ROUNDABOUTS - STEEP GRADES, PEDESTRIANS and CYCLISTS

Presentation by Andrew O’Brien

Canadian Institute of Transportation Engineers Conference
Kelowna, Tuesday, 7 June 2016
40 Years of Roundabouts
- Steep Grades
- Grading
- Pedestrians
- Cyclists
Paper describes some of the safety issues at roundabouts with respect to:

- roundabouts on steep grades
- inward or outward sloping of circulating roadways
- pedestrians
- cyclists
- the safety outcomes for pedestrian-involved & cyclist-involved crashes, by severity, at roundabouts and signalised intersections in the greater Melbourne metro area
Roundabouts on steep grades

Roundabouts on ruling grades of up to 12%

- Grading sharp changes at rural intersections
- Apply same principles at roundabouts where necessary.
- Important to see the approach geometry, then
- Important to see roundabout ‘layout’ from near holding line.

FIGURE 5.3 Main Road Intersections - Approach Grading on Side Roads
Roundabouts on steep grades - examples

REVISED VERTICAL PROFILE
7-8-2015
Roundabouts on steep grades - examples
Roundabouts on steep grades - examples

• a 10% grade entering the roundabout from the east
Roundabouts on steep grades - examples

- a ruling 8% grade entering the roundabout from the east (right hand side roundabout)
Roundabouts on steep grades - examples

- A ruling 8% grade entering the roundabout from the east (left side of roundabout)
Inwards or Outwards?

Safety and operational outcomes of grading circulating roadways of roundabouts:

- **Inward sloping:**
  - appears to have originated from ‘rotaries’ where radii were large to accommodate weaving & high speeds;
  - Common in Queensland, Tasmania and Christchurch area (NZ) (Pommy influence);
  - safety outcomes - high single vehicle crash rate;
  - Problem of semi’s “unhitching” on rapid slope changes (Victoria)
  - Often cannot view central island kerb - build wall?
Inwards or Outwards?
Inwards or Outwards?
Inwards or Outwards?
Inwards or Outwards?
Inwards or Outwards?

Safety and operational outcomes of grading circulating roadways of roundabouts:

• Outward sloping:
  - Reaction to smaller roundabouts and terrain (follow the slope)

• Tilted plane/folded plane:
  - Common sense!
  - Determined by terrain (follow the slope)

• Central island visibility is key
“Appearing to affirm that roundabouts are not a serious safety problem for pedestrians in New Zealand, a search of the New Zealand Crash Analysis System (CAS) showed that nationwide there has been no pedestrian fatality (and 24 serious injury) at any urban roundabout for the five year period 2004-2008, compared to 11 fatal (and 160 serious injury) at urban traffic signal intersections. These statistics are inferring that traffic signals may be presenting considerably more safety problems for pedestrians than roundabouts”. (Improved Multi-lane Roundabout Designs For Urban Areas (Draft) 2010)
### Safety Outcomes

#### Melbourne metro area experience - Signals & Roundabouts

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1998-2003

2004-2009
Safety Outcomes

Melbourne metro area experience - Signals & Roundabouts

• Melbourne has about 2500 signals, and 4500-5000 roundabouts in a metro area of 4m population.
• The growth in roundabout numbers is far greater than for signals - mostly in new subdivisions at collector and local street intersections
• Most roundabouts are at local or collector intersections
• Exposure based crash rates are typically lower for roundabouts
• On average there would be far higher numbers of pedestrians using signals
## Pedestrian Safety Outcomes

### Melbourne metro area experience - Signals & Roundabouts

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Pedestrians
## Cyclist Safety Outcomes

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Pedestrian Safety Outcomes

‘Uncontrolled’ pedestrians have NO RIGHTS at Australian roundabouts (since uniform road rules - 2007?)

Melbourne metro area experience - treatments

• ‘pram crossings’
• Zebra crossings (walking legs)
• Signalised pedestrian crossing
• Pelican crossing - signals that flash yellow to vehicles during flashing DON’T WALK period
Pedestrian Treatments - pram crossing
Pedestrian Treatments - pram crossing

Zebra on speed hump at mini-roundabout
Pedestrian Treatments - signalised crossing
Pedestrian Treatments - PELICAN crossing
Figure 5.4: Two bicycle routes crossing at a single-lane roundabout with no physical separation of bicycle lanes
Bike Treatments - Austroads Guide 2009

Single lane roundabout
Bike Treatments - Austroads Guide 2009

Multi-lane roundabout ‘Protected’
Bike Treatments -

Zebra on speed hump at mini-roundabout
Bike Treatments -

Before

After
Bike Treatments - Innovations

Hook-turn

First movement
Second movement
Bike Treatments - Innovations

Hook-turn

Place ‘hook turn’ box here

‘hook turn’ box
What to do with 10,000 cpd!

(cpd = cyclists per day)
Bike Treatments -
Bike Treatments - New southbound bicycle lane