DEVELOPMENT OF ROAD SAFETY AUDIT IN THAILAND

Pichai Taneerananon
Associate Professor
Dept. Civil Engg.
Prince of Songkla University
Hat Yai Thailand 90110
Fax: +66 74 446519
email tpichai@ratree.psu.ac.th

Weeradej Cheewapattananuwong
Civil Engineer
Traffic Egineering Division
Department of Highways
Bangkok Thailand 10400
Fax: +6622456904
weeradej@hotmail.com

Kittipol Asaporn
Traffic Expert
Traffic Eng. Division
Dept. of Highways
Bangkok Thailand
Fax: +6622456904

ABSTRACT: Road crashes are the biggest public health burden in Thailand. A 1997 road master plan study shows that the economic loss to the country is 106,368 million baht (US$ 2,875 million @ $ = 37 B) per year or equivalent to 3.41% of GNP in 1993 of 3,120,000 million baht. The number of fatalities from road crashes in 1998 was 13,836 a significant reduction from the 1995 figure of 16,727. Despite the decline in both the number of fatalities and crashes, road accidents are still ranked third as a cause of death. Efforts by road authorities, particularly the Department of Highways has thus far concentrated on correcting accident blackspots, which is primarily an accident reduction action. Recent development in the road safety area is the road safety audit concept, an accident prevention process. Road safety audit has its origins in the UK in the late Nineteen eighties. In Thailand, road safety audit is in its infancy with the practice in the process of being institutionalised. However, the concept has been informally used by academics and engineers.

1. INTRODUCTION

In Thailand the number of road crashes and fatalities appear to have peaked in 1994 and 1995 respectively. For 1994 there were 102,610 crashes and 15,176 fatalities and 1995, the corresponding figures were 94,362 and 16,727. However, the numbers are still very high compared to those of developed countries and it remains the biggest health burden to the country. Even though the road crash problem is well known in the country, nothing very concrete has been done until recently. In 1995 the Thai government through the Ministry of Transport and Communications (MOTC) commissioned the development of a Road Safety Master Plan and a Road Traffic Accident Information System. In addition, the first National Road Safety Conference was held in June 1998 to highlight the road safety problem; the Prime Minister the Hon. Chuan Leekpai who was the keynote speaker stressed the need to have a good road system. He believed that the 4 lane national trunk road project could contribute to the reduction of road tolls.

Road safety audit has its origins in the UK in the Nineteen eighties. The process was formalised in the forms of guidelines in the UK, and Australia and New Zealand in the early nineties. In Thailand, road safety audit is in its infancy with the practice in the process of being institutionalised, as a result of the recommendation from the recently completed study on a road safety master plan. However, the concept has been informally used by academics and engineers of the Department of Highways in recent years.

2. ROAD CRASH SITUATION IN THAILAND

According to records of the Police Department, and the Department of Highways (DOH) (Department of Highways 1997) the number of crashes has increased dramatically from 24,132 cases in 1987 to 102,610 cases in 1994 (See Table I and Figure 1) when it peaked During the same period the number of fatalities has gone from 2,104 to 15,176 , it reached the peak number of 16,727 and declined to 13,836 in 1997. The large jump in the number of accidents and fatalities from 1991 onwards is due to the fact that in 1992, DOH has started to include accident records gathered by local police stations in the provinces. Prior to this, only accident data collected by DOH provincial offices were used.

Table 1 : Thailand traffic accident statistics, 1987 - 1997

Year	Bangkok Metropolis			Other Provinces			Whole - Kingdom		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
1987	19,745	752	6,333	4,387	1,352	2,256	24,132	2,104	8,589
1988	31,175	817	9,565	4,114	1,198	3,939	35,289	2,015	13,504
1989	31,709	917	10,005	6,388	4,451	3,076	38,097	5,368	13,081
1990	33,064	949	10,701	7,417	4,816	7,551	40,481	5,765	18,252
1991	38,355	1,057	10,778	7,946	5,276	8,777	46,301	6,333	19,555
1992	46,743	983	11,025	14,586	7,201	9,677	61,329	8,184	20,702
1993	64,006	1,011	11,031	20,886	8,485	14,299	84,892	9,496	25,330
1994	72,359	1,290	18,849	30,251	13,856	24,692	102,610	15,146	43,541
1995	64,469	1,284	21,697	24,898	15,443	29,021	94,362	16,727	50,718
1996	60,308	1,069	23,314	28,248	13,336	26,730	88,556	14,405	50,044
1997	54,324	903	20,933	28,012	12,933	27,828	82,336	13,836	48,761

Source : Research and Planning Division, Police Department, Ministry of Interior, and Traffic Engineering Division , Department of Highways (1997).

