INTERSECTION TRAFFIC CONTROL

COMMITTEE

Meeting Minutes
March 5th, 2014

Attendees

<table>
<thead>
<tr>
<th>Name</th>
<th>Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morgan Abbott</td>
<td>TKDA</td>
</tr>
<tr>
<td>Dean Chamberlain</td>
<td>WSB</td>
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<tr>
<td>John Fahrendorf</td>
<td>WSB</td>
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<tr>
<td>Joe Gustafson</td>
<td>Washington Co</td>
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<tr>
<td>Roger Plum</td>
<td>SEH</td>
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<tr>
<td>Scott Poska</td>
<td>SRF</td>
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<tr>
<td>Molly Stewart</td>
<td>Bolton and Menk</td>
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<tr>
<td>Darwin Yasis</td>
<td>MnDOT</td>
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</tbody>
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Meeting Location: SEH – Vadnais Heights
Meeting Topic: Roundabout Topics
Meeting Presenters: Darwin Yasis (MnDOT) and Joe Gustafson (Washington County)

I. Oversize/Overweight/Trucks in Roundabouts (Darwin Yasis – MnDOT)
   • See attached slides
   • Additional notes from presentation:
     o (Slide 1) Oversize/overweight analysis not part of joint study with WisDOT
     o (Slide 3) Legal size of vehicles in Wisconsin: WB-65
     o (Slide 3) Legal size of vehicles in Minnesota: WB-67
     o (Slide 3) Roadway Design Manual currently has WB-62 as design vehicle
     o (Slide 5) Case 1 corresponds with early thoughts on roundabout design
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II. Roundabout “diets” and striping (Joe Gustafson – Washington County)

- See attached slides
- Notes on roundabout striping diagram (in addition to notes on diagram):
  - No yellow or white lines between “sharkstooth” yield line and dotted “guide” line
  - Arrows in circulatory lanes moved up farther to crossing point
  - Strong skip line between adjacent lanes in circulatory area (WisDOT uses these)
  - Tube delineators installed to cordon off unused pavement
  - Dotted “guide” stripe: 18” thickness white line with 1.5” black on sides parallel to circulatory roadway

III. Round Robin

- Dean C. – Additional multi-lane roundabout safety study in progress by WSB – to be presented as committee meeting topic or round robin
- John F. – U of M study on multi-lane roundabouts found similar strategies as Washington County for increasing safety at multi-
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lane roundabouts

- Darwin Y. – Roundabout steering committee meets at Water’s Edge. See him if you are interested.

Meeting note: Attendance lower due to MN Transportation Conference on same day.
OSOW/Trucks and Roundabout Study

Darwin Yasis
MnDOT State Geometrics Engineer

NCITE Meeting – March 5, 2014

We all have a stake in A

We all have a stake in B
MnDOT/WisDOT Truck Study

- Establish baseline for current design practice for MLRs
- Assess design techniques, operations, and safety performance of current design types
- Receive input from trucking industry
Truck Types

- WB-62
- WB-65

<table>
<thead>
<tr>
<th>Design Vehicle</th>
<th>Dimension</th>
<th>Design Radii</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Height (ft)</td>
<td>Width (ft)</td>
</tr>
<tr>
<td>WB-62</td>
<td>13.5</td>
<td>8.5</td>
</tr>
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MnDOT/WisDOT Truck Study

- Classification of Roundabout Types
  - Case 1 – Trucks encroach on adjacent lanes while entering, circulating, and exiting a roundabout
  - Case 2 – Trucks enter the roundabout without encroaching but may encroach into adjacent lanes when circulating and exiting the roundabout
  - Case 3 – Trucks can stay within their lane while they enter, circulate, and exit the roundabout
MnDOT/WisDOT Truck Study

- Typical Case 1 Roundabout Layout

Image Source: Roundabouts & Traffic Engineering, Inc.
MnDOT/WisDOT Truck Study

- Typical Case 2 Roundabout Layout

Image Source: Roundabouts & Traffic Engineering, Inc.
MnDOT/WisDOT Truck Study

- Typical Case 3 Roundabout Layout
MnDOT/WisDOT Truck Study

- Observation at Case 2 Approaches

<table>
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<tr>
<th>Location</th>
<th>Conflicting Traffic Present</th>
<th>No conflicting traffic Present</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Observations</td>
<td>% of time trucks stayed in lane</td>
</tr>
<tr>
<td>Totals</td>
<td>124</td>
<td>91%</td>
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Observation at Case 2 Circulatory Roadways

