

# COMMON PROBLEMS POSSIBLE SOLUTIONS

---

# Temporary Accommodation Principles

- **Accessibility:** Site access for pedestrians and bicyclists (including those with disabilities) with minimal inconvenience and indirection. Also, access for emergency services.
- **Continuity:** A route free of physical interruptions both spatially and temporally.
- **Economic Feasibility:** Accomplishing the construction at reasonable cost to the citizens of your jurisdiction, bearing in mind the hidden costs of inaccessibility and (ped/bike) crashes.
- **Separation:** Physical methods to reduce conflicts between ped/bike traffic, high-speed motorized traffic, and hazardous portions of the work zone.

*These often conflict!*

# Pedestrians Not Separated from Work Area

## Problem



Source: Wisconsin DOT

## Possible Solution



Source: Wikimedia Commons

- European guidelines strongly emphasize the need for fencing to delineate and separate the work area from the pedestrian pathway.

# Trenches 1

## Problem



Source: Wikimedia Commons

## Possible Solution



Source: Wikimedia Commons

- Tape is not detectable for visually impaired.
- Tape should only be used as a delineator in emergencies.
- Portable fence panels readily available from rental yards.

# Trenches 2

Problem



Possible Solution



# Pedestrians Led Into Closed Area

## Problem



Source: [www.pedbikeimages.org/](http://www.pedbikeimages.org/) Dan Burden

## Possible Solution



Source: American Traffic Safety Services Association (ATSSA)

# Non-Detectable Sidewalk Closure

## Problem



Source: Wisconsin DOT

## Possible Solution



Source: PSS (Plastic Safety Systems)







# Tripping Hazards

## Problem



Source: John Shaw

## Possible Solution



Source: Handiramp.com

# Open Manholes 1

## Problem



[http://media.jrn.com/images/cni-wnt\\_poodogs1\\_0517\\_ct.jpg](http://media.jrn.com/images/cni-wnt_poodogs1_0517_ct.jpg)

## Possible Solution



<http://www.unitedsafetyshop.com/wp-content/uploads/2013/07/Avalon-Clear-Path-Barrier-3.jpg>

# Open Manholes 2

## Problem



Source: Wikimedia Commons

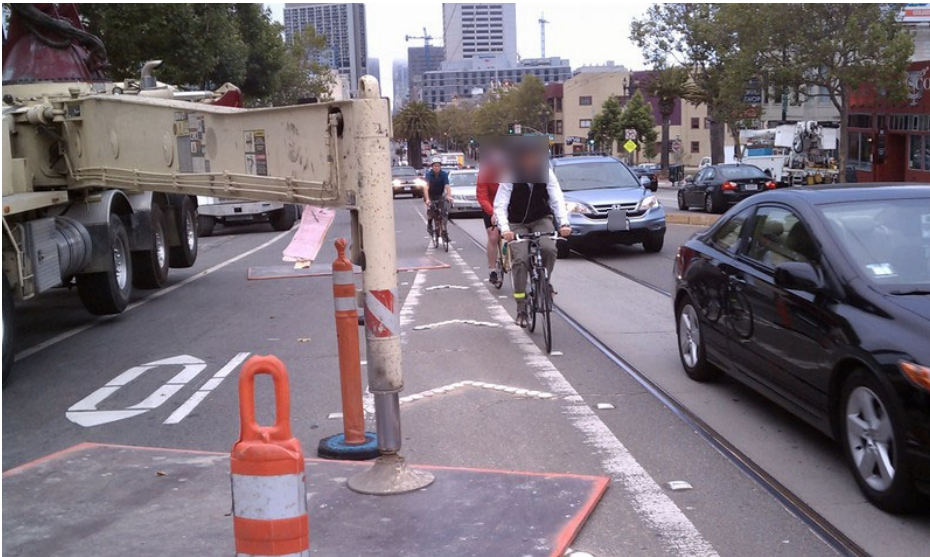
## Possible Solution



Source: [www.pedbikeimages.org/](http://www.pedbikeimages.org/)Dan Burden

# Street Plates

## Problem



## Possible Solution



Source: [Platelocks.com](http://Platelocks.com)

# Loss of Access to Properties: 1

## Problem



Source: Wisconsin DOT

## Possible Solution



Source: IRF Webinar Pedestrian Safety in Work Zones April 29, 2015

# Loss of Access to Properties: 2

## Problem



[http://www.birchcliffnews.com/wp-content/uploads/2012/08/DSC\\_0154.jpg](http://www.birchcliffnews.com/wp-content/uploads/2012/08/DSC_0154.jpg)

## Possible Solution



# Loss of Access to Properties: 3

## Problem



Source : Charles Akben-Marchand, Images of Centretown

## Possible Solution



Source: Wikimedia Commons



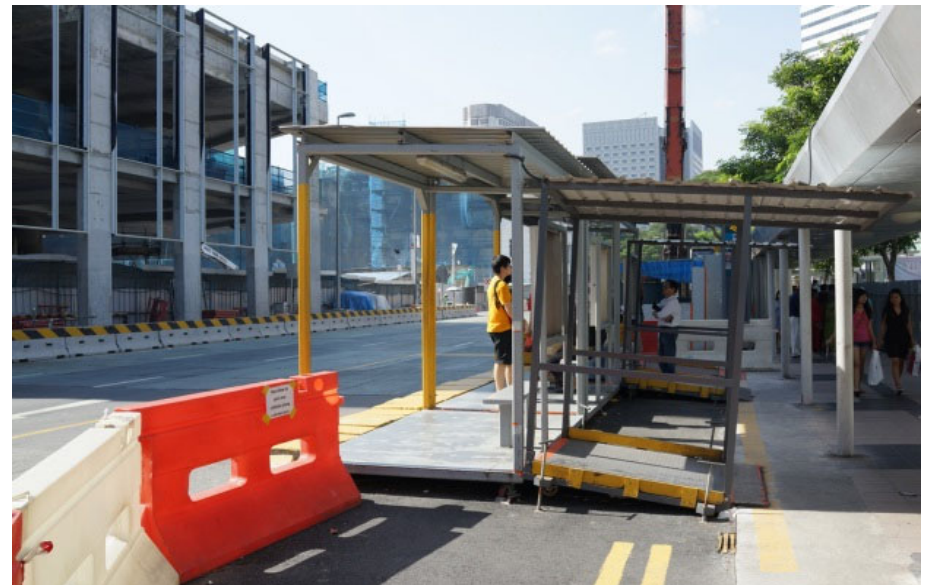
# Transit Passengers Boarding in Closed Areas

## Problem



Source: Wisconsin DOT

## Possible Solution



Source: photobucket.com

# Ped Visibility & Glare During Night Work

## Problem



Source: IRF Webinar: Pedestrian Safety in Work Zones

## Possible Solution

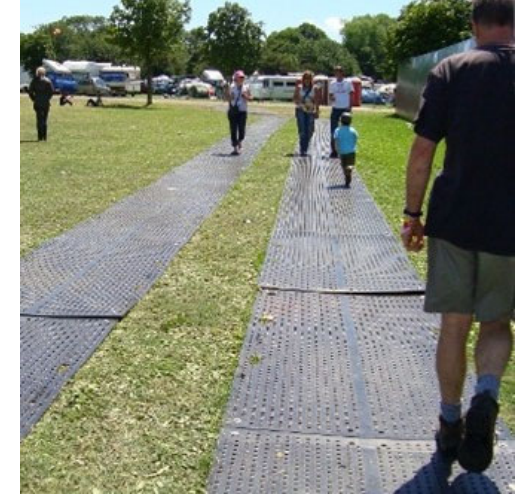


Source: flickr.com/photos/aeschylus18917/3204156550

HOW CAN WE IMPROVE?