3. COMBATING THE ROAD CRASHES

3.1 Efforts by Government Agencies

There have been various efforts made by government agencies in combating road crashes, these include the improvement of national road standards by DOH, the Ministry of Health's work in emergency services for crash victims and in raising the public awareness about road crashes, and the work of Khonkhaen provincial committee on accident prevention (Chartbunchachai 1997) which proved effective in crash reduction and now being modelled by several provinces in the country. However, all the efforts were carried out without a national vision or strategy and were therefore fragmented .

3.2 Road Safety Master Plan

The grave situation of road crashes which continues with unacceptably high number of fatalities has finally lead to the development of a Road safety master plan (RSMP) which started in 1995 and finished in 1997 (Kingdom of Thailand 1997). The RSMP addresses an extensive list of issues comprising road safety economy, policy and organisation; legislation; law enforcement; accident analysis and research; education, drivers training and public information; vehicle safety; infrastructure; and emergency services. Under infrastructure, road safety audit was introduced. MOTC in 1997 proposed 9 programs of activities to be implemented over a five year period. with a total budget of 9,850 million Baht (approx. US$ 266 million @ 37 B to 1 $). These programs are as follows (Ministry of Transport, 1997) :

- Road Safety Economy, Policy and Organisation
- Legislation and Law Enforcement
- Accident Analysis and Research
- Driver Training and Licensing
- Traffic Training in Schools
- Public Information
- Vehicle Safety
- Road Improvements and
- Emergency Treatment of Accident Victims

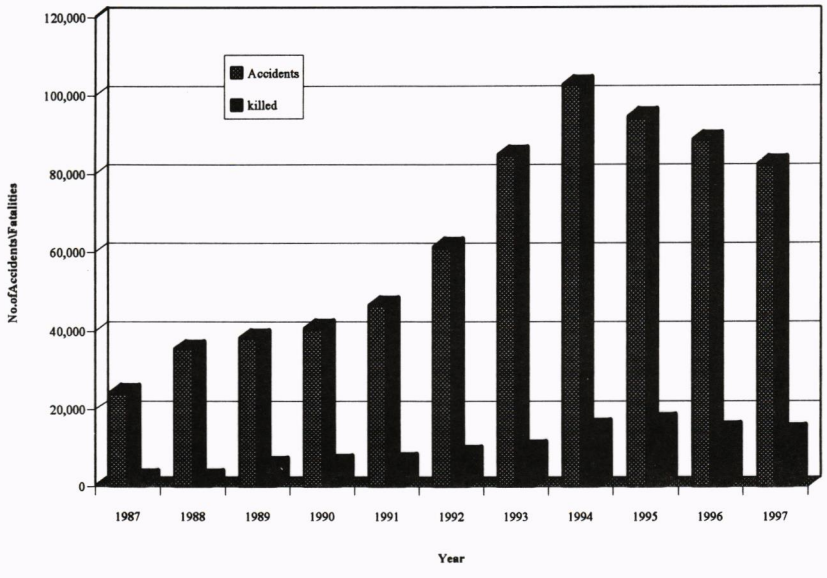

Figure – 1 Number of Accidents and Fatalities

4. ROAD SAFETY AUDIT

4.1 International Perspective

In 1990, the Institution of Highways and Transportation published Guidelines for Accident Reduction and Prevention with two objectives (IHT 1990a). The first was to reduce accidents through the application of cost effective measures on existing roads, but the approach, though essential was recognised as being akin to locking the stable door after the horse has bolted. The second objective of the Guidelines based on the premise that prevention is better than cure was application of safety principles in the provision, improvement and maintenance of roads as a means of accident prevention (IHT 1990b) .

The publication of the Guidelines for : The Safety Audit of Highways (IHT 1990b) was aimed to assist the attainment of the second objective. As an initiative to further promote improvement in road safety, the UK Department of Transport made road safety audits mandatory for trunk road and motorway schemes from April 1991 (Road Society for the Prevention of Accidents 1992). A new version ' Guidelines for the Road Safety Audit of Highways' was published by IHT in late 1996 (IHT 1996) it contains substantial updates from the 1990 publications.

