Concrete Roundabouts

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Terminology

Concrete

- Rigid
- Uses cement as binder
- Pro: longer lasting
- Con: higher cost

Asphalt

- Flexible
- Uses liquid asphalt as binder
- Pro: usually lower cost
- Con: requires frequent maintenance & rehabilitation

Why Concrete Roundabouts?

Realize there is a choice

- Materials
- Performance (future maintenance)
- Economics
- Constructability
- Safety
- Aesthetics

Why Concrete Roundabouts?

Let's ask the questions…

1. Where do we typically use concrete pavement? (situations, traffic conditions, applications, etc.)
2. What performance characteristics of concrete pavement make it the best choice for roundabouts?

Where is Concrete Pavement Used?

Answers:

- High traffic areas
- Areas with lots of turning movements
- Situations where we need a “long-term fix”
- Situations where future maintenance must be kept to an absolute minimum
- Areas where future disruption to traffic must be kept to a minimum
- Areas where safety is a priority

Why Concrete for Roundabouts?

Answers:

- Long service life
- Minimal maintenance requirements
- Resistance to surface deformation
  - Doesn’t rut or shove
  - Maintains drainage characteristics
  - No future overlays required (grade issues)
- Ease of construction (constructability)

Why Concrete (cont.)

Answers:

- Superior safety aspects
  - Drainage
  - Skid resistance
  - Lighting
- More aesthetically pleasing
- Faster construction
- Economical over long-term (LCC)

Why Concrete Roundabouts?

Concrete is the perfect material for roundabout applications.

Benefits of Concrete Pavements

- Strength
- Durability
- Ease of Construction
- Life Cycle Cost
- Lighting/Reflectivity
- Safety
- Environmentally Friendly
- Aesthetics

Design of Concrete Roundabouts

- Thickness Design
- Joint Design
  - Layout locations
  - Allow adjustments
- Construction

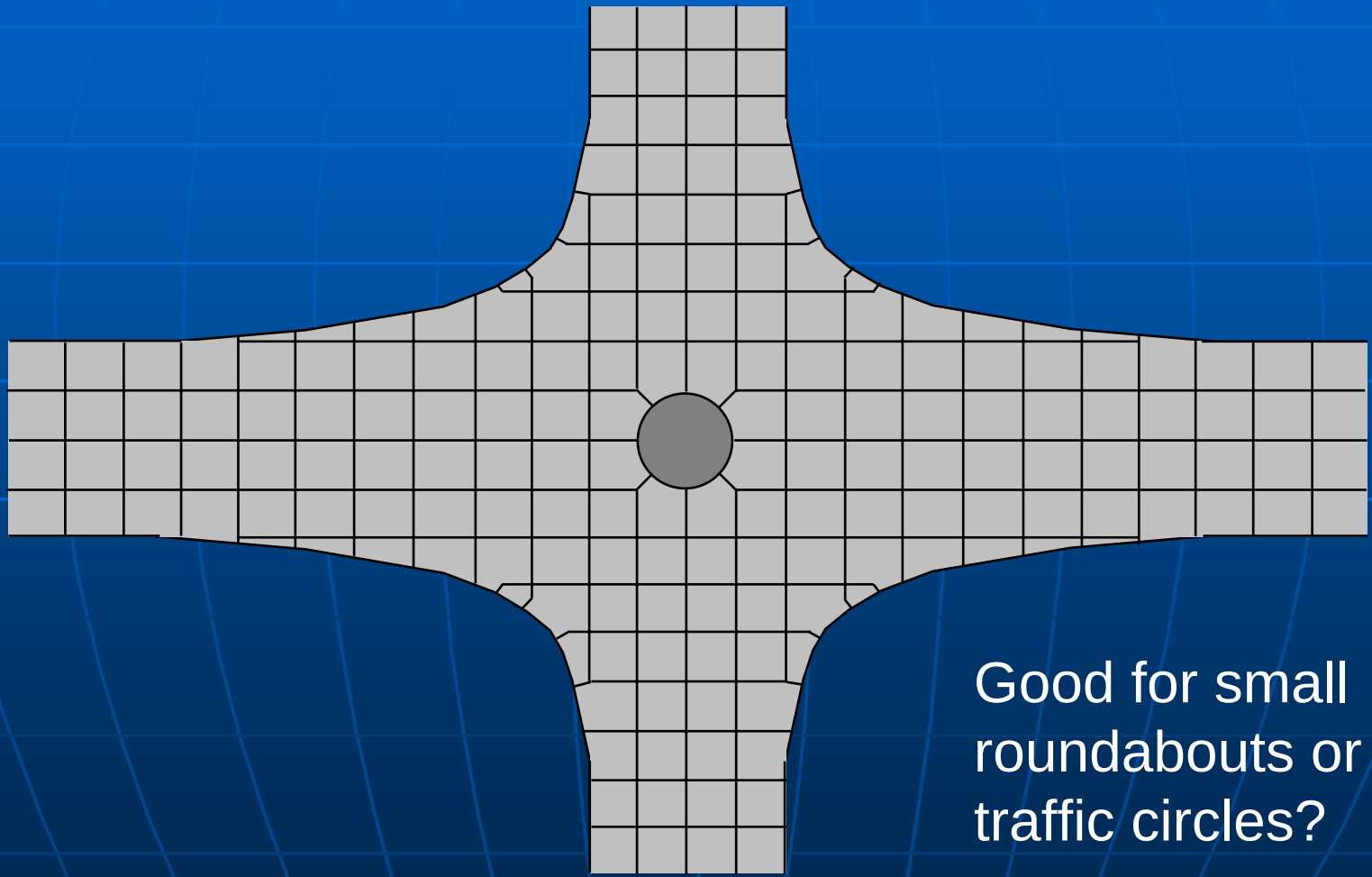
Pavement Thickness Design

- AASHTO
  - 1993 Pavement Design Guide
    - Most current
  - New Mechanistic-Empirical Design Guide
    - Under calibration/implementation
- PCA (ACPA)
  - StreetPave software; will be released Fall 2005

