

Why don't we build safe roundabouts?

Presentation to the Australasian Road Safety Conference
28 Sept 2022

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Thank you, Mel.
Tena koutou.



Play part of video (18 sec to 44 sec):

<https://www.youtube.com/watch?v=tZ43ciWwvZ4>

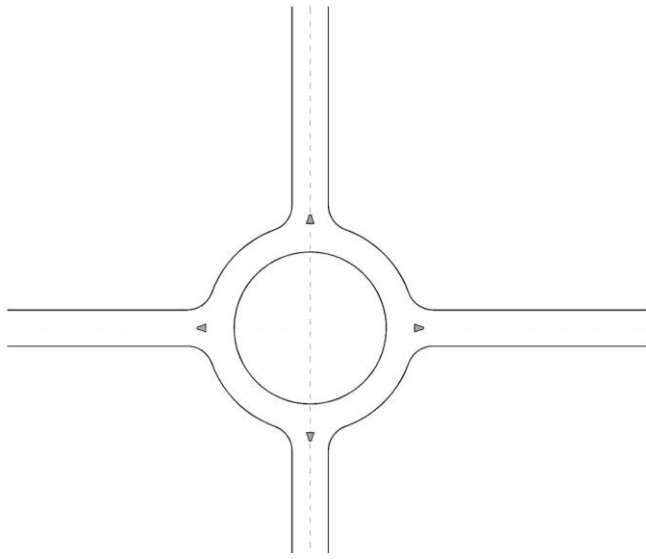
Road to Zero

A young child with light brown hair is sitting in a car seat, looking out the window. The child is wearing a dark harness. The car's interior is visible, including the window frame and a headrest. The background outside the window is a blurred green landscape with white flowers.

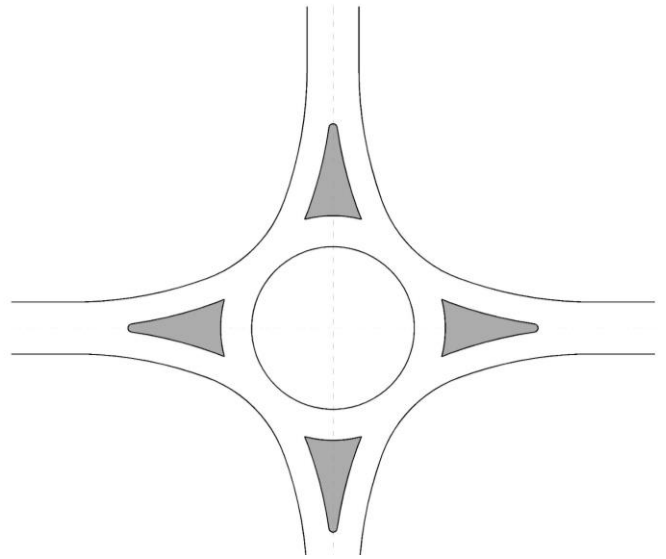
"It's time we stopped paying the road toll"

I'm sure that all my New Zealand colleagues are aware of this advert but our overseas visitors probably haven't seen it. The authorities have started the Road to Zero campaign and it's time we stopped paying the road toll.

Roundabout design philosophy



Radial



Tangential

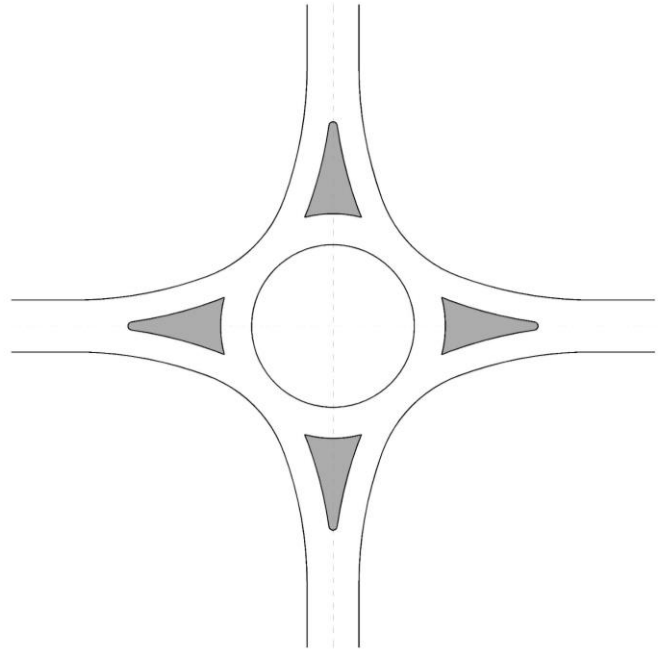
I would like to highlight the differences between radial and tangential roundabout designs. These drawings are diagrammatic. They show the difference in design approach.

