Roundabouts 101

CPAM Concrete Paving Workshop

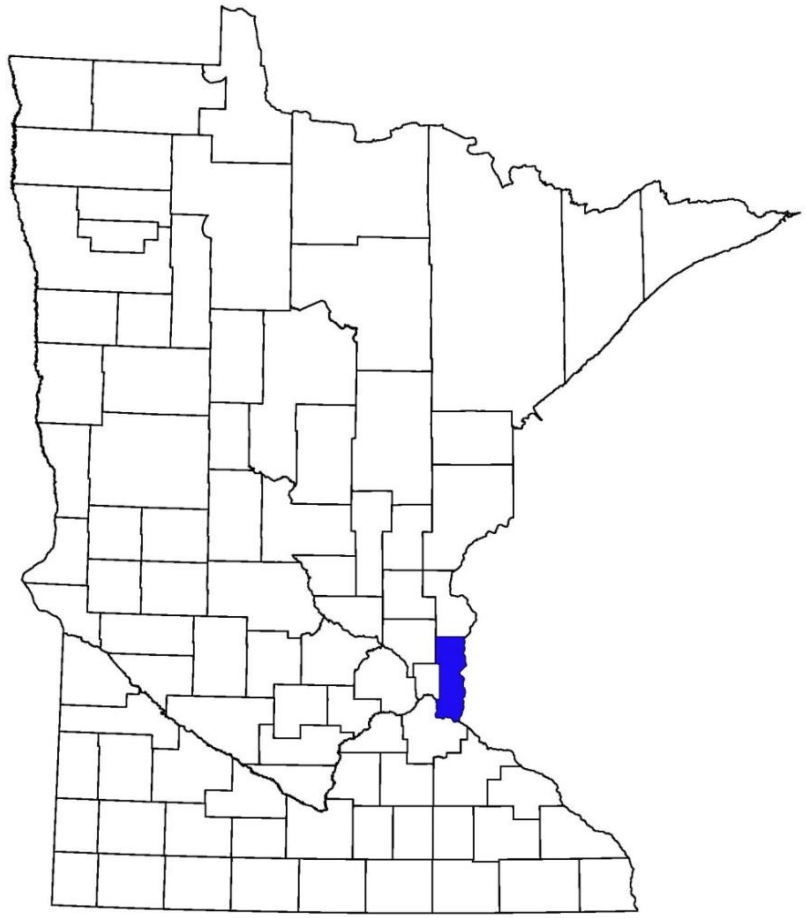
March 10, 2023

Presentation Topics

- Background
- Intersection Selection
- Why concrete?
- Intersection Reconstruction Costs
- Other Lessons Learned