---

# Some solutions come in boxes.



Source: Oxford Plastics LLC

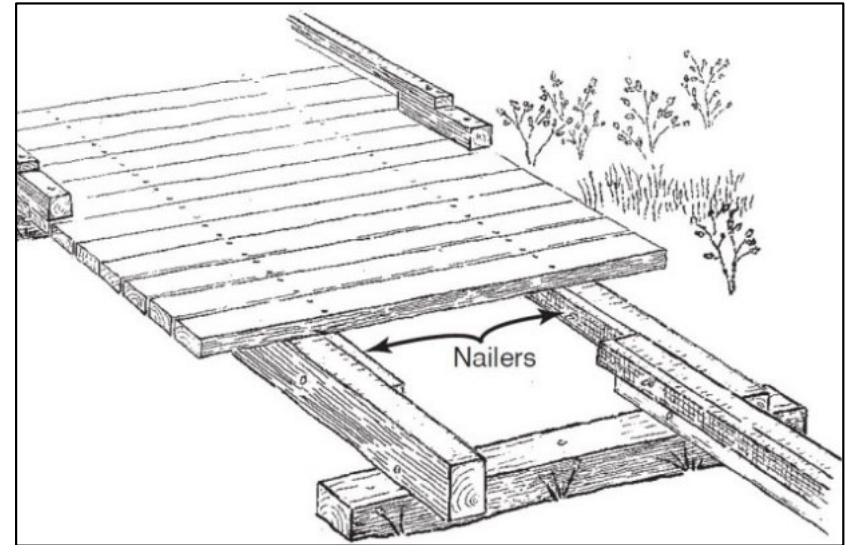


Source: Oxford Plastics LLC

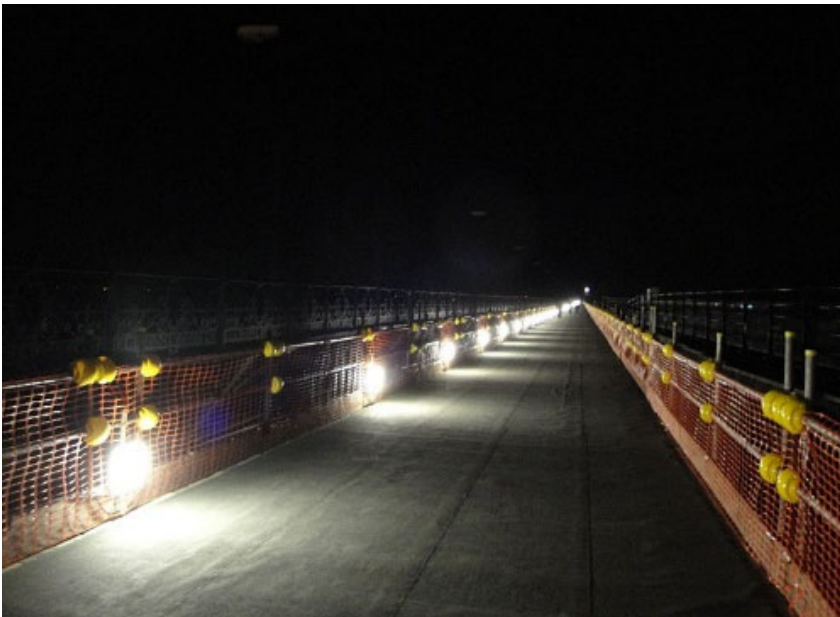
# Some solutions can be fabricated on site.



Source: Wikimedia Commons/Work\_On\_Darby\_Street,\_Auckland



Source: FHWA.dot.gov/environment/recreational\_trails/publications



Source: Wikimedia Commons



Source: flickr.com

# Materials Storage



- Is it purely a field engineering issue?
- Could a materials storage area be identified on the PS&E?

# Benches



- Pedestrian detours require additional physical effort.
- If the detour is long or the grade is steep, peds may need a resting place.

# Covered Walkways



Source: City of Seattle



Source: American Traffic Safety Services Association (ATSSA)

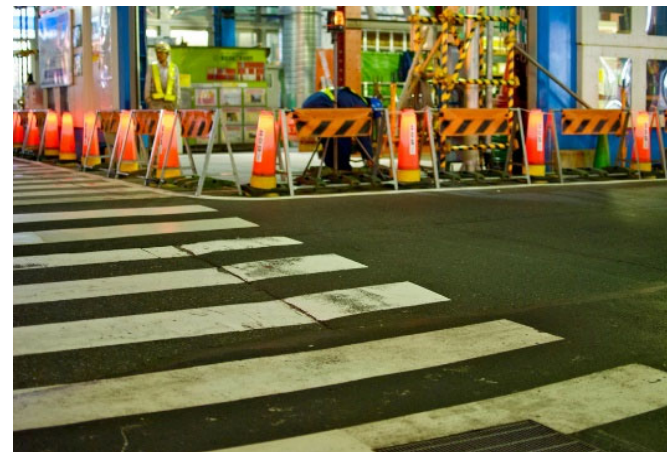
## Issues

- Strength Specifications
- Lighting
- Maintenance, Graffiti, Vandalism





# Fencing & Channelization



- Type and durability of fencing should be proportionate to hazard severity and duration

# Discussion

Where is this type of fencing appropriate? Not appropriate?



# MORE ABOUT PROWAG AND DIMENSIONS

---

# PROWAG Dimensions & Slopes:

## Pedestrian Access Routes

Pedestrian Access Routes	Criteria	Notes
Width	Min 4.0' (1.2m)	Median/island : Min 5.0' (1.5m)
Grade	Matching street grade	Where feasible, max 5%
Cross slope	Max 2%	
Surface	Firm, stable, slip resistant	
Vertical discontinuities	Max 0.5" (13mm)	Beveled with a slope less 50% (0.25' (6.4mm) - 0.5' (13mm))
Horizontal Openings	Max 0.5" (13mm)	
Flangeway	Max 2.5" (64mm)	Non-freight rail track
Gaps	Max 3.0" (75mm)	Freight rail track
Passing Spaces	Min (5.0' by 5.0' (1.5m)) Interval Max 200' (61m)	Necessary where the clear width is less than 5.0' (1.5m)

# Ramps

## Permanent

- 8.3% (1:12) max slope
- 10% (1:10) slope if rising 6" or less
- 12.5% (1:8) slope if rising 3" or less

## Temporary (our unofficial advice)

- Allow 10% slope for rise up to 9" if necessary to maintain property access.
- Use skid-resistant surfacing if slope exceeds 8.3%.

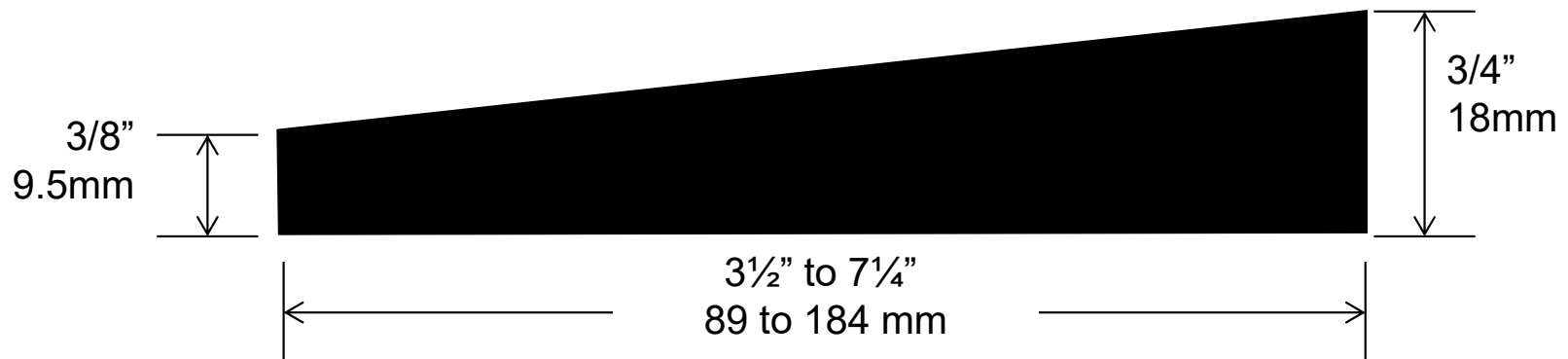
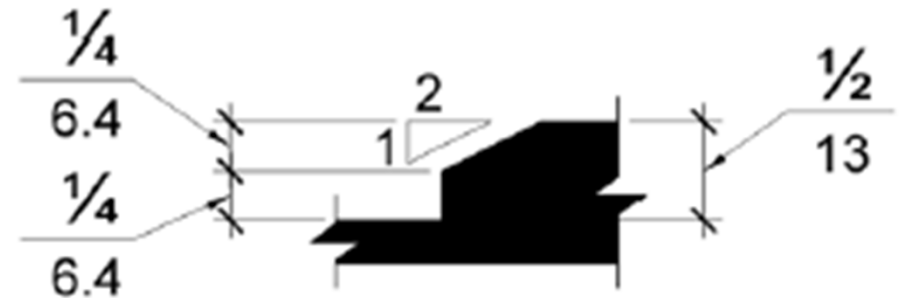
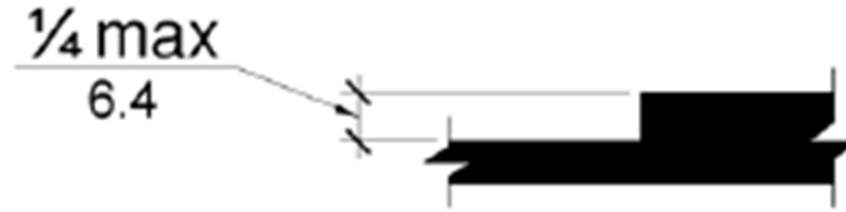


