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" (2011 AASHTO Greenbook)

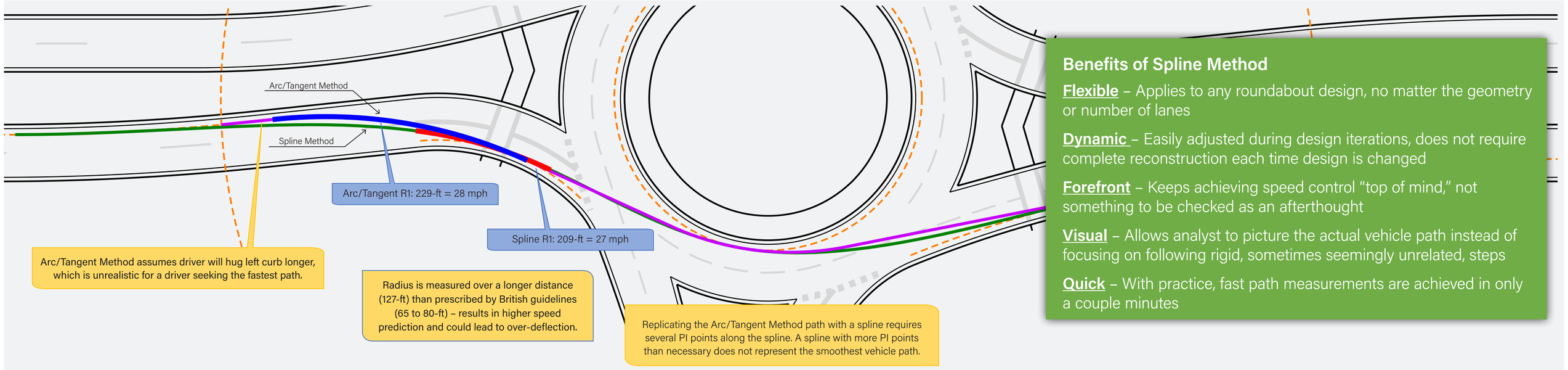
» Drivers do not drive tangent-curve-tangent paths, instead they drive spirals to minimize discomfort

» Spiral paths are easily represented in drafting software with the use of splines

Supports using Spline Method

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

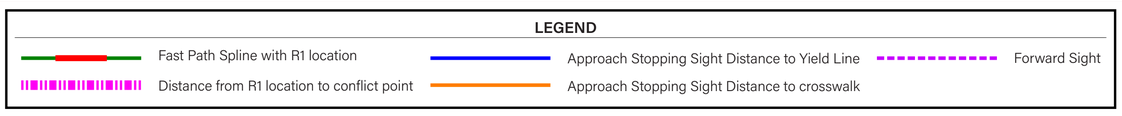
Dynamic – Easily adjusted during design iterations, does not require complete reconstruction each time design is changed

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

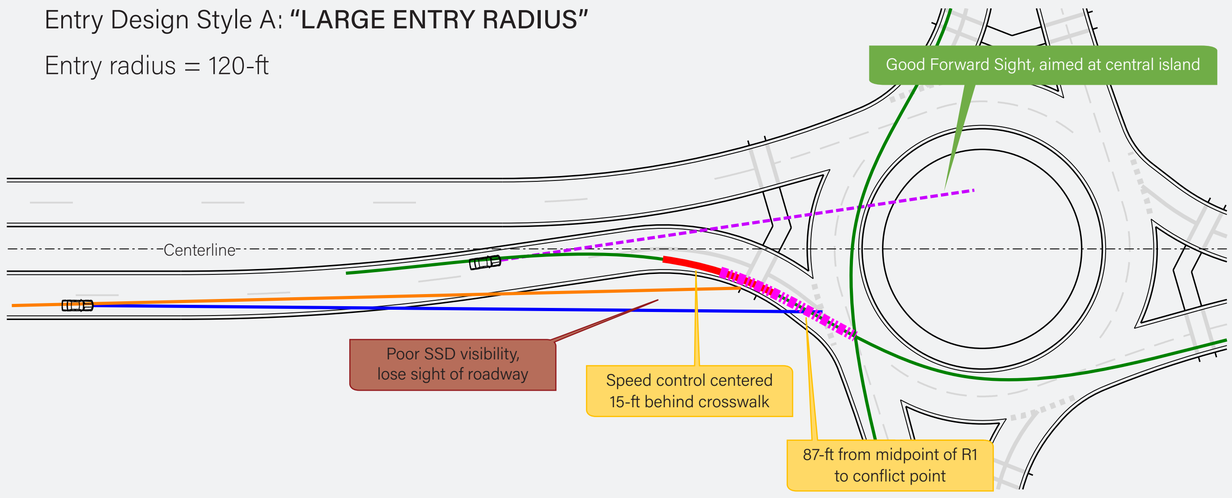
Speed Control Location – Investigating three entry design styles at Rural and Urban roundabouts



