TranSafe

transfund NEW ZEALAND ARATAKI AOTEAROA

A safety newsletter published by Transfund New Zealand

April 2001 Issue 5

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More attention needed to roadside hazards

For numerous reasons vehicles occasionally have to pull off the road, or sometimes they may leave the road unintentionally.

In either event, when they do, they need space. However, recent Transfund safety audits have highlighted problems with posts, trees and other hazardous objects within the road corridor. Common problems include:

- service poles and other structures too close to the roadway
- deep drains near the carriageway
- inappropriate use of guard-rail or sight rail
- objects without hazard markers on them
- inappropriately placed or missing bridge end markers.

Roadside hazard workshops last year, sponsored by Transit New Zealand, endorsed the concept of a "clear zone". The clear zone is an area free of fixed objects, adjacent to the roadway, providing a recovery zone for vehicles that have left the carriageway.

Research indicates that on high-speed (>70 km/h) roads a clear width of 9 metres from the edge of the carriageway permits about 80% of vehicles leaving the roadway out of control to recover. For urban roads a smaller clear width may be sufficient, while roads with steeper side slopes require greater width.

Roading authorities should ensure that a clear zone only contains objects that will collapse or break away on impact without significantly damaging an errant vehicle. Where provision of a clear zone is not practicable, they should consider erecting an appropriate barrier.

Dealing with hazards

There are three main types of treatment possible for existing roadside hazards. In order of preference they are:

Remove/eliminate the hazard.

Examples include:

- removing trees and monitoring future plantings
- putting services underground
- lowering protruding culvert headwalls and sump structures
- covering deep drains
- shaping drainage outlets to match the side slope and shielding them.

Mitigate/reduce the hazard.

Examples include:

- rationalising the number of posts/poles required at a site

These power poles close by the roadside are a potential hazard for a vehicle leaving the road.

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- setting objects further back from the road
- flattening side slopes and ditches
- installing frangible or break-away supports and structures
- installing energy-absorbing barriers and end treatments.

Isolate the hazard.

Examples include:

- installing crash barrier protection
- realigning roadways.

Where the hazard still remains in some form, it should be adequately highlighted so that road users are aware of its presence, particularly at night.

Typical treatments include:

- attaching hazard markers to the object
- installing end markers at the sides of bridges, tunnels, and underpasses
- painting all or part of the object with retro-reflective white paint.

Barriers can be hazards too

It is important to remember that the installation of a roadside barrier can also constitute a safety hazard in itself. A barrier should not be installed if it will introduce a greater hazard than the object it is designed to protect. Like all other hazards, barriers should be set back from the road as far as possible (unless a steep slope precludes this).

Particular problems arise with some older barrier end treatments that can act like "spears" if a vehicle should run into them. The proper installation of terminals that meet the new standard, including tapering barrier ends away from the road and eliminating gaps between adjacent barriers, can minimise this danger.

Kerbs located in front of barriers can also reduce their effectiveness by causing errant vehicles to become airborne. Ensuring the barrier is at least in line with, or protrudes in front of, the kerb line is a way around this, as is setting the barrier well back from the kerb line. Also, many barriers are designed to deflect upon impact; therefore placing a barrier too close to a hazard will not adequately shield it.

Objects near curves present a particular hazard to road users. A vehicle is more likely to lose control on a curve and more likely to strike roadside objects head-on, so particular care should be taken to identify hazardous objects in these locations and treat them. An example would be placing streetlights on the inside of a curve rather than the outside. Clear zone widths should also be increased around curves where possible.

Road controlling authorities should also have in place bylaws controlling the placement of advertising signs and other privately maintained hazardous objects within the road corridor, such as mailboxes and plantings.

Even without structures in the way, the shoulders themselves may be a hazard if they are too steep. International literature recommends side slopes in the range 4:1 to 6:1 as a minimum for motorists to retain or regain control of a vehicle. Ideally they should be even flatter unless there are significant drainage problems.

A number of documents and guidelines are available to help practitioners improve their roadside clear zones. To obtain a list of these, phone Ian Appleton at Transfund on (04) 495 3271 or email ian.appleton@transfund.govt.nz.

How safe are roundabouts for cyclists?

By Axel Wilke and Glen Koorey*

* Axel Wilke is a consultant with City Solutions, Christchurch; Glen Koorey is with Opus International Consultants. The article is submitted in their roles as executive members of the Cycling Advocates' Network, and is published in the interests of disseminating ideas for improving the safety of all road users. Opinions expressed are those of the authors and do not necessarily reflect the views of Transfund New Zealand.