Jointing for Concrete Roundabouts

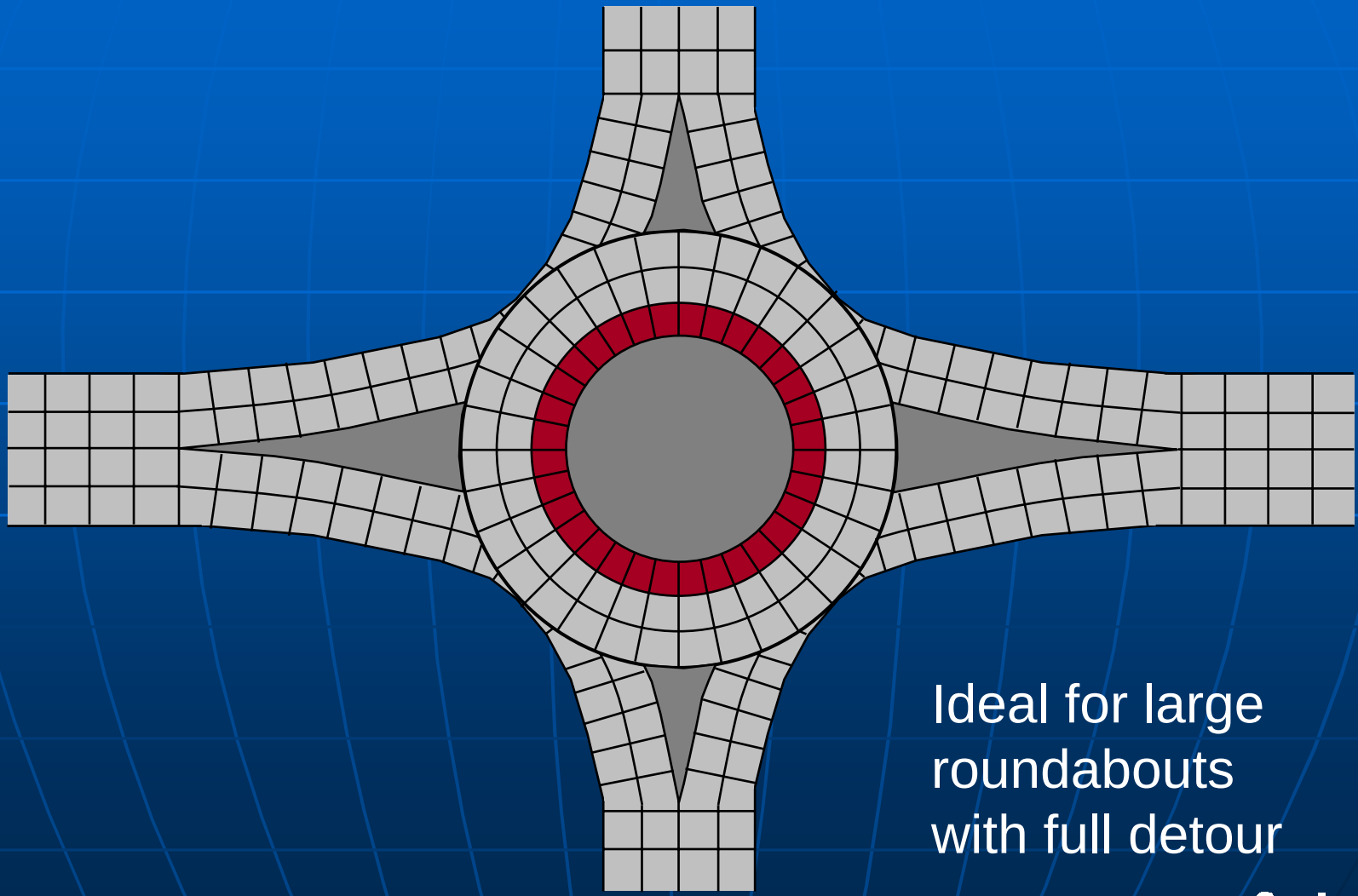
- Decide on joint layout philosophy
  - ~~Like normal intersection~~
  - Isolate circle from legs
  - Pave through, isolate two legs
- Follow 10-step method
- Joints in circular portion radiate from center
- Joints in legs are normal (perpendicular)