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MnDOT/WisDOT Truck Study

- Input from Trucking Industry

  - Knowledge of company policies related to driving through multilane roundabouts – only 4 respondents had knowledge of company policy in place (brochures, videos, diagrams, trainings)

  - Vast majority of drivers indicate that drivers are not confused with pavement markings or truck aprons

  - Many respondents indicate that entries are confusing because of inadequate signing or advanced warning to indicate whether trucks must stay in lane, use the truck apron, or off-track into adjacent lanes
Input from Trucking Industry

- Slight majority of drivers prefer wider lanes
- Several drivers are concerned that truck aprons may cause safety issues such as load shifting or tire damage
- Several respondents suggested using a sign that states “Trucks Use Both Lanes” or “Do not Pass Trucks in Roundabout”
- Other concerns include Oversize/Overweight Trucks accommodation
### MnDOT/WisDOT Truck Study

#### Summary of Design Characteristics by Case Types

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<td>Entry Radii</td>
<td>64 to 75 ft</td>
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<td>120 to 130 ft</td>
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<td>Entry Widths</td>
<td>24 to 28 ft</td>
<td>32 to 34 ft</td>
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<td>Was implemented</td>
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* Authors opinion of Case 1 roundabouts nationwide
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* Authors opinion of Case 1 roundabouts nationwide
MnDOT OSOW Taskforce

- Coordination efforts between MnDOT and MN Trucking Association
  - Ongoing collaboration/meetings to identify and discuss issues and concerns
    - Restricted passage through roundabouts
    - Education efforts needed
    - Load shifting and tire damage
    - Use of truck apron
    - Curb Types (S524, D424, R type)
    - Investigate possible use of truck signing
MnDOT OSOW Taskforce

- Design strategies for better truck accommodation

- 2% slope recommended

- Min. 13ft truck apron

- S curb recommended
  - Other curb types currently being evaluated

TYPICAL CIRCULATORY ROADWAY SECTION
Figure 12-4.05A
MnDOT OSOW Taskforce

- Design Strategies for better truck accommodation

Utilize a left offset design

Utilize vein striping to prevent path overlap

Utilize vein striping on splitter island instead of right curb apron

MULTI-LANE ENTRY DESIGN
Figure 12-4.05D
MnDOT OSOW Taskforce

- Coordination efforts between MnDOT and MN Trucking Association
  - Develop guidelines and recommendations
    - Roundabout Informational Campaign
    - Entry radii, Entry Width, Curb types, Truck Aprons
    - Update of Chapter 12 of MnDOT RDM
MnDOT Current Efforts

- Coordination efforts between Geometric Design Office with Office of Freights & Commercial Vehicle Operations
  - Development of OSOW / truck routes
  - Incorporation of roundabout locations
  - Incorporation of roundabout dimensions and design characteristics
  - Trucker’s Page 511
    [http://tr.511mn.org/truckers.jsf](http://tr.511mn.org/truckers.jsf)
MnDOT Current Efforts

- OSOW corridor map is available
- Other truck routing maps also available
- Online interactive maps also available
MnDOT Current Efforts

- Trucker’s page website
Questions

Darwin Yasis

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2013 Bailey/Radio “Roundabout Diet” and Roundabout Striping Update

NCITE Intersection Traffic Control Committee
March 5, 2014

Joe Gustafson, PE, PTOE
Transportation Engineer
Washington County Public Works
Stillwater, MN
First, some roundabout philosophy...
What is a roundabout?

Per Minnesota and Federal MUTCD:
“Roundabout - a circular intersection with yield control at entry, which permits a vehicle on the circulatory roadway to proceed, and with deflection of the approaching vehicle counterclockwise around a central island.”
What is a roundabout?

Per NCHRP 672:
“Roundabouts are a subset of circular intersections with specific design and traffic control features. These features include yield control of all entering traffic, channelized approaches, and geometric curvature and features to induce desirable vehicular speeds.”
But Wait!

Kingston, NY
But Wait!

• Yield control of all entering traffic? Check.
• Channelized approaches? Check.
• Geometric curvature and features to induce desirable vehicular speeds? Sort of.

Before and after, yes to all three. Capacity & safety got better.
So what makes a roundabout?
What makes a roundabout?

