing road.

In the *feasibility stage*, RSAs look at route, layout and treatment options. The RSA will provide an assessment of the relative safety performance of the different options as well as identify the safety needs of specific user groups. Items such as the following could be considered: route choice and continuity; design speed and standards; impacts on adjacent network; provision of intersections and interchanges; access control; number of lanes; traffic control; functionality; and provisions for future needs.

In the *draft design stage*, consideration is given to such things as horizontal and vertical alignment (sight distance, etc.); lines of sight; intersection layout; lane and shoulder widths; cross-slopes and superelevations; provisions for bicycles pedestrians, emergency response rest areas and parking; and construction safety.

In the *detailed design stage*, the geometric design, signing and lane marking plans, lighting designs, and landscaping plans are scrutinized. Other items can include roadsides, intersection details, and provisions for special users.

In the *pre-opening stage*, a site visit is made both in daylight and at night taking into consideration all road users to ensure that the final design/construction has taken into account all of the previous audit concerns. Other items such as signal operation, drainage and roadside conditions can be examined.

On an *existing road or network of roads*, RSAs can be carried out to examine a host of issues related to roadway hazards that may or may not have been considered during the design process. RSAs on an existing road could consider any or all of the items considered in the previous stages including the adequacy of the roadway, roadside and intersection features, intermodal interaction, or access management.

2.2 Who Performs and Audit

An RSA is normally performed by a person or team of 3 to 5 people that is independent of the designer for new road projects and, for existing roads, independent of the pressures and constraints that might normally affect such a review. Though a single person can perform an audit, a team approach is preferred if possible because of the diverse backgrounds and experiences found in a team as well as the greater capacity of a group of people to identify a wider variety of hazards. Of course, for practical reasons on a small project, a single auditor may be sufficient.

A minimum level of experience necessary to perform an audit would include a background and understanding in road safety engineering as well as crash causation and prevention. In a team, it is best to create a multi disciplinary group comprised of people with backgrounds including design, traffic engineering, construction, or enforcement. Teams may also utilize expertise from pedestrian/bicycle coordinators, human factors experts, commercial vehicle safety professionals or government agencies other than transportation.

Independence is a key term here because it is necessary for a clear and unbiased perspective. This is not to say that an audit team should unfairly criticize the design team. They need to be

able to communicate their findings to the design team in a way that makes the experience a constructive, learning experience. Choosing independent auditors also allows personnel to be chosen who possess the appropriate skills and experience needed to independently review projects or roads in an objective manner.

2.3 How an RSA is Performed

Naturally, how an RSA is performed will depend upon the type of project being audited and the stage at which a project is audited. In general, however, AUSTROADS identifies three phases as follows:

1. The designer or client selects an auditor, provides documentation and meets with the auditor/audit team.
- B. The auditor/audit team reviews all of the documentation, examines plans, performs one or more site reviews (including night visit), uses a detailed checklist to ensure essential items are considered, brainstorms concerns to reach team consensus, develop a formal audit report, and then meet with designer or client.
- C. The designer or client decides on appropriate actions required to respond to the audit report and documents their decisions.

Take note that the auditor uses a checklist during the audit. There are checklists that have been developed by various agencies for each of the audit stages, though AUSTROADS may be the most complete. The checklists are very detailed to ensure that an auditor considers all relevant safety aspects for a given project stage. They also serve to prompt thought and discussion among the audit team members about the projects they are auditing. They are a tool that helps the team focus their efforts, but are not designed to be filled in on-site, but rather after the on-site review. They should be considered flexible and adaptable to ensure that new items can be added when necessary. In terms of audits on rural roads discussed later in this paper, an approach that suggests an alternative option to checklists will be presented.

It also important to note the last phase in which the client or designer is called upon to respond to the findings in the RSA report. This is an absolutely critical element in the audit process for a number of reasons. First, it is the step in the process that crystallizes a set of actions that should be undertaken and therefore provides “marching orders”. In addition, the question of legal liability is often raised when RSAs are discussed. It is generally believed that an RSA makes you much less vulnerable to legal liabilities because it provides documentation of the decision-making process. However, the minimization of liability is contingent upon a sufficient response from the designer or client. It is essential that the designer or client either states actions that will be taken or the reasons, constraints or justification for not taking action on a particular finding in the audit report. Without such documentation, regardless of the actions taken, an audit may not be as effective as desired.

3.0 Rural Road Safety Audits

The previous sections provided a general overview of what a road safety audit is and how it is carried out. This section will build on this information by discussing how the general RSA

approach can possibly be modified to take into account the specific constraints and needs of the rural environment. Specifically, in a rural environment, care must be taken to ensure that the results of a road safety audit are practical and can be accomplished in consideration of limited budgets versus the extent of the network. The key adaptations to consider revolve around the audit team formation, the use of checklists and the preparation of the audit report.