Layout Joints as Normal



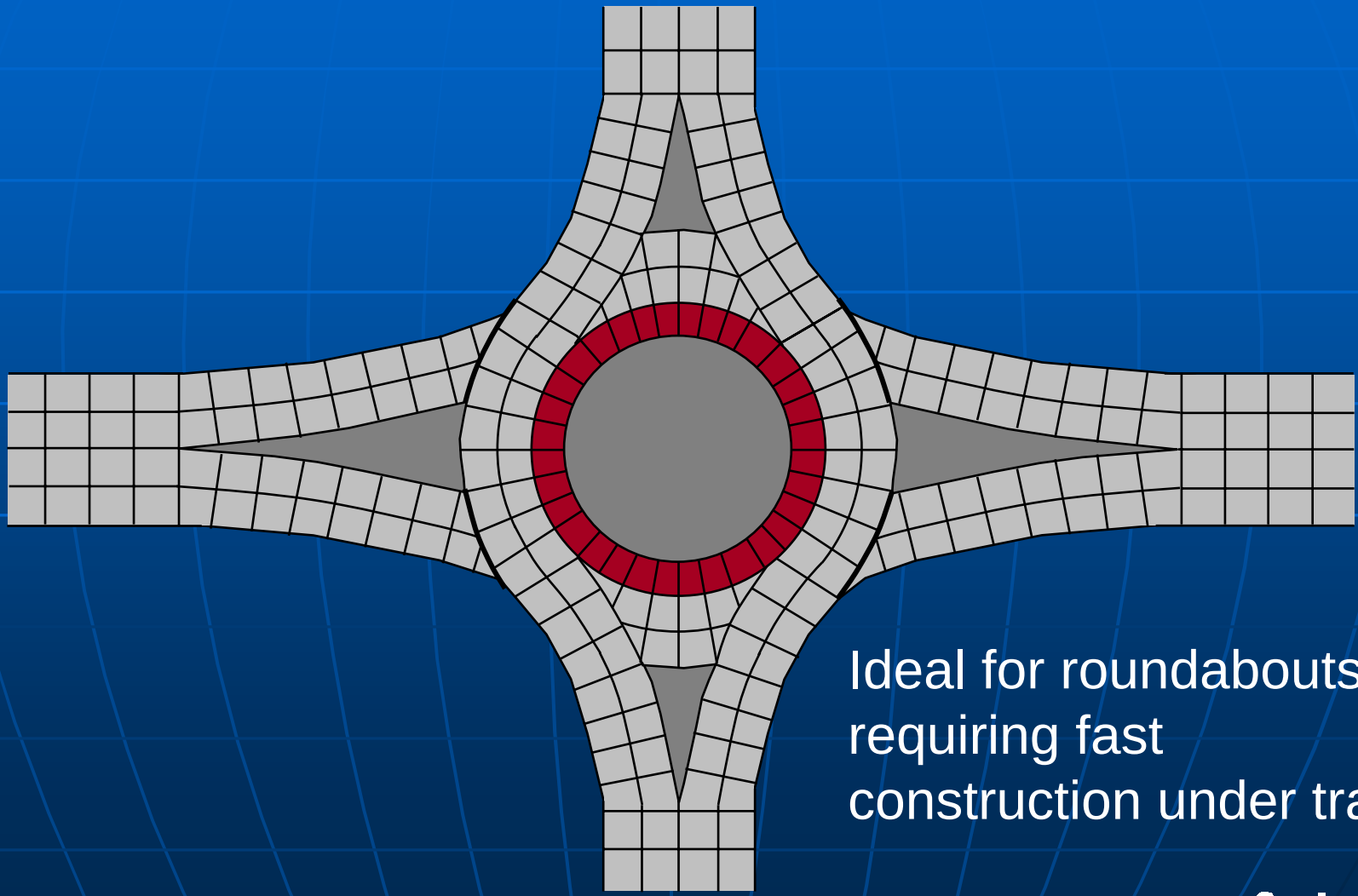
Good for small roundabouts or traffic circles?

Isolate Circle from Legs



Ideal for large roundabouts with full detour

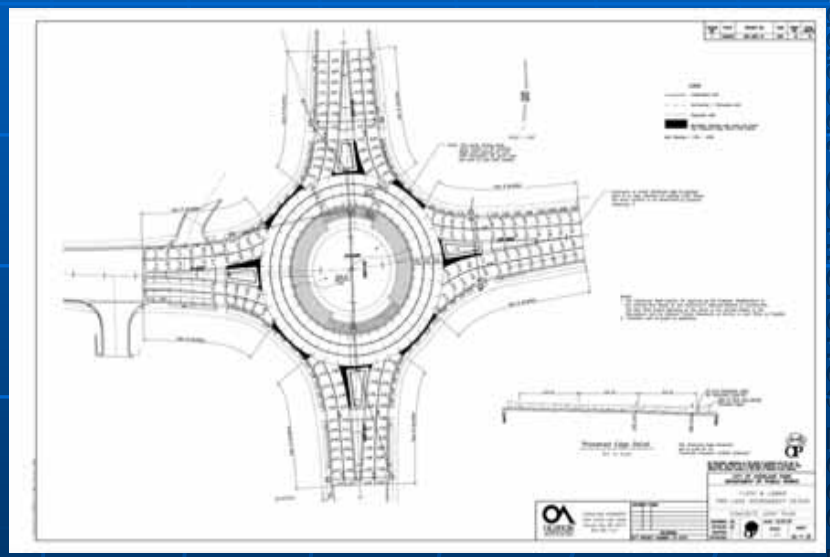
Pave Through



Ideal for roundabouts requiring fast construction under traffic

Concrete Roundabout Jointing

- Develop a jointing plan
  - Bird's eye view
- Remember rules
- Follow the steps
- Be practical!



