



Roundabouts and the **Jointing Process**



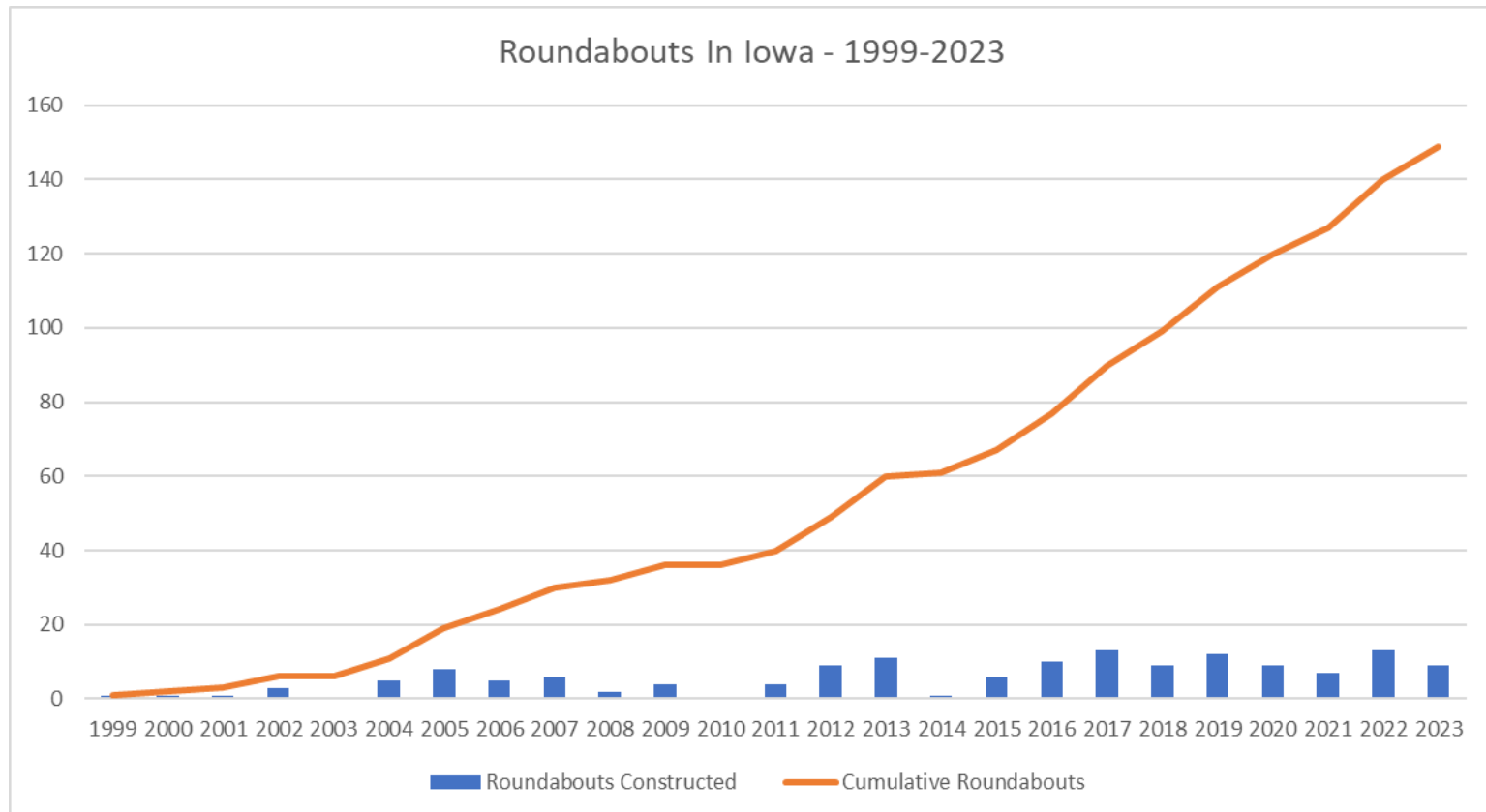
Presentation Outline

- Trends
- Roundabout
 - Elements
 - Types
 - Design features
- Jointing Layout
 - Joint Types and Patterns
 - Process
 - Tips

Roundabout Trends

- Number of Roundabouts in Iowa

Kittleson and Associates, <https://roundabouts.kittelson.com/Home/Map>

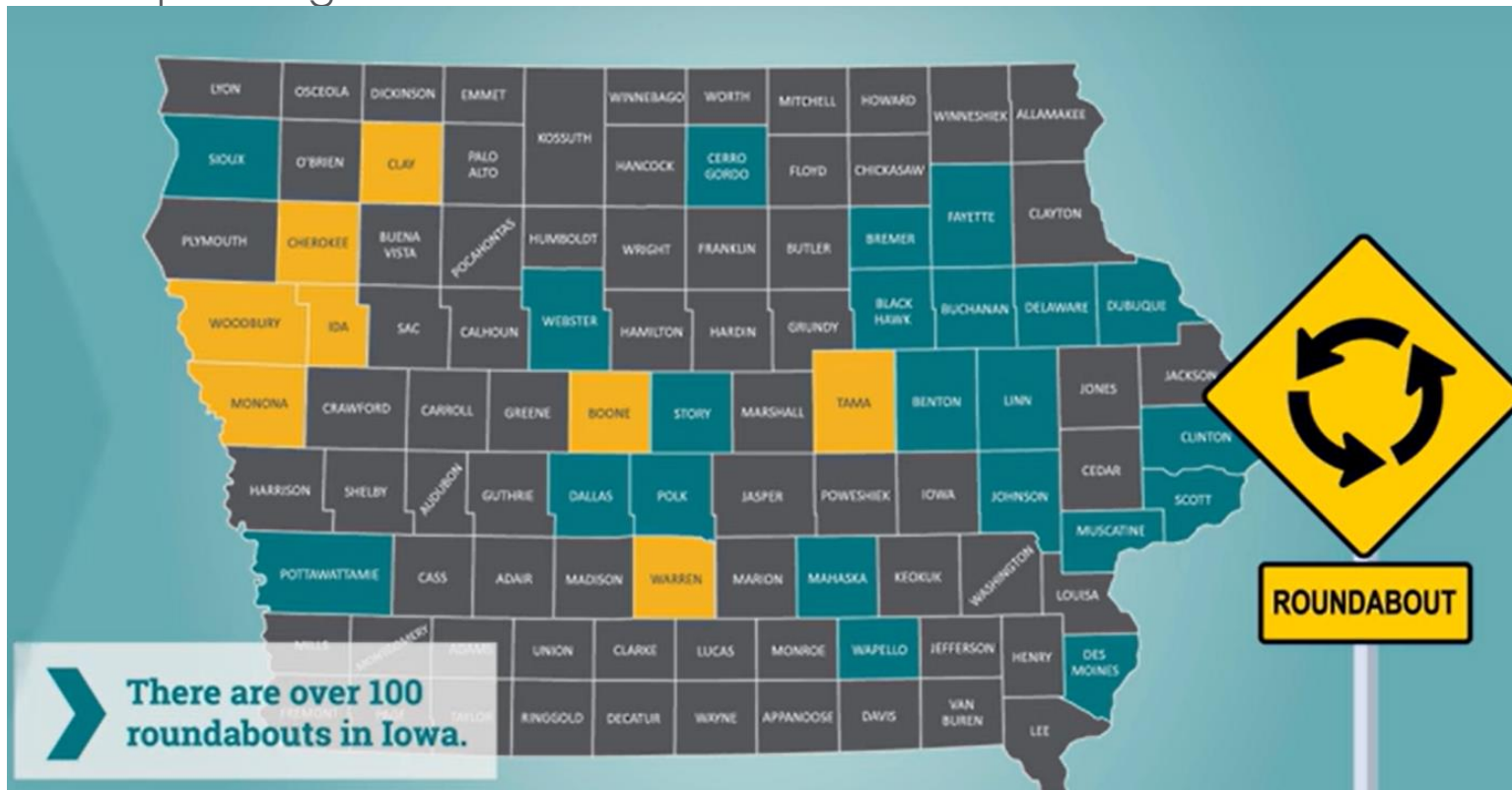


Roundabout Trends

- Roundabout locations

Blue = Current Roundabouts

Yellow = In planning



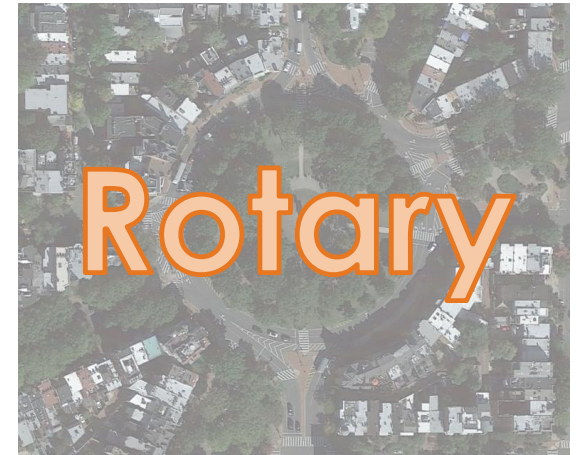
ROUNDABOUTS AND THE JOINTING PROCESS

What is a Roundabout?

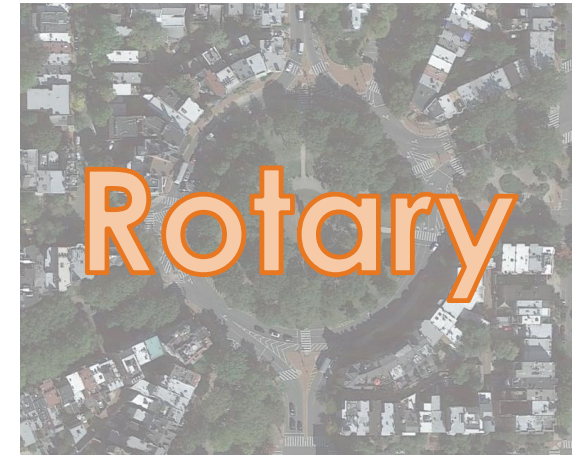


ROUNDBABOUTS AND THE JOINTING PROCESS

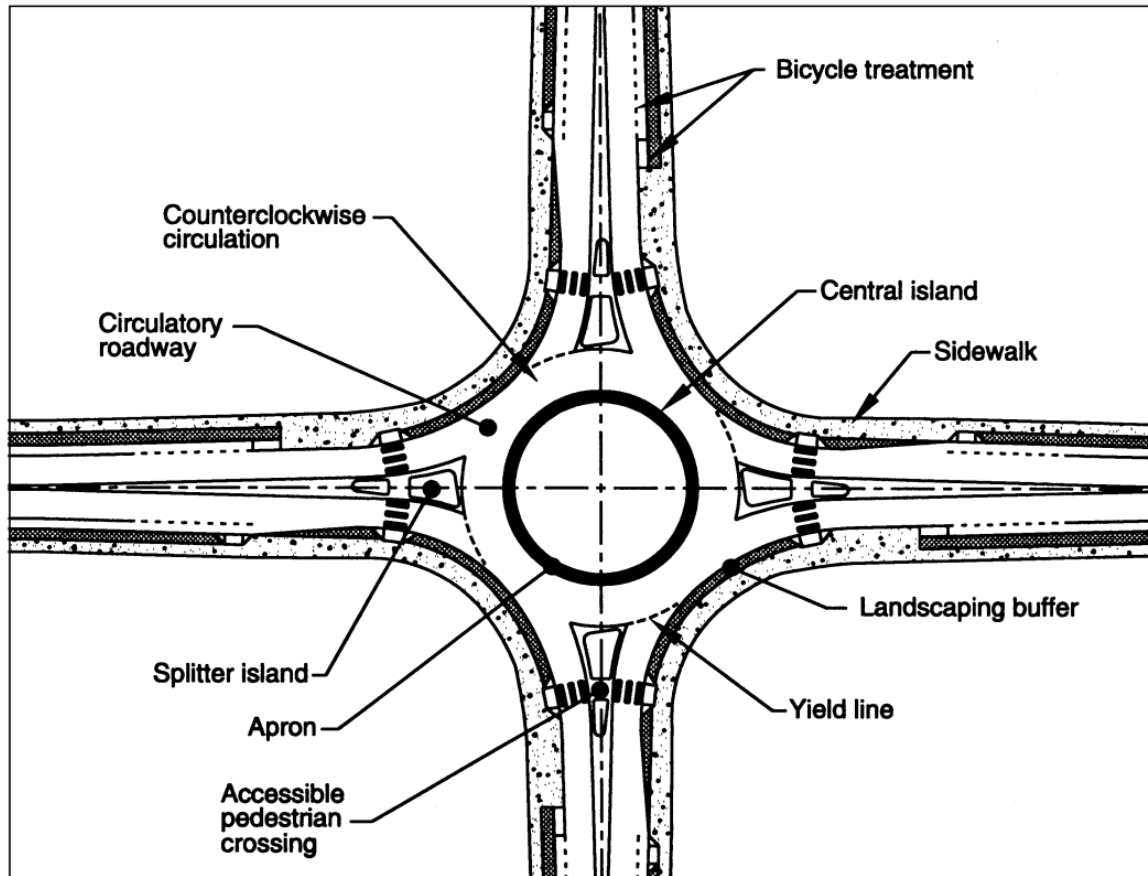
What is a Roundabout?



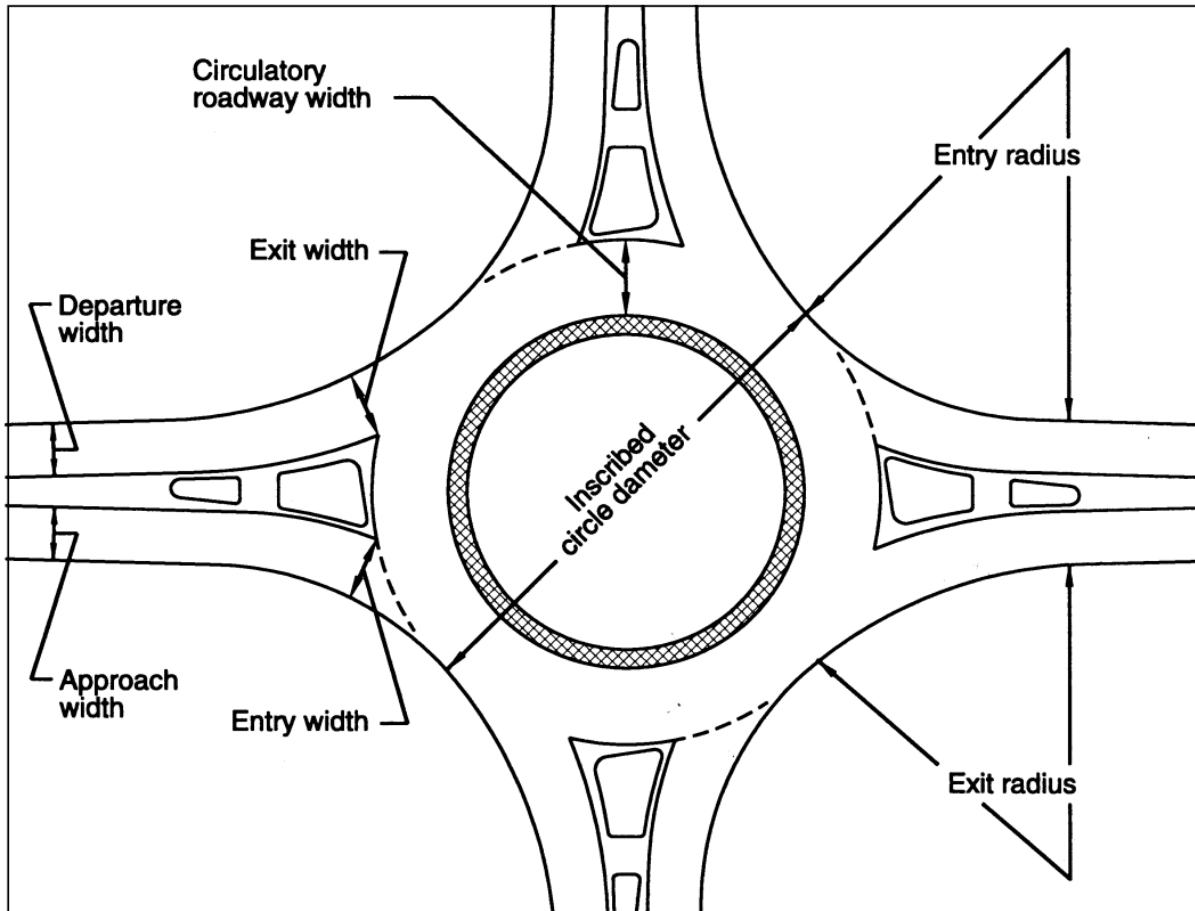
What is a Roundabout?