• Size? At what diameter is it too big or too small to be a roundabout?
• Traffic control? If you add signals to a roundabout, is it no longer a roundabout? Or is it a signalized roundabout?
• Geometry? Traffic circles and rotaries sometimes have flared entry too…
• Operating speed?
• What about outside the USA?
• Conflict points? What are these anyway?
Conflict Points in NCHRP 672

- Just one problem: This is incompatible with multi-lane roundabouts, and the MUTCD.
- No conflict point diagram is provided in NCHRP 672 for multi-lane roundabouts.
Roundabouts and the MUTCD

- A-to-B and C-to-D forms one intersection point, not two.

- Two inputs & two outputs is a crossing conflict.

mutcd.fhwa.dot.gov
Why is it important?

Legal operations and proper driver behavior are very different at these two configurations!
Correct Conflict Points

There is no “circle road” at a roundabout. Just a central island.

- 4 Crossing Conflicts
- 8 “Joining” Conflicts
- 8 “Separating” Conflicts

Why is it important?

Legal operations and proper driver behavior are very different at these two configurations!

Crossing to Enter

Turning / Merging to Enter
Why is it important?

Legal operations and proper driver behavior are very different at these two configurations!

Straight Out to Exit

Right Turn to Exit
End center, edge, and lane lines at far side of yield line on approach.

Refer to plan set for line widths, skip/gap patterns, and contrast requirements.

Face of curb nose

Groove or pavement joint (no pavement marking)

White hatch lines at 10 ft spacing and 45 degrees to curb line.

Edge line sometimes omitted on approach to crosswalk. Otherwise align as shown.
Lane arrows moved forwards
Intent is to clarify that exit is a through movement and prevent outside lefts.

End center, edge, and lane lines at far side of yield line on approach.

Refer to plan set for line widths, skip/gap patterns, and contrast requirements.

Edge line sometimes omitted on approach to crosswalk. Otherwise align as shown.

Face of curb nose

Groove or pavement joint (no pavement marking)

White hatch lines at 10 ft spacing and 45 degrees to curb line.
Smooth Edge Line Extension alignment provides right-side exit path delineation.
Pavement groove (in lieu of concrete joint) provide left-side exit path delineation.
“Roundabout Diets”
a.k.a. “Right-Sizing” Roundabouts

Eliminating opportunities for driver error while still preserving adequate levels of service.
Radio/Bailey Original Design

• Anticipated significant traffic growth prior to 2008 “Great Recession”.
• Provided a short 4-lane section on Bailey Road at the roundabout. Rest of Bailey Road is 2-lane undivided.
• “2x2” design (Two entering thru lanes crossing two lanes of cross traffic) provided more capacity than needed, and created opportunity for driver error.
“Roundabout Diet”
CSAH 18 (Bailey Rd) at CSAH 13 (Radio Dr) in Woodbury, MN

Drivers making through movements from the outer lane are the ones most likely to fail to yield. This possibility has been eliminated on two of the four approaches.
“Roundabout Diet”

CSAH 18 (Bailey Rd) at CSAH 13 (Radio Dr) in Woodbury, MN

Improved yielding compliance on the other two approaches. The false notion of an “inner ring” has been effectively dispelled. No more attempts to “merge”.

Image description: A roundabout intersection with clear lane markings and directions. A text box highlights the roundabout's benefits and the elimination of attempts to merge.
“Roundabout Diet”
CSAH 18 (Bailey Rd) at CSAH 13 (Radio Dr) in Woodbury, MN

Improper “outside lefts” are now physically prevented from all four directions.
Is it working?

• Before conversion, “2x2” roundabout averaged 3 crashes per month.
• After conversion to “1x2” roundabout, only two crashes reported in six months since.
  – One crash was driver inattention.
  – Other crash was snow/ice excessive speed.
• 88% crash reduction so far, mobility is still good.
Is it working?

Crashes by Type - Quarterly
Radio & Bailey Roundabout
Includes All Police Calls for Crashes

No. of Crashes

3-Month Period (Quarter)
2014 Roundabout Issues

• How long will our “1x2” roundabouts handle traffic? What happens then?
• Next crash issue to tackle – Left side yield signs being hit due to inadequate deceleration, especially in snow/ice.
• New truck apron and curb designs?
• Industry acceptance of roundabout terminology.
Thank You

Questions?

www.co.washington.mn.us/roundabout_u