THE BENEFITS OF ROAD SAFETY AUDIT IN THE MOTORISING WORLD

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ABSTRACT

As new road infrastructure projects are planned, designed and built, there is a belief amongst all concerned that road safety will naturally benefit. After all, experienced designers using the latest standards have been used! This belief can lead to a situation where other issues (such as costs, timing, environmental issues to list but a few) receive explicit and detailed consideration, while road safety issues do not. Road safety is too important to leave as an implicit part of a new road project - it needs to be explicitly detailed throughout the planning, design and construction process.

The one sure way to make this happen is to introduce the road safety audit process into the road design process. This paper aims to promote the advancement of road safety audit worldwide, and especially in motorising nations. In many of these nations, a road-building boom is creating urgency for the adoption of the road safety audit process in order to safeguard against the construction of new blackspots.

The paper details the proven benefits and costs of audits, providing sound financial reasons why governments should introduce road safety audit into the design and construction of new road projects. The results of recent audits in two motorising nations are used to encourage governments worldwide to adopt this low cost/high benefit process.

KEY WORDS

ROAD SAFETY AUDIT/ EVALUATIONS/SAFETY ISSUES

1 THE COSTS AND THE BENEFITS OF ROAD SAFETY AUDIT

Road safety audit is “a formal examination of a future road or traffic project or an existing road, in which an independent, qualified team reports on the project’s crash potential and safety performance”. (AUSTROADS 2002). It is a simple and low-cost process, but one that requires considerable skill, judgement and technical knowledge within the audit team. Since road safety audit first evolved in Britain in the 1980’s, through until the present day, many road authorities in a number of vastly differing nations have recognised the potential of auditing as a means of preventing crashes and have embraced the process as an effective road safety tool. At the same time, other road authorities have stood back from adopting this new process, often questioning the need for it.

The road safety audit process is detailed in a number of guides (AUSTROADS 2002, IHT 1996) – readers are referred to those guides for details.

Representatives of numerous road authorities around the globe have been seeking objective facts about the effectiveness of the audit process before they commit to it. Their

organisations have delayed implementation of the audit process while they remain unconvinced about the cost-benefits of road safety audits.

In order to address this very real issue, and in order to advance the adoption of the audit process within Australia and New Zealand (as well as other parts of the world), AUSTROADS commissioned an evaluation of the costs and the benefits of the road safety audit process. ARRB Transport Research undertook this evaluation for AUSTROADS, and the results are detailed in full in AUSTROADS report AP-R209 Evaluation of the Proposed Actions Emanating from Road Safety Audits (AUSTROADS 2002a).

1.1 Costs of road safety audits

The cost of conducting audits varies widely and depends as much as anything on the size of the project. In Australia, AUSTROADS (2002) suggests that auditing a large new project (requiring audits at four stages) may add about 4% to the road design costs. With design costs typically about 5-6% of a total project cost, the impact of a road safety audit on the costs of a project is really quite small. The Institution of Highway Transportation's (IHT) review of safety audit practices (Brownfield et al 1996) revealed similarly small costs associated with audits:

- staff time for audits averaged 25 hours;
- the increase in construction costs due to redesign averaged 0.5% for large projects and 3% for smaller projects.

1.2 Benefits of road safety audits

The AUSTROADS study started with a literature review, identifying studies in which the benefits of the audit process had been quantified from an economic viewpoint.

- Surrey County Council conducted a study to determine whether casualty savings had been achieved as a result of undertaking audits. Before and after crash statistics were compared for 19 audited projects with 19 unaudited projects of similar remedial treatments. Crash statistics were compared for the 38 sites for a period of at least two years before and two years after construction. Average casualty saving of 1.25 per year for audited schemes, compared to 0.26 for non-audited schemes.
- A study was conducted by the Transport Research Laboratory for the UK Highways Authority to assess the benefits of the audit program carried out on trunk roads. The evaluation compared the costs of implementing safety recommendations made by the audit team at the design stage with the costs of making changes after the project was constructed. For the 22 audited sites, an average saving of £11,373 per site was calculated.
- A Jordanian study attempted to quantify the benefits of road safety audit by considering nine sites that had been constructed in the previous decade (without any auditing), had developed crash problems, and then had been improved geometrically. It was assumed that if an audit had been undertaken, the improvements would have been made at the design stage. Overall the first year rate of return was 120%.

  The value of the benefits achieved by audits in Jordan (from savings in crashes) may be greater than could be achieved in a western nation such as Britain or Australia. Hoque et al (1998) believes the benefits of road safety audit in developing

countries is likely to be higher than in western countries, given that reported fatality rates in the developing nations are substantially higher and that vehicle ownership in those countries is increasing rapidly.

- Thirteen road schemes in Denmark were studied. Each had been audited during the design phase. An evaluation panel conducted cost benefit analyses of the safety audits of the 13 projects. The panel used a general accident prediction method (used for highway planning and black spot priority ranking) to estimate the crash savings. The results of the analysis showed that the total costs and estimated casualty savings for the 13 projects gave a first year rate of return of 146%.