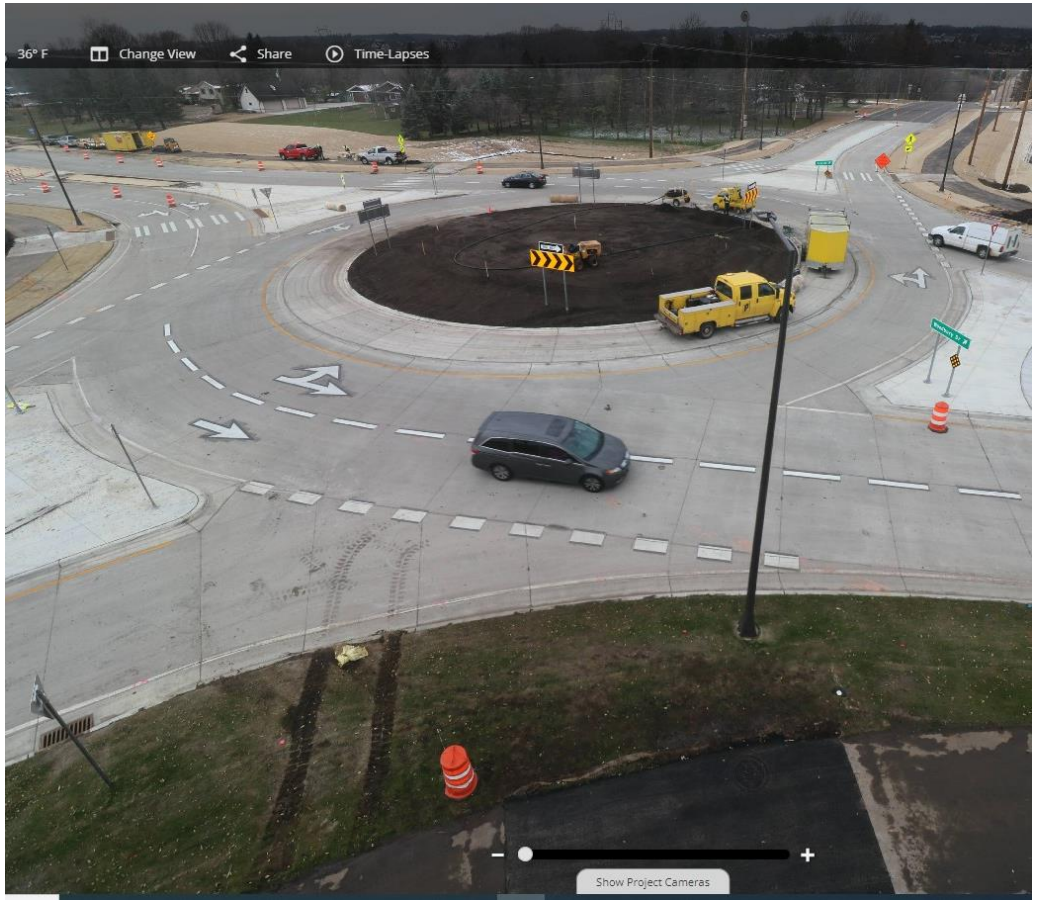
Washington County

- East side of Twin Cities metro area
- 423 Square miles
- About 1/3 suburban, 2/3 rural.
- About 261,000 people as of 2019
- County Seat: Stillwater, pop. 20,000
- Largest City: Woodbury, pop. 72,000



Washington County Roundabouts

- Washington County has been constructing roundabouts since 2007
- 37 roundabouts in Washington County
- 21 roundabouts on County system
- ***9 concrete roundabouts***



Intersection Selection

- Reasons to consider Roundabouts vs. Traffic Signals
  - Capacity
  - Safety
  - Cost
  - Property Impacts
  - Bike & Pedestrian Safety

Why Concrete?

- Issues with bituminous
- Joint layout benefits
- Drainage improvements
- Strength/rutting resistance
- Lower frequency of maintenance

Why Concrete?

