

Trialling best value delineation treatments for rural roads

Full report: www.nzta.govt.nz/resources/research/reports/618

Best value delineation for rural roads

Updated guidance is available on the best types, quantities and configurations of delineation roadmarkings and devices to use on rural roads.

The guidance, the result of a research project by Opus Research, will be used to update existing guidelines for rural roadmarking and delineation.

Balancing delineation options

The importance of finding cost-effective delineation solutions for rural roads is demonstrated by the fatal crash statistics. In 2015, nearly 73 percent of fatal crashes in New Zealand occurred on rural roads, and nearly half of these (43 percent) were due to motorists losing control of their vehicle or running off the road.

Not surprisingly, this type of crash is more common on corners, than on straight sections of road, and delineation, roadmarkings and devices (such as road edge marker posts and reflective pavement markers) are common tools used to aid driver navigation. Delineation devices become increasingly important when visibility is poor (such as in night or rain conditions) and can allow drivers to preview the road ahead in the same way as if they were driving in dry day conditions.

However, delineation treatments come at a cost, and this cost is not always easy for road managers to justify on low-volume rural roads, especially when set against competing priorities elsewhere in the network.

This need to balance competing priorities, and optimise costs across the rural network is taken as a starting point by the research report authors who recognise that:

“...any delineation treatment should aim to achieve a balance between cost, safety and customer comfort. Consideration should also be given to the level of exposure within different road hierarchies in order to maximise resource value, where roads with higher volumes of customers receive higher levels of service (eg following the One Network Road Classification).”

Developing a best value delineation approach, the authors conclude, is all about understanding the effectiveness of different delineation solutions so safety, cost, journey time and comfort can be optimised across the network.

The research behind the guidance

The project examined delineation treatments for rural roads, which included sealed roads in rural locations with speed limits of 70 km/h and over. A particular focus was on low-volume roads, where

the need for treatments to be cost effective becomes more pronounced.

A combined research methodology was used, incorporating a literature review, on-road trials, a driver survey, and an analysis of the costs and benefits of the various treatments.

Four delineation treatments were tested during the trials:

- targeted delineation for corners by removing edge marker posts on a straight stretch of road before a curve
- a structured marking edge line on a curve
- raised reflective pavement markers on a curve
- audio tactile profile markings on the edge line on a curve.

All four treatments were designed to help motorists negotiate curves on rural roads, with the last three also targeted at helping in wet weather conditions.



The key considerations in deciding which treatments performed best were to do with targeted delineation (to assist drivers by signalling more difficult parts of the road network), consolidation (where one configuration with a new product might replace two traditional products), and better delineation in rain (as a common poor visibility environment, where crashes are over represented).

The findings provided new information about the importance of complementary devices, including edge marker posts and raised reflectorised pavement markings in different contexts. To help implement better delineation solutions for lower volume rural roads, the report offers practical updates of the rural road delineation guidance, based on the findings from the research.

Recommendations from the research

The report makes several recommendations, based on the findings of the research, including the following with respect to specific delineation treatments.

- Edge post markers – these are cost-effective, all-weather, delineation tools, with good safety value, and should be used and maintained on all road hierarchies, on both straight stretches and curves. The findings show new evidence that they also provide critical guidance in night-time driving conditions beyond navigation, as they improve motorists' judgement of speed and distance.
- Raised reflective pavement markers – these are a cost-effective, inclement weather and night-time solution that should be more widely used on most rural roads, especially in areas that experience a lot of wet weather and wet weather crashes. Raised pavement markers add complementary safety value, even to high-quality roadmarkings, and increase the visibility of traditional continuous line treatments when driving in the rain.

Other recommendations included specific improvements and updates to national guidance for delineation treatments. Greater consistency in how treatments were used would support self-explaining road designs – where motorists are intuitively cued to an increase in risk through an increase in delineation. Such guidance could align with existing road categorisations, such as 'curved', 'winding' and 'tortuous' sections of road, based on the One Network Road Classification. Greater consistency would also be useful in relation to our aging population and rapidly emerging technologies, such as autonomous vehicles.

Areas where more research was required, included:

- trialling tangent-point delineation solutions at curves – this would involve targeting delineation treatments to the areas of the curve where drivers most frequently look
- examining the apparent gap between motorists' behaviour and reflectometer readings in wet conditions – there is some evidence to suggest that the human eye detects some markings better than expected in rainy conditions
- investigating the possibility that textured road surface markings provide additional visibility effects for motorists, as well as grip and drainage
- conducting further trials of structured markings – although these appeared to improve visibility for drivers in rainy conditions, there were issues with the markings trialled during the research.

As a final recommendation, the Opus Research team suggest that early communications and greater transparency with the public about why a change or reduction in delineation treatments was planned for an area would help reduce backlash. Road users are passionate about their safety on the road and view delineation as a critical ingredient in a safe, enjoyable road environment.