Elements of a Roundabout



Elements of a Roundabout



Types of Roundabout

Mini-Roundabout



- 15 mph Design Speed
- 45 to 80 ft Diameter
- Painted or mountable splitter islands
- Mountable central island
- Similar footprint to a traditional intersection
- Maximum capacity of 10,000 veh/day
- Maximum approach speed of 30 mph

Types of Roundabout



Compact Roundabout

- 15 mph Design Speed
- 80 to 100 ft Diameter
- Raised splitter islands
- More pedestrian and bicyclist friendly
- Meets all the design requirements of effective roundabouts
- Maximum capacity of 15,000 veh/day

Types of Roundabout

Single-Lane Roundabout

- 20-25 mph Design Speed
- 100 to 130 ft Diameter
- Approach speeds of up to 60 mph
- Maximum capacity of 20,000 veh/day



Types of Roundabout

Two-Lane Roundabout with One- and Two-Lane Approaches

- 25 mph Design Speed
- 150 to 200 ft Diameter
- Capacity of 20,000+ veh/day



Types of Roundabout



Two-Lane Roundabout

- 25 mph Design Speed
- 150 to 200 ft Diameter
- Capacity of 20,000+ veh/day

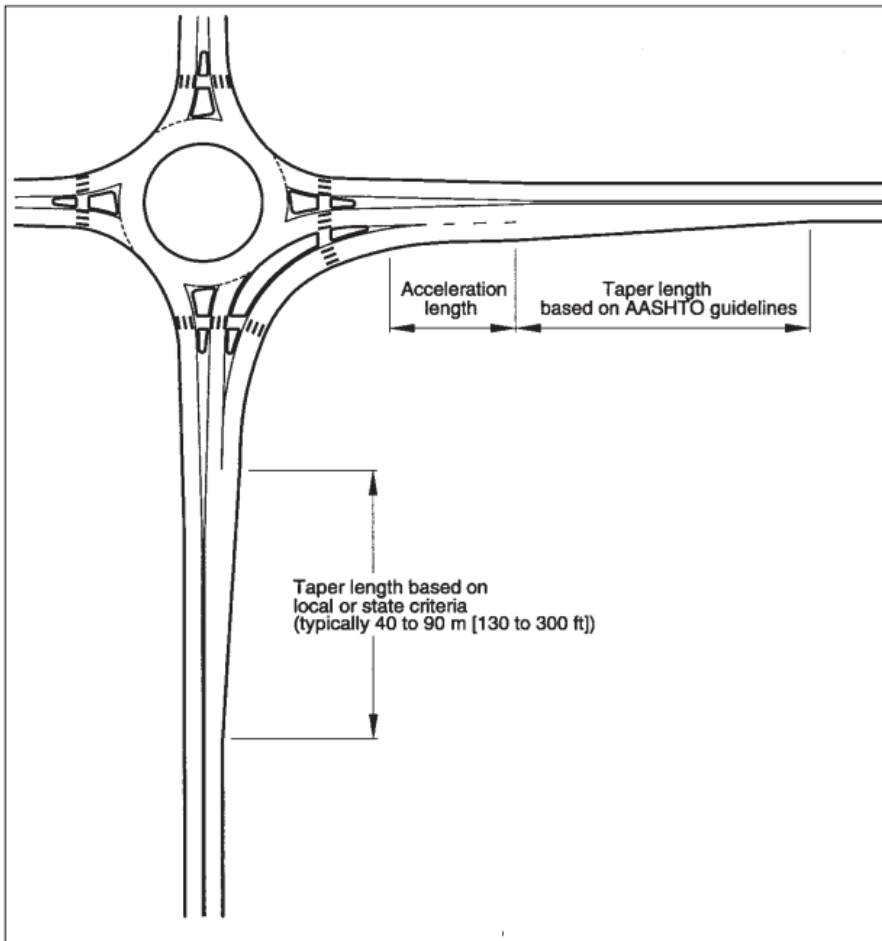
Types of Roundabout



Turbo Roundabout

- Potential replacement for two-lane roundabout
- Two currently in the US
 - Jacksonville, FL
 - Gilroy, CA
- Raised lane separator to help channelize traffic

Roundabout Design



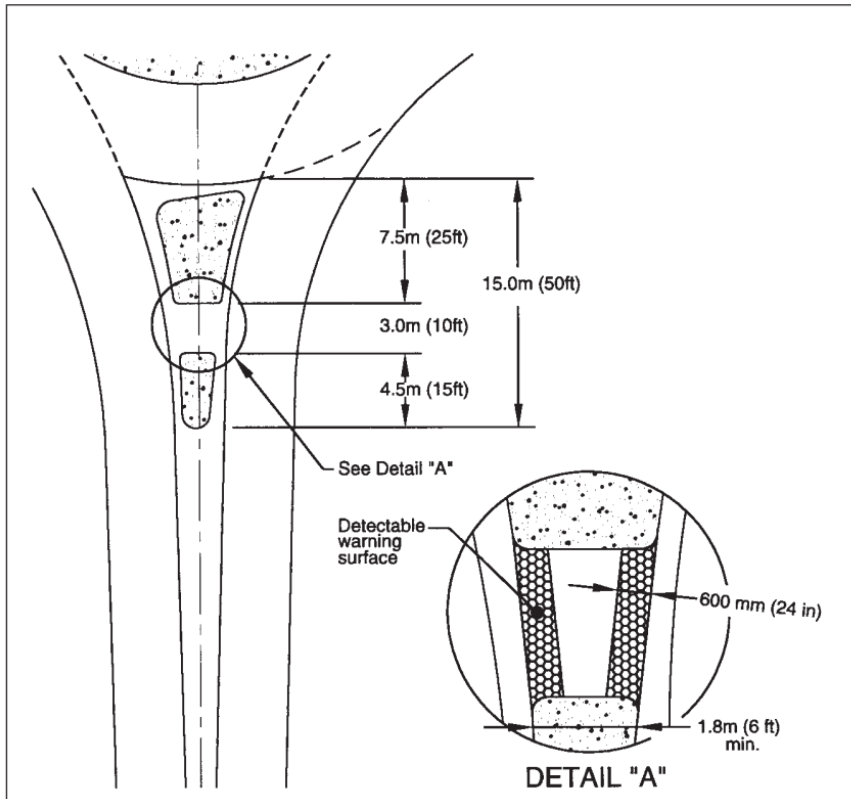
Bypass Lanes

- Increases capacity with significant amount of traffic turning right
- Increases conflicts with pedestrians and bicyclists

Splitter Islands

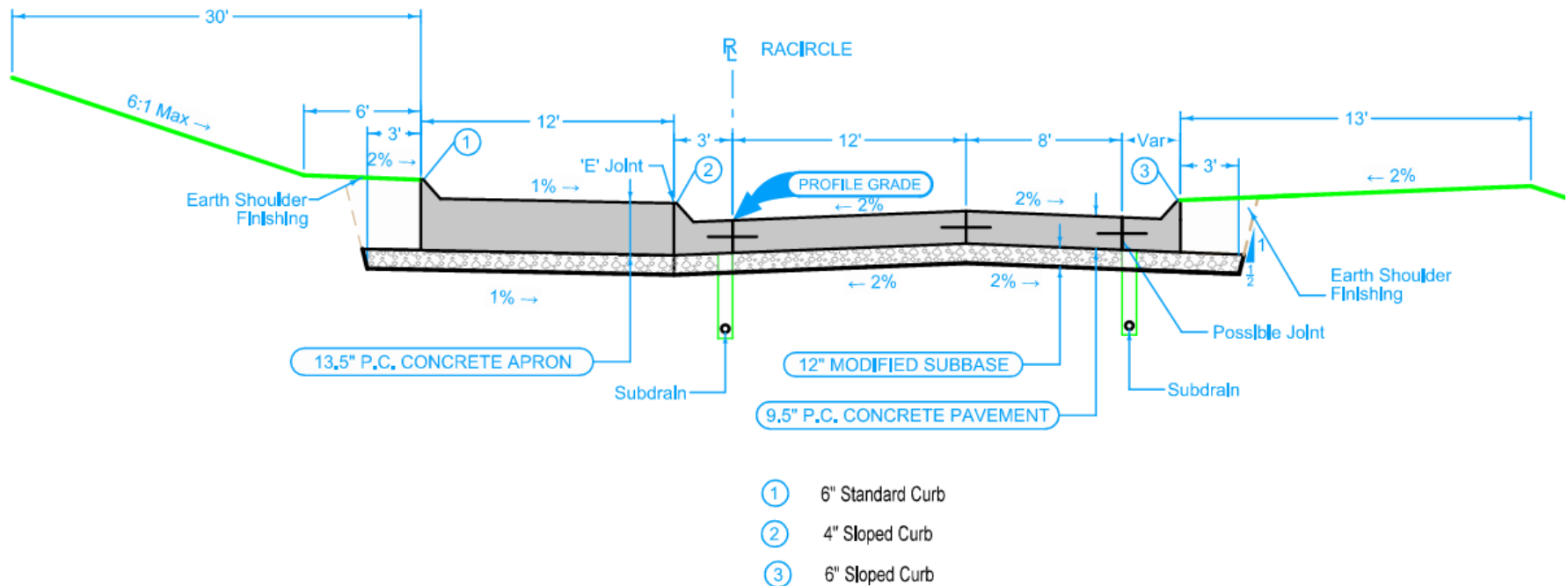
Features

- Provides a refuge area for pedestrians
- TAS recommends constructing pedestrian crossings
- 50' minimum length
 - 200' recommended



ROUNDBABOUTS AND THE JOINTING PROCESS

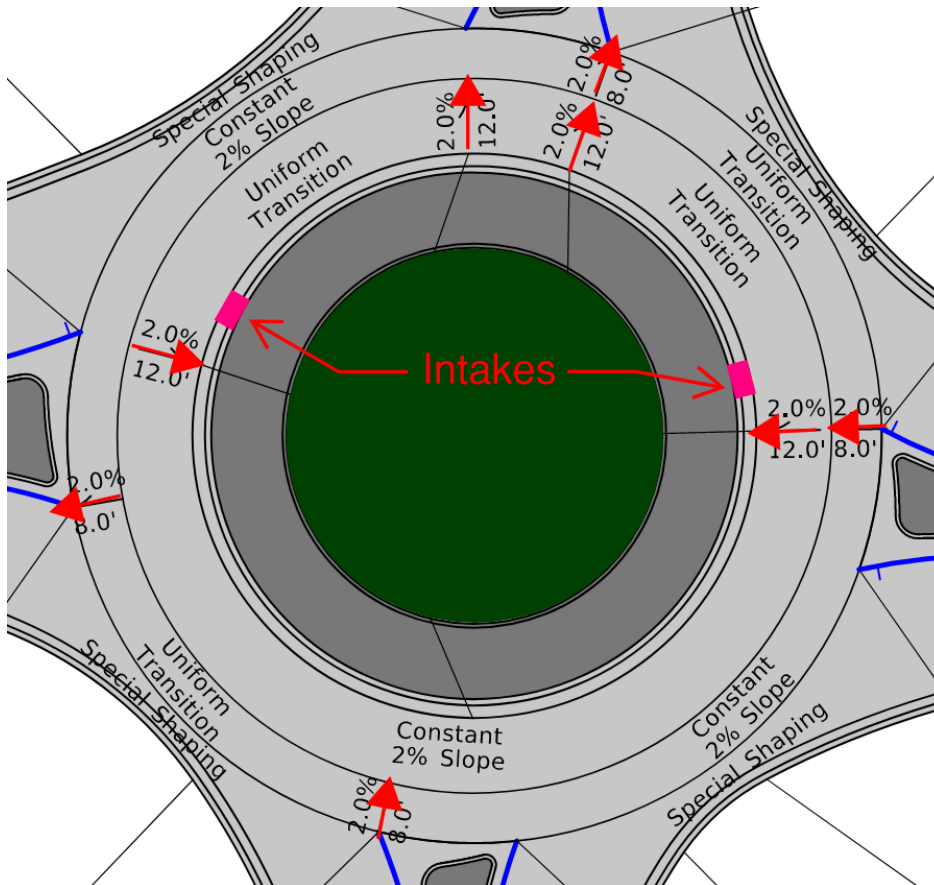
Circulating Roadway



Circulating Roadway

Features

- Start with typical slopes
- Add staking if needed based on the site conditions



Truck Apron

Features

- Mountable curb between the circulating roadway and the apron
- Typically, colored concrete
- Size and shaped based on the design vehicle



ROUNDBABOUTS AND THE JOINTING PROCESS

Center Island Design



Center Island Design



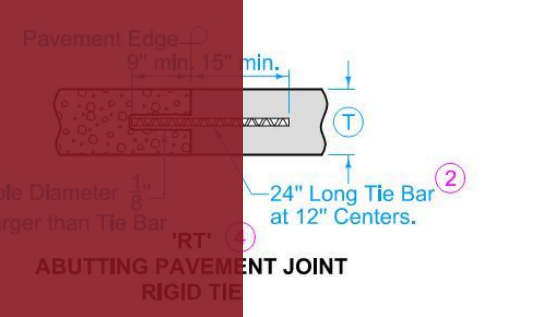
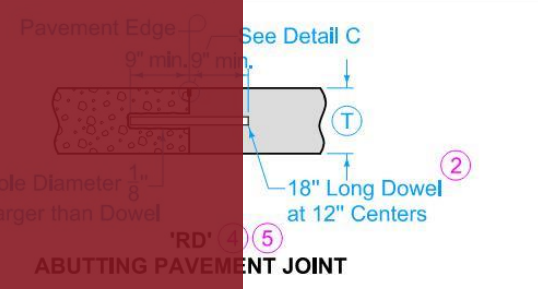
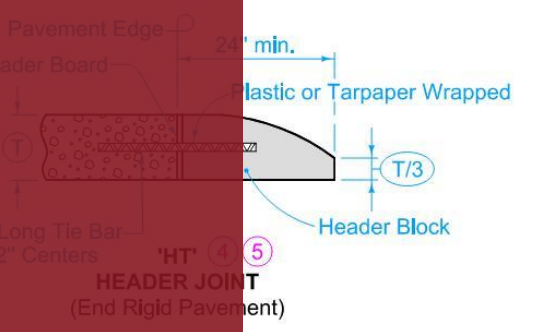
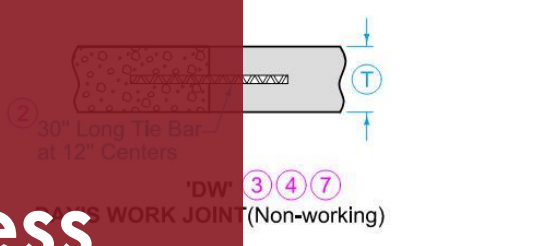
Roundabout Jointing Process

- Joint Types

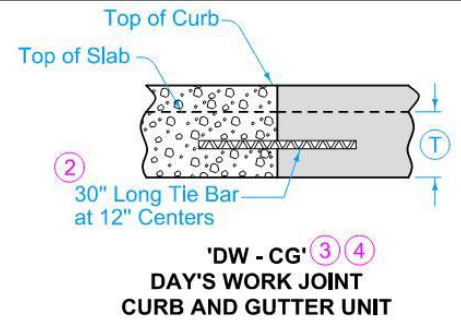
- Patterns

- The Process

- Tips



- See dowel assemblies for fabrication details.
- See Bar Size Table for Contraction Joints on Sheet
- Locate 'DW' joint at a mid-panel location between full 'C' or 'CD' joints. Place no closer than 5 feet to a 'C' or 'CD' joint.
- Place bars within the limits shown under dowel assemblies.
- Edge with 1/8 inch tool for length of joint. For HT joint remove header block and board when second slab is placed.
- Unless specified otherwise, use 'CD' transverse contraction joints in mainline pavement when T is greater or equal to 8 inches. Use 'C' joints when T is less than 8 inches.
- 'RT' joint may be used in lieu of 'DW' joint at the end of the days work. Remove any pavement damaged during the drilling at no additional cost to the Contracting Authority.