With a radial roundabout, you come to the intersection and it's like turning left at a T-intersection. When you leave the roundabout, it's another distinct left turn. The approach to a roundabout points to the centre of the circle.

With a tangential roundabout, the turning movements are much smoother. The approaches are tangential to the inscribed roundabout island.

Tangential

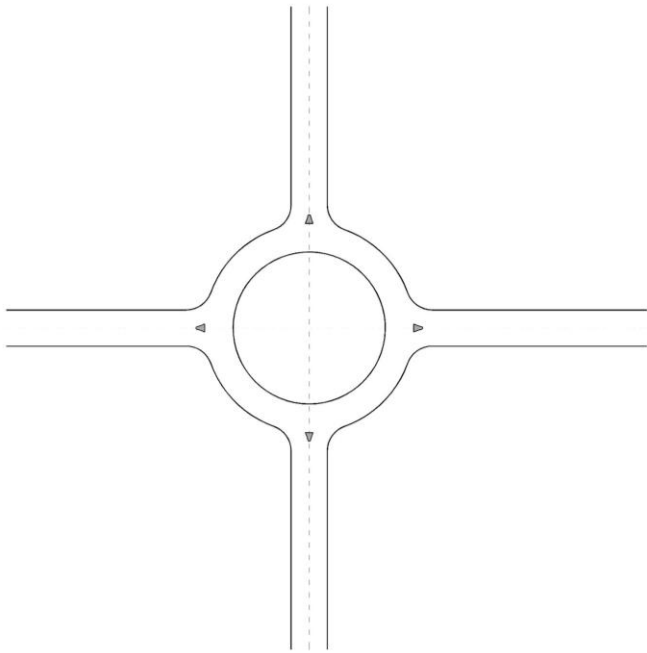
- Anglophone countries
- Efficient



All the Anglophone countries use the tangential design.

The philosophy behind this concept is to make roundabouts as efficient for driving as is possible.