In Australia, different States have taken various approaches to road safety audits (Ogden and Jordan 1993). For example, in New South Wales, the Roads and Traffic Authority (RTA) has mandated that each year 20 projects within each of the RTA's regions are audited; these projects are to cover a range of project sizes and project stages. In addition, RTA has also introduced a requirement that 20 per cent of the existing road system is to be audited each year to "identify the deficiencies of the existing road (and) identify priorities for action." In New Zealand, the national government transport agency (Transit New Zealand) has a Safety Audit Office and began conducting pilot safety audit projects in 1992.

Following the first International Road Safety Audit Forum held in Melbourne in May 1998, significant outcomes have emerged including the definitions of various stages to conduct road safety audit , in essence, audit of existing would be treated as a separate type of audit and not a part of the various pre construction and pre-opening stages of the audit.

Definition of road safety audit

AUSTROADS (1994) defines road safety audit as *'a formal examination of an existing or future road or traffic project, or any project which interacts with road users, in which an independent, qualified examiner reports on the project's accident potential and safety performance.'*

When to apply a road safety audit

A road safety audit can be conducted at five stages of a project (AUSTROADS 1994). These are:

- the feasibility stage,
- the draft design stage,
- the detailed design stage,
- the pre - opening stage, and,
- an audit of an existing road.

Although safety audit during construction is not specified as a separate stage, it is nonetheless mentioned in the AUSTROADS' guide.

The IHT guidelines (1998) describes four similar stages at which road safety can be carried out. It treats auditing of existing roads as a separate case, an extension to the identification of safety problems based an accident data.

Current issues

The current development in road safety audit in Australia concerns a number of contentious issues including: accreditation for road safety auditors; trend towards one man audit teams; the cost effectiveness of road safety audit; the high proportion of audits of existing roads with the consequence that a large number of recommended improvements could not be implemented because of funding constraints. The whole thing has led to a loss of confidence in all the stages of road safety audit; a view that road safety audit was merely a compliance check with standards while the process can indeed deliver more; and the necessity of training in the audit process for various groups of people (Jordan 1998). At the Austroads International Road Safety Audit Forum, the legal and ownership of design issues were raised both needs to be formally addressed. The current issues in the UK (Bulpitt 1998) include: training and experience of safety auditors; monitoring of safety audited schemes after opening; legal implication for auditors; and auditing of innovative schemes with over -cautious comments to avoid future litigation. In New Zealand, (Appleton and Hannah 1998) the issue of competitive pricing of auditing which can result in 'unprofessional' practice and the cost effectiveness of safety audit were some of the main concerns.

4.2 Development of Road Safety Audit in Thailand

The term "Road Safety Audit" was first made known to Thai road safety professionals in 1995 when the first author published a report on the causes and prevention of road crashes in which a section was devoted to road safety audit (Taneerananon et.al. 1995), based on the 1990 IHT guidelines. Further exposure of road safety audit was made in November, the same year at the Second National Convention on Civil Engineering (Taneerananon 1995) where the first author presented the concept of road safety audit and its potential application in Thailand based on the 1994 AUSTROADS Road Safety Audit guidelines. The

process of road safety audit was first officially recognised in the MOTC road safety master plan in which the process was recommended as a measure of crash prevention; it was primarily based on the 1994 AUSTROADS guidelines and the 1990 IHT guidelines.

In its 5 year action plan, the MOTC has listed the introduction of road safety audit process as an activity with top priority along with the systematic planning for reduction of black spots. These activities were earmarked for the first year of the action plan (MOTC 1997).

4.3 Practice of Road Safety Audit in Thailand

As far as the authors know, the first conduct of road safety audit in Thailand was carried out in 1996 when the first author and his students audited two roads in the South of Thailand using the 1994 AUSTROADS guidelines (Taneerananon et. al. 1996). It was an academic exercise with the end results contributing to significant improvements on one of the roads.

As mentioned previously that the MOTC has prepared an action plan in which road safety audit process was listed as one of the top priority activities, to be implemented in the Department of Highways, Public Works Department and Office of Accelerated Rural Development However, due to budget constraint, a consequence of the on - going Asian economic crisis, the process has not been started. However during the preparation of the Road Safety Master Plan in which the third author was involved, he made a recommendation to the Director General of DOH to implement RSA by setting up a sub - committee to audit and approve the safety aspects of all the designs before they go into construction.