LEGEND	
	Existing Pavement
	Proposed Pavement

		REVISED 11
FIGURE 7010.101	STANDARD ROAD PLAN	PV- SHEET

REVISIONS: Modified circle note 32.

Paul D. Wrigand
SUDAS DIRECTOR

Shant Nelan
DESIGN METHODS ENGINEER

JOINTS

TRANSVERSE CONTRACTION

ROUNDBABOUTS AND THE JOINTING PROCESS

Joint Types

- Joint Types: KT, L, CD, C, and E
- Design Manual, Chapter 7a
- Standard Road Plan, PV-101
- 'E' joint
 - Used for isolation of circulating roadway

- ⑩ Bar supports may be necessary for fixed form paving to ensure the bar remains in a horizontal position in the plastic concrete.
- ⑪ Sawing or sealing of joint not required.
- ⑫ The following joints are interchangeable, subject to pouring sequence:
'BT-1', 'L-1', and 'KT-1'
'KT-2' and 'L-2'
'KT-3' and 'L-3'

Joint	Bars	Bar Length and Spacing
< 8"	#5	30" Long at 30" Centers
≥ 8"	#5	36" Long at 30" Centers

Joint	Bars	Bar Length and Spacing
< 8"	#4	36" Long at 30" Centers
≥ 8"	#5	36" Long at 30" Centers
		36" Long at 15" Centers

Joint	Bars	Bar Length and Spacing
< 8"	#5	24" Long at 30" Centers
≥ 8"	#5	24" Long at 30" Centers
		24" Long at 15" Centers

Joint	Bars	Bar Length and Spacing
< 8"	#4	30" Long at 30" Centers
≥ 8"	#5	30" Long at 30" Centers
		30" Long at 15" Centers

LEGEND

- Existing Pavement
- Proposed Pavement

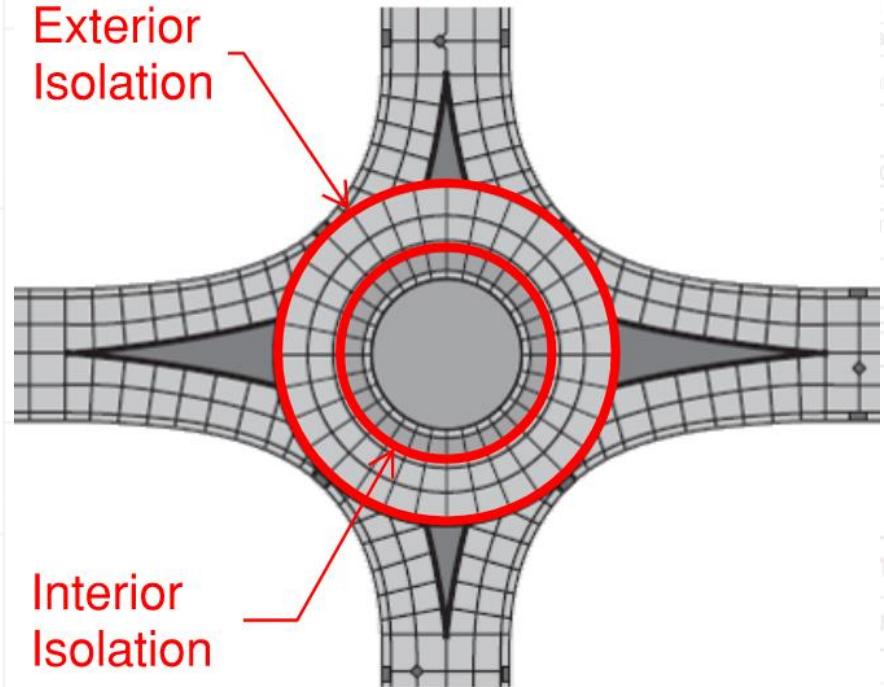
SUDAS	IOWADOT	REV# 11
FIGURE 7010.101	STANDARD ROAD PLAN	PV-101 SHEET
REVISIONS: Modified check note 32.		
 SUPERVISOR		 DESIGN METHODIST

JOINTS

Isolation Joint Locations

- Interior Location
 - Between Circulating Roadway and Truck Apron
- Exterior Location
 - Outer edge of Circulating Roadway
 - Not used by Iowa DOT

'CF' JOINT	
TYPE	WIDTH
CF-1	2"
CF-2	2 1/2"
CF-3	3"
CF-4	4 1/2"



- 14 See Bar Size Table for Doweled Expansion Joints.
- 15 Edge with 1/4 inch tool for length of joint indicated if formed; edging not required when cut with diamond saw.
- 16 See Dowel Assemblies for fabrication details and placement limits. Coat the free end of dowel bar with epoxy or other adhesive. At intake locations, do not use epoxy or other adhesive.
- 17 Pre-drill or pre-form holes in joint material for appropriate dowel size.
- 18 Compact tire buffings by spading with a square-nose shovel.

JOINTS	
MATERIAL	(Detail F)
Concrete	(Detail F)
Asphalt	(Detail F)
Joint Filler	(Detail F)
Joint Sealant	(Detail F)

DOWELED EXPANSION JOINTS	
JOINT TYPE	MINIMUM JOINT WIDTH
'ED', 'EE', 'EF'	≥ 10"
'CF'	1 1/2"

EXPANSION

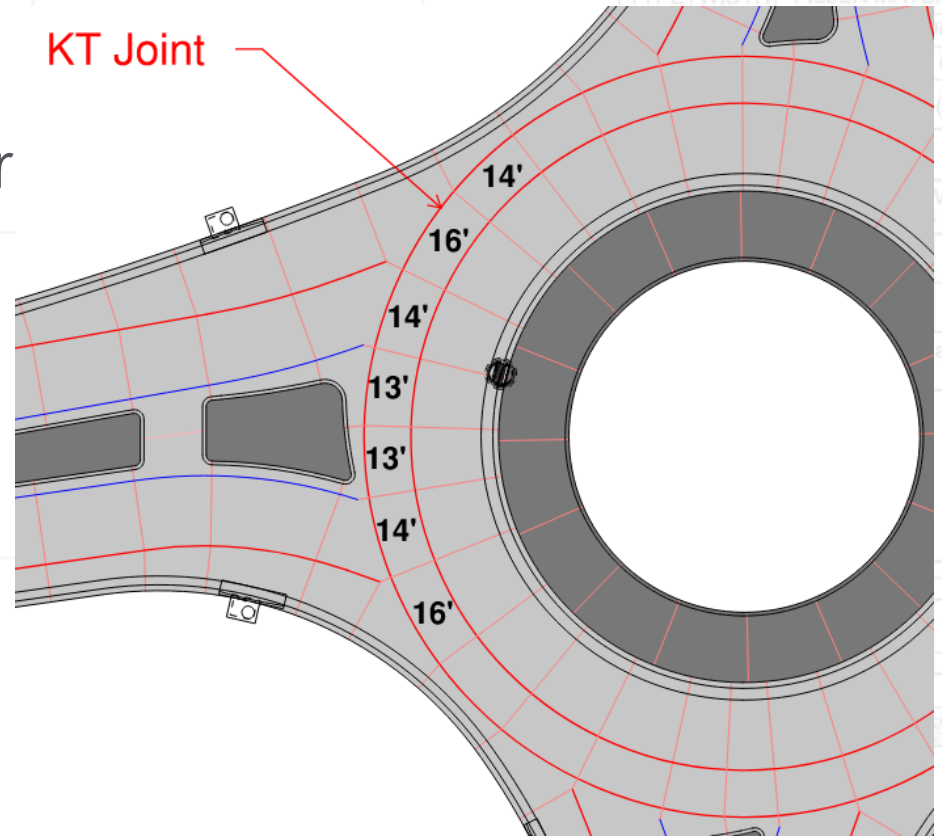
JOINTS

ROUNDBABOUTS AND THE JOINTING PROCESS

Without Exterior Isolation

- Used by Iowa DOT
- Use KT Joint
- Some load transfer
- Ties pavement together
- Irregular panel shapes

KT Joint



- See Bar Size Table for Doweled Expansion Joints.
- Edge with 1/4 inch tool for length of joint indicated if formed; edging not required when cut with diamond saw.
- See Dowel Assemblies for fabrication details and placement limits. Coat the free end of dowel bar with epoxy. At intake locations, dowel bars may be cut in-place.
- Predrill or preform holes in joint material for appropriate dowel size.
- Compact tire buffings by spacing with a square-nose shovel.

DOWELED EXPANSION JOINTS

TYPE	WIDTH	FILLER MATERIAL
CF-1	2"	
CF-2	2"	
CF-3	2"	
CF-4	2"	

(Detail F)

(Detail G)

(Detail H)

VELED

≥ 10"

1 1/2"

allowed

10-11

PV-

SHEET

11

10-11

11

10-11

11

10-11

11

10-11

11

10-11

11

10-11

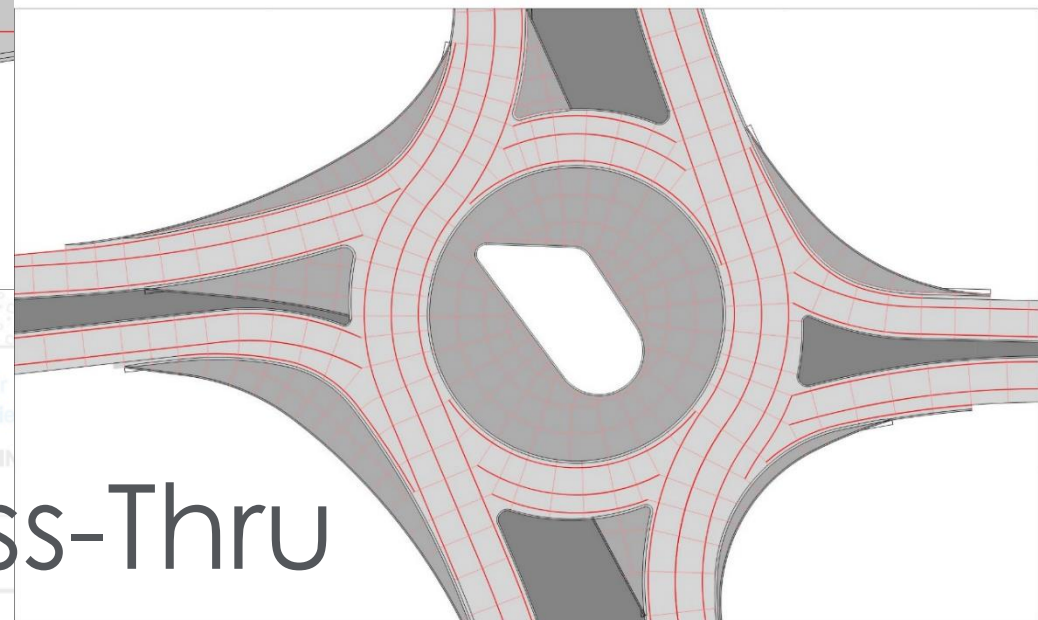
ROUNDBABOUTS AND THE JOINTING PROCESS

Joint Patterns

'B' PLAIN JOINT
(Abutting Pavement Slabs)

Circular

- 1 See dowel assemblies for fabrication details.
- 2 See Bar Size Table for Contraction Joints on Sheet
- 3 Locate 'DW' joint at a mid-panel location between fu 'C' or 'CD' joints. Place no closer than 5 feet to a 'C' or 'CD' joint.
- 4 Place bars within the limits shown under dowel assemblies.
- 5 Edge with 1/8 inch tool for length of joint. For HT joint remove header block and board when second slab is placed.
- 6 Unless specified otherwise, use 'CD' transverse contraction joints in mainline pavement when is greater or equal to 8 inches. Use 'C' joints when is less than 8 inches.
- 7 'RT' joint may be used in lieu of 'DW' joint at the end of the days work. Remove any pavement damaged during the drilling at no additional cost to the Contracting Authority.