Radial

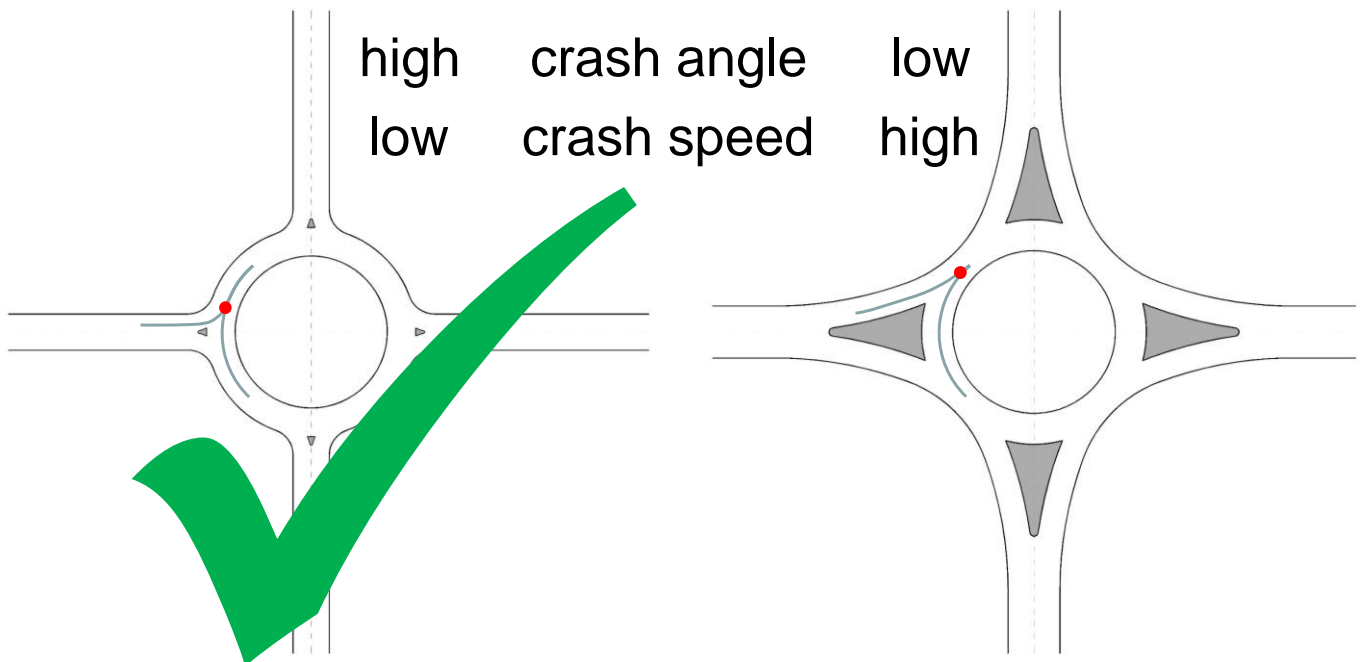


- Continental Europe
- Safe

Continental European countries use the radial design.

The philosophy behind this concept is to make roundabouts as safe for all users as is possible.

Conflict point analysis



When we do conflict point analysis, we look at where conflicts occur as highlighted by the red dots. One major factor is the angle at which crashes occur. With a radial roundabout, the conflict is closer to a right angle. The tangential design has lower crash angles. From this perspective, the tangential design would appear to be safer.

However, the other major factor is the speed at which crashes happen. At a radial layout, any crashes that do happen occur at a lower speed as drivers turn slowly into the roundabout. With a tangential roundabout, as driving is much smoother, crashes happen at a higher speed. Taken the two factors together, the radial roundabout crashes have lower severity. And if someone makes a mistake, it's easier for the other party to avoid the crash altogether if their speed is low, so radial roundabouts also have fewer crashes.

Radial roundabouts get the Road to Zero tick of approval, right?

Myth buster

Myth

- Radial roundabouts don't work for large trucks
- Radial roundabouts are just a cycle safety measure
- Urban treatment only

Truth

- Many European countries solely build radial rxs
- See above
- See above



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Let's do some myth busting.

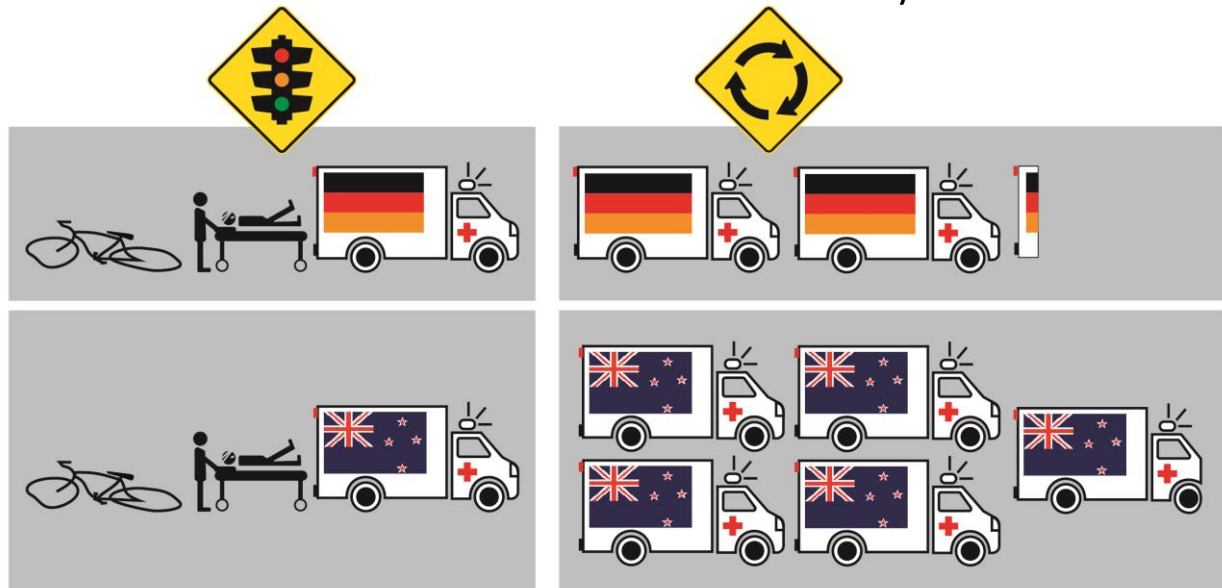
The first myth is that radial roundabouts don't work for large trucks. Wrong! Many European countries solely build radial roundabouts, and last time I looked, they did have trucks in Europe.