In his recommendations, he suggested the followings:

a) The safety sub - committee should have the Director of DOH Traffic Engineering Division as chairman and experts in road design as members.

b) The sub - committee is authorised to call consulting firms which do the designs to explain the purpose of various design aspects and make corrections according to the committee's comments.

c) During construction, the project engineer must submit road safety plan to the committee.

d) After construction, the committee must inspect and monitor the project.

The recommendations were not accepted by the design office, citing the "non-recognition" of the designers' professionalism and the duplication of work as well as "too many bosses" as the reasons. In the end the recommendations were dropped.

Examples of Road Safety Audit

An Audit of a Highway Improvement Scheme

An audit of a major upgrade of a section of an inter - city highway route 2 between Saraburi and Korat in the Northeastern region of Thailand, a total of 47 km, was conducted by the second author who is familiar with the concept of road safety audit. This section of the highway was to be upgraded from 4 to 6 lanes making a conventional U turn in high volume and fast moving traffic hazardous as the manoeuvre would involve 4 conflict points . During the detailed design stage audit, the second author recommended an elevated U - turn, taking into account the high speed through traffic and the need to provide safe crossing for local traffic.

Audit at " During Construction stage" of a road in Nakorn Nayok

On the DOH 4 lane highway to Nakorn Nayok, a Northeastern province, a section was closed for bridge repair. No prior warning signs were placed on the approach to the site. (See Figures 2,3). There were a number accidents involving vehicles hitting the temporary signs. Proper signing was recommended the contractor.

Figure - 2 Inadequate signing of road closure for bride repair on DOH road to Nakorn Nayok

Figure - 3 Inadequate sign placed on roadway to indicate diversion on the other side of the road

Audit at "Pre – Opening Stage" of the Local Road in Bangkok

DOH built a road parallel to the railway line in Bangkok, its name "The local road" was as given in the Hopewell project. This section of the road was designed as a 2 – way 4 lane road (See Figure 4). However, prior to its opening, police expressed concern about the jump in the number of conflict points where this road meets the existing, highly congested Kampangpetch road. Safety audit suggests use of one lane initially as one – way and closure of the other 3 lanes as shown in Figure 5 . In future the two available lanes would be converted to parking lanes, and two lanes used for one – way traffic.

Figure – 4 The original design of this section of "The Local Road" was to be for two – way traffic

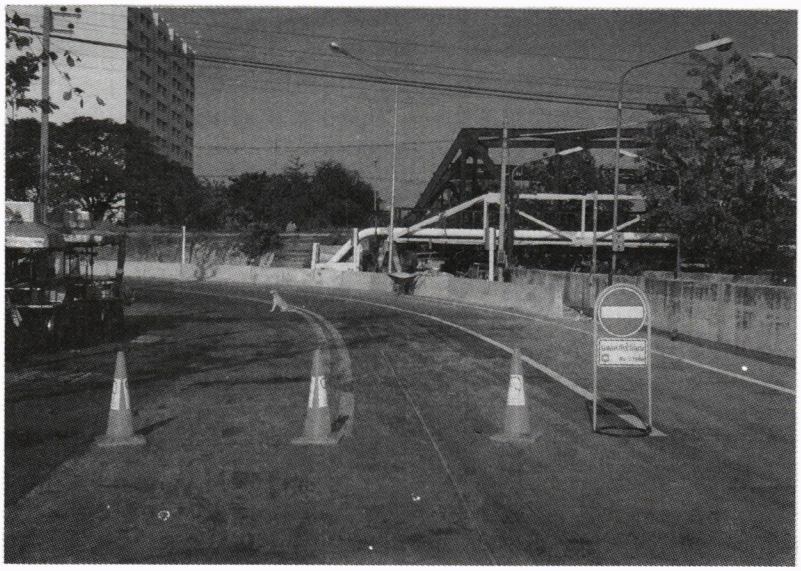

Figure – 5 Auditing results in the road being used as a one – way link

Audit of a Signal Head on the Local Road

On this sections of the road, the green aspect of the signal head gave wrong signal to drivers unfamiliar with the site that they could go straight; this has led to a number of accidents. Following an audit, green aspect was replaced by left and right turn arrows. On the information sign, the straight arrow pointing to Rangsit was also changed to a bend arrow to indicate a required left turn (See Figure 6).