The Rules of Jointing

Things to Do

- Match existing joints or cracks
- Cut at the proper time
- Place joints to meet in-pavement structures
- Understand can make adjustments joint location!
- Be Practical

Things to Avoid

- Slabs < 1 ft (0.3 m) wide
- Slabs > 15 ft (5.0 m) wide
- Angles < 60º (~90º is best)
  - Do this by dog-legging joints through curve radius points
- Creating interior corners
- Odd Shapes (keep slabs square or pie-shaped)

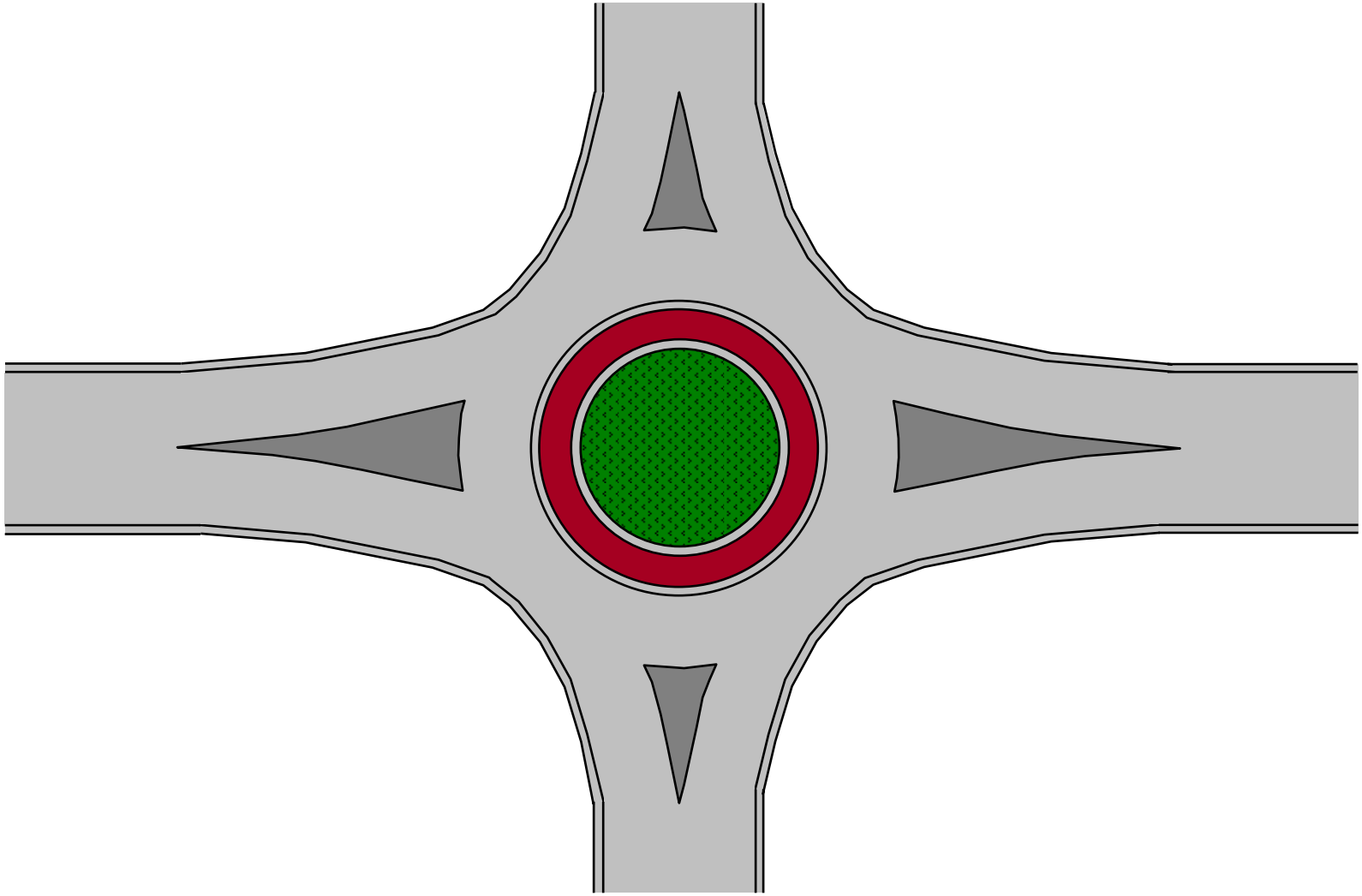
Recommended Max. Joint Spacing

- 24 x T
  - If concrete placed on unstabilized base (i.e. compacted aggregate or granular base)
- 21 x T
  - If concrete placed on stabilized base (i.e. asphalt- or cement-treated)
- 15 ft absolute maximum for street & highway pavements

Step 1

Draw all pavement edge and back-of-curb lines in the plan view.

Draw locations of all manholes, drainage inlets, and valve covers so that joints can intersect these.