The second myth is that radial roundabouts are just a cycle safety measure. Wrong! Many European countries solely build radial roundabouts, regardless whether there are many cyclists using the intersection or just a few.

The third myth is that radial roundabouts are an urban treatment only. I'm sorry that I sound like a broken record but this is also wrong. Many European countries solely build radial roundabouts, both in urban and rural areas.

Roundabout crash rates (cycling)

Roundabouts are so safe for drivers “so what’s left is cycle crashes”



Cycling-related crashes at roundabouts normalised by rates at traffic signals

It has been put to me that since roundabouts are so safe for drivers, they hardly ever crash so it's only natural that the crashes that you do get often involve people cycling, implying that this collateral damage is what we ought to accept. Let's look into this.

We've analysed cycling injury crashes in Germany and New Zealand by intersection type. It's not a straightforward exercise to compare countries with very different levels of cycling participation and since there is much more cycling in Germany, you would expect that there are more crashes injuring people cycling at German intersections. To achieve a comparison, we have normalised the cycling injury crashes at traffic signals for the two countries. We derived scaling factors for the two countries to scale up to 100% participation.

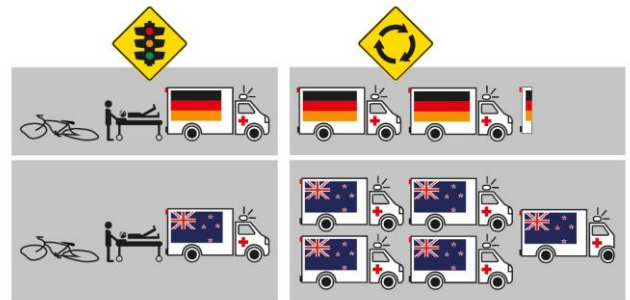
We then applied the German scaling factor to the cycling injury crashes at German roundabouts. What we see is that for each cycle injury at traffic signals, there are 2.1 cycle injuries at roundabouts. For cycling, traffic signals are safer. The risk of injury is twice as high (2.1 times, to be precise) at a roundabout.

Have a think – what would you expect the relative risk to be in New Zealand? ... Applying the NZ scaling factor shows that for each cycle injury at traffic signals, there are 4.9 cycle injuries at roundabouts. Wow! That is a lot higher than the risk at German roundabouts; it's nearly 2.5 times as high. Why is that?

Conclusions from crash rates analysis

Two options

1. We build our signalised intersections much safer than the Germans do, or
2. German roundabout design is fundamentally safer than what we seem to be able to achieve



No good reason to believe that the first option applies

There are two options that could explain the difference in cycle injuries.

The first option is that we build our signalised intersections in NZ much safer than the Germans manage to do.