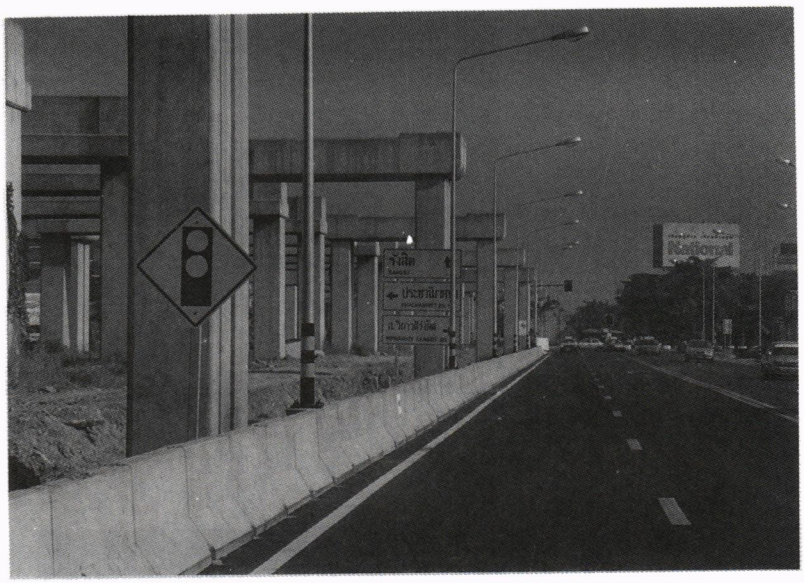

Figure – 6 Following an audit the green aspect was replaced by left and right turn arrows at this junction

Audit of traffic lane marking on the Local Road

As shown in Figure 7, the two lanes were originally marked as shared through and left turn, and shared through and right turn. This has led to a number of accidents. Auditing of the jucntion has resulted in the two lanes being converted to left turn only lanes. This also required the change of signal head and removal of the Chatuchak and Pak Kret directional signs.

4.4 Future Development

Road safety audit has been institutionalised at the policy level, it is only a matter of time before it becomes a requirement for road authorities. The lack or almost non - existence of experienced auditors within Thailand highlights the need for training and transfer of knowledge from international groups of road safety engineers who are experienced in the process. This could be organised with funding from aid agencies such as JICA, AustAid or ODA. The Thai government should take initiatives in the training of the country's road safety auditor.

Figure – 7 Lane marking was changed following an audit

5. CONCLUSION

The paper describes the road crash situation in Thailand and the country's effort in deal with the problem. It gives an account of the development and practice of road safety audit in the country with examples of informal audits which were carried out within the Department of Highways. It also highlights the need of training of auditors and the transfer of knowledge in road safety audit.

REFERENCES

APPLETON, I. AND HANNAH, J. (1998) Origins of Road Safety Audit and Issues in New Zealand. **International Road Safety Audit Forum**, pp. 1-2.

BULPITT M. (1998) Safety Audit - An Overview. **International Road Safety Forum**, pp. 1-6.

CHARTBUNCHACHAI, V. (1997) Development and Performance of Khonkhaen Provincial Accident prevention Commitee. **Principles,Strategies and Performance of Accident Control Project**. pp 73-83.

DEPARTMENT OF HIGHWAYS, (1997) **Traffic Accident Statistics**. Annual Report.

IHT (1990a) Highway Safety Guidelines : **Accident Reduction and Prevention,, International Edition**, p. 4.

IHT (1990b) Guidelines for : **The Safety Audit of Highways**. p.3.

IHT (1996) Guidelines for : **The Safety Audit of Highways.**

JORDAN, P.W. (1998) Road Safety Audit - Origins and Current Issues In Australia. **International Road Safety Forum**, pp. 1-6.

KINGDOM OF THAILAND, MINISTRY OF TRANSPORT AND COMMUNICATIONS (1997) Developing a Road Safety Master plan and a Road traffic Accident Information System.

MINISTRY OF TRANSPORT AND COMMUNICATIONS (1997) Summary of Action Plan for Road Safety.

OGDEN, K.W. AND JORDAN, P.W. (1993) Road Safety Audits : Prevention is better than Cure, Civil Engineering Working Paper. p2. (Department of Civil Engineering, Monash University, Clayton, Victoria).

ROYAL SOCIETY FOR THE PREVENTION OF ACCIDENTS (1992) **Road Safety Engineering Manual**. p.3.

TANEERANANON, P. ET AL. (1994) A Study of the causes of and methods for prevention of road crashes. **Office of the Commission for Management of Road Traffic**.

TANEERANANON, P. ET. AL. (1996) Safety Auditing of Roads in Thailand. **Proc. Roads 96Conf.**,Christchurch, New Zealand, Part 6, pp. 423-438.