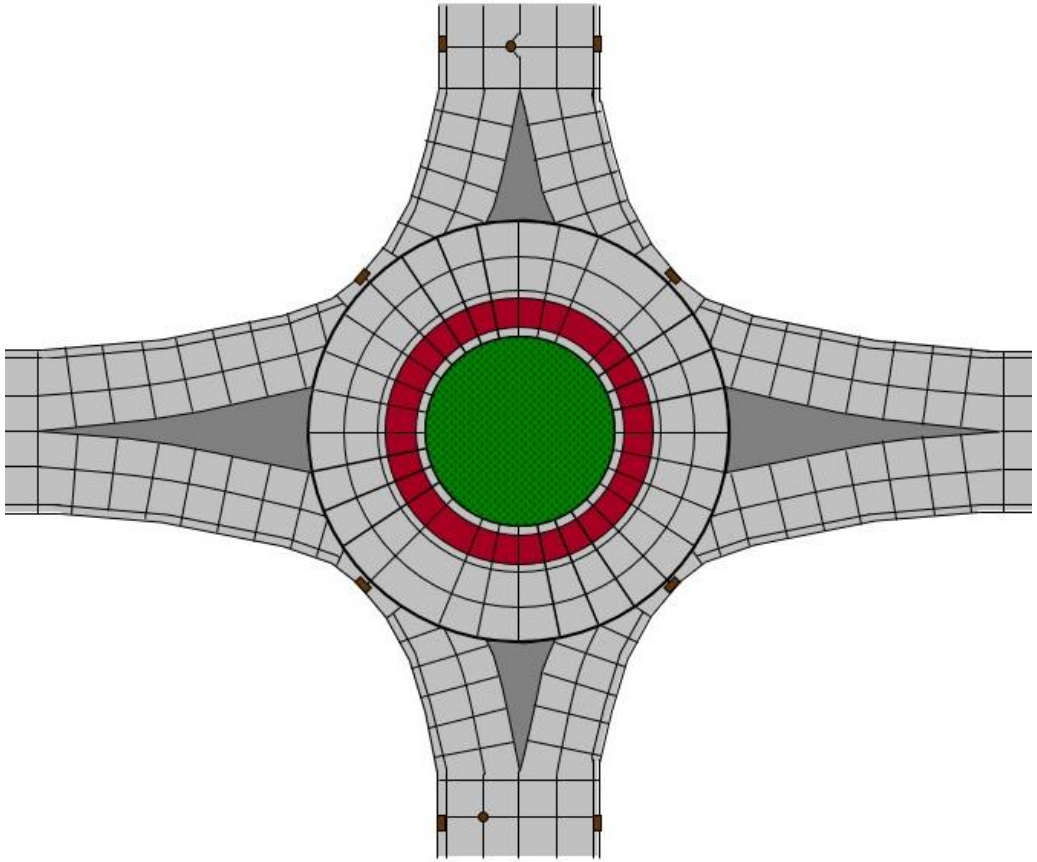
- Past issues with bituminous roundabouts
  - Pavement distress
  - Pavement maintenance difficulty
  - Drainage issues

Why Concrete?

- Three types of joint layouts
  - Isolation
  - Pave-Through
  - Pinwheel/Spiral
- Traffic Engineering staff prefer pinwheel/spiral joint layout
  - Joints can assist drivers exiting roundabout during wet or rainy conditions

Why Concrete?

- Isolation joint layout
  - Circulating roadway is isolated from the legs
  - Vehicles cannot follow joints when exiting roundabout