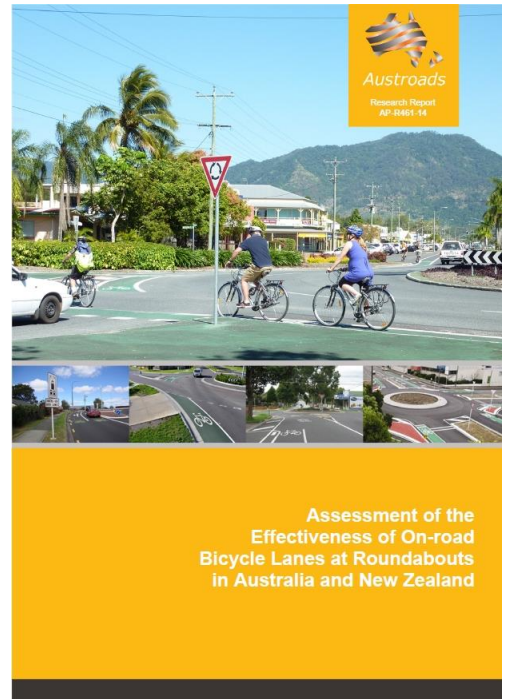
The second option is that German roundabout design is fundamentally safer than what we seem to be able to achieve in NZ.

And as much as I think about it, I cannot come up with a plausible explanation why the first option could possibly apply. I therefore conclude that for some reason, people cycling through NZ roundabouts are about 2.5 times more likely to get injured than their German counterparts.

Austrroads research

- Research topic: painted cycle lanes within roundabouts
- Conclusions
 - Bad idea
 - Cycle safety objective can be met by introducing radial roundabouts
- Received pushback from Austrroads review panel
 - Request to dilute our findings
 - v13 was accepted

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Our team was invited by Austrroads to conduct research on painted cycle lanes within the circulating lane of roundabouts. How should this be done to improve cycle safety? We agreed on a method and undertook a literature research and conducted field experiments.

We concluded that painted cycle lanes within a roundabout isn't a good idea. In fact, we had solid evidence that the cycle safety would worsen. But given that the research objective was to improve cycle safety, the evidence gathered pointed towards options for improving safety. And of those, introducing radial roundabouts were showing the best safety improvements.

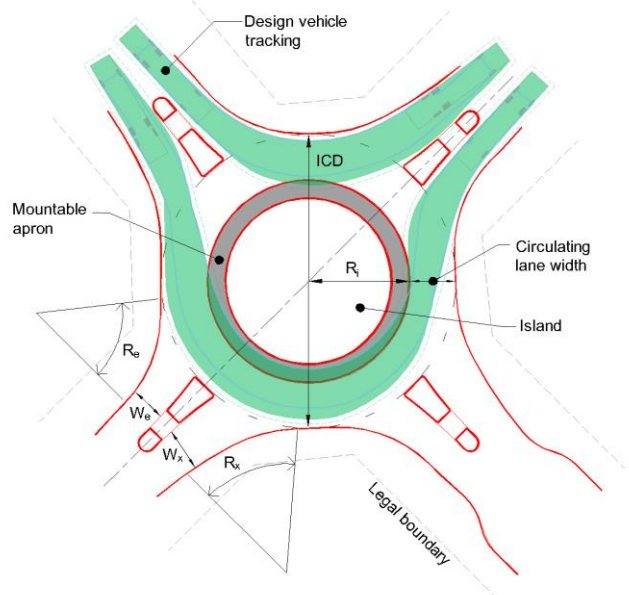
When we submitted our research to Austrroads, we received significant pushback from their review panel. And I really understand why: you wouldn't get onto those panels without decades of experience and expertise in the relevant topic area. Chances are that earlier in your career, you would have been involved in developing what is now codified in Austrroads. And to have researchers come along and suggest that using a different design philosophy would give better safety outcomes must be very challenging. Hence, we were asked to dilute our research findings.

We were not prepared to do so and the core findings stayed the same with each new revision. This process went on for one and a half years and version 13 of our

work was finally accepted. We had refused all along to dilute our findings as we felt this would be unethical.

Cycling Network Guidance (CNG)

- Asked to develop roundabout guidance: safe cycling layout
 - Developed based on German guidance
 - Team happy but publication got blocked somewhere
 - “Put it on the ViaStrada website”
- <https://bit.ly/2UcGUlt>



<https://viastrada.nz/safe-rdbt>

VIASTRADA

The ViaStrada team alongside Abley had the task of developing NZ planning and design guidance for cycling. The ViaStrada team was tasked with developing roundabout guidance.