Pass-Thru

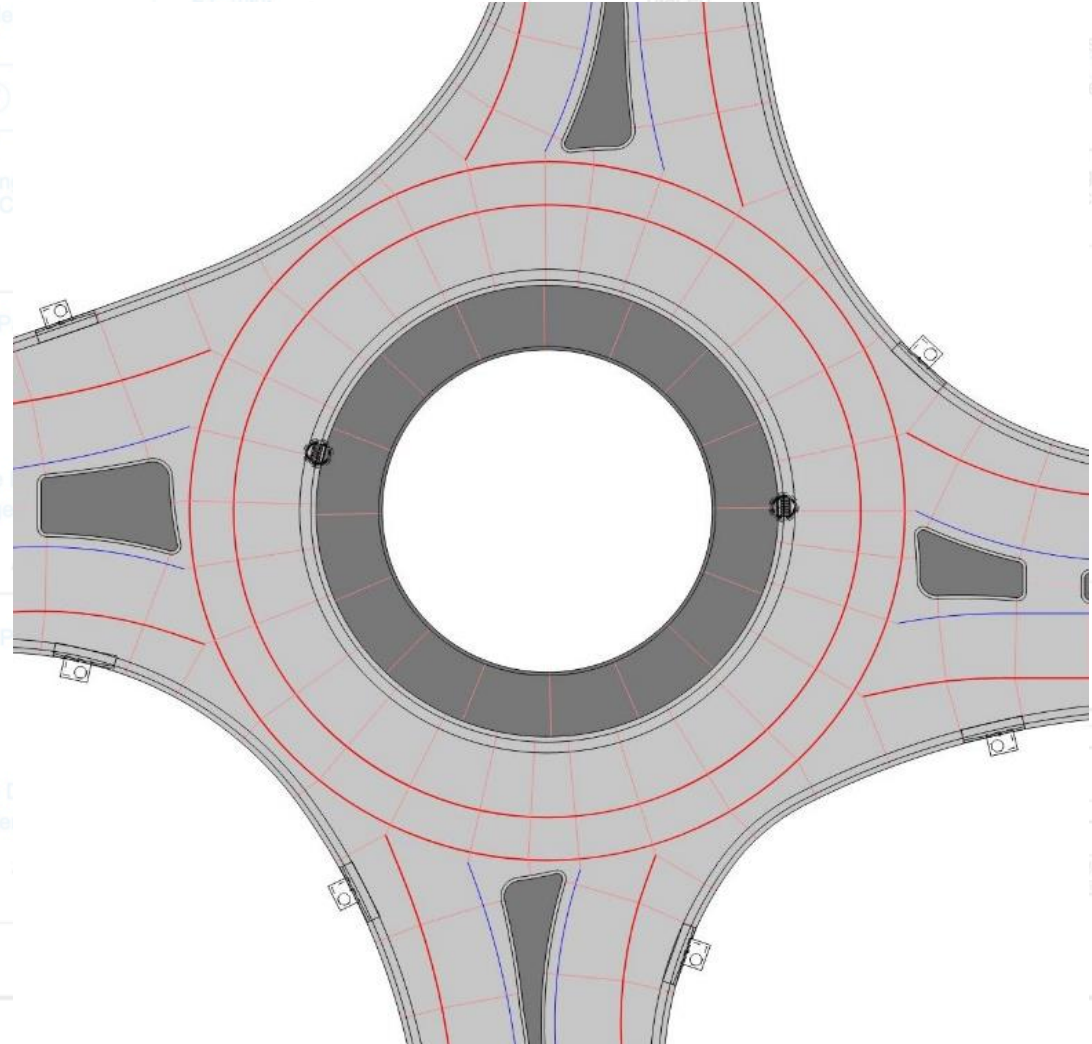
'CT' TIED CONTRACTION JOINT

TRANSVERSE CONTRACTION

ROUNDBABOUTS AND THE JOINTING PROCESS

Circular Pattern

- Most Common
- Easier to joint at intersections
- Easily adaptable
- Difficult to slip-form



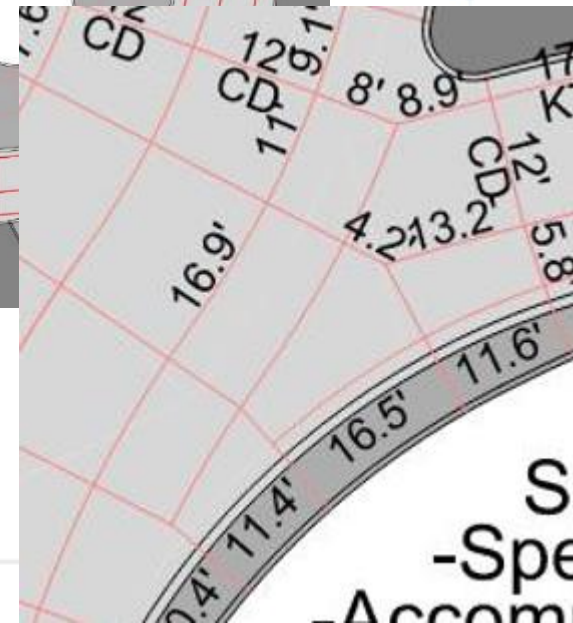
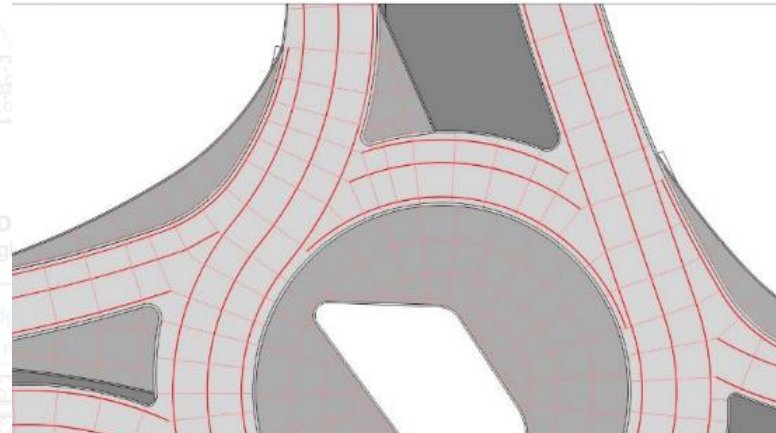
- ① See dowel assemblies for fabrication details.
- ② See Bar Size Table for Contraction Joints on Sheet
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- ④ Place bars within the limits shown under dowel assemblies.
- ⑤ Edge with 1/8 inch tool for length of joint. For HT joint, remove header block and board when second slab is placed.

TRANSVERSE CONTRACTION

ROUNDBABOUTS AND THE JOINTING PROCESS

Pass-Through Pattern

- Common for dominant movement
- Easier to slipform
- Easier for staging
- Positive delineation for travel
- Challenging to joint



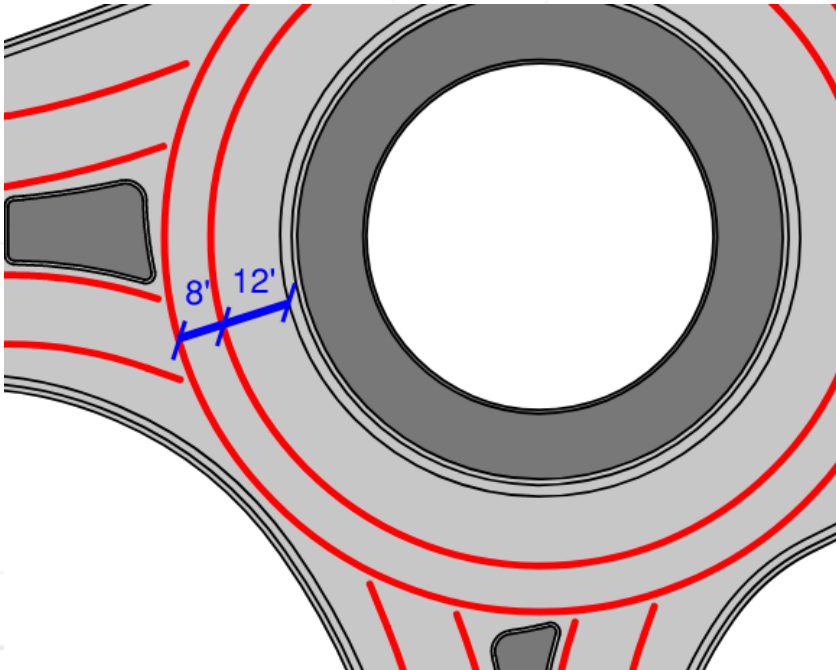
ROUNDBABOUTS AND THE JOINTING PROCESS

Longitudinal Joints

Circular Pattern*

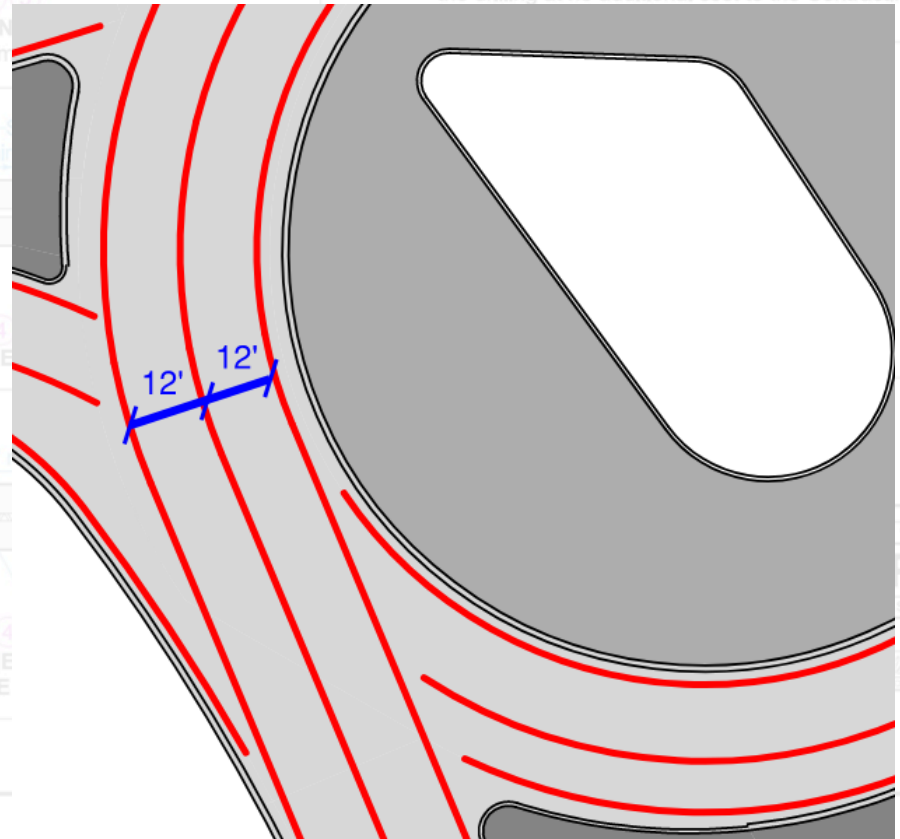
- 12' wide inside circle
- 8' wide outside circle

*based on 20' circulating travel path



Pass-Through Pattern

- Match approach legs



ROUNDBABOUTS AND THE JOINTING PROCESS

Longitudinal Joints

Avoid wide panels

- DOT tries to keep its panels no wider than 12'



ROUNDBABOUTS AND THE JOINTING PROCESS

Jointing Process

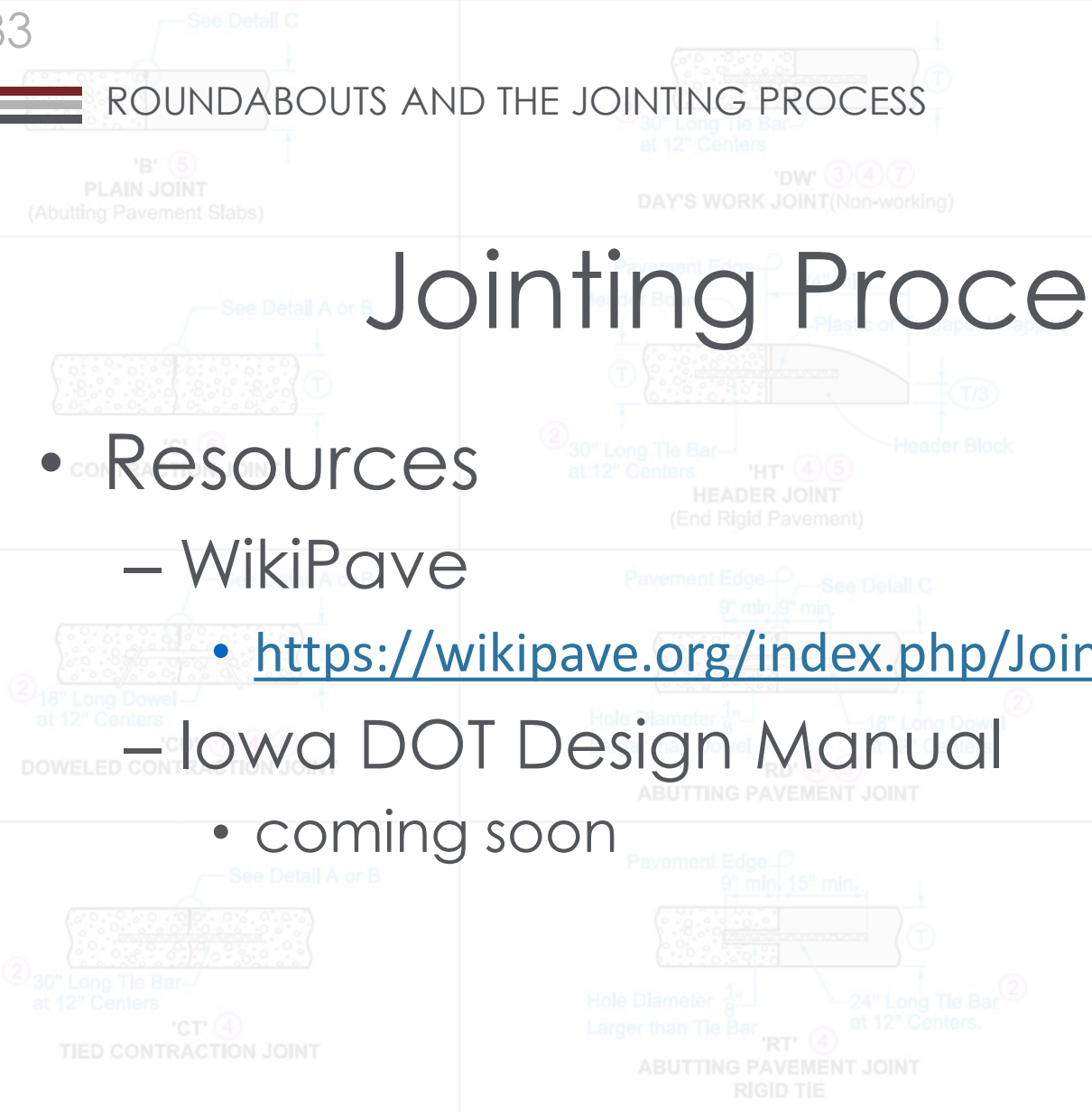
- Resources
 - WikiPave

https://wikipave.org/index.php/Joint_Layout

Iowa DOT Design Manual

- coming soon

- See dowel assemblies for fabrication details.
- See Bar Size Table for Contraction Joints on Sheet
- Locate 'DW' joint at a mid-panel location between full 'C' or 'CD' joints. Place no closer than 5 feet to a 'C' or 'CD' joint.
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LEGEND

