TURBO ROUNDABOUT DESIGN GUIDELINES
TRANSLATED TO THE USA

BILL BARANOWSKI, PE, FITE
WesternITE Monterey, CA June 2019
PRESENTATION OUTLINE

1. Turbo Roundabouts in the Netherlands
2. Turbo Roundabouts in Slovenia and Utah
3. Potential Guidelines for the USA

Special Thanks to Dirk DeBaan, Bertus Fortuijn, and Tomaz Tollazzi.
GOALS

• Reduce Multi-lane Roundabout crashes due to entry overlap and weaving
• Reduce Speeds in Roundabouts
• Increase the Capacity of Multi-lane Roundabouts
FATAL ACCIDENTS IN THE NETHERLANDS

1972: 3264

2015: 621

2020: < 500

www.SWOV.nl
THE NETHERLANDS VS. UTAH

The Netherlands

Some highlights:
- 41.543 km² (Utah: 220.080 km²)
- 17 million people (Utah: 2.5)
- 410 people / km² (Utah: 11)
- Below sea level (- 6 meter)
- Indipendence since 1648
- Kingdom
- Facilities 2015: 561 (Utah: 278)
TURBO LOCATIONS IN NL

Total in NL: 324 (March 2017)

www.turborotonde.nl

The Netherlands:

- Turboverkeersplein
- Turborotonde
- Turbokluifrotonde
- Sterrotonde
- Spiraalrotonde
- Rotorrotonde
- Partiële turborotonde
- Ovonde
- Look-a-like
- Knierotonde
- Ei-rotonde
WHY TURBO?

Failure to Yield
Entering a roundabout is similar to an intersection between two one-way roads, where the road from the left continues out of the roundabout. To proceed into the roundabout, entering drivers must yield to all traffic from the left, waiting until all traffic from the left is clear.

Unlike a traffic circle, drivers are not permitted to enter alongside vehicles circulating in the left lane, because those circulating vehicles are allowed to exit the roundabout.

Extra signs mounted below the yield signs remind drivers to yield to both lanes. Never enter unless all traffic from the left is clear.

Improper Lane Use
As with any other intersection, the proper lane must be chosen before entering a roundabout. Signs in advance of the intersection will always indicate which lanes may be used to turn or to continue ahead. As with any other intersection, keep left to turn left through the roundabout, and keep right to turn right. Never change lanes within an intersection, including within roundabouts.

At Radio Drive and Bailey Road, lane use signs require that drivers turning left must use only the left (inside) lane, preventing the type of crash shown below.

In this type of crash, Vehicle 1 is at fault for failing to obey the lane use signs and choosing the incorrect lane. Drivers wishing to turn left must be in the left (inside) lane before entering the roundabout.

Drivers in the outside (right) lane are not allowed to turn left; they are required to exit the roundabout. Drivers in the left lane may exit or turn left.

Multiple signs and pavement markings on every approach remind drivers of the need to choose the proper lane. Failure to use the proper lane can result inтё ticket or a crash.

Learn more on the web at www.co.washington.mn.us
Click on “Roads & Transit” and then on “Roundabout U”
Or contact the Washington County Public Works Department at (651) 430-4100

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Cut Across Collisions

Pictures from Presentation of Dr.-Ing. Lothar Bondzio on internet
SOLUTION:
LANE-DIVIDERS
TURBO ROUNDABOUTS HAVE MORE THAN ONE LANE IN THE CIRCLE
SELECT DESIRED LANE BEFORE ENTERING THE TURBO
YIELD TO MAXIMUM TWO LANES AT ENTRY
NO WEAVING OR CUTTING ON TURBO ROUNDBOUTS

Dirk DeBaan
EXITING THE TURBO ROUNDABOUT

Dirk DeBaan
## INCREASE IN SAFETY

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Injury accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junction give way</td>
<td>Single lane roundabout</td>
<td>-70%</td>
</tr>
<tr>
<td>Junction give way</td>
<td>Turbo roundabout</td>
<td>-70%</td>
</tr>
<tr>
<td>Single lane roundabout</td>
<td>Turbo roundabout</td>
<td>+20%</td>
</tr>
<tr>
<td>Multi lane roundabout</td>
<td>Turbo roundabout</td>
<td>-53%</td>
</tr>
<tr>
<td>Junction with traffic lights</td>
<td>Turbo roundabout</td>
<td>-50%</td>
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</tbody>
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Dirk DeBaan
DESIGN ELEMENTS: MOUNTABLE BY LARGE VEHICLES