CASE 1: Rural, 200-ft ICD, 50 mph design speed | Entry speed controlled to 27 mph in all layouts

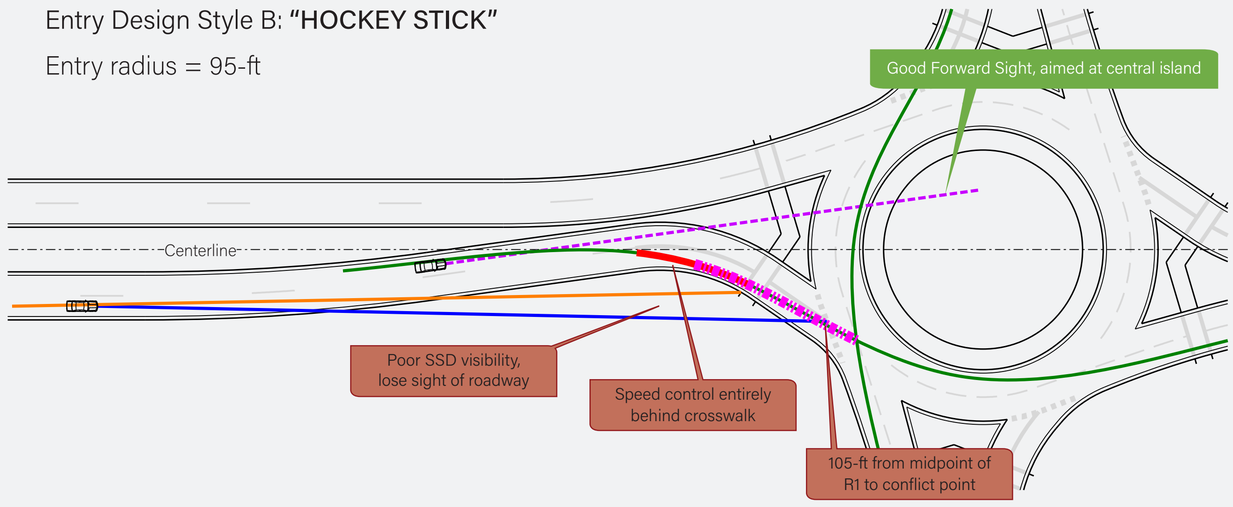
Entry Design Style A: **"LARGE ENTRY RADIUS"**