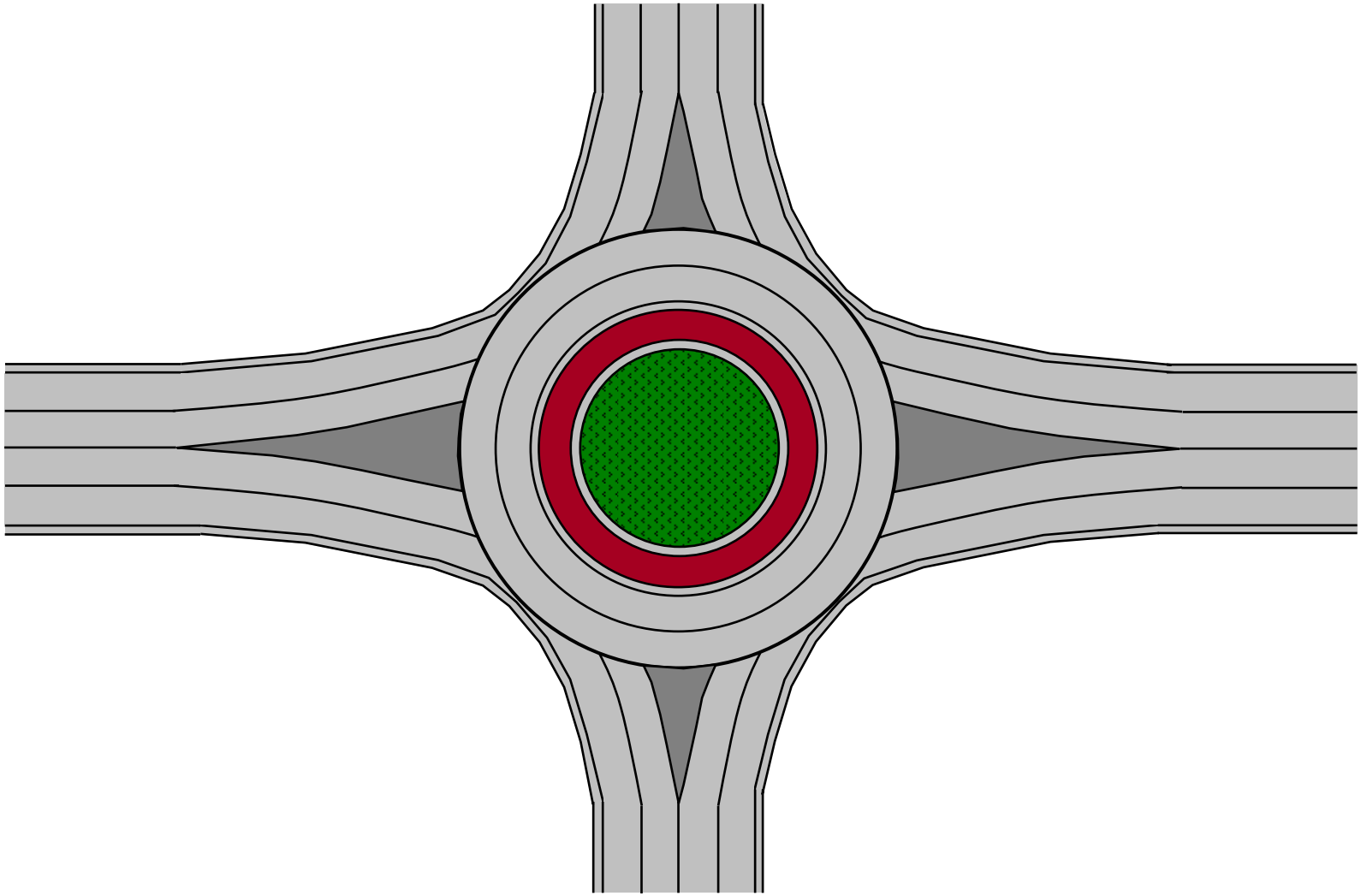


Step 2

Draw all lane lines on the legs and in the circular portion.

- If isolating circle from legs, do not extend these through the circle.
- If using “pave-through” method, determine which roadway will be paved through.