# Small Vertical Transitions (Thresholds)

Mainly applicable to wood construction



Source: Wikimedia Commons



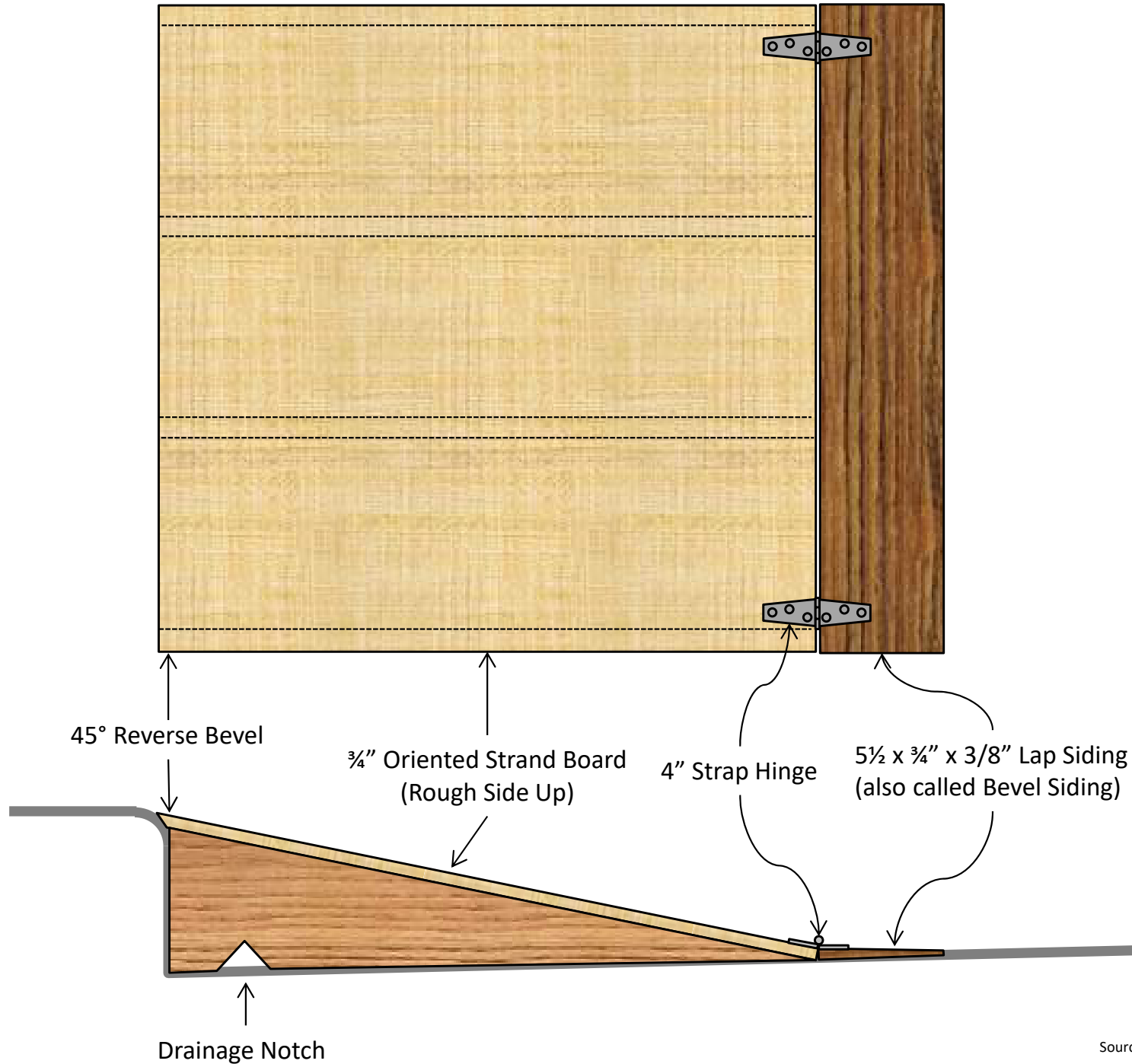
# Temporary Curb Ramps



Source: American Traffic Safety Services Association (ATSSA)

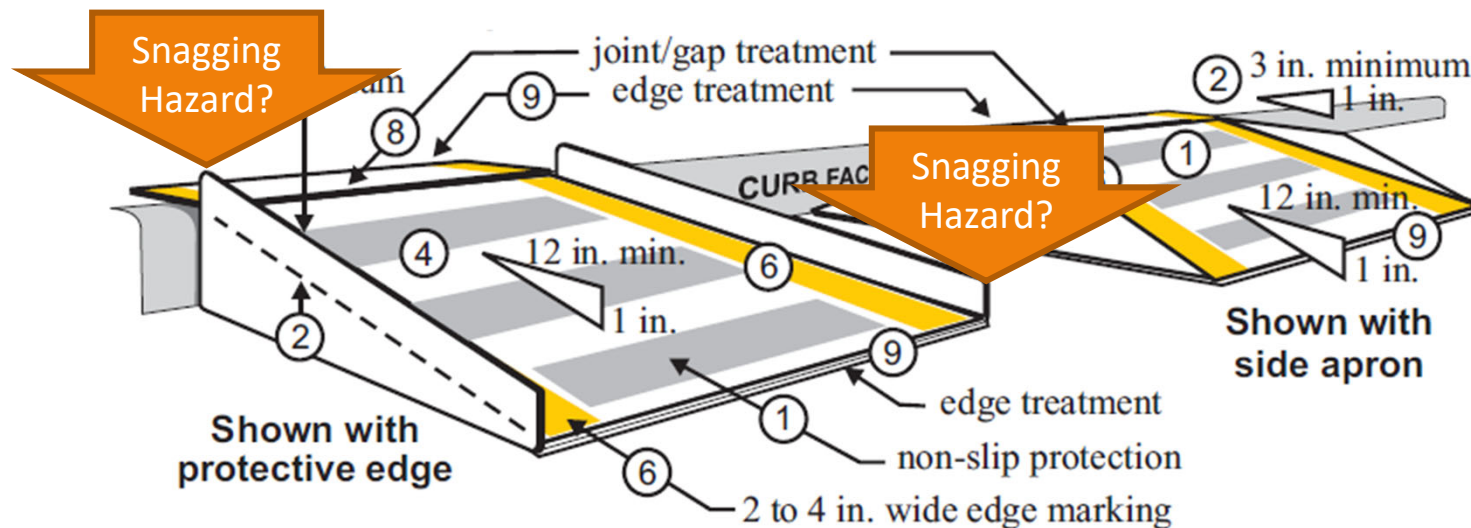
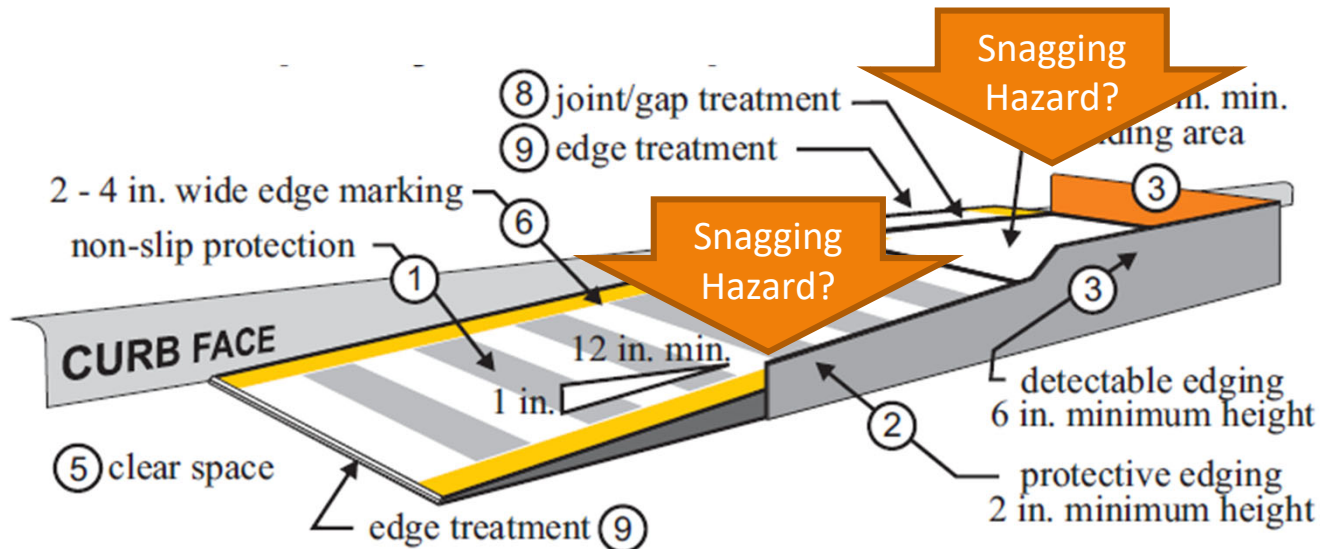