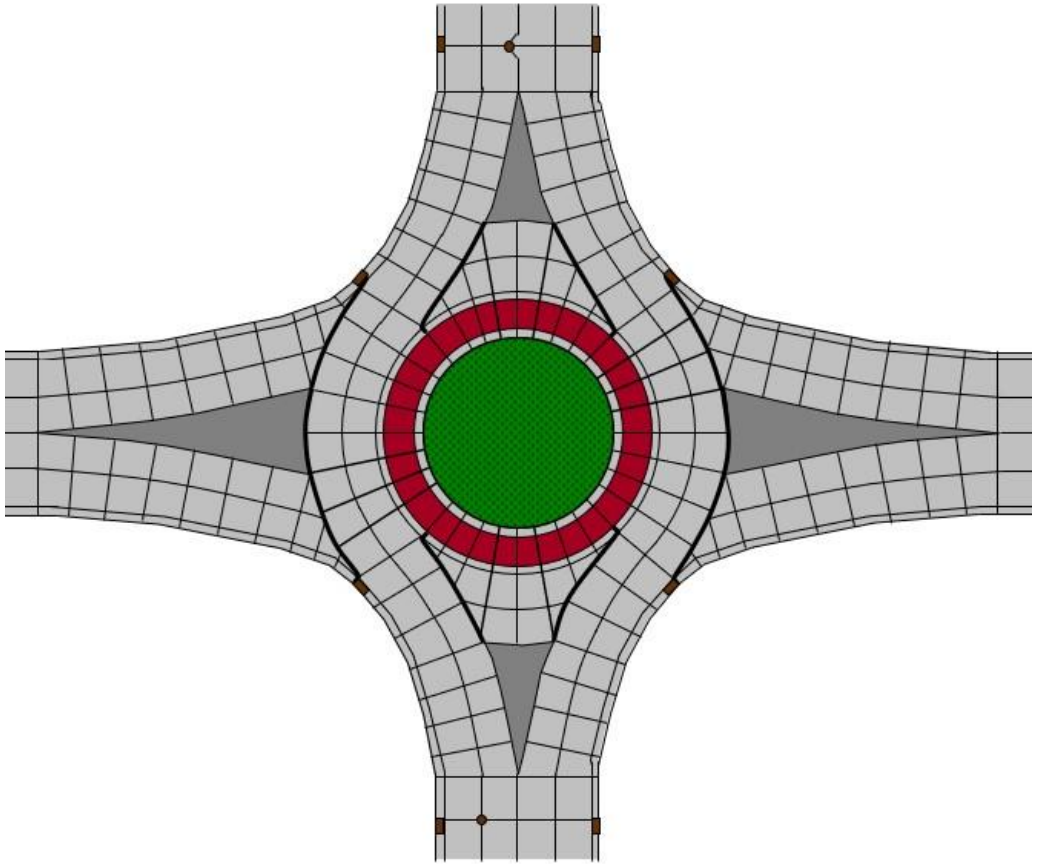


Why Concrete?

- Isolation joint layout
  - Circulating roadway is isolated from the legs