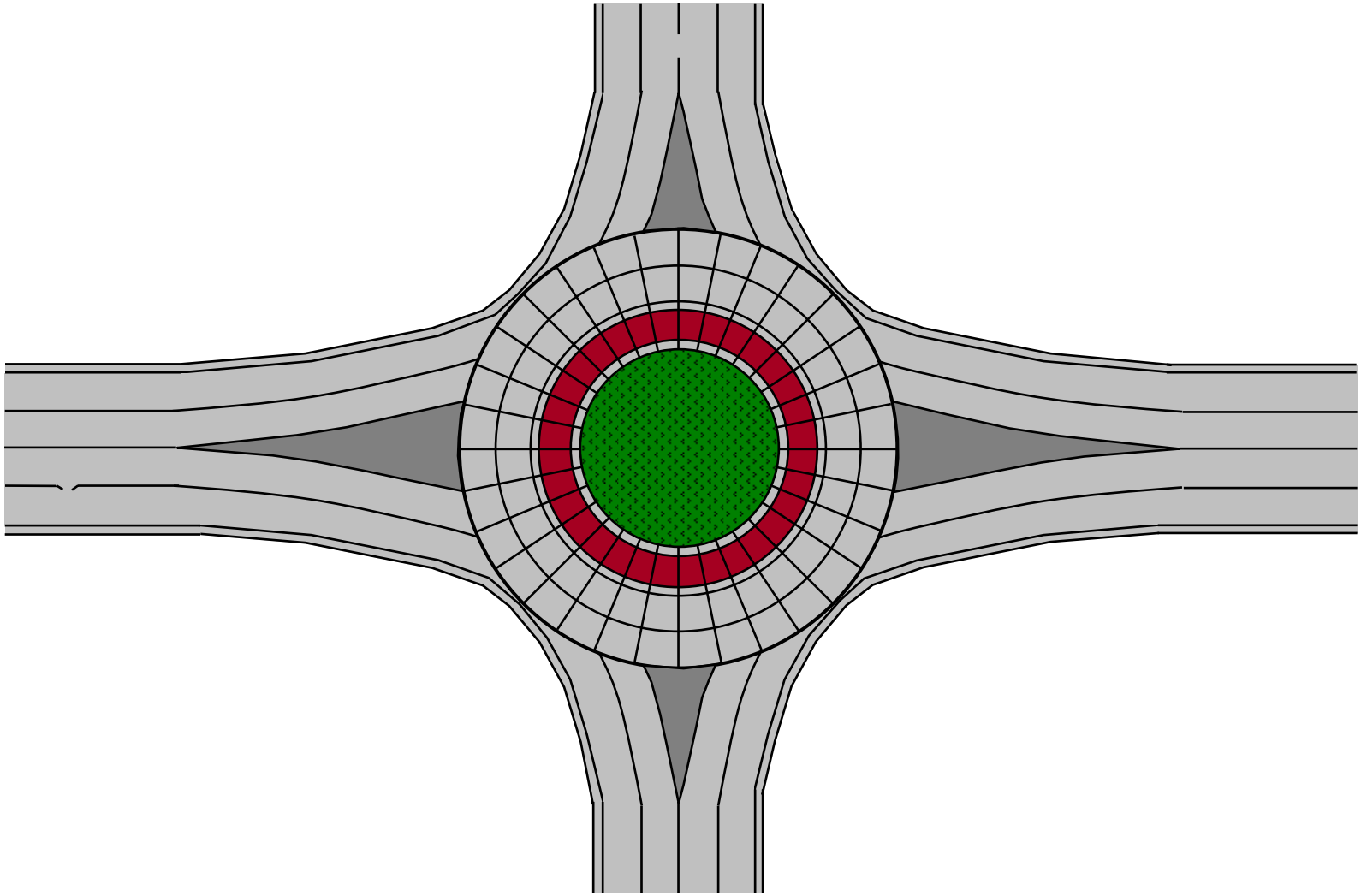
Make sure no distance is greater than the maximum recommended width.



Step 3

In the circle, add “transverse” joints radiating out from the center of the circle. Make sure that the largest dimension of a pie-shaped slab is smaller than the maximum recommended.

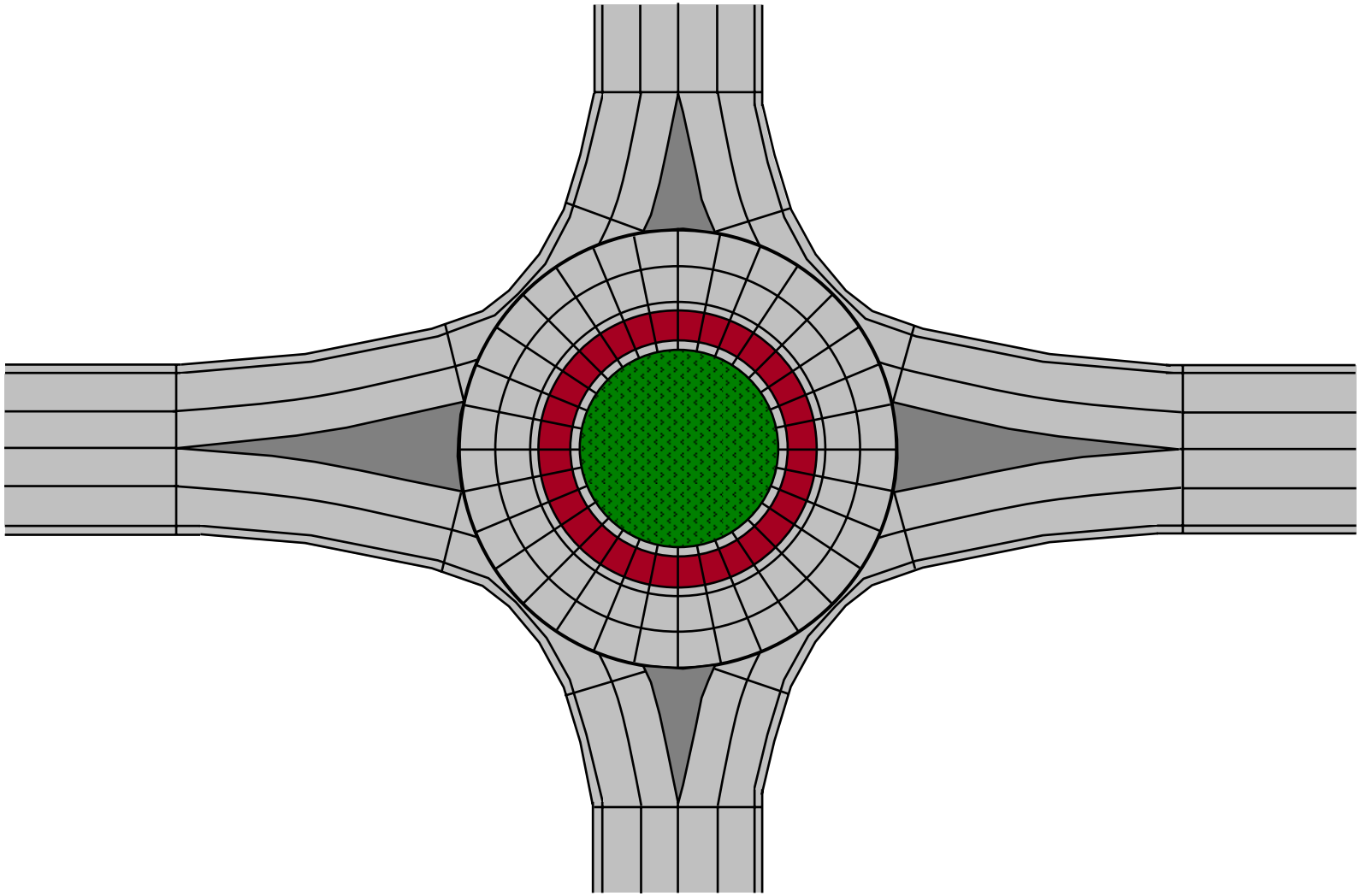
Extend these joints through the back of the curb & gutter.