Roundabouts have become a favourite form of intersection control in recent years, with the accepted advantages being ease of traffic flow and safety benefits. This article looks at their impacts on cyclists.

Different types of roundabout have different impacts on cycling. For this article, three categories are being defined: mini (with drive-over island), single lane, and multi-lane (including mixed single/multi-lane layouts).

Impacts of roundabout categories on cyclists

Many cyclists believe roundabouts are best avoided. This is confirmed in the Transfund publication The Ins and Outs of Roundabouts (April 2000). Cyclists account for 6% of reported crashes at roundabouts, compared to only 1% at traffic signals.

Since it is known that cyclists have a much higher under-reporting rate for non-injury crashes than motorists, it may be more meaningful to look at injury data only. LTSA data for the period 1996-2000 shows that out of 916 injury crashes at roundabouts, 243 involved a cyclist, i.e. 26%. This compares with cycle injury crashes at traffic signals (223/3585 = 6%) and priority controlled intersections (1167/9116 = 13%).

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Some Swedish research[1] gives a more explicit picture about the different roundabout categories. The Swedish accident prediction model has been checked against the crash history of 58 single and 14 multi-lane roundabouts. Examining predicted and observed crash data, multi-lane roundabouts are 2.6 times more hazardous for cyclists than single lane roundabouts; with motor traffic and cycle flow data taken into account.

Kerry Wood[2] calculates that cyclists are 20 times more likely to be injured than other road users at a roundabout in NZ. He argues that the real figure may be even higher, because of the under-reporting rate for cycle injury crashes and the fact that some cyclists are known to avoid roundabouts.

No specific data is available for mini roundabouts, but the authors regard them as a valuable traffic-calming tool that should benefit all road users, based on subjective observations.

Crash types

According to LTSA injury crash data for 1996-2000, the most common roundabout crash type for cyclists involves a motor vehicle entering the roundabout and colliding with a cyclist who is already travelling around the roundabout (57% of all cyclist/roundabout crashes).

Another common type involves motorists leaving the roundabout, colliding with cyclists who are continuing further around the roundabout carriageway.

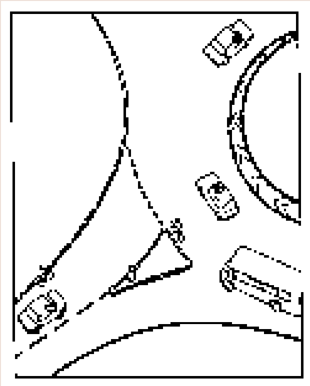
Multi-lane layouts with "Alberta" style markings, frequently used in New Zealand, are a particular problem for cyclists who want to continue circulating the roundabout. As this style of marking leads traffic in the outer lane towards the next exit, a cyclist using the outside lane would have to change to the inner lane in such a situation – clearly a dangerous manoeuvre.

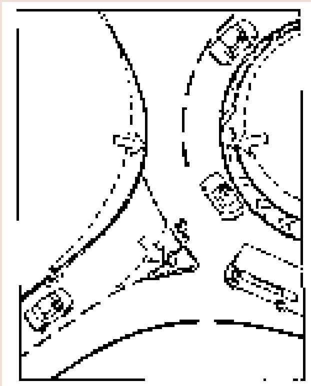
Cycle friendly roundabout design

A common continental design principle for achieving a cycle-friendly environment is to minimise the speed differential between cyclists and motorists. The same principle can be applied at roundabouts. The slower the motorised traffic, the safer the cyclist (and pedestrian) will be.

RCAs may want to make more use of trafficable central island collars, which help increase the deflection of passenger cars, thus decreasing entering and circulating speeds, without preventing longer vehicles from turning.

Other means of reducing speeds by deflecting vehicle paths include entry and exit kerb deflections (without squeezing the cyclist!), suitably directed approach islands, and offset roundabout legs. The accompanying diagram shows how roundabouts can be retrofitted to increase deflection, with the dashed lines denoting previous kerb alignments.





Diagrams from a British publication show (left) an existing roundabout and (right) an improved layout with increased entry deflection, narrow circulatory carriageway and circulatory lane markings.

