Getting 10 Roundabouts for the Price of One: Highly Effective Low Cost Intersection Treatments

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Abstract

During the 2011 Black-Spot bids the Mildura CBD intersection of Ninth Street and Pine Avenue, in our preliminary roundabout design, returned a Benefit Cost Ratio that would have failed. Alternative options needed to be considered. The final innovative roundabout design cost 1/10th the price, significantly reduced vehicle speeds, was mostly constructed under traffic management conditions and did not involve the usual extensive civil works and business access disruption required in traditional roundabout construction. Following completion of works there have been no crashes reported. This paper examines the process, design and advantages of implanting low cost roundabout options in urban areas.

Background

In the five years prior to 2011 the CBD intersection of Ninth Street and Pine Avenue recorded one fatality, one serious injury and one injury crash.

The site had many constraints. In particular varying road widths, frequent semi-trailer movements and non-compliance with the 40km/h zone.

Given these and many other constraints a fully mountable roundabout Gateway Treatment was deemed the most appropriate option to not only reduce the speed of vehicles entering the roundabout but also as a control into the CBD precinct . Problematic to retro fitting a roundabout can be inadequate circulating path curvatures. To counter this speed cushions were installed to manage vehicle speeds within the intersection. Council successfully submitted the design and subsequently received $55,000 Black-Spot funding.

Method

The installation of spike down speed cushions was integral to the overall success of the project. The speed cushions provide three major functions:

- Reduce the speed of vehicles travelling into and through the intersection (see table 1).
- Reduce the speed of vehicles on the approach to the intersection to increase pedestrian safety.
- To negate the need for significant civil works. In traditional retrofit design, kerb outstands are installed to create the required circulating path curvatures. However carefully considered placement of the speed cushions in the approach are used as the speed reduction treatment.

The simplicity of the spike down concrete filled roundabout used is also critical to the design. It does not contain any furniture within the roundabout - thereby allowing heavy vehicles to run their trailers over the structure without damage.

Figure 1. Before and After Photos

Table 1. Speed data results

Control site of Eighth Street and Pine Avenue Intersection departure at 25m
Exceeding = 34.9%,
85% Speed = 44.6 km/h,
95% Speed = 49.3 km/h,
Post installation Ninth Street and Pine Avenue – Speed cushion approach 200mm from ramp
Exceeding = 0.0%,
85% Speed = 18.2 km/h,
95% Speed = 20.4 km/h,
Post installation Ninth Street and Pine Ave – Intersection departure at 25m
Exceeding = 4.9%,
85% Speed = 35.7 km/h,
95% Speed = 39.2 km/h,
Note - Pre-construction speed data was not available for Ninth Street and Pine Avenue. However Eighth Street and Pine Avenue presents very similar conditions road and traffic conditions. Eighth Street and Pine Avenue will receive the new roundabout treatment in July 2017 and Mildura Rural City Council will conduct additional data collection to verify the above results.

Results

The results are:

- reduced risk based on lower observed speeds
- reduced raw crash numbers
- an example of a low cost roundabout design and installation that minimises impact on local businesses during construction.

- that VicRoads crash data reveals that no FSI or injury crashes have occurred at this location since the installation in February 2012.

- that during interviews conducted with staff of local businesses they reported not having witnessed nor of heard of any crashes, including minor, since the installation of the roundabout four years ago.

Conclusions

The civil works required for a traditional roundabout can take many weeks and, along with diversion of traffic, can have a devastating effect on local business trade. Sweep paths to suit heavy vehicles can be near impossible to achieve on retrofit roundabout sites and if crash history consists of minor injury type crashes competitive BCRs cannot be achieved.

In contrast this design incorporates speed cushions on all approaches slowing vehicles to less than 20km/h thereby significantly reducing impact speeds if a crash occurs. Reduced speed also improves crash outcomes for vulnerable road users. Within the intersection the spike down roundabout manages traffic flow. Construction can take less than two days and the cost is less than 10% of a traditional roundabout.

With no known crashes occurring at the site since the February 2012 installation, the benefit in safety and financial savings to the community has been significant.

References

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