Awesome, we thought. That's finally the chance to write local guidance for radial roundabouts. We used the German guidance as the basis. It takes just 40 pages of German guidance to say everything that you need to know how to do that. We condensed it to something much shorter still.

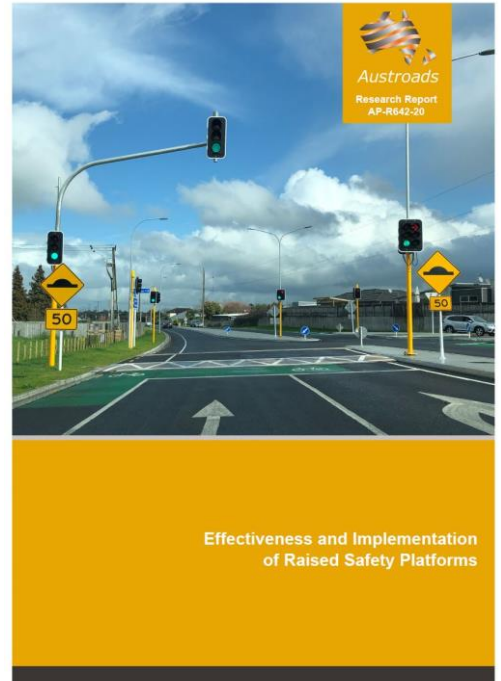
The team at Waka Kotahi was happy with our work, but others within that agency did not want to see that guidance published. Don't ask me why; I don't know.

We were told to put the material onto our own website so that the industry can find it: <https://viastrada.nz/safe-rdbt>

And then, some 18 months later, our guidance suddenly appeared as part of the official CNG guidance. Much later still, it was suggested to me that somebody who thought that this material should be part of the normal industry guidance pushed the “publish button” the day they retired. And it's been online ever since: <https://bit.ly/2UcGUlt>

Raised Safety Platforms (RSPs)

- 2020 research report on RSPs is welcome
 - Achieves speed reduction (e.g. at roundabouts)
 - Acknowledges that speed reduction is acceptable even on arterials
- RSPs feature as treatments that improve Safe System alignment
- Radial roundabout concepts can achieve the same as RSPs



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If you haven't come across the 2020 research report on RSPs, I really recommend that you look at it. It's a fantastic piece of work, by New Zealanders for a NZ client under the auspices of Austroads. RSPs achieve speed reductions at intersections and crossing points. Importantly for me, this acknowledges that speed reduction is acceptable, even on arterial roads and state highways. RSPs feature as treatments that improve Safe System alignment.

This gives me hope that we are a step closer of adopting radial roundabouts, as they achieve speed reductions at this form of intersection control just as well as RSPs do. Combining RSPs and radial roundabouts gives the best of both worlds, combining the safety benefits of this design concept with making the approaches easily crossable for people on foot or bike.

Conclusions

- Road to Zero – how do we make it happen?
- Change is hard to achieve and slow
- Efficiency and safety are competing objectives
 - Hierarchical approach – safety first, then efficiency
 - Take up radial design philosophy

Nobody should have to pay the road toll

VIASTRADA



In conclusion, I wonder how do we make Road to Zero happen when some of our guidance is not optimised for safety but favours efficiency? This is true across much of the guidance, but it is most obvious for roundabouts. I have found during my career that change is hard to achieve and when it happens, it can be incredibly slow. At least much slower than what the ambitious Road to Zero timelines suggest.

What I really want to emphasise is that efficiency and safety are competing objectives. This may not be entirely obvious to all my peers and if this had not occurred to you before, I encourage you to ponder this question. Many of the jurisdictions that have a much better road safety record than NZ don't balance these competing objectives, but they have long adopted a hierarchical approach – they sort out the safety of projects first and once they have settled on the most effective treatment, they deal with efficiency as the secondary consideration. If we were to adopt this way of thinking, we would take up the radial design philosophy for roundabouts. Because they are clearly safer, for all intersection users, but especially for people cycling.

I say that because **nobody should have to pay the road toll.**

Thank you, are there any questions?



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