Entry radius = 120-ft



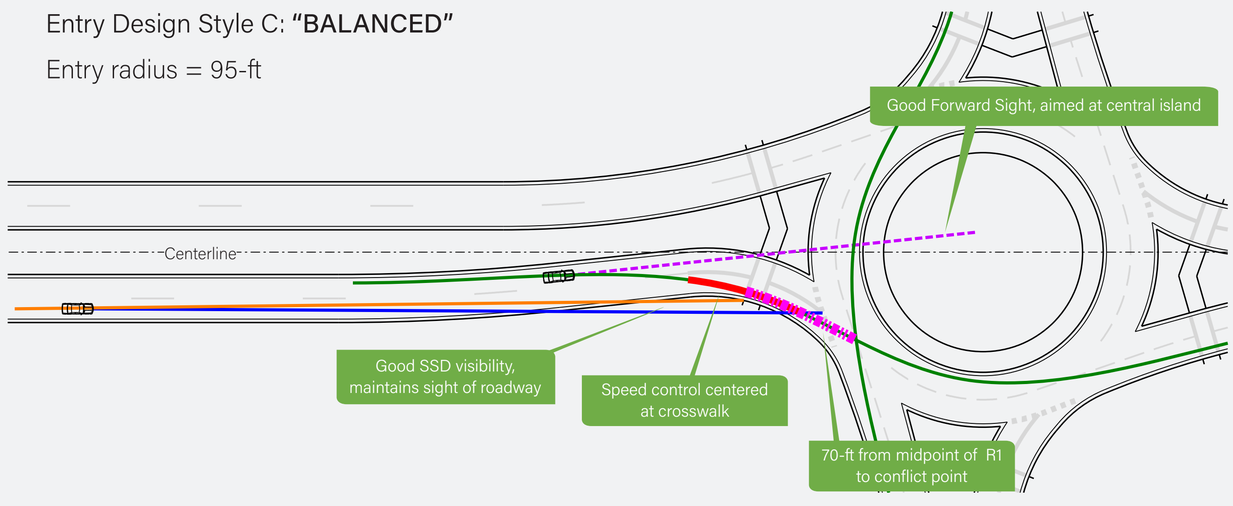
Entry Design Style B: **"HOCKEY STICK"**

Entry radius = 95-ft



Entry Design Style C: **"BALANCED"**

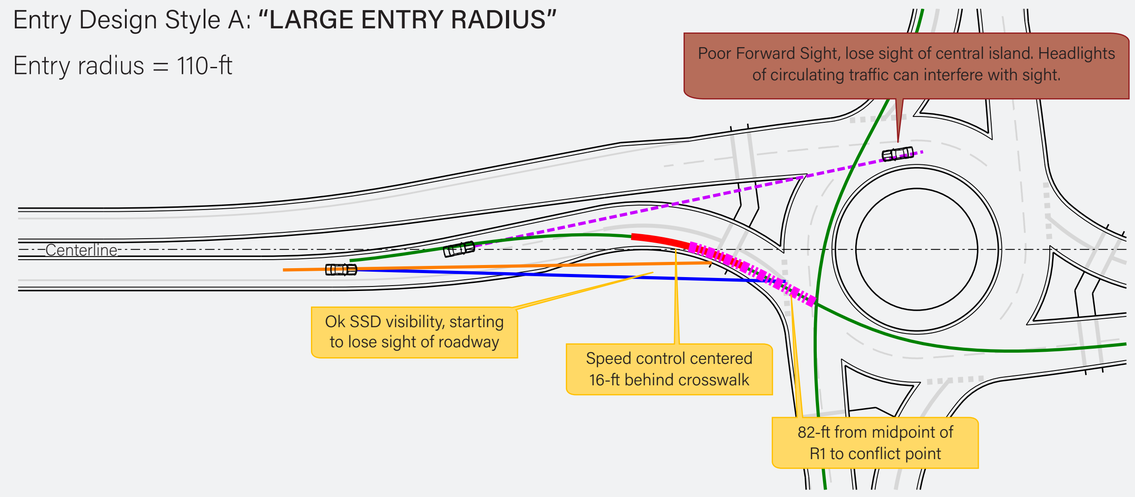
Entry radius = 95-ft



CASE 2: Urban, 155-ft ICD, 35 mph design speed | Entry speed controlled to 26 mph in all layouts

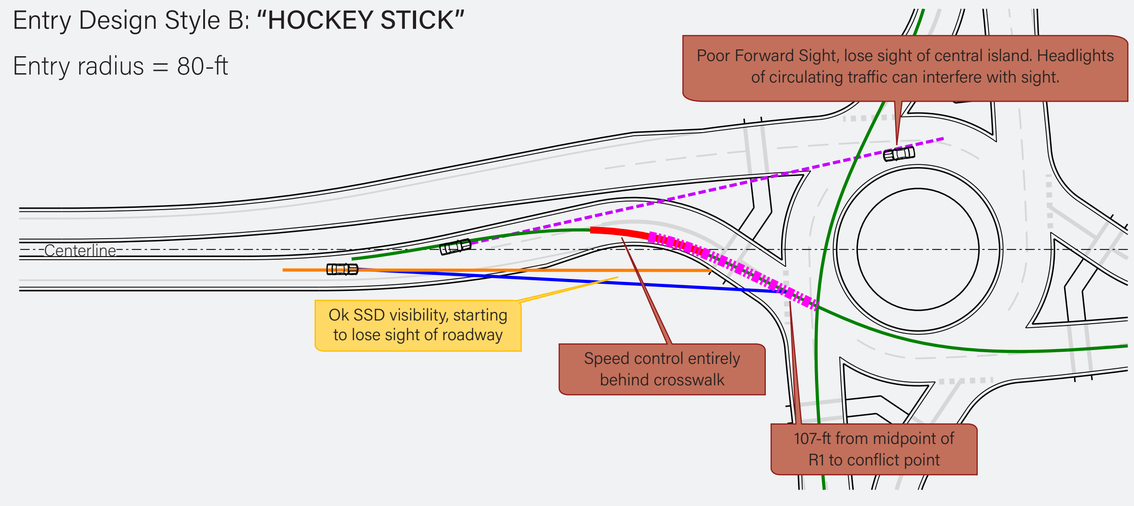
Entry Design Style A: **"LARGE ENTRY RADIUS"**

Entry radius = 110-ft



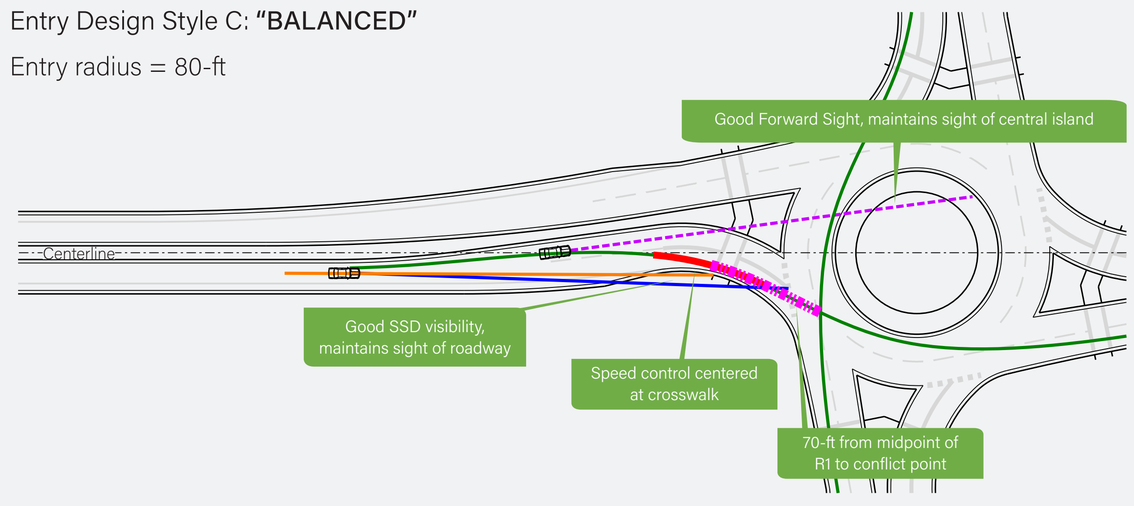
Entry Design Style B: **"HOCKEY STICK"**

Entry radius = 80-ft



Entry Design Style C: **"BALANCED"**

Entry 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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