# Temporary Curb Ramp Fabricated from Standard Lumber





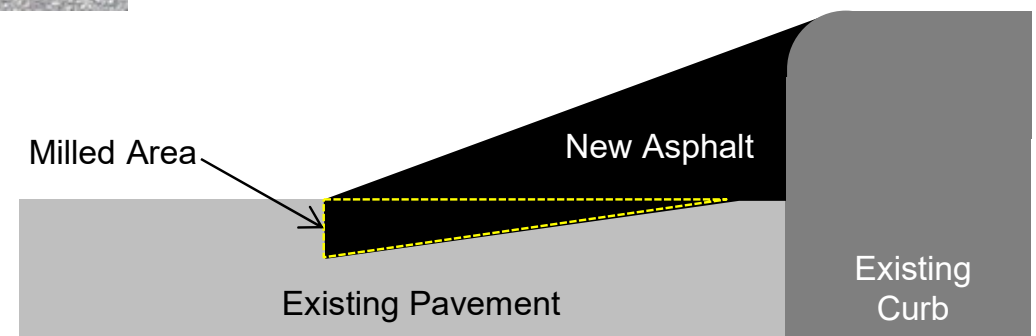
# Minnesota DOT Curb Ramp Designs



# What about asphalt?



Source: UW-TOPS Lab



Source: UW-TOPS Lab

# Detectability – Truncated Domes

- Alerts visually impaired pedestrians to presence of cross-traffic or edge of a platform.
- Color should contrast with adjacent pavement.
- Surfacing options
  - Rubber/vinyl tiles
  - Ceramic tiles
  - Concrete paving blocks
  - Cast iron plates
  - Stainless steel plates
- If temporary, durability of materials should match expected service life.



# Inlets



Source: seattlepi.com

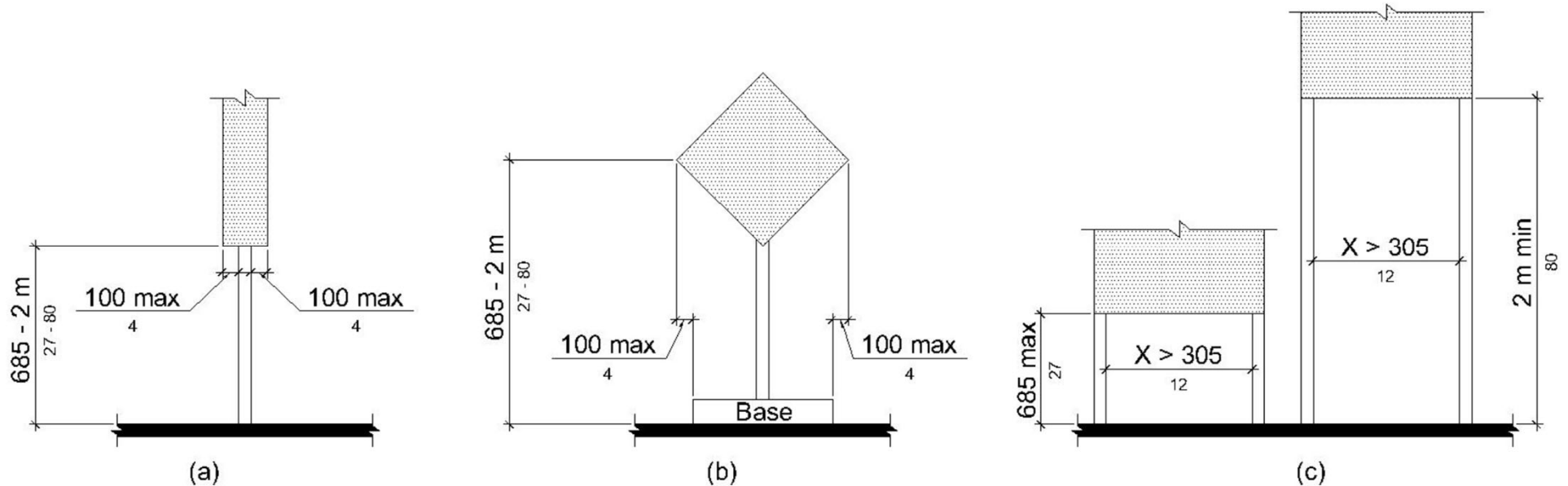


Source: Wikimedia Commons/Berlin gully deckle lagois-seibert

- PROWAG says the slots should not exceed  $\frac{1}{2}$  inch wide.
- What can you do if the existing covers have wider slots?
- What happens in the autumn?

# Sign Supports

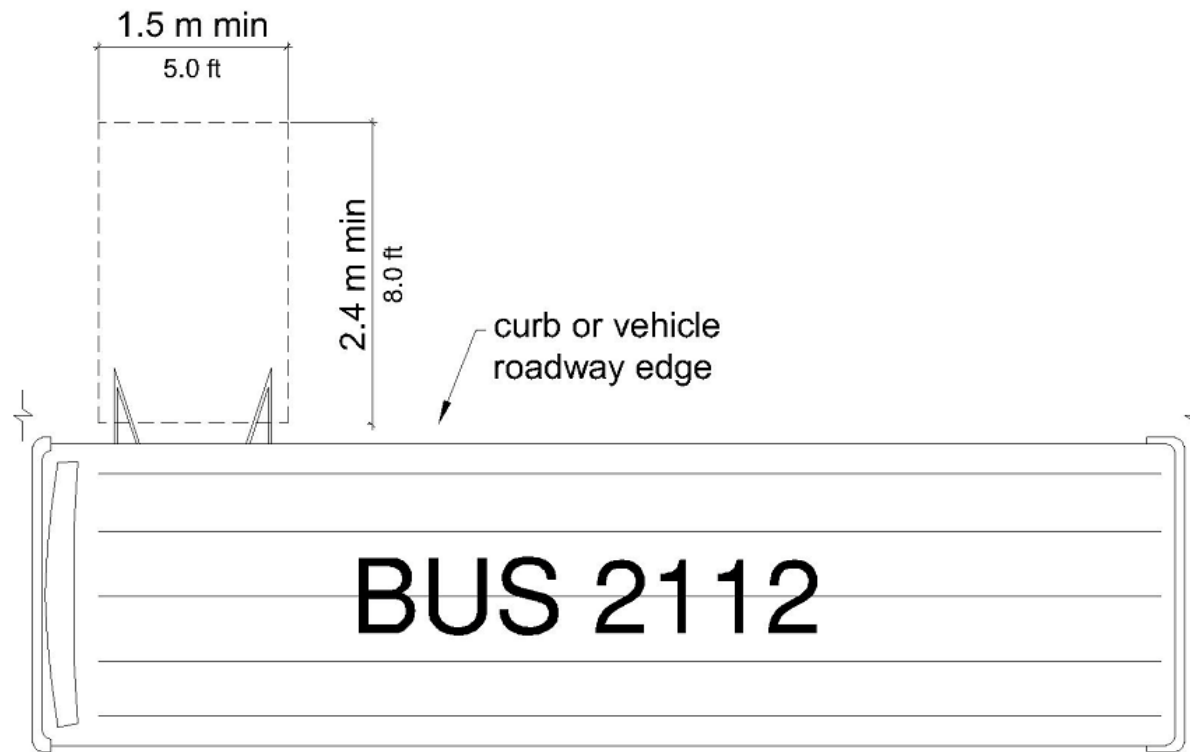
Large numbers: millimeters Small numbers: inches



- PROWAG guidance on sign supports is very prescriptive
- Potential conflicts with MUTCD
- Uncertainty about crashworthiness

# Other Slopes and Dimensions Covered in PROWAG

- Curb ramps (parallel and perpendicular)
- Blended transitions
- Transit stops
- Landings



PROWAG Recommended Permanent Bus Stop Dimensions

# Coordination with Bus Operators



- Establish early coordination for relocation of bus stops
- Consider effects on permanent transit facilities



# Small Group Exercise

Your project involves re-decking an existing bridge which is 56 feet wide. It carries a four-lane undivided state highway through the central business district of a small town, which is a tourist destination with heavy pedestrian and motor vehicle volumes that persist throughout the construction season. Normally there are 12 foot travel lanes (two in each direction) and a 4 foot sidewalk on each side. The sidewalks are 6" higher than the traffic lanes.