Having completed the literature review, the results of a series of design audits and existing road audits were obtained by ARRB from road authorities around Australia and New Zealand. For each one, the proposed recommended action was identified, the benefit-cost ratios (BCRs) for each audit recommendation was calculated, the range and median of BCRs recorded, and the overall BCR of the design and existing road audits calculated.

In each case, for each audit recommendation, the reduction in risk was determined using the ARRB '*Road Safety Risk Manager*' (McInerney and White 1999, and ARRB 2002) and the cost of implementing the recommendations was estimated. The total reduction in risk and implementation costs for each audit was summed, allowing the full benefit for each audit to be calculated. From those the audit BCR was calculated. For the nine design stage audits:

- the BCR's of implementing the recommendations ranged from 3:1 up to 242:1.
- More than 90% of all the recommendations had positive BCR's.
- 65% of the recommendations were "low cost" (ie less than $1000AUD).

The results for the audits of existing roads were lower overall but still very positive.

- The BCR's for these audits ranged from 2.4: to 84:1.
- 78% of all proposed actions had positive BCR's.
- More than 50% of all proposed actions were below $5000AUD.

These five studies provide the "cold, hard facts" to show that the road safety audit process should be supported and progressed globally. The return on investment in audits is high. In particular, road safety audit at the design stages of a road project is to be encouraged.

2 TWO RECENT ROAD SAFETY AUDITS IN THE MOTORISING WORLD

To illustrate and outline the potential for road safety audits in the motorising world, some findings from two recent major audits are outlined below. These demonstrate that the road safety audit process offers much to these countries. Knowing the potential costs and benefits of the audit process (as detailed above), road authorities from Africa to Asia and beyond should be actively adopting audit into their design offices. The time is right for the road safety audit process to become a routine part of the planning, design and construction for all road projects the world over.

2.1 A detailed design audit of a National Highway, India.

A detailed design audit of the designs for the upgrading of a national highway in India revealed a number of safety concerns. Some of these concerns would have been identified (and hopefully corrected) if an earlier stage of audit had been carried out.

- No allowance had been made for safe movement along or across the new road by the non-motorised road users. In most motorising nations, pedestrians are the largest road user group (closely followed by cyclists), and their safety when using the national highways is a major safety issue.

- A raised central carriageway (on compacted earth) was proposed through several towns and villages. This design was intended to minimise conflicts at ground level, but it had the potential to divide the local community, impede pedestrian access across the road, create major congestion and associated safety concerns in the service roads, to cause difficulties for buses when picking up/setting down passengers, and to create roadside hazard concerns.

- Several existing uncontrolled Y junctions were designed to remain as Y junctions, controlled only by Stop signs. Such junctions have great potential for head on crashes if drivers ignore the Stop signs. It is unrealistic to expect drivers on a national highway to always fully comply with isolated stop signs. The risk of serious head on or side swipe crashes was therefore rated high.

2.2 An audit of the Primary Road Network of Eritrea

Regular audits of existing roads allow road safety hazards to be identified before they result in crashes. They can also be useful in regions that lack reliable crash data, and which therefore cannot implement a crash blackspot program with any real certainty. The audit process is able to identify typical safety issues and rank these through a simple benefit cost ratio.

Almost 1000kms of the primary road network of Eritrea were audited in early 2002 as a part of the Eritrea Road Safety Project. Approximately half of the roads were sealed, all were two lane two-way roads, and all were important roads for this emerging African nation. Common safety issues included:

- Variations in cross-section. The road width varied but was commonly 6.5 metres sealed in most parts. There was little shoulder over most of the length. The cross-section was too narrow for the types of vehicles and for the mix of motorised/non-motorised road users on this road.

- Sight lines through many bends were inadequate even for the current low speeds.

- A lack of road signs. There was an urgent need for the increased use of warning, regulatory and direction signs. Drivers need to be warned, informed, and advised of regulatory issues (such as speed limits). Regulatory signs in both languages (Triginyan and English) are needed.

- Only the most basic delineation existed along the road network. What did exist was adequate during daylight conditions, but was of little use at night due to poor reflectivity.

- There is a wide range of road users on the primary road network of Eritrea including trucks, buses, cars, animal drawn vehicles, pedestrians and cyclists. In general, no special safety provision is made for any of the vulnerable users. Their ad hoc interaction with motor vehicles creates a high risk of serious crashes.

- Many bus stops had evolved in locations that were convenient for the passengers but which had very poor sight distance for other approaching drivers. Overtaking at these locations can be a high-risk activity. High-speed conflicts with crossing pedestrians were also a serious safety concern.

3 CONCLUSION

This paper has outlined the results of five studies that have shown road safety audit to be a low cost, high benefit process. The paper has also briefly outlined typical safety issues identified in two recent audits – one in Africa and one in India. The range of safety issues identified in those audits shows a very real need for increased awareness of a wide range of safety issues that are relevant to the road users in these countries. Road safety audit is a process that is able to assist in this.

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