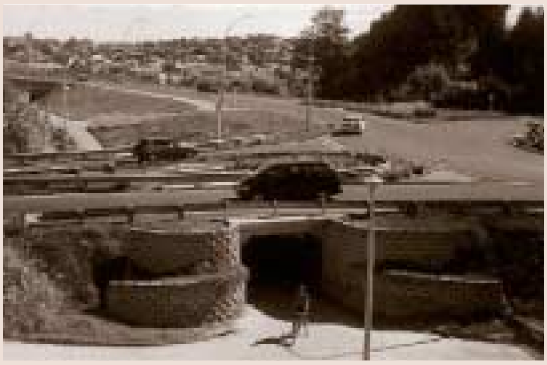
Where too much right-hand side visibility encourages motorists to enter a roundabout at high speeds, measures should be employed to control the visibility.
(The Christchurch intersection with the highest crash record, the Deans/Riccarton roundabout, is currently being landscaped on one corner, forcing drivers on one approach with insufficient deflection to slow down.)

Still, some motorists may not see cyclists in their proximity, as they may be looking out for other vehicles in the distance travelling at a higher speed. The authors believe it is a good idea to have circulating cycle lanes provided across roundabout approaches, to remind motorists to check for cyclists. Applying colour in the cycle lanes would provide still further emphasis.

Alternatives for cyclists should be provided at multi-lane roundabouts. Separate crossings around the perimeter may be safe, but many cyclists would not consider them cycle-friendly, as they can introduce traffic delays.
A high cycle demand may justify underpasses.

Safe for all?

Some roundabout projects which achieve good travel time or efficiency ratings, and can reduce the overall crash rate of an intersection, may make the road environment considerably less safe for some road users, especially cyclists.



Underpass at multi-lane roundabout provides safety for cyclists and pedestrians

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Valuable feedback on audits

During March five workshops were held – in Auckland, Hamilton, Wellington, Christchurch and Invercargill – in order to obtain feedback on the use of Transfund's *Interim Procedures for the Safety Audit of Traffic Control at Roadwork Sites.* The interim procedures were issued in February 1999 and have now been in use for two

Participants at the workshops, organised for Transfund by the NZ Institute of Highway Technology (NZIHT), included representatives of Transit New Zealand, local authorities, consultants and contractors.

Feedback from the last two workshops was not available as this issue of TranSafe went to press, but evidence from the first three venues indicates general support for the concept of auditing roadwork sites. Points aired by those attending included:

- There was a general desire to ensure that both the procedures and the audits themselves are positive in nature. The main aim of the audits should be to improve safety at worksites, not to attribute blame for failings or oversights.
- Auditors should discuss their findings with the contractor from the outset – not after publication of an auditor's report – in order to effect immediate improvements to site safety. In some circumstances it may also be desirable to involve the client in such discussions, e.g. where the auditor feels that the Traffic Management Plan (TMP) is not satisfactory.
- A key issue discussed was whether safety audits should measure compliance with a project's TMP or with the Transit Code of Practice for Temporary Traffic Management. It was noted that the TMP should be aligned with the Code.
- There was a strong call for auditors to be trained. Transit's Interim Code specifies that Safety Auditors must be trained to Level 1 – Site Traffic Management Supervisor.
- There was discussion about the site hazard rating forms, some participants arguing that site factors or traffic effects could reflect unfairly on a contractor's "score". Clarification is needed on whether audits are primarily measuring *site safety or contractor performance.*

The information collected at all five workshops is being collated and analysed with a view to incorporating it into draft revised audit procedures. The intention is that these draft procedures will be included as an appendix to the Code of Practice for Temporary Traffic Management, and will then be reviewed together with the Code, commencing in October 2001.

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So while a roundabout may be the most efficient and (for motorists) safest intersection control in a given situation, planners should review whether it is really the best solution to the overall problem. If it is, then special facilities should be investigated for those who are disadvantaged, such as a pedestrian underpass or separate cycleway that avoids the roundabout completely.

(1) Swedish National Road and Transport Research Institute (VTI) – *What Roundabout Design Provides the Highest Possible Safety?* Nordic Road & Transport Research, no.2, 2000.

(2) Wood, Kerry – *Bicycle Crashes in New Zealand.* Masters thesis, Lincoln University, 1999.

Free training workshops

Transfund is hosting a series of free workshops entitled "Highways Liability and Risk Management" as part of its education and training programme. The workshops are being held in Wellington (30 April), Auckland (3 May) and Christchurch (4 May).

They will be presented by Paul Forman, who heads the Investigations & Risk Management Team at the UK's Transport Research Laboratory (TRL). Mr Forman holds a postgraduate degree in road safety engineering.

Transfund is keen to see that RCAs improve the management of their road safety responsibility and is promoting the concepts of Safety Management Systems. Mr Forman's lecture has been adapted to suit New Zealand requirements.

To attend, register as soon as possible with Lynette Walsh at the NZIHT – phone 06 759-7065, fax 06 759-7066, or email *lynette@nziht.co.nz.* Places will be allocated on a first-come, first-served basis.

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