- Existing Pavement
- Proposed Pavement

SUDAS IOWADOT

FIGURE 7010.101 STANDARD ROAD PLAN

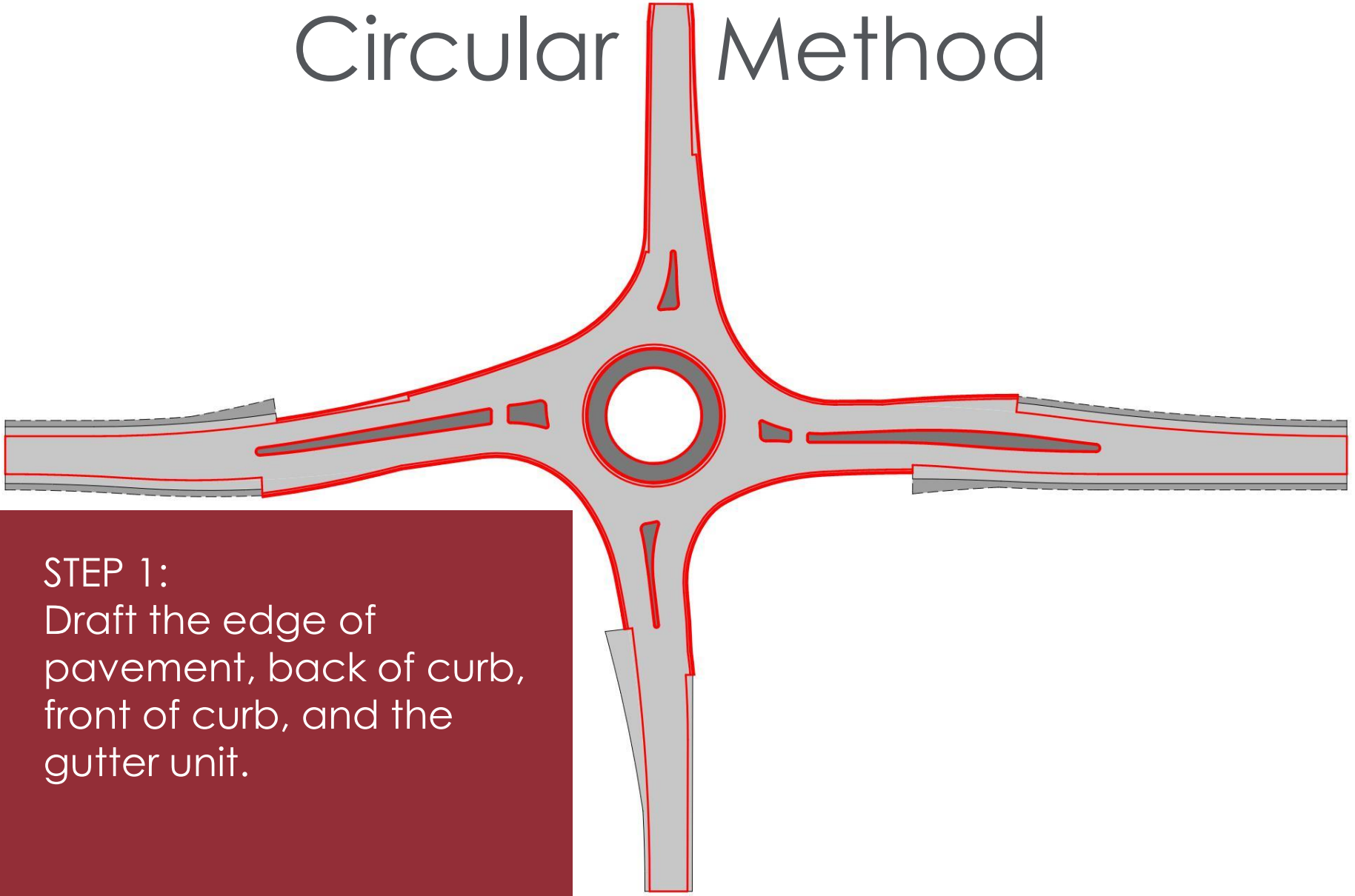
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DESIGN APPROVED: [Signature] DESIGN METHODS: [Signature]

JOINTS

TRANSVERSE CONTRACTION

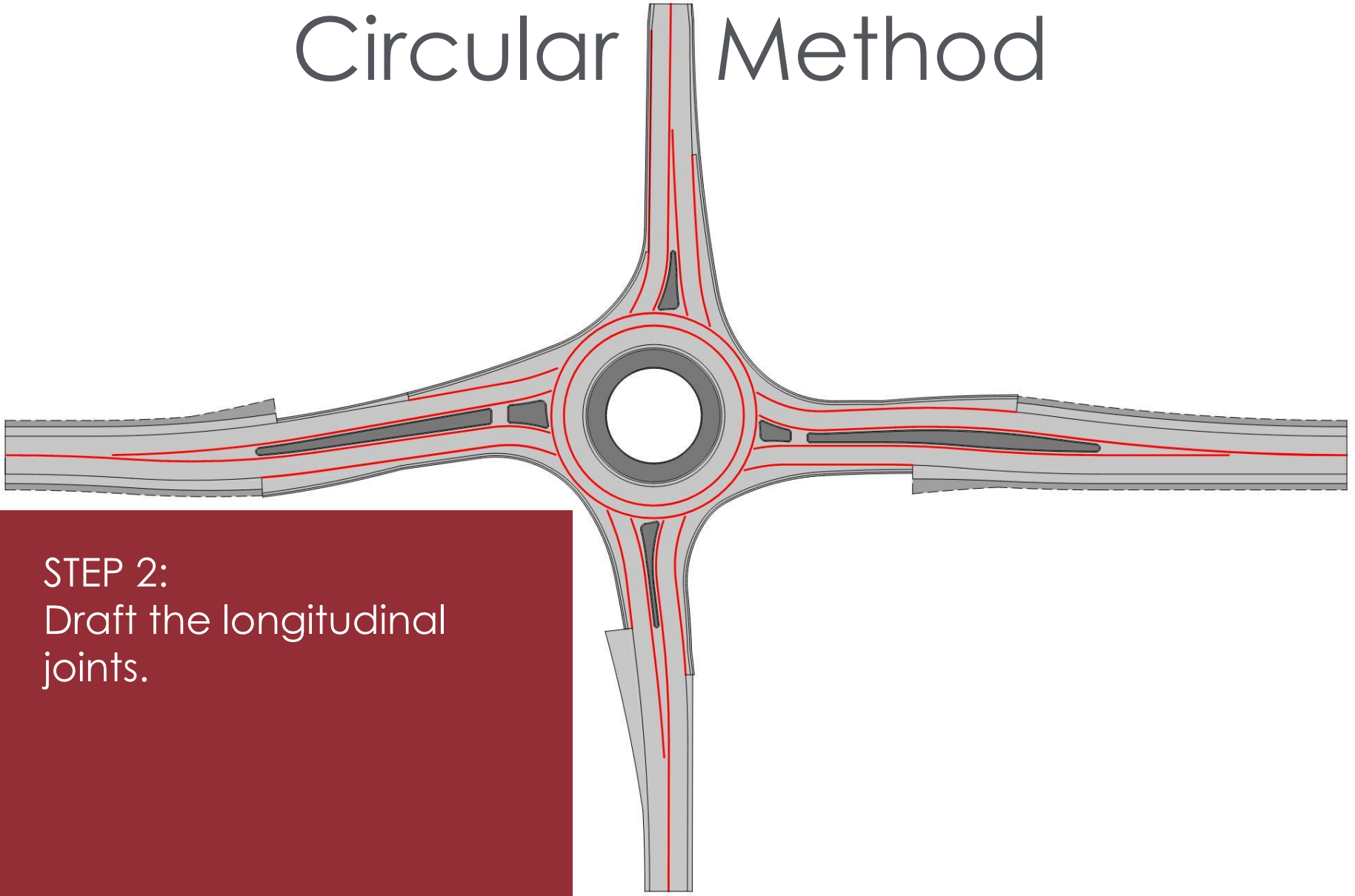
Circular Method



STEP 1:

Draft the edge of pavement, back of curb, front of curb, and the gutter unit.

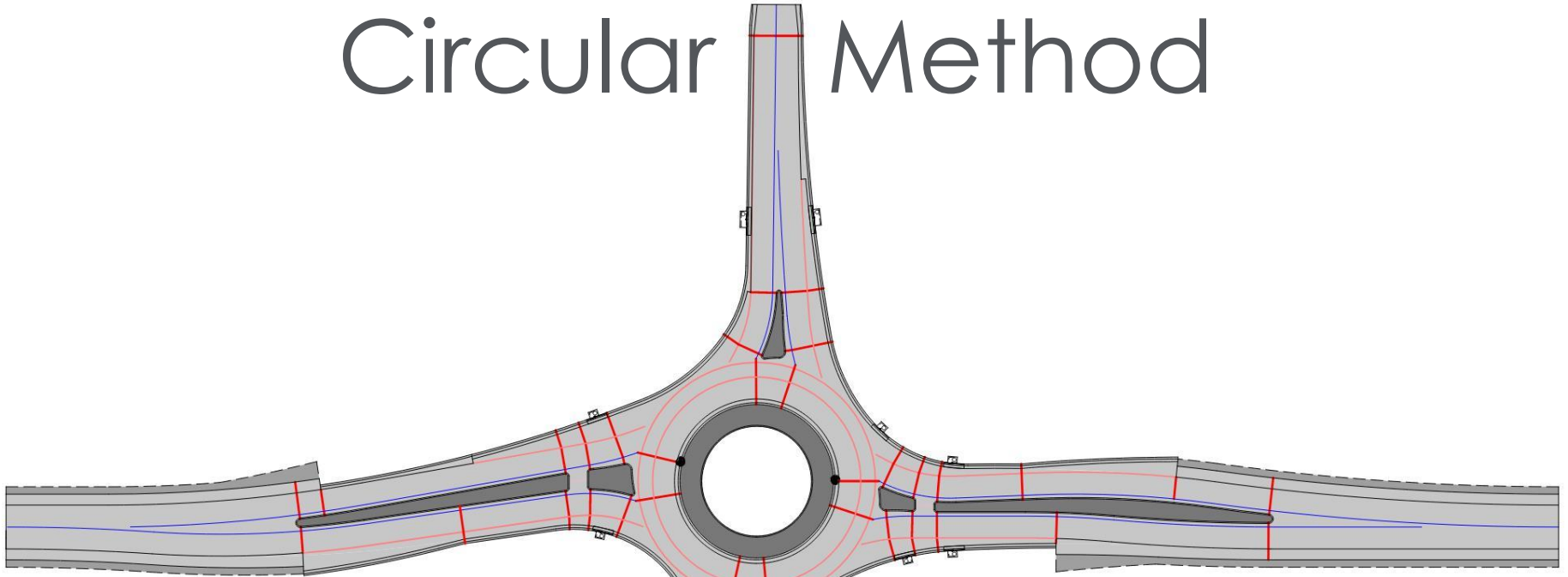
Circular Method



STEP 2:
Draft the longitudinal
joints.

ROUNDABOUTS AND THE JOINTING PROCESS

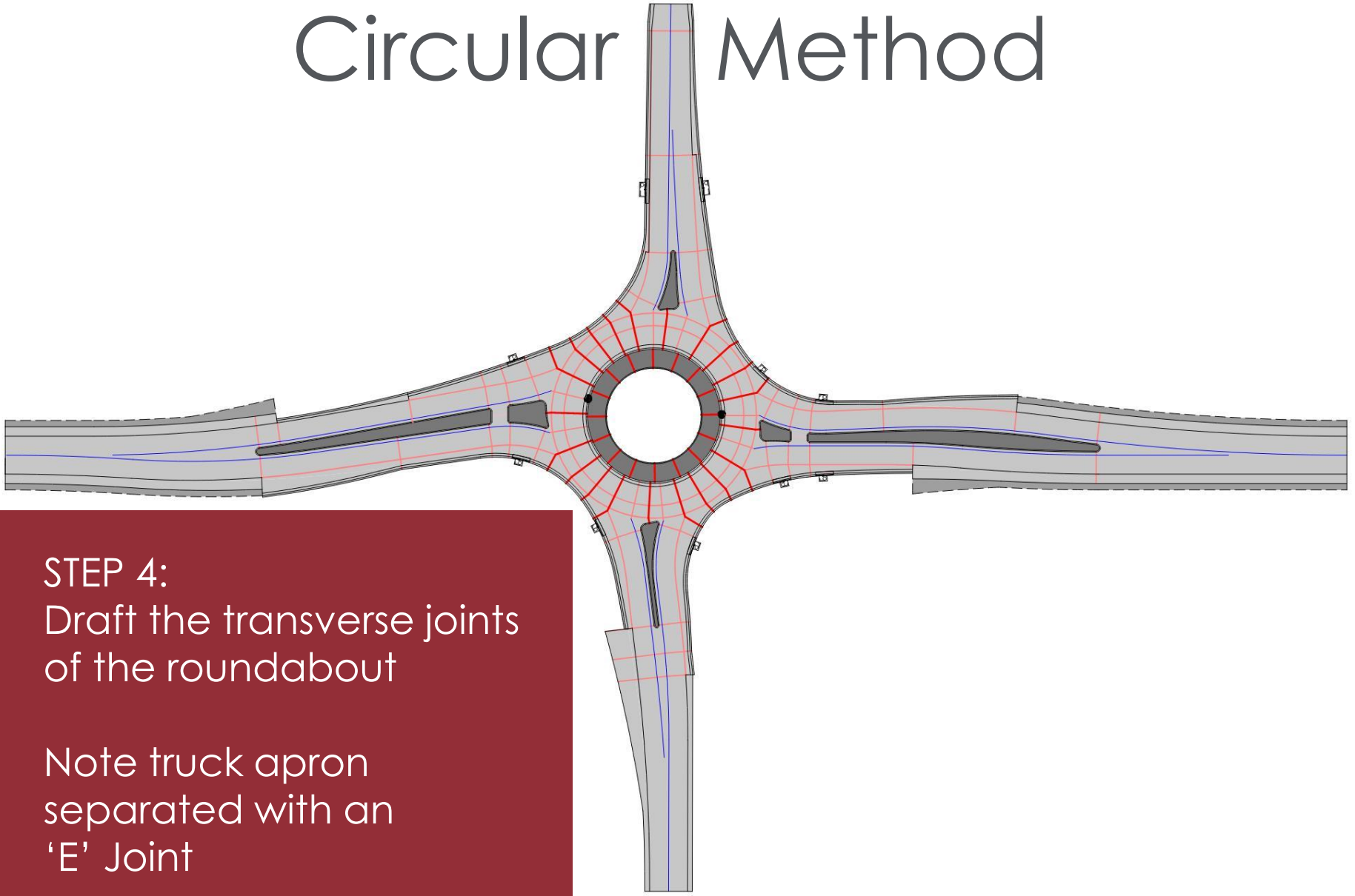
Circular Method



STEP 3:
Draft the critical
transverse joints

- Intersection of leg and circle
- Width changes
- Islands
- Crosswalks
- Other key features