Step 4

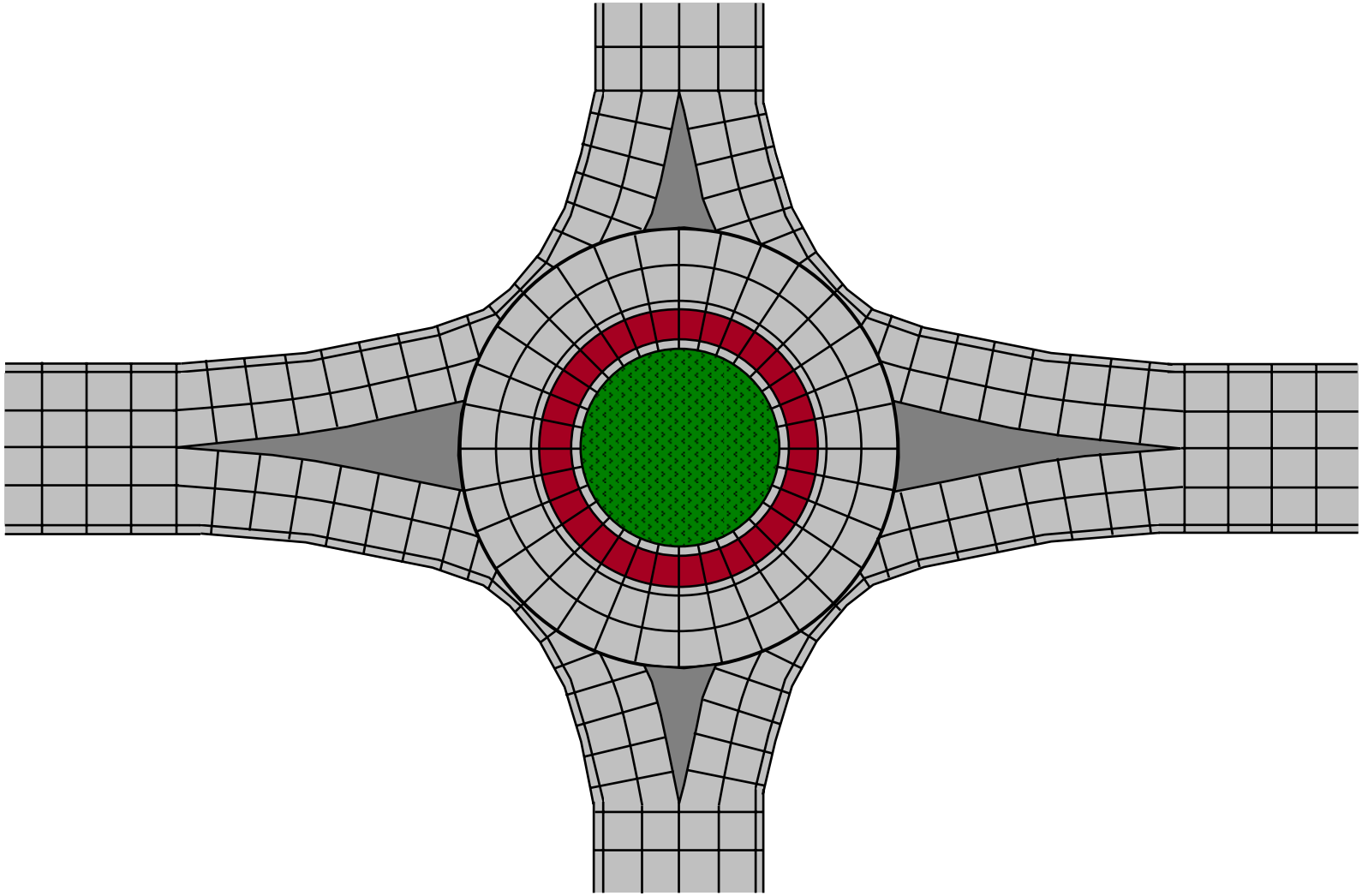
On the legs, add transverse joints at all locations where a width change occurs in the pavement (at bullnose of median islands, begin & end of curves, tapers, tangents, curb returns, etc.).