  - Vehicles cannot follow joints when exiting roundabout

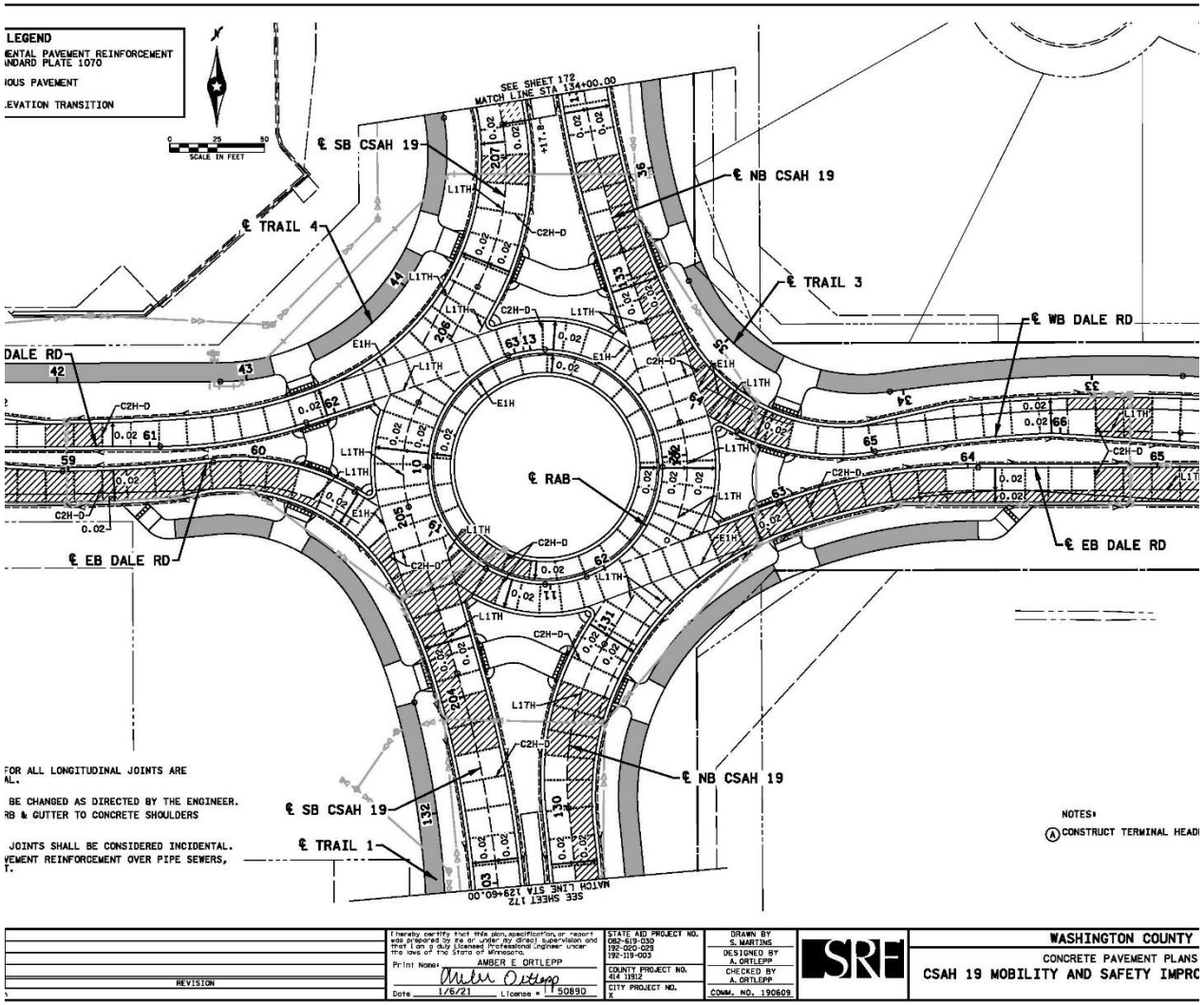
Why Concrete?