Because of the town's picturesque terrain, there is only one alternate route which is extremely congested. Therefore, it has been decided that the bridge will be redecked in halves, split down the middle (staged construction). It is necessary to maintain at least one traffic lane in each direction, and a pedestrian walkway on at least one side of the bridge. The usable work space needs to extend at least to the centerline. Because of previous near-misses in the town, your boss also wants a barrier to separate pedestrians from the traffic lanes.

How would you allocate the available width?



# TEMPORARY SURFACING

---

# Discussion



Is this an acceptable temporary surface?

# Possible Surfacing Options

- Asphalt
  - Controlled Low Strength Material (CLSM)
  - Stabilized Soil
  - Well-Compacted Gravel
  - Proprietary Matting Systems
  - Plywood
  - Oriented Strand Board (OSB)
  - Timber
- 
- Service life of surfacing should be proportionate to duration of the temporary condition

# Controlled Low Strength Material (CLSM)



Source: FHWA /pavement/recycling



Source: North Dakota State University

- Very lean concrete
- Target strength 150 psi (if stronger, removal requires hammering)
- Self-leveling
- 1-8 hours cure time

# Stabilized Soil



Source: [roadrecycling.org/FDR-Process](http://roadrecycling.org/FDR-Process)

- Soil + Portland cement or fly ash
- Soil + polymer
- Tilled and recompact

# Compacted Gravel

- Rounded vs angular particles
- Open-graded vs dense-graded (breaker run)
- Limestone vs other types
- Degree of compaction

# Proprietary Matting Systems



- Plastic mats
- Manufacturer-specific surface textures
- Manufacturer-specific connection details

# Proprietary Cover Systems



Source: Oxford Plastics LLC



Source: Oxford Plastics LLC

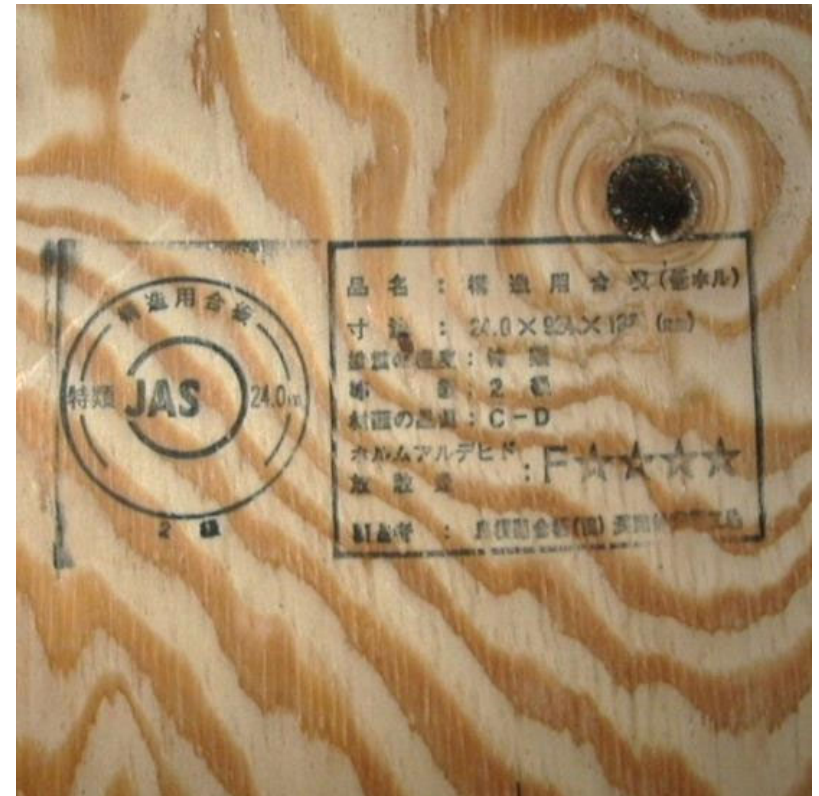


Source: Oxford Plastics LLC



# Plywood

- Face smoothness grading System (A-D)
- Adhesive categories
  - INTERIOR: cannot withstand water.
  - EXPOSURE 2: can withstand brief exposure to rain
  - EXPOSURE 1: can withstand intermittent rain exposure (CDX)
  - EXTERIOR: can withstand repeated wetting and drying
- Sheet sizes: 4x8, 4x9, 4x10
- Treated Plywood: C-D plywood with preservatives; longer service life but 50% higher cost than CDX
- Marine Plywood: A-B face, no preservatives, 3 times the price of CDX



Source: Wikimedia/KouzouyouGouhan\_Stamp\_01.jpg

# T1-11 Plywood



- Rough face → Higher friction
- Shallow groves every 4" or 8"

Source: [Wikimedia/putnamlumber.com/Images/products/plywood/T1-11\\_Deco\\_4](https://commons.wikimedia.org/wiki/File:Putnam_Lumber_Products_Plywood_T1-11_Deco_4)

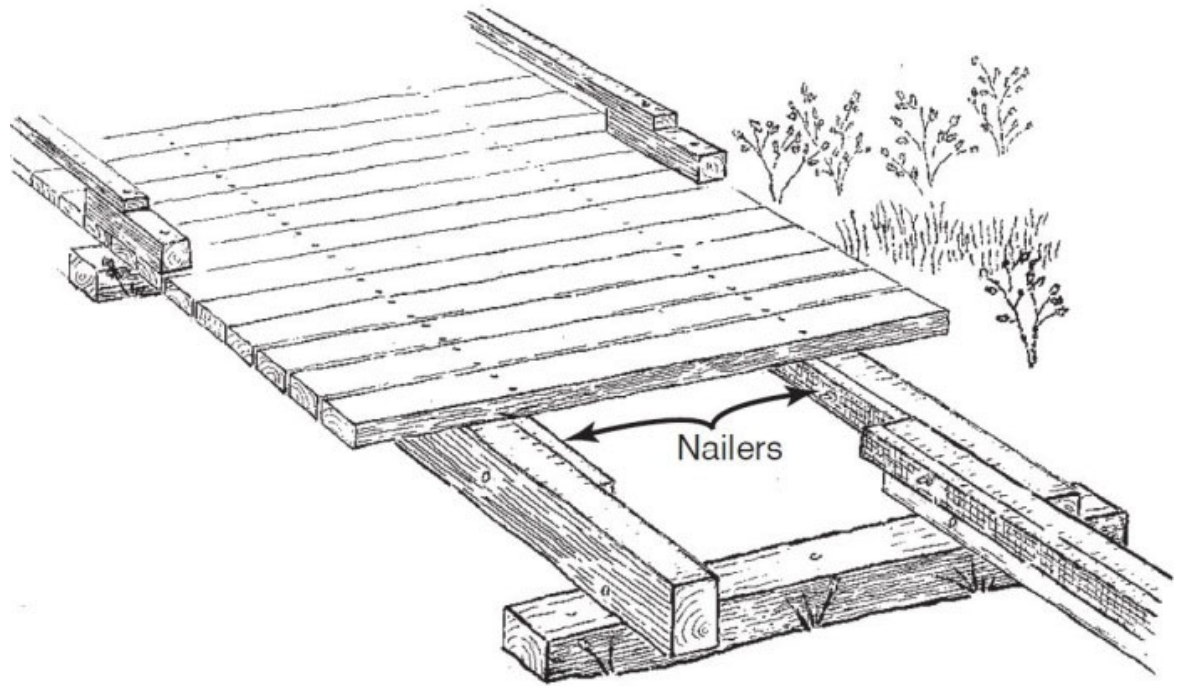
# Oriented Strand Board (OSB)



