Deficiency database prioritisation process

Identify road hazards and deficiencies and prioritise interventions on the basis of risk

The Governments '*Safer Journeys*' vision is that by 2020 New Zealand will have *A safe road system that is increasingly free of death and serious injury. Safe System* is an international concept built on three key principles:

1. the fallibility of the road user – errors must be expected even among compliant users[1]
2. the physical vulnerability of the road user in a crash – humans have limited ability to withstand kinetic impact
3. responsibility for road trauma is shared between users and designers of the system[2].

Road safety is built on these foundational principles. The challenge then becomes how to design and manage the system to minimise crashes and reduce their severity, through managing interactions between the road, the speed, the vehicle, and minimising the possibility of human error.

The *Safe System* approach is significantly different from historic approaches, because the focus shifts away from focusing primarily on the user, to shared responsibility for better outcomes. It is applied in the countries that are acting most successfully to reduce road trauma: Sweden, Norway, the Netherlands, France, and Australia.

The approach requires a long term and balanced focus on measuring and improving outcomes in all four elements of the system (safer roads and roadsides, safer speeds, safer vehicles and safer use) because all interact to contribute to road trauma in different situations.

The deficiency database prioritisation process software is a key tool to identify and prioritise measures to help prevent people's mistakes from being fatal ones. It use will be critical to achieving the '*Safer journeys'* 2020 vision.

Hazards vs deficiencies

One key issue that Road Controlling Authorities (RCAs) must consider is whether factors that contribute to a crash are hazards, or whether they are deficiencies:

- hazards are factors that require management (eg a flooded road)
- deficiencies (also known as 'safety deficiencies') are factors that can be actively addressed (eg an intersection that can be made safer).

[1] Half of all road fatalities are compliant road users (Jim Langford, Monash, presentation to Road Safety Trust innovation workshop, Sept 2009.)

[2] System design causes or allows at least some crashes. Crash severity and trauma can be alleviated by good design, and thus designers share responsibility for the degree of road trauma.

All RCAs have safety management systems for their road networks. These systems invariably require RCAs to identify safety deficiencies within their networks and to prioritise interventions to address them.

Within the *safe systems* approach RCAs also need to consider 'potential' sites, ie sites where the consequences of a crash would be significant but where, to date, no crashes have been recorded.

The conventional benefit:cost ratio approach to works prioritisation largely ignores potential sites in favour of historical crash blackspots. While this approach can be justified, RCAs should consider and prioritise 'potential' sites for future review or attention, if the possible consequences are sufficiently serious.

Why use a deficiency database?

To address these issues systematically, hazards and deficiencies must first be identified and recorded.

While informal knowledge-based and paper-based lists can be used to identify hazards and deficiencies, RCAs can be vulnerable to litigation or criticism if more formal systems are not in place.

The most efficient method is to create a computerised list of hazards and deficiencies, commonly known as a deficiency database.

A joint report by the Ministry of Transport and Land Transport New Zealand[3], issued in 2005, identified three proprietary Safety Deficiency Databases available in New Zealand. However, none of these databases has been widely adopted by RCAs, reportedly because they appear complex and difficult to use.

Prioritising on the basis of risk

There are many ways to prioritise competing minor works. The most widely used is a benefit:cost ratio approach, which focuses on the economics of projects and is largely based on historical information. An alternative method involves a risk-based approach, which focuses on the probabilities and consequences of crashes.

A risk-based approach to project prioritisation allows you to:

- consider the likelihood and consequences of an event occurring
- combine these two factors to establish crash risk
- calculate how much that risk will be reduced by a project
- rank competing projects using their risk profiles.

A risk-based system also allows both historical and potential crashes to compete fairly.

Benefit:cost ratios and first-year rates of return can be used as additional filters when establishing project priority lists.

Data needs

A major challenge in the compilation of deficiency databases is the collection of data. The Ministry of Transport and Land Transport NZ report suggests[3] that over 50 different data fields may be required for each entry. However, RCAs already hold much of this data.

The benefits

Careful selection and design of the deficiency database can reduce the need for fieldwork and duplicated effort, as well as complications relating to data maintenance. A good deficiency database can also reduce complexity and administrative burden by:

- using standard site identifiers
- making maximum use of existing data
- using standard terminology
- automating calculations
- automating links to existing data held in other databases.

How we can help

NZTA has an agreement with the software developer (CJN) to extending the capabilities of the road asset maintenance management (RAMM) database to include a deficiency database and

hazard register. Until this is achieved NZTA assisted by Aecom have developed a deficiency database prioritisation process spreadsheet that:

- makes maximum use of existing RCA RAMM data
- uses RAMM-compatible site identification methods
- differentiates between hazards (to be managed) and deficiencies (to be addressed)
- calculates the risk at a deficient site
- calculates the risk after each potential treatment and the risk reduction offered by that treatment
- updates all costs using a 'patch' to the current cost index
- can calculate other prioritisation factors, such as risk reduction per thousand dollars
- can be extended to include benefit:cost ratios.

The latest version (version 3) of the spreadsheet including a handbook and explanatory Power Point presentation are available along with user support. NZTA also holds workshops on the use of the *Deficiency database prioritisation process* spreadsheet subject to demand.

For more information or to register your interest in attending a workshop, please contact: Bill Greenwood Principal Engineer

(03 964 2876) or
networkstandards@nzta.govt.nz

[3] *Deficiency database and prioritisation process report*, November 2005; Report DDBP_001v2, Ministry of Transport and Land Transport NZ.