3.1 Audit Team Formation

The minimum qualifications called for in an auditor or auditor team remain the same in a rural environment as they are in the more general audit approach. Specifically, the auditor should be independent of the client or designer and have experience in road safety engineering and an understanding of crash causation and prevention. If a team is used, a multi disciplinary group is preferred though the expertise of the team is contingent upon the specific needs of the locality.

Recognizing the general funding constraints that may affect the ability of a some local jurisdictions to hire qualified consultants, Haiar and Wilson (1999) have suggested the idea of sharing personnel between jurisdictions. This could be useful from the standpoint of being assured that the person(s) performing the audit are sensitive to the issues at the local level while also providing a degree of independence that is needed in an RSA. At the same time, a team could be composed with little or no cost if the local jurisdiction also invited the State DOT or even the Federal Highway Administration (FHWA) to participate in an audit. Certainly it is reasonable to expect that the State and the FHWA may not be able to participate in every audit, but they could provide support for some activities and make a contribution.

3.2 Use Checklists?

As mentioned previously, the use of checklists is at the heart of traditional RSA practices. The checklist provides a mechanism for auditors to ensure that they have considered every necessary item during the audit. However, questions have been raised in the rural setting as to whether a checklist will actually prove to be the best tool. Essentially, a checklist can lead to a “laundry list” of safety fixes that may or may not be considered reasonable or correctable in a rural setting with limited resources given the extent of the network.

In order to address this challenge, two approaches have been proposed for rural roads. In the first case, Transfund New Zealand (1998) has developed a manual that specifically considers safety audits for existing roads, with an emphasis on rural roads. They have adapted the AUSTROADS checklists for rural roads and grouped them into two specific lists, namely: a) maintenance deficiencies; and b) inappropriate standards or safety problems. The sheets are used during the audit as the normal checklists would be, though perhaps more time is spent on the inappropriate standards than on the maintenance deficiencies.

The one overriding concept that drives the audit on the rural roads is consistency. Specifically, Transfund strives for ensuring consistency on road stretches rather than trying to achieve “perfect” roads. Basically, understanding that resources will never be sufficient to fix every safety item in a rural setting, Transfund begins by establishing an acceptable standard for the road section being audited and tries to ensure that all parts of the road meet this standard.

Wilson (2000) has gone one step further in this approach. He has drafted a functional

classification for rural roads. He has identified five types of rural roads – i.e. rural major high-speed; rural major medium-speed; rural minor; rural local; and rural low-volume. For each classification he has a typical description of the road group and how they generally function. This could be taken even further with general descriptions of the types of slopes, clear zones or other characteristics that are considered acceptable for each classification. With this material in hand, it is much more direct for auditors to consider a higher degree of consistency when auditing specific types of existing roads on a network. Like the Transfund approach, this approach does not search for “perfection” in every road, but strives to introduce a practical element of safety into the decision-making process for rural roads.

3.3 Audit Reports

One of the challenges in an RSA in a rural setting is ensuring that the audit results in a set of practical, actionable items that a local political body – e.g. county council, etc. – can decide upon. Various possibilities exist. First, an audit team could deliver a traditional style audit report – i.e. one that reports deficiencies but does not suggest recommendations for countermeasures – to the County Engineer. The County Engineer would then be responsible to respond to the audit report. His response, including suggested countermeasures to address the audit findings, would then be considered the proposed action list. This response and the audit report could then be forwarded to the appropriate officials for decisive action.

As another approach, Wilson (2000) suggests that the audit report include specific suggestions for improvements for each area of concern identified. For each safety concern, a location and description is provided followed by a measure of urgency. Urgency would fall into one of four categories – leave it as is; no urgency, but should be addressed; schedule improvement in reasonably short time; and as soon as possible – and is based on the classification of the roadway and the anticipated cost of the improvements. In addition, each concern would have a recommended improvement chosen from the following: remove; repair; relocate; replace; delineate; shield; other.

Under the scenario described above, the development of the report would be done in an open manner with the County Engineer. The final report would then be submitted to the County Council or other body for action and their decisions would theoretically be the response to the audit report.

4.0 Conclusion

From the foregoing discussion it should be clear that the formally accepted and practiced RSA process is not always adequate for existing rural roads. On the contrary, standard RSAs could lead to unrealistic suggestions for safety improvements that could not be met given costs and the extent of the rural network. Therefore, several adjustments have been suggested that could make the RSA more practical for application in a rural setting. Chief among these suggestions are ideas for forming a team, adapting checklists and adjusting the format of the final audit report. It should be kept in mind that this is a rapidly evolving area and more and better solutions and suggestions may emerge in the not too distant future. As well, if one concept should be driven home, it is that a flexible approach to and interpretation of RSAs in a rural setting is needed to ensure that an RSA can lead to specific and accomplishable recommendations that will improve safety on a rural road network.

References

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