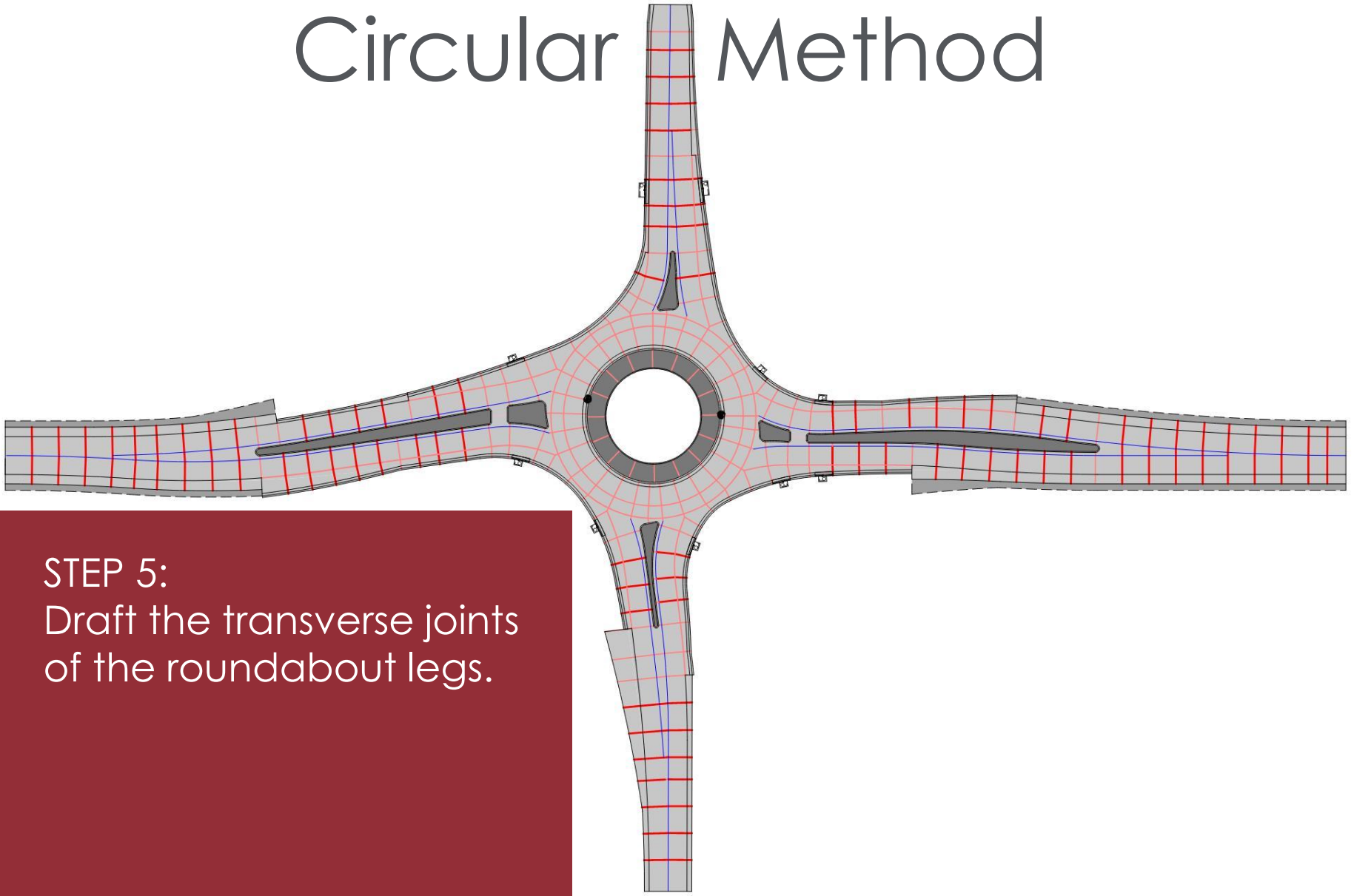
Circular Method



STEP 4:
Draft the transverse joints
of the roundabout

Note truck apron
separated with an
'E' Joint

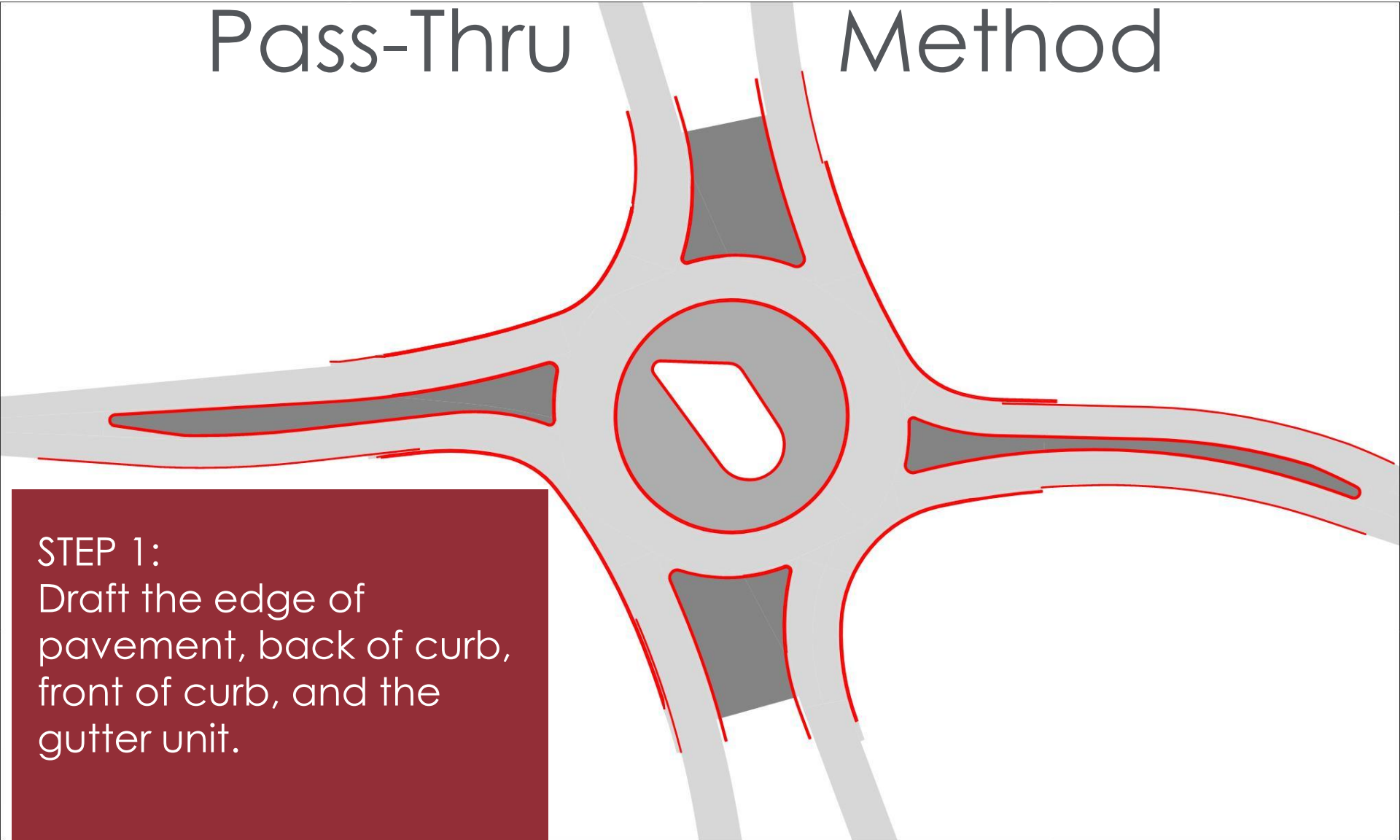
Circular Method



STEP 5:
Draft the transverse joints
of the roundabout legs.

 ROUNDABOUTS AND THE JOINTING PROCESS

Pass-Thru Method

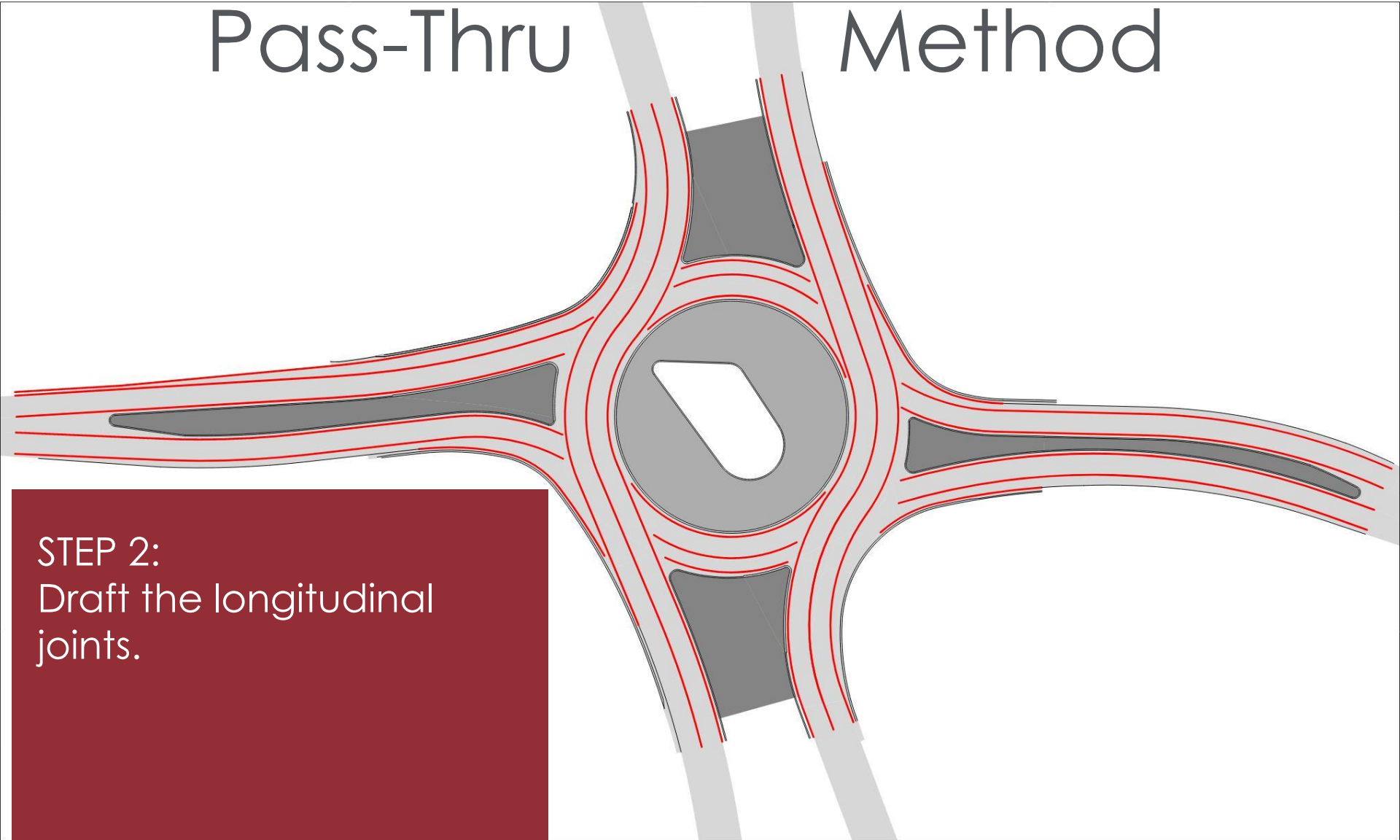


STEP 1:
Draft the edge of
pavement, back of curb,
front of curb, and the
gutter unit.

 ROUNDABOUTS AND THE JOINTING PROCESS

Pass-Thru

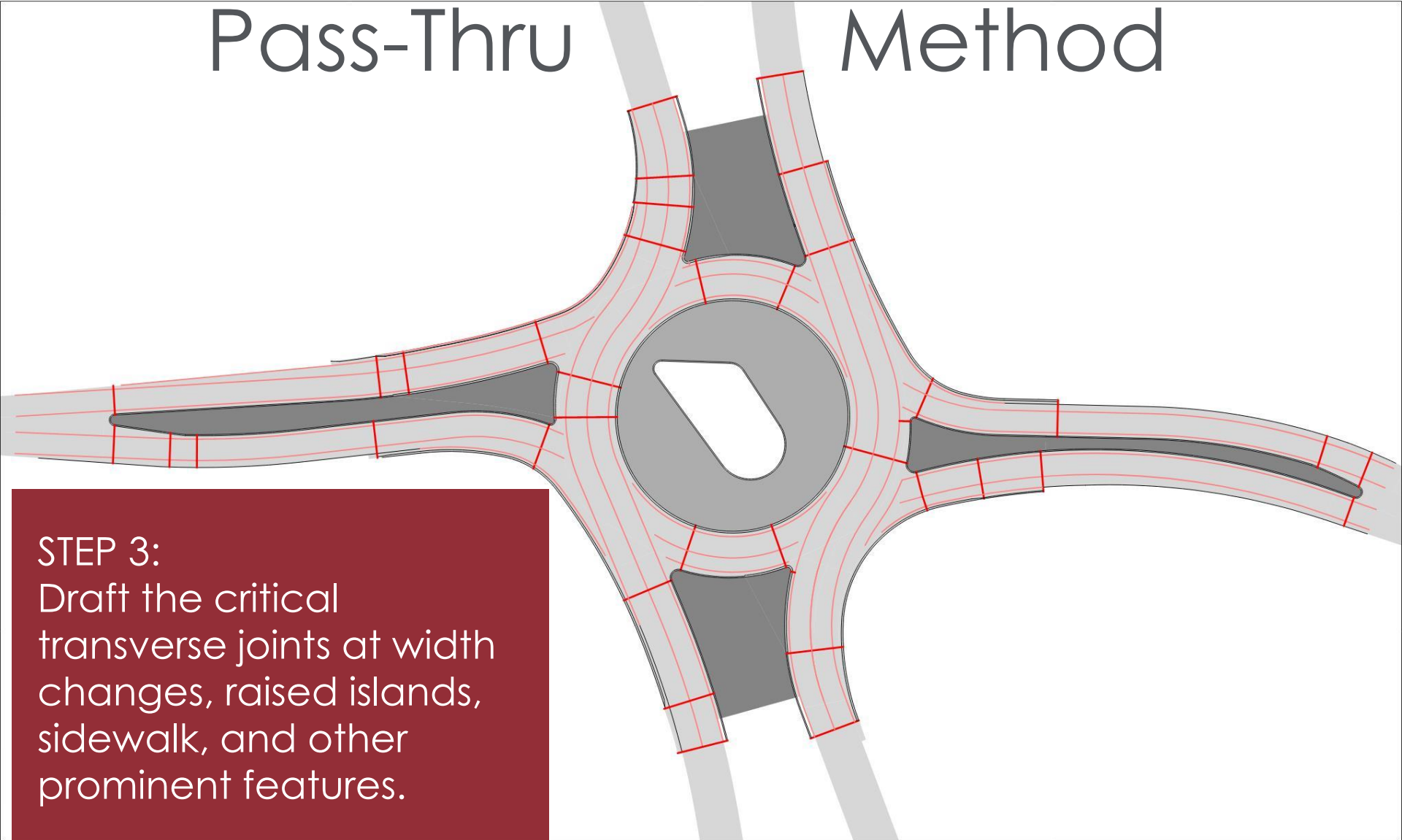
Method



STEP 2:
Draft the longitudinal
joints.