Dirk DeBaan
RAISED LANE DIVIDER
DETAIL: RAISED MOUNTABLE LANE DIVIDER (12” W X 2.75” H)

Original

Changed for snow plowing

Fortuijn
TRUCK TRAVERSING LANE DIVIDER
DESIGN ELEMENTS
TURBO ROUNDABOUT WITH GIVE WAY TO CARS

Dirk DeBaan
OUTSIDE BUILT-UP AREA
BIKES MUST YIELD (>35 MPH)

Fortuijn
TURBO ROUNDABOUT WITH GIVE WAY TO BICYCLES
CARS GIVE WAY
INSIDE BUILT-UP AREAS
VEHICLES YIELD TO BIKES (@BUMP)
INSIDE BUILT-UP AREAS
VEHICLES YIELD TO BIKES (@BUMP)
• Small Speed tables
• Entry table A-A longer than Exit B-B
• 0.08 meters = 3.15 inches high
RADIAL DESIGN FOR SINGLE-LANE IN NL

important aspects:
- Inform roaduser in time
- Entrances should connect radial
- Small entrance and exit lanes
- Small entrance and exit radius
- Wide bend out
- Raise central island

Dirk DeBaan
TWO-LANE RADIAL VS. TANGENTIAL

The Netherlands: radial

UK: tangential
BASIC TURBO ROUNDABOUT

Capacity
3500 pcu/h

Lane-shifting
180°
TRUCK SIZES

WB-50 Size trucks fit within circulatory lanes.

WB-72 to WB-81 Size trucks use the mountable aprons in the center and armpits.
TYPICAL CIRCULATORY LANE WIDTHS

Inner radius = 39 ft.

Edge Apron

Road Side

17.4’  16.40’

17.6’  16.6’

The striping is staggered over 17.6 and 16.6 ft. That are the intervals between the center points on the translation-axis.

Fortuijn
COMBINATION OF SIGNPOSTING AND PAVEMENT MARKING
TURBO: MARIBOR, SLOVENIA

Tollazzi
WINTER OPERATIONS
KOTOR, SLOVENIA
FLUSH DIVIDERS

Poland and Canada: with milled noise dividers; more crashes than with raised lane dividers.
The turbo roundabout has more capacity, compared to the "typical" two-lane roundabout. Why?:

- *the inner circulatory traffic lane becomes more attractive to drivers, since there is no need for weaving – lane utilization is equal;*
- *Entering drivers are no longer hesitant which increases the capacity of entries.*
TURBO ISSUES

1. The Raised Lane Concrete Divider may have issues with snow plows and motorcycles.
UTAH TURBO PROJECT

West Jordan, UT
VS. TANGENTIAL DESIGN OPTION

West Jordan, UT
PARK CITY: 2-LANE ENTRY ISSUES
RAISED LANE DIVIDER
(SINCE 2008)
SUMMARY OF KEY POINTS IN THE DESIGN

Characteristic features of turbo roundabouts

- Insert second lane at one or more entries
- Yield to no more than two lanes
- Smooth spiral marking
- Raised and mountable lane dividers
- One lane offering choice of direction
- At least two exit legs are two-lane

- Optimal curvature by small diameter
- Approach legs are at right angles to roundabout
- Roundabout shields cut off view of horizon
- Aprons in central island and armpit: additional roadway for trucks
SUMMARY: TURBO-ROUNDBOUT

✓ At least one entry has a second lane inserted on the central island side;
✓ Mountable-raised lane dividers control traffic path and speed by keeping vehicles in their lane with smaller roundabout ICD;
✓ Traffic must choose the appropriate lane for the desired turning movement prior to entering the roundabout; and
✓ Spiral road markings guide traffic from inside to outside, avoiding weaving and reducing conflicts in the roundabout.
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