Source: Wikimedia Commons/Elke Wetzig

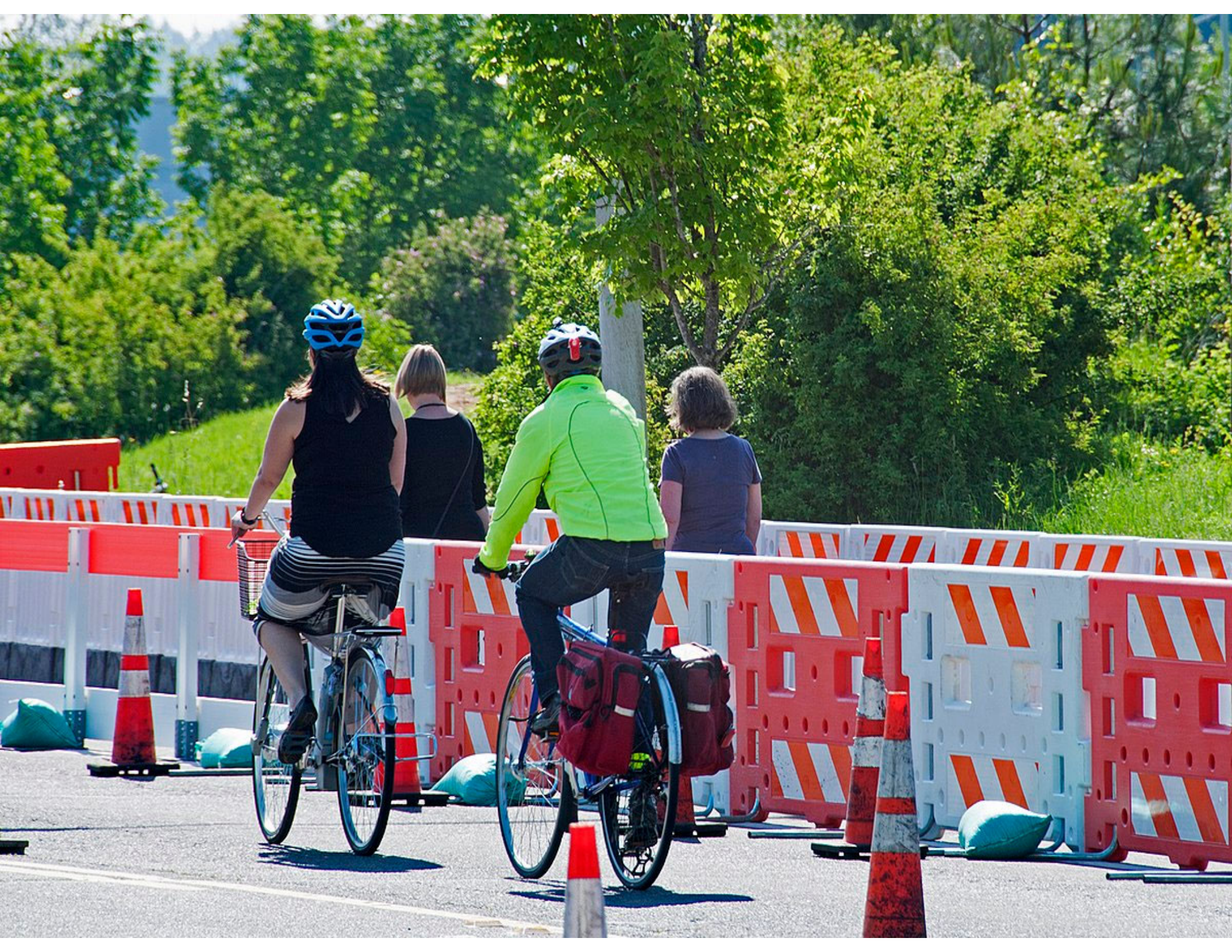
- Laminated from wood shreds
- Several layers “oriented” at right angles to each other
- Has smooth and rough sides
- No knots or weak spots
- Water resistance depends on adhesive – most are EXPOSURE 1
- Edge painting reduces swelling

# Timber



Source: [FHWA.dot.gov/environment/recreational\\_trails/publications](https://www.fhwa.dot.gov/environment/recreational_trails/publications)







RAMP  
CLOSED

← DETOUR

→ KS

NO  
VEHICLES

PEDESTRIAN

TO  
ARGYLE ST



DETOUR  
←

WALK  
CLOSED  
USE [red bar]