ROUNDABOUTS AND THE JOINTING PROCESS

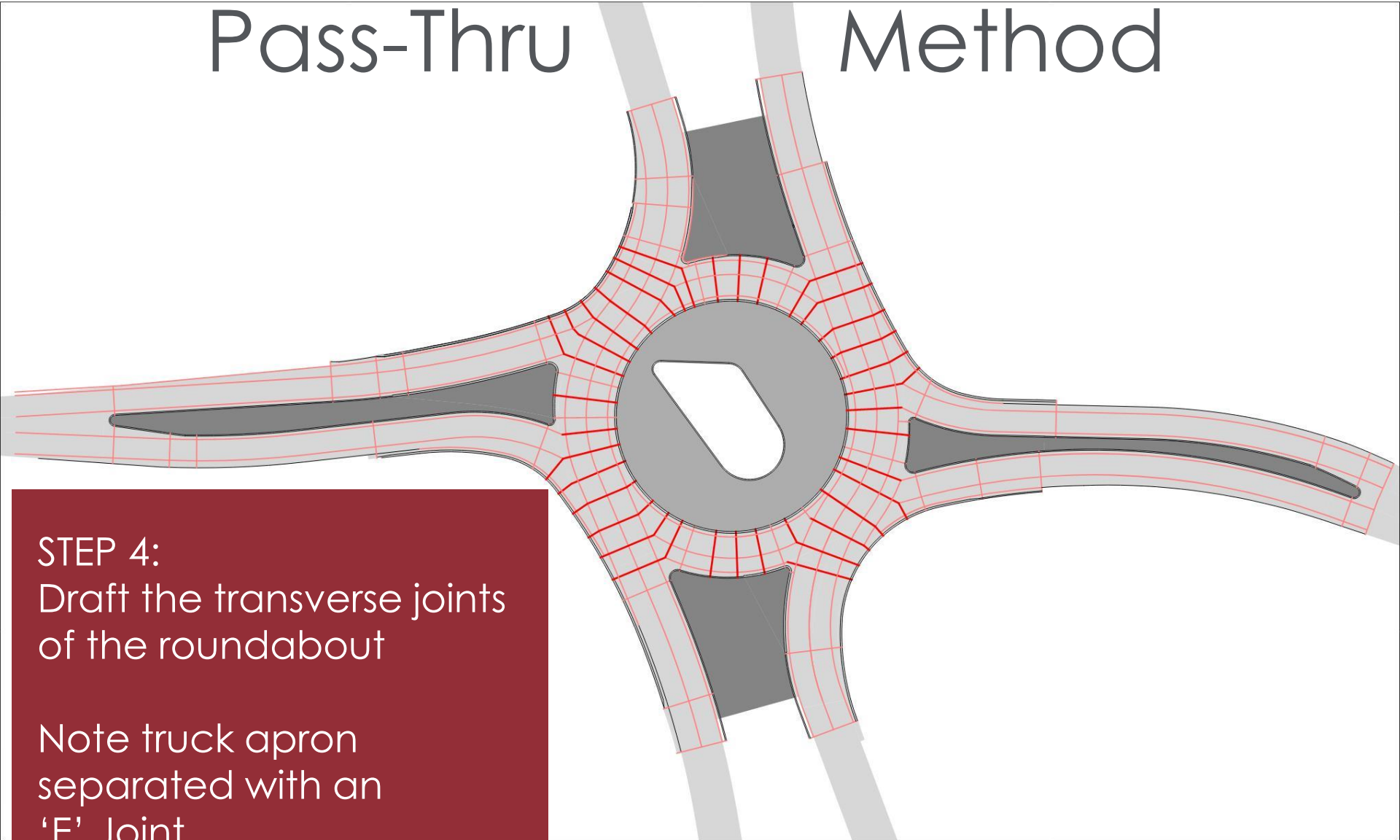
Pass-Thru Method



STEP 3:
Draft the critical transverse joints at width changes, raised islands, sidewalk, and other prominent features.

 ROUNDABOUTS AND THE JOINTING PROCESS

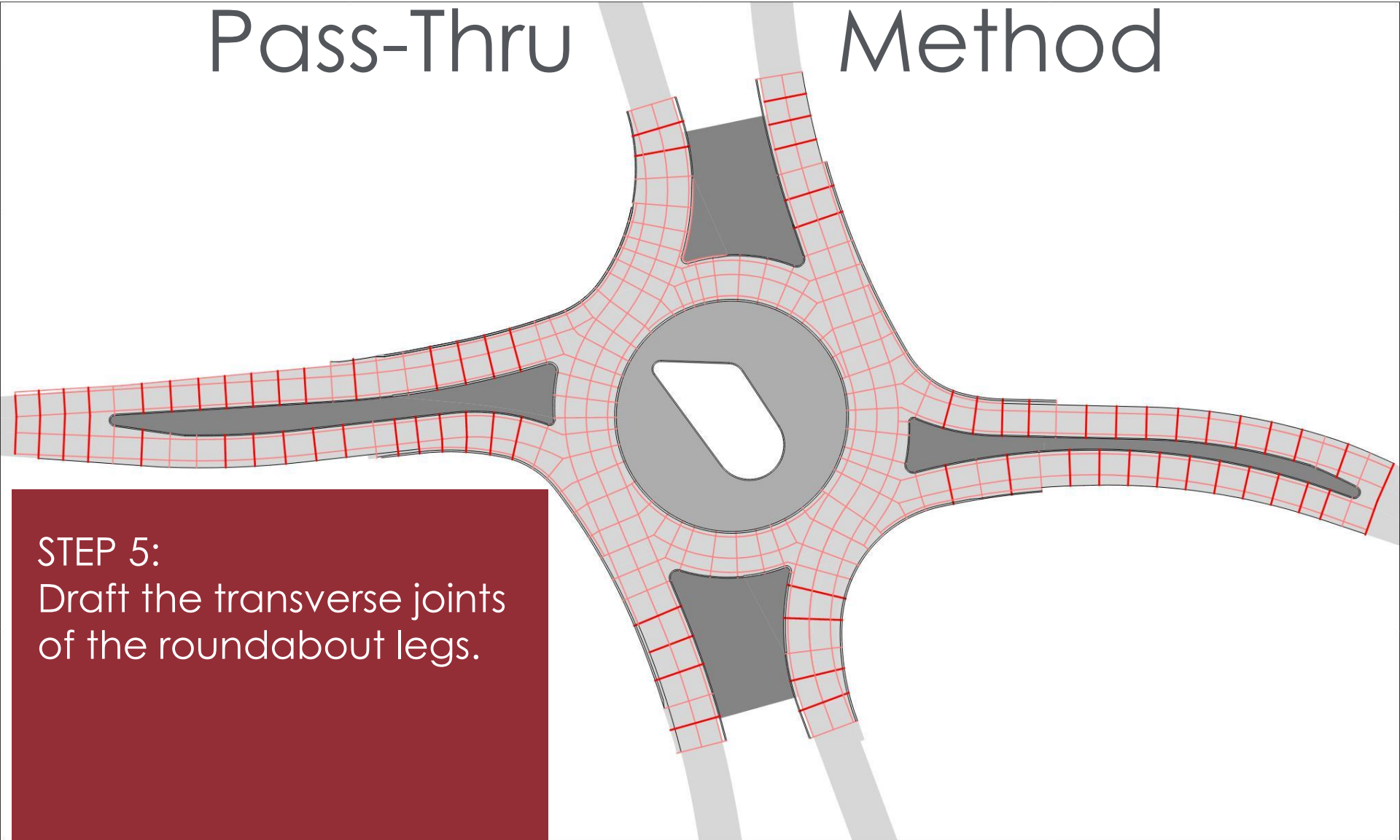
Pass-Thru Method



STEP 4:
Draft the transverse joints
of the roundabout

Note truck apron
separated with an
'E' Joint

Pass-Thru Method

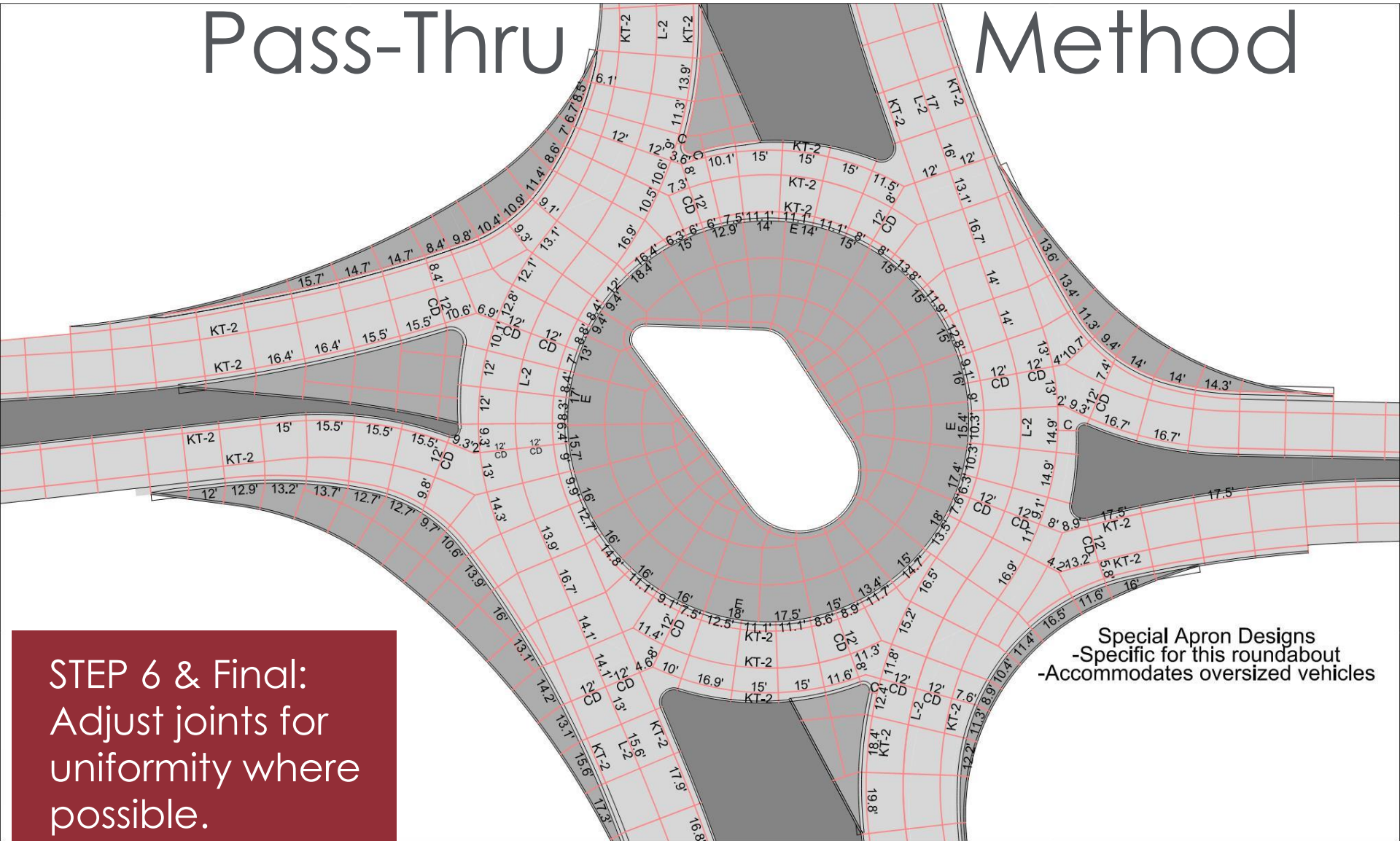


STEP 5:
Draft the transverse joints
of the roundabout legs.

ROUNDBOUTS AND THE JOINTING PROCESS

Pass-Thru

Method



STEP 6 & Final:
Adjust joints for
uniformity where
possible.

Special Apron Designs
-Specific for this roundabout
-Accommodates oversized vehicles

Summary of Jointing Process

- 1 Draft the edge of pavement, back of curb, front of curb, and the gutter unit.
- 2 Draft the longitudinal joints.
- 3 Draft the critical transverse joints at intersection of legs and circle, width changes, raised islands, crosswalk, and other prominent features.
- 4 Draft the transverse joints of the roundabout. Truck apron joints are isolated with an E Joint.
- 5 Draft the transverse joints of the roundabout legs.
- 6 Adjust joints for uniformity where possible.

Tips

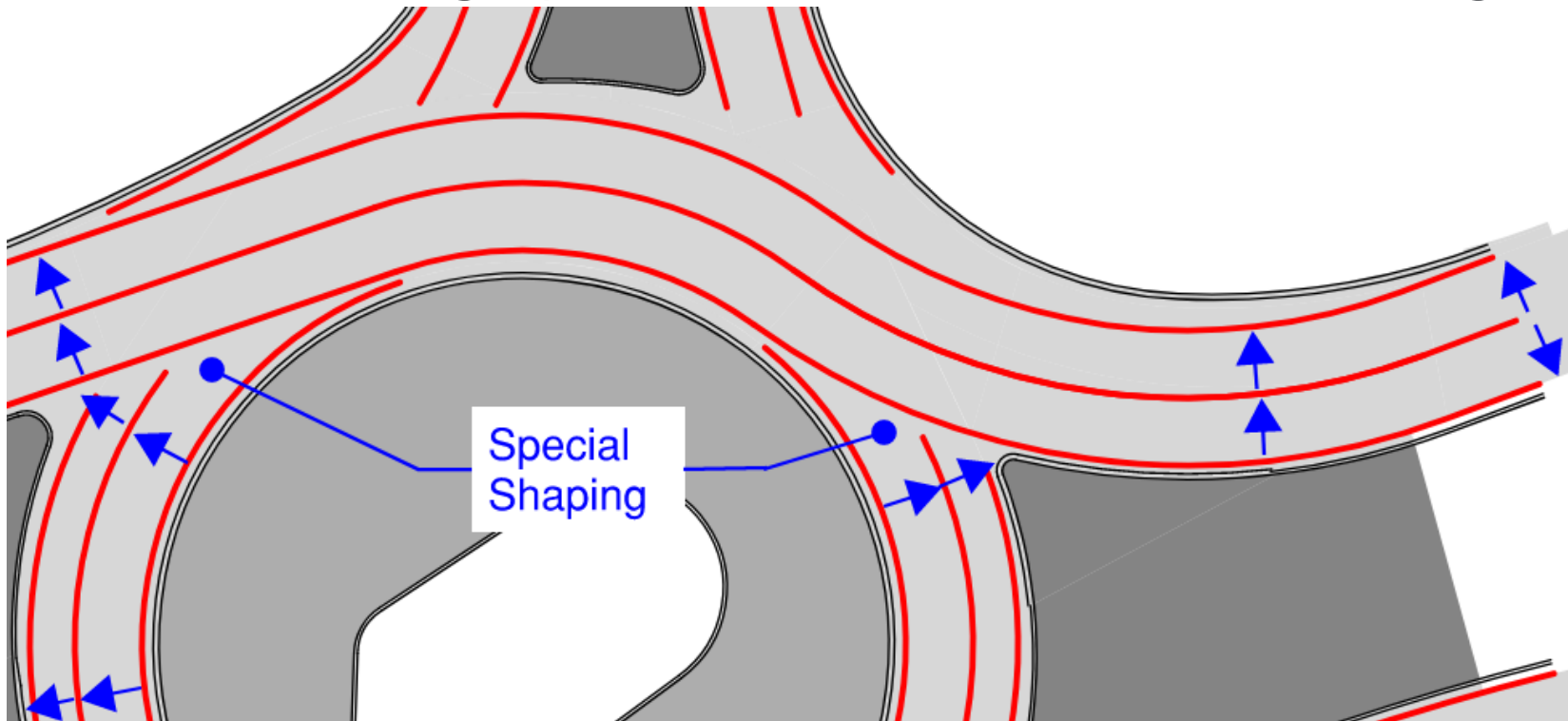
Remember the Rules

- 90-degree angles
 - Minimum 70-degree angles
- Avoid long panels
 - Minimize small panels
 - Controlled by pavement thickness
- Minimum length of joint is 2'
- Minimize odd shapes

