WHERE IS YOUR SPEED CONTROL?
Exploring the measurement methods and location of speed control at roundabouts

Measuring Fast Paths – A comparison of Arc/Tangent and Spline methods

Definition of a fast path:
“Shortest straight-ahead vehicle path... (constructed) with flowing curves” (TRRL LR 1120)

Why we draw fast paths:
To ensure our roundabout designs slow driver speeds in order to reduce the severity of crashes.

Arc/Tangent Methods
» Use arcs and tangents to approximate the path of a driver
» Developed by some agencies to be structured and repeatable

Spline Method
» Use B-splines to approximate the path of a driver
» Best representation of the “flowing curves” sited in British research from the 1980s that correlated entry curvature to the number of entry/circulating crashes (TRRL LR 1120)

Cars Drive Spirals
» “A spiral curve approximates the natural turning path of a vehicle” (2021 AASHTO Greenbook)
» Drivers do not drive tangent-curve-tangent paths, instead they drive spirals to minimize discomfort
» Spiral paths are easily represented in drafting software with the use of splines

Cautions with Arc/Tangent Methods
» Can overpredict fast path speeds, resulting in unnecessary over-deflection, which can degrade visibility
» Not applicable for all geometrics and/or lane configurations
» May not provide smoothest, most realistic path

Benefits of Spline Method
Flexible - Applies to any roundabout design, no matter the geometry or number of lanes
Dynamic - Easily adjusted during design iterations, does not require complete reconstruction each time design is changed
Forefront - Keeps achieving speed control “top of mind,” not something to be checked as an afterthought
Visual - Allows analyst to picture the actual vehicle path instead of focusing on following rigid, sometimes seemingly unrelated, steps
Quick - With practice, fast path measurements are achieved in only a couple minutes

Speed Control Location – Investigating three entry design styles at Rural and Urban roundabouts

CASE 1: Rural, 200-ft ICD, 50 mph design speed | Entry speed controlled to 27 mph in all layouts
Entry Design Style A: “LARGEST ENTRY RADIUS”
Entry radius = 120-ft

Entry Design Style B: “HOCKEY STICK”
Entry radius = 95-ft

Entry Design Style C: “BALANCED”
Entry radius = 95-ft

CASE 2: Urban, 155-ft ICD, 35 mph design speed | Entry speed controlled to 26 mph in all layouts
Entry Design Style A: “LARGEST ENTRY RADIUS”
Enter radius = 110-ft

Entry Design Style B: “HOCKEY STICK”
Enter radius = 80-ft

Entry Design Style C: “BALANCED”
Enter radius = 80-ft

Recommendation: “BALANCED” Design

- Provides speed control at the crosswalk
- Minimizes opportunity for drivers to accelerate into the circle/conflict point
- Provides consistent speeds and smooth paths entering and circulating the roundabout
- Has less space between R1 and R2 locations, minimizing opportunity for drivers to change speeds

- Provides good forward sight of the central island
- Provides good SSD visibility, drivers maintain sight of the roadway when viewing yield line and crosswalk at design speeds
- Has tighter entry radius, resulting in slower in-lane speeds compared to a larger radius

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Legend:
- Fast Path: Spline with R1 Location
- Approach Stopping Sight Distance to Field Line
- Approach Stopping Sight Distance to Intersection
- Forward Sight
- Approach Sightline to Conflict Point