BIKE LANE  
CLOSED  
AHEAD





PHOTO CREDIT: MICHAEL ANDERSON/BIKEPORTLAND





# Guidelines

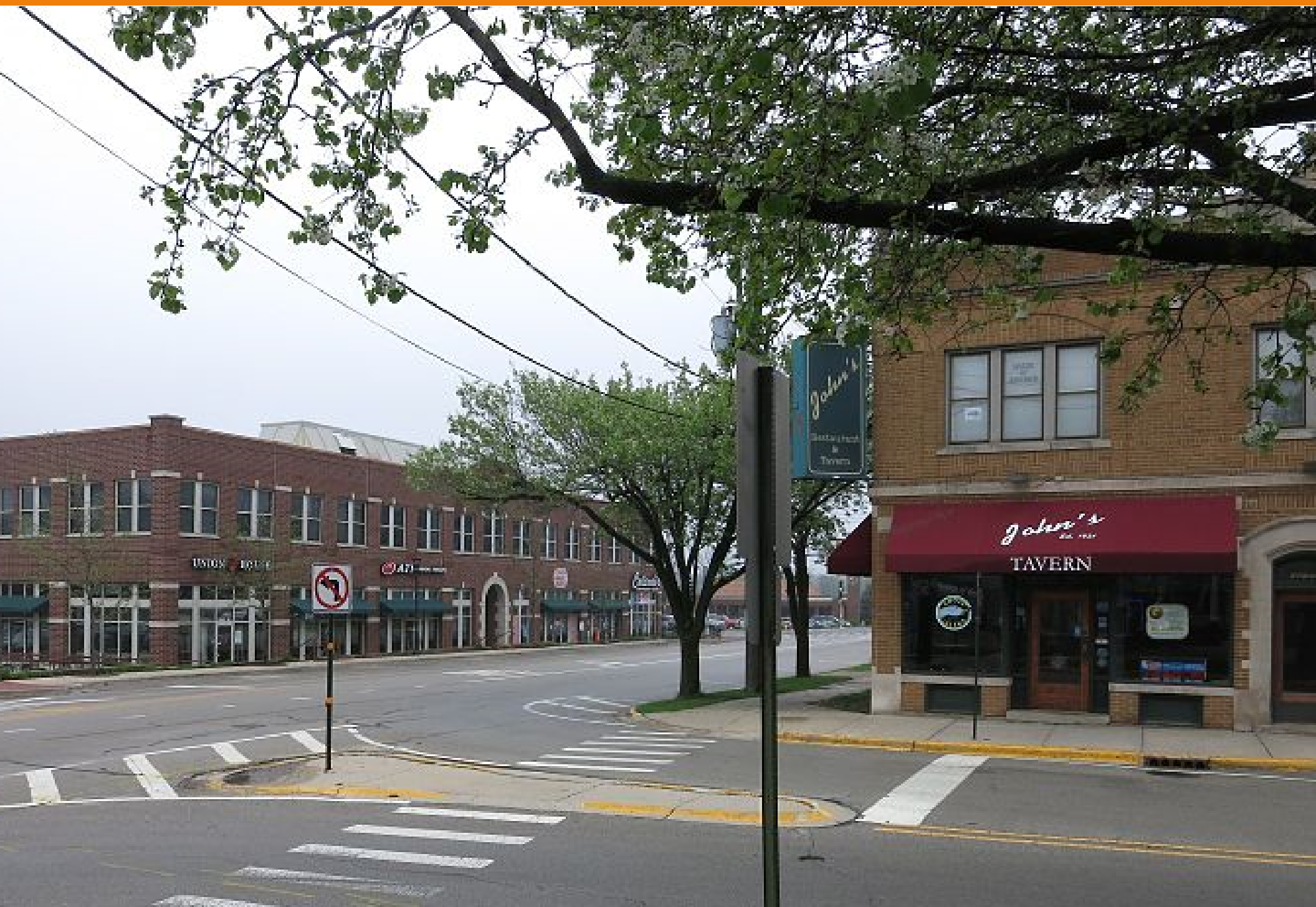


# on Motorcycle and Bicycle Work Zone Safety

# STAGING

---

# Older Downtowns: Temporary Pedestrianization of Alleys





Hometown  
Hardware

Alex's  
Restaurant

Trusty  
Bank

SPEED  
LIMIT  
**10**

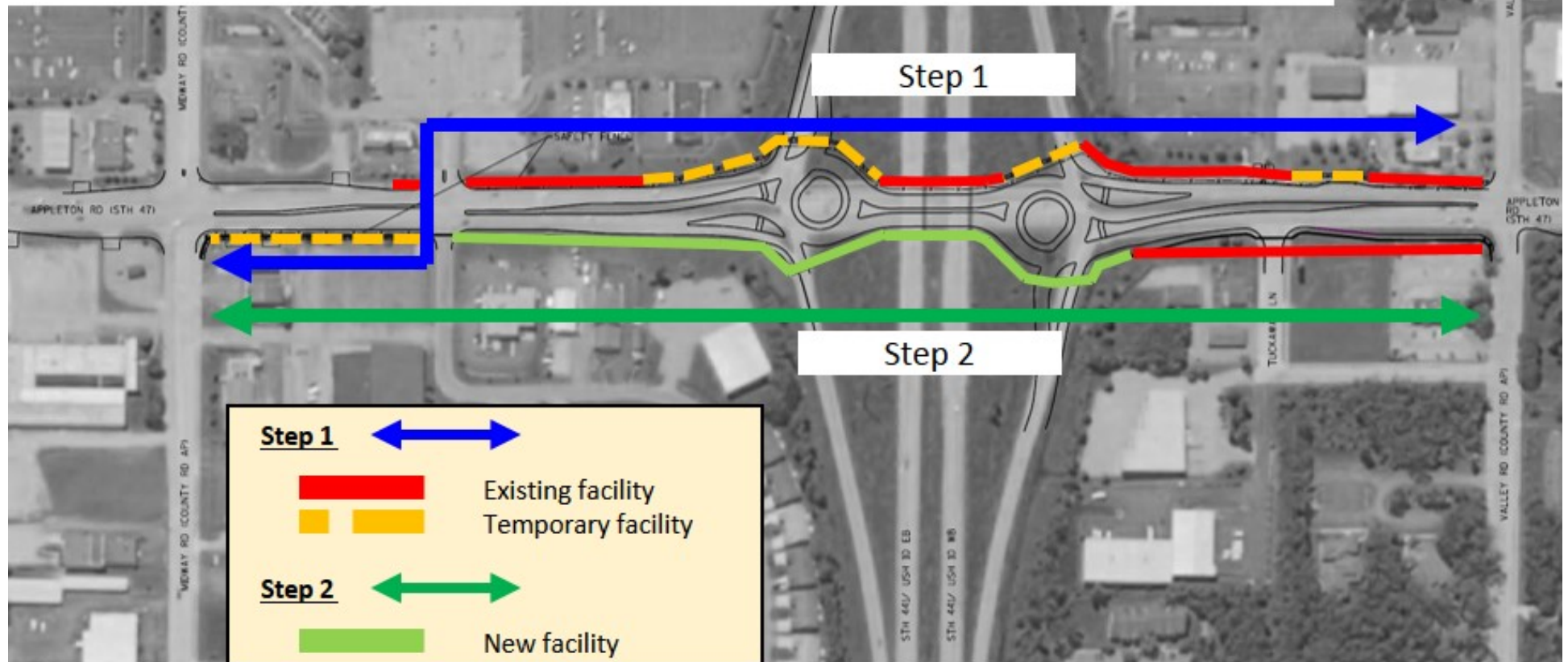




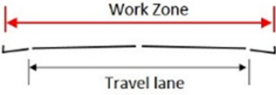
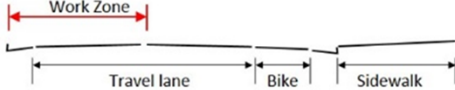
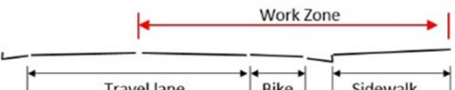
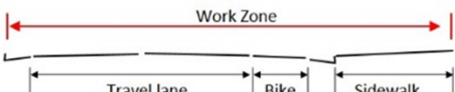
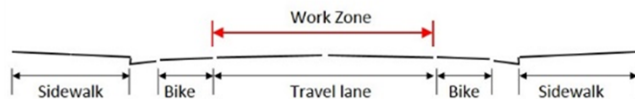
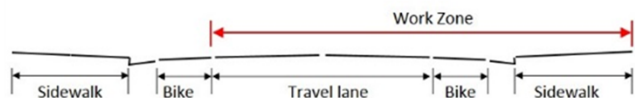
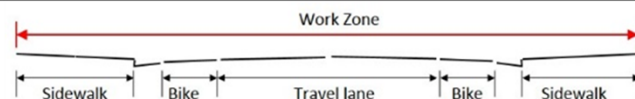
# Phasing & Coordination

## <General Info>

1. Pedestrian to be accommodated on one side at all times
2. Stage 1 based on using a combination of existing sidewalk and temporary asphaltic sidewalk
3. Stage 2 based on completion of the permanent sidewalk
4. Safety fence shall be placed between the sidewalk and work zone to prevent pedestrians entering the work zone
5. Temporary pedestrian accommodations are approximate and may be adjusted in the field



# When is a ped/bike staging plan appropriate?

Existing Ped/bike Facilities	Type of Work	Diagram	Pedestrian Staging Plan Required?
None	Within Travelled Way		No
One Side	In travelled way on opposite side from ped/bike facility		No
	In travelled way on same side as ped/bike facility		Yes
	In travelled way on both sides		Yes
Both Sides	Within Travelled Way Only		No
	Motor vehicle lanes and ped/bike facility on one side		Usually
	Motor vehicle lanes and ped/bike facilities on both sides.		Yes

# Seven Options for Integrating Ped-Bike Construction into Overall Project Staging 1

## Inside-Out

- Build roadway first, then sidewalks
- Difficult to maintain access to properties

## Outside-In

- Build sidewalks first, then roadway

## Inside-Out with Lane Closures (roadway widening projects)

- Peds remain on old sidewalk while roadway is built
- Peds temporarily moved to a closed lane while sidewalks built
- Lane opened to traffic when sidewalks completed

# Seven Options for Integrating Ped-Bike Construction into Overall Project Staging 2

## Outside-In with Traffic or Parking Lane Closures

- Peds temporarily relocated to closed traffic lane while sidewalks are built
- After new sidewalks are in place, roadway is built

## Temporary Pedestrian Pathways

- Pedestrians relocated to a new temporary walkway
- New roadway and permanent sidewalks constructed
- Temporary walkway removed