Extend these joints through the back of the curb & gutter.



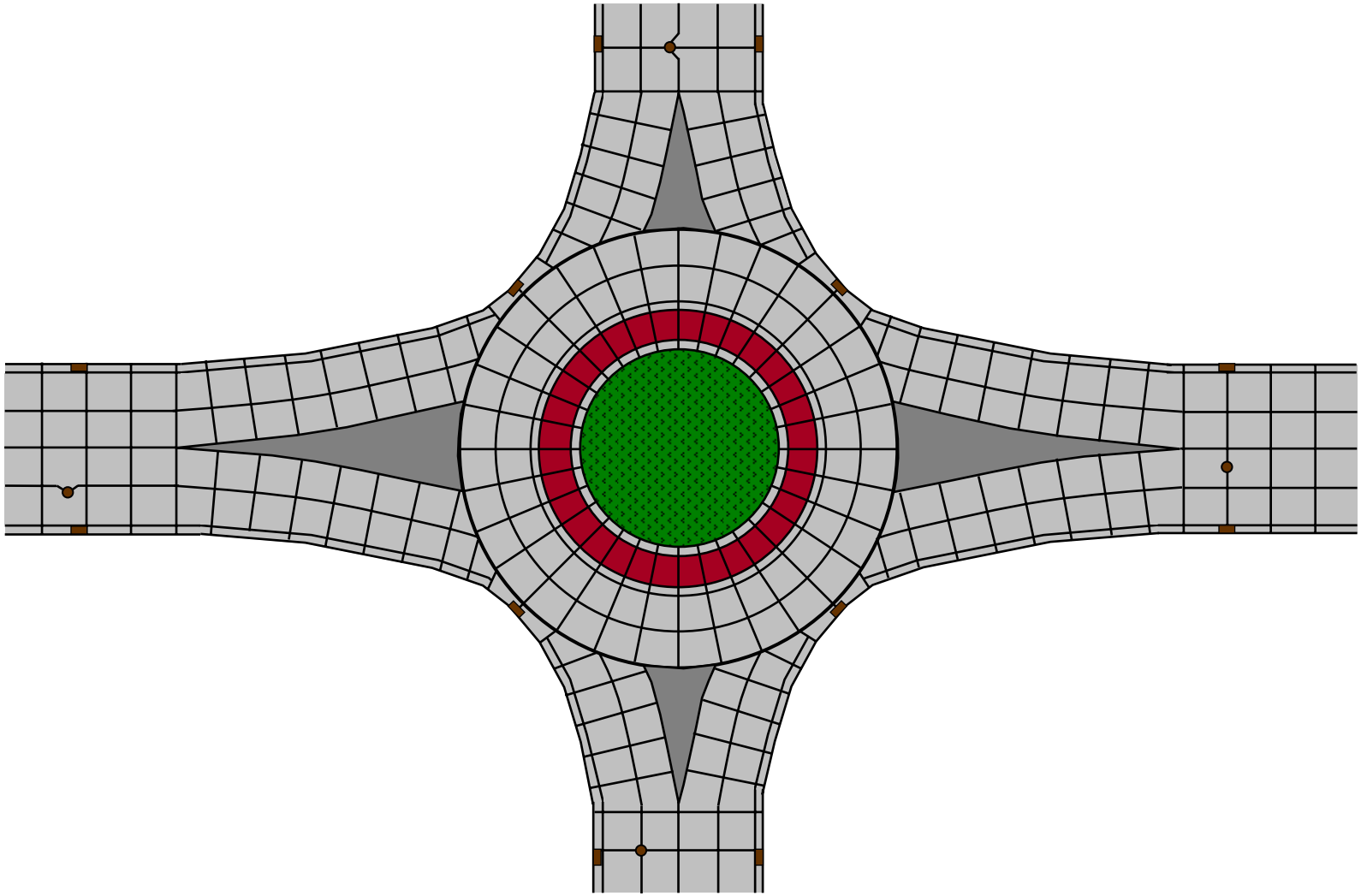
Step 5

Add transverse joints beyond & between those added in Step 4. Space joints out evenly between other joints, making sure to not violate maximum joint spacing.



Step 6

Make adjustments for in-pavement objects, fixtures, and to eliminate L-shapes, small triangular slabs, etc.



Case Study

- Roundabout at 110th Street & Lamar Avenue in Overland Park, Kansas
  - Part of new convention center (showcase)
- National Pavement Award Winner for Excellence in Concrete Pavements

Rough Grading

- Subgrade preparation & base course construction complete
- Concrete curb under construction

Curb Placement – Widened Gutter

Concrete Roundabout Opened to Traffic

More Info

- "Concrete Roundabout Pavements: A Guide to their Design and Construction," Roads and Traffic Authority, New South Wales, Australia, April 1996.
- Available from: www.bookshop.nsw.gov.au

Questions?

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