Tips

Joint Early

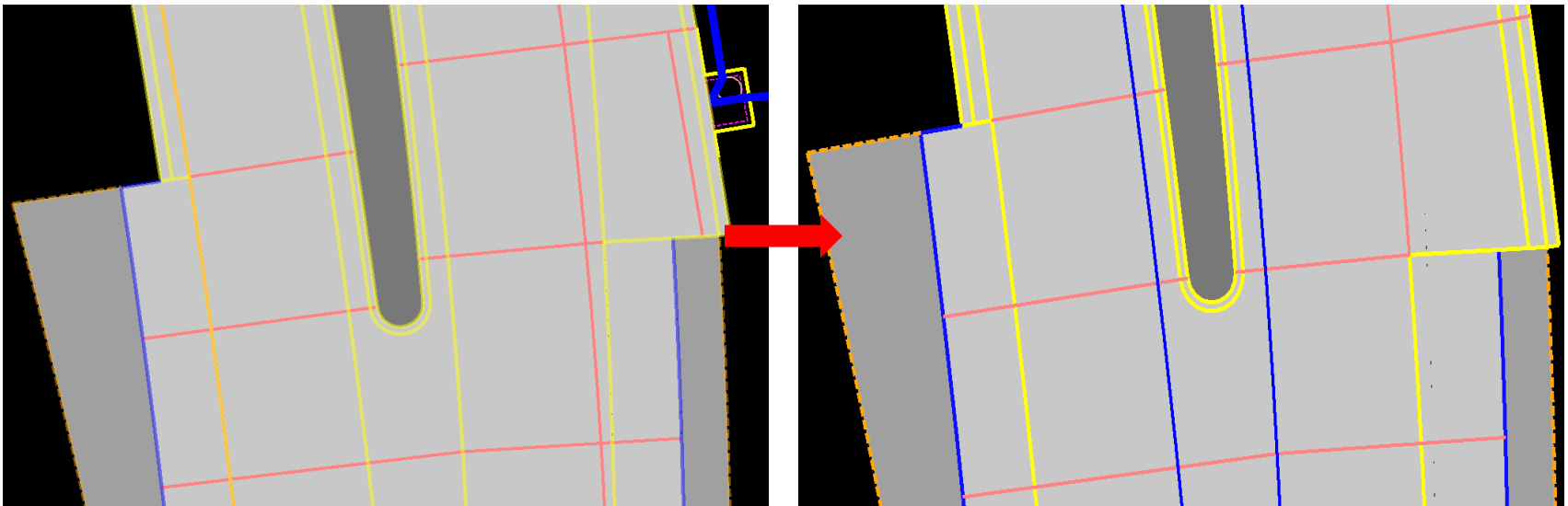
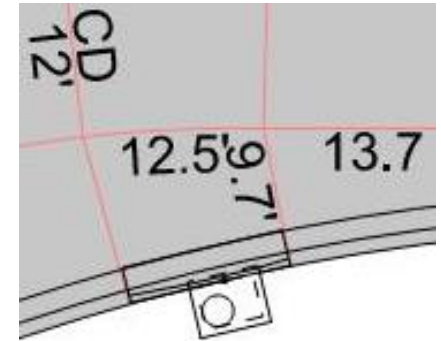
- Don't wait until final plans
- Pass-Through pattern vs. Circle Pattern Staking



Tips

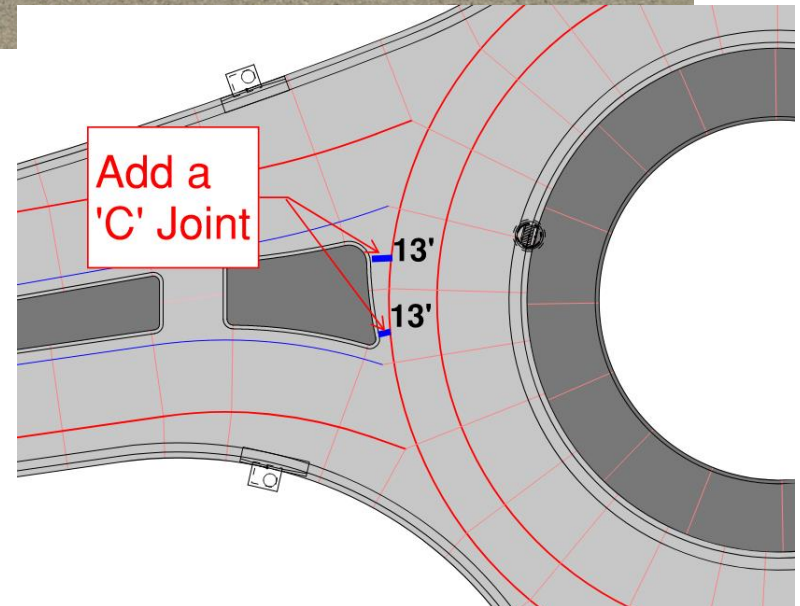
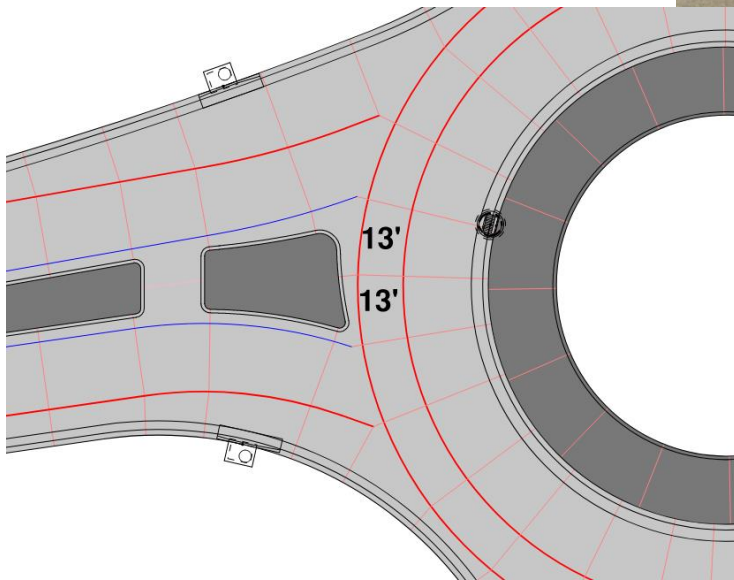
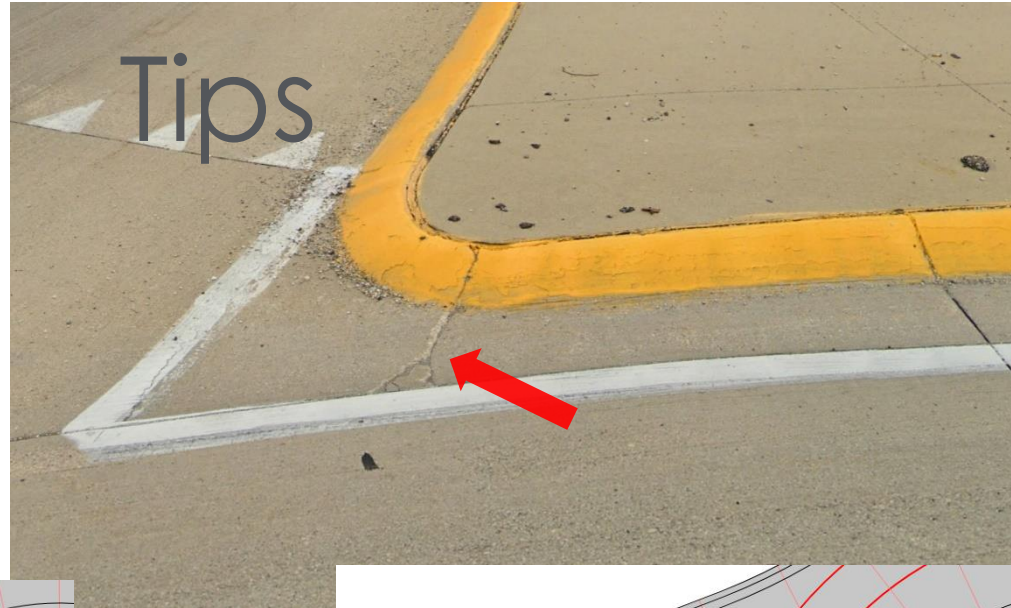
Let jointing impact other elements

- Intake locations
- Curb to shoulder transitions
- Island locations



 ROUNDABOUTS AND THE JOINTING PROCESS

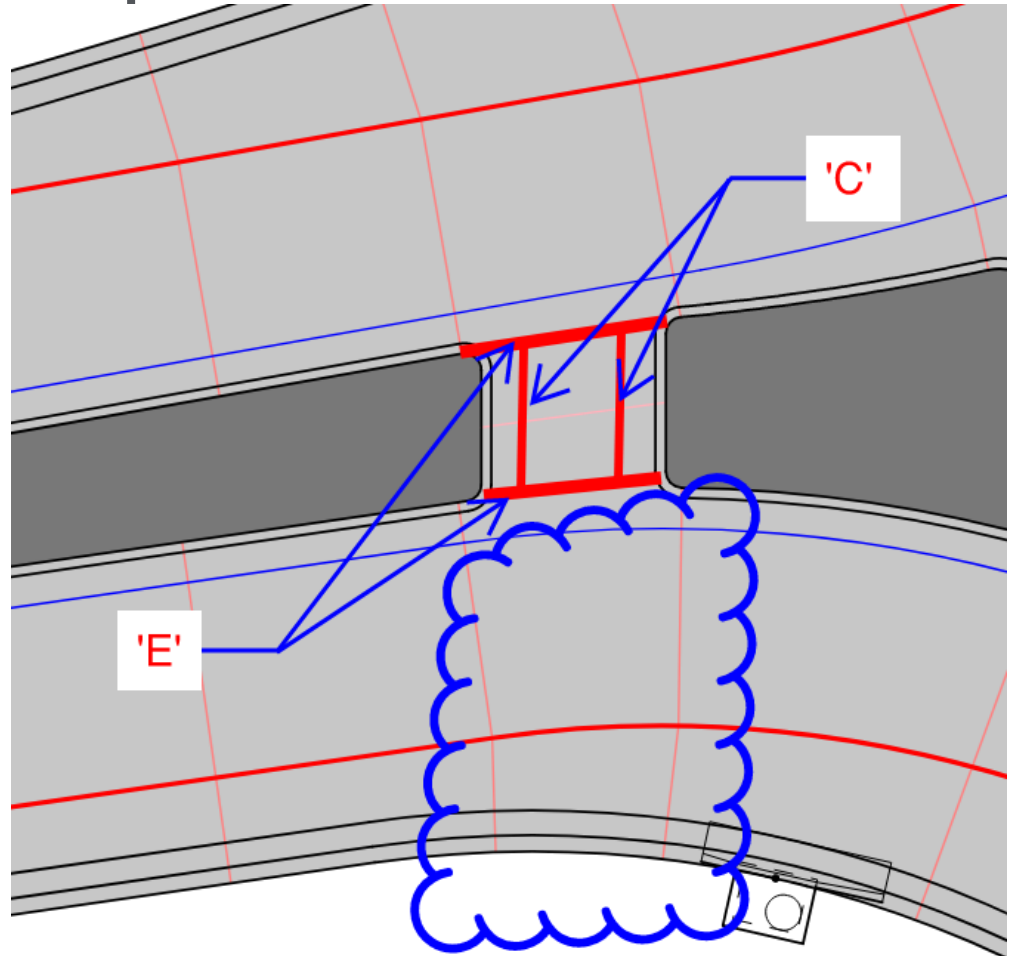
Box outs at
island corners



Tips

Remember the Crosswalks

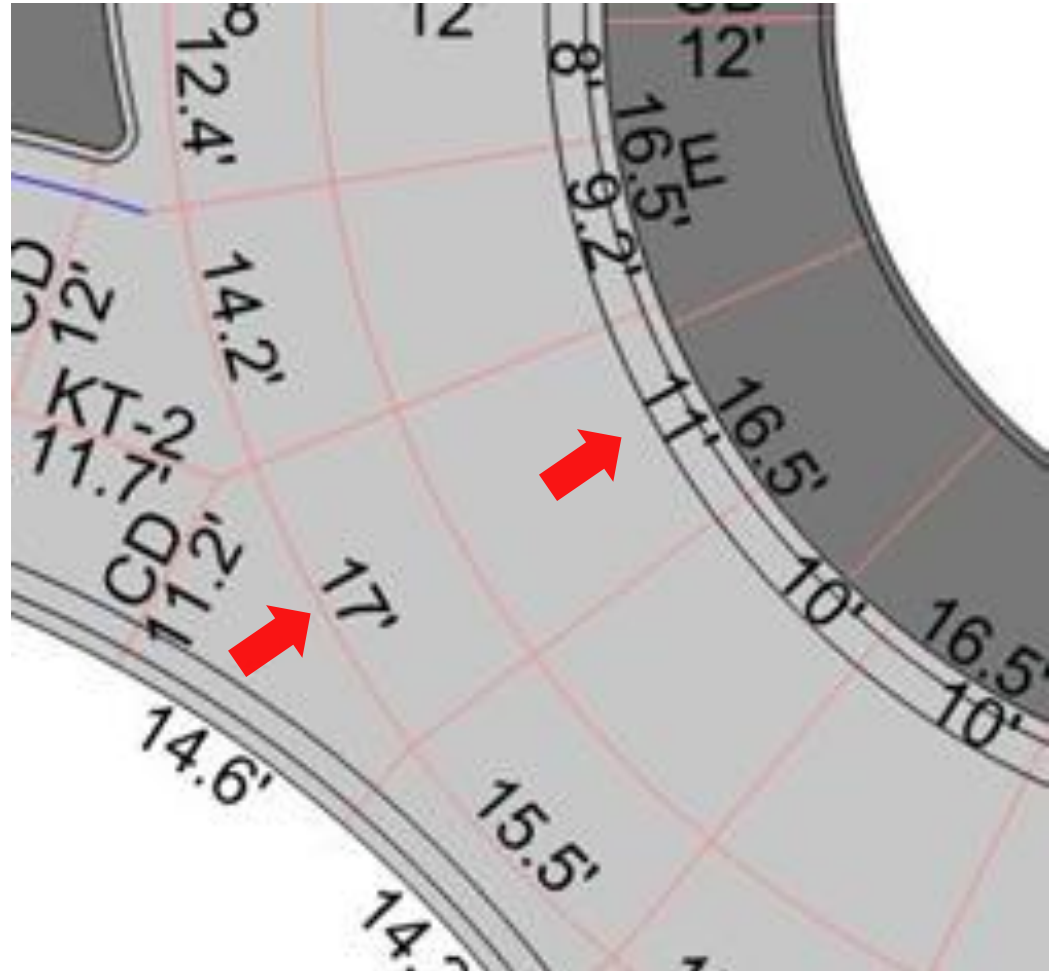
- Isolate crossing refuge area
- Align transverse joints with outside edge of crosswalk



Tips

Dimensions

- Circulating Roadway
 - Outside
 - ... and Inside





THANK YOU FOR YOUR TIME AND ATTENTION



Jason Holst
jason.holst@iowadot.us

Kyle Schrock
kyle.schrock@iowadot.us

ROUNDBABOUTS AND THE JOINTING PROCESS



Three horizontal lines in red, grey, and black.

ROUNABOUTS AND THE JOINTING PROCESS

References/notes

- ✓ E. Ferreebee. "Roundabout Design and Construction" intrans.iastate.edu [Online]. Available: https://intrans.iastate.edu/app/uploads/sites/7/2020/10/Ferreebee-Roundabout_Design_Const_10-20-2020.pdf
- ✓ ACPA Concrete Pavement Wiki, "Joint Layout," [Online]. Available: https://wikipave.org/index.php/Joint_Layout
- ✓ Google Earth. Accessed: January 2024.
- ✓ Iowa DOT Design Manual. Chapter 7A-2, "Jointing Guidelines" [Online]. Available: <https://iowadot.gov/design/dmanual/07a-02.pdf>
- ✓ B. W. Robinson, "ROUNDABOUTS: An Information Guide," Report No. FHWA-RD-00-067, June 2000. [Online]. Available: <https://www.fhwa.dot.gov/publications/research/safety/00067/00067.pdf>