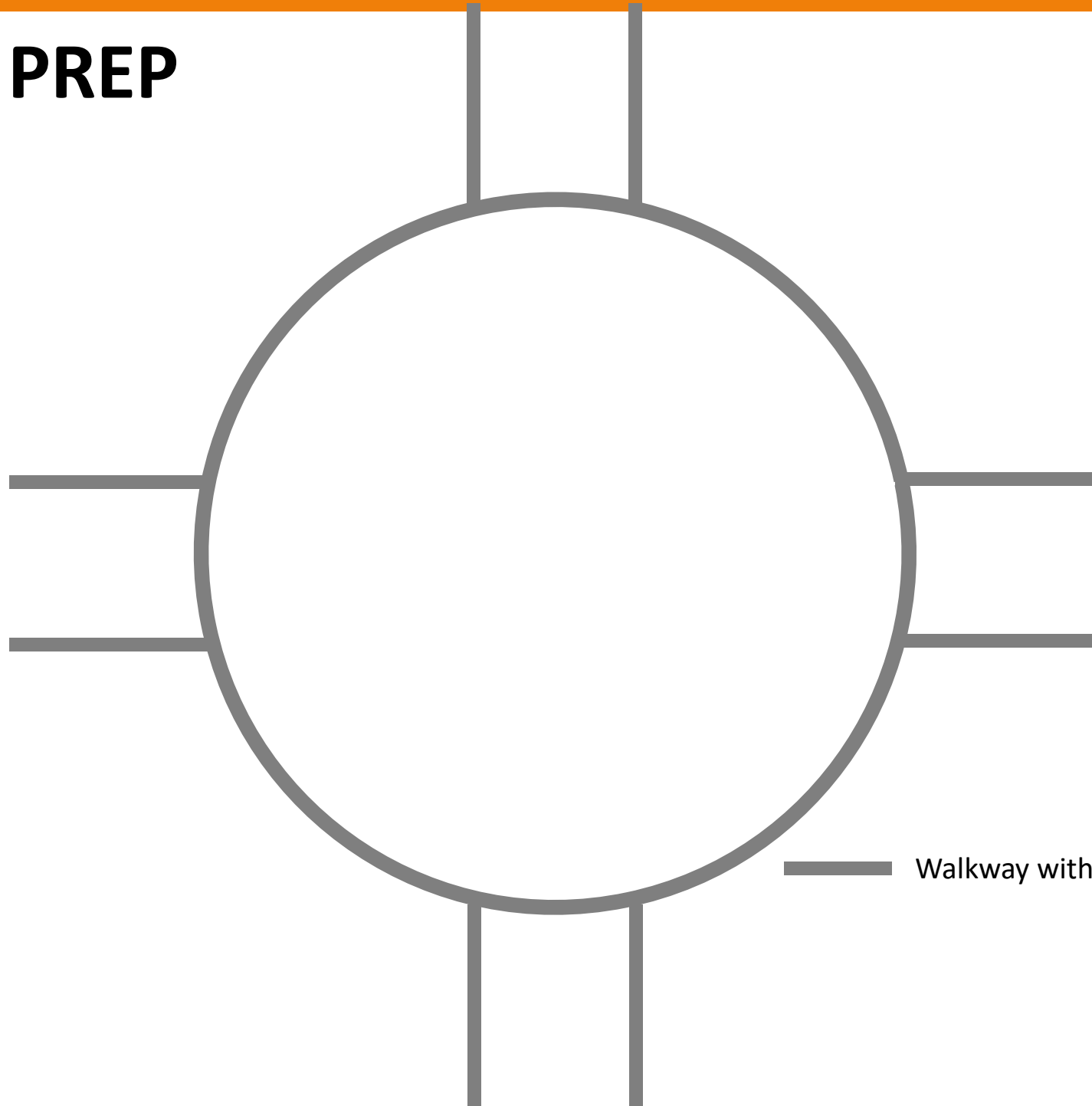
## Complete Pedestrian Detour

## Accelerated Construction with Full Closures

# PEDESTRIAN STAGING FOR ROUNDBABOUTS

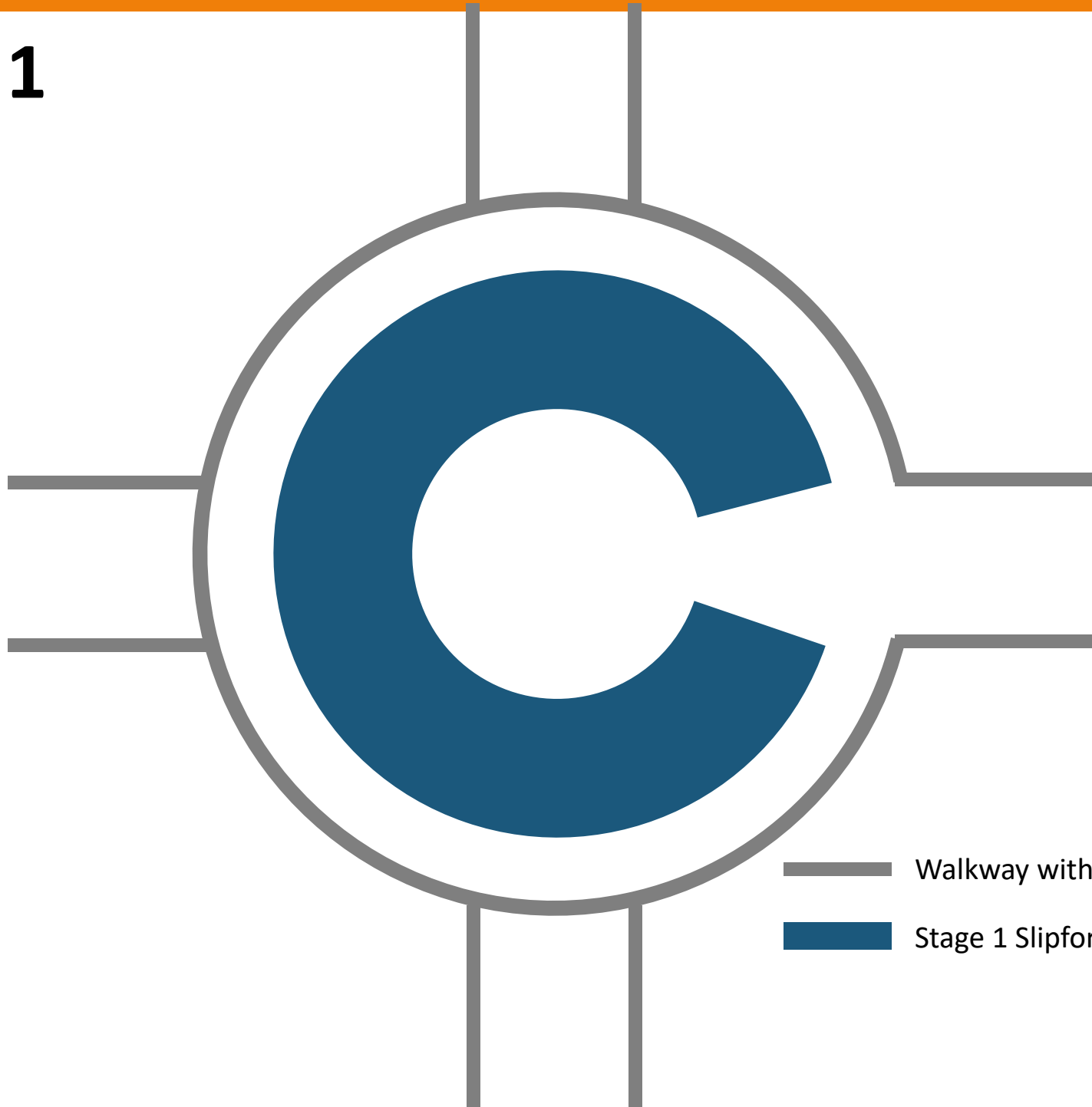
---

# PREP



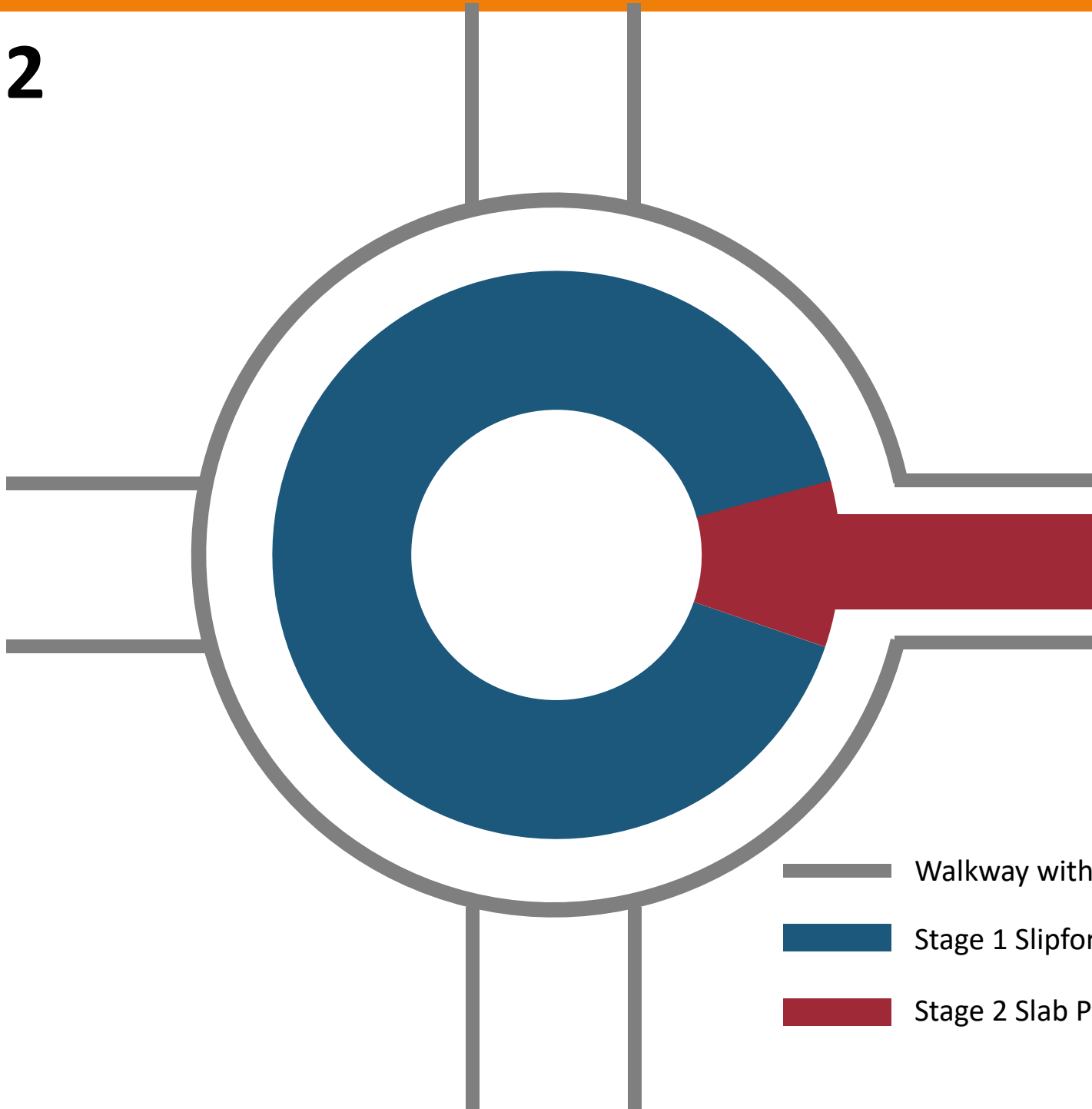
— Walkway with Temporary Fences

**1**



- Walkway with Temporary Fences
- Stage 1 Slipform Paving