- Pave-Through joint layout
  - Allows for slip-form paving
  - Pave-through concrete isolated from other legs
  - Sometimes used when there is a predominant traffic movement



Why Concrete?

- Pinwheel/Spiral Joint Layout
  - Allows traffic to follow joints when exiting roundabout
  - Can be used on multi-lane or single-lane roundabouts
  - Washington County preference



Why Concrete?

- Pinwheel/Spiral Joint Layout
  - Allows traffic to follow joints when exiting roundabout
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Why Concrete?

- Drainage improvements
  - Roundabout drainage is tricky
  - Can be difficult to pave with bituminous
    - Bird baths, pooling water
  - Vibratory screed has delivered best results for drainage

Why Concrete?

- Pavement Strength
  - Does not rut or shove
  - Accommodates high vehicle volumes and trucks
- Lower maintenance frequency
  - Durable
  - Lower frequency = Less impact to roadway users

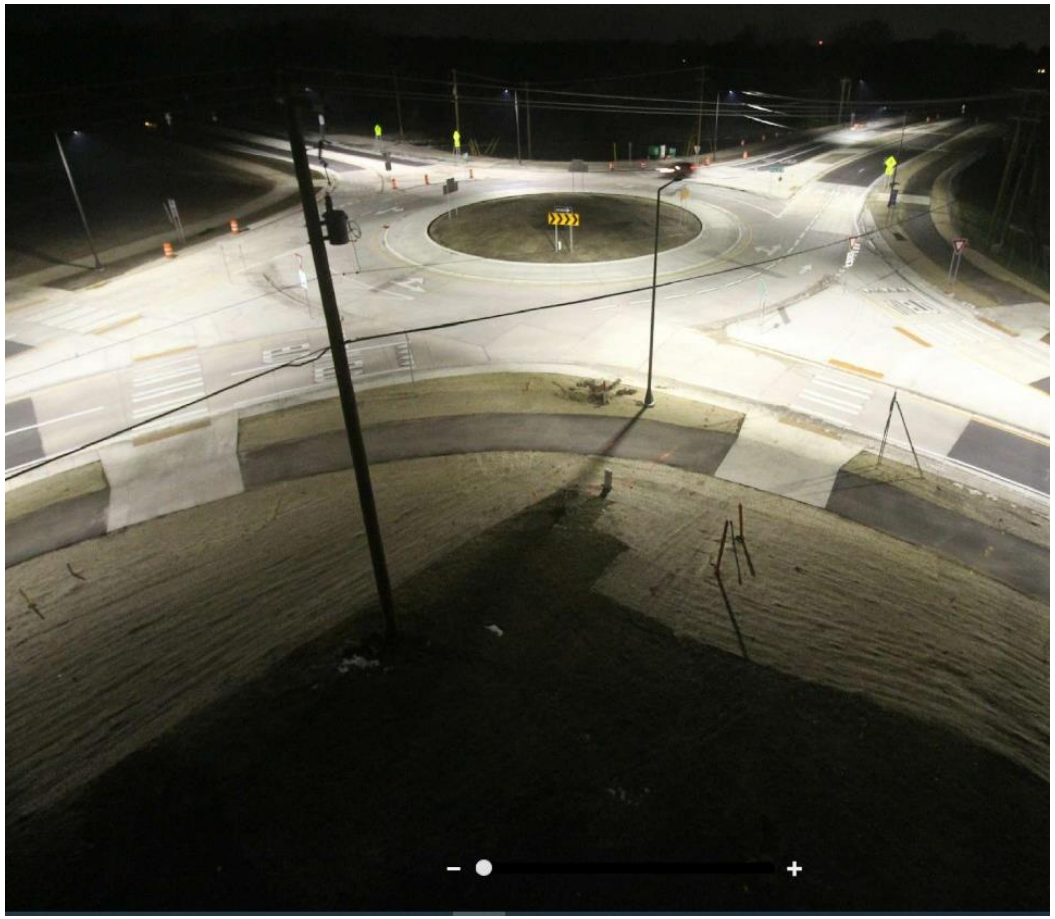
Summary

Why Concrete Roundabouts for Washington County?

- Preferred Joint Layout
- Drainage Improvements
- Resists Rutting and Stresses Better
- Lower Maintenance Frequency

Intersection Reconstruction Costs

- Cost is less of a consideration
  - Make the right decision based on other factors
- Performed cost comparisons on early projects
  - Intersection reconstruction cost with traffic signal ~ Intersection reconstruction cost with a roundabout
  - Bituminous roundabout cost ~ Concrete roundabout cost



Other Lessons Learned

- Vibrating screed has worked better than slip-forming
- Elevations have more accurate with curb & gutter placement, followed by vibrating screed for roadway
- County is moving toward specifying vibrating screed and not allowing slip-forming for roundabouts

Other Lessons Learned

- Construct a bypass for construction if possible; close intersection if you must
- Difficult constructing roundabouts under traffic
  - Safety concerns
  - Piecemeal work

Other Lessons Learned

- Add black contrast around white striping
- Black contrast assists visibility at night and during the day

Other Lessons Learned

- Create roundabout design criteria for your agency
- There are a lot of different guidelines and nuances for roundabout design (curb types, striping, approach offsets, etc.)
- Each consultant has different recommendations and preferences

05.19.2021
DESIGN CRITERIA for Roundabouts
Washington County

County State Aid Highway No. _____

State Aid Project No. _____

DESIGN ELEMENT	VALUE	CRITERIA / REFERENCE
General		**NCHRP Report 672**
Lane Configuration		Varies – Based on Volumes and Projections MnDOT Road Design Manual Table 12-3.04A
Approach Type		Left Offset
Approach/Exit Width		
Single Lane		16' to 20': MnDOT State Aid Rules Chapter 8820 & MnDOT Road Design Manual
Dual Lanes		28': MnDOT Road Design Manual
Inscribed Diameter		Varies – MnDOT Road Design Manual Table 12-3.04A & 12-4.02C
Inscribed Roadway Area Width		18-ft to 22-ft (single lane) / 32-ft (dual lanes)
Inscribed Roadway Area Slope		2%
Pavement Structure		24-inch Select Granular, 6-inch Agg Base, 8-inch Concrete (subject to ESAL calcs) Spiral jointing pattern (Panels lead out of roundabout)
Location of Concrete - Bituminous Transition		2-lane County Road: Nose of Splitter Island 4-Lane County Road: Outer Crosswalk Edge Local Road: Minimum at Outer Crosswalk Edge: Ask Local Agency
Turning Templates		
Design Vehicle		Varies
Truck Encroachment		Varies – WI FDM 30.5.5 & WI FDM Table 30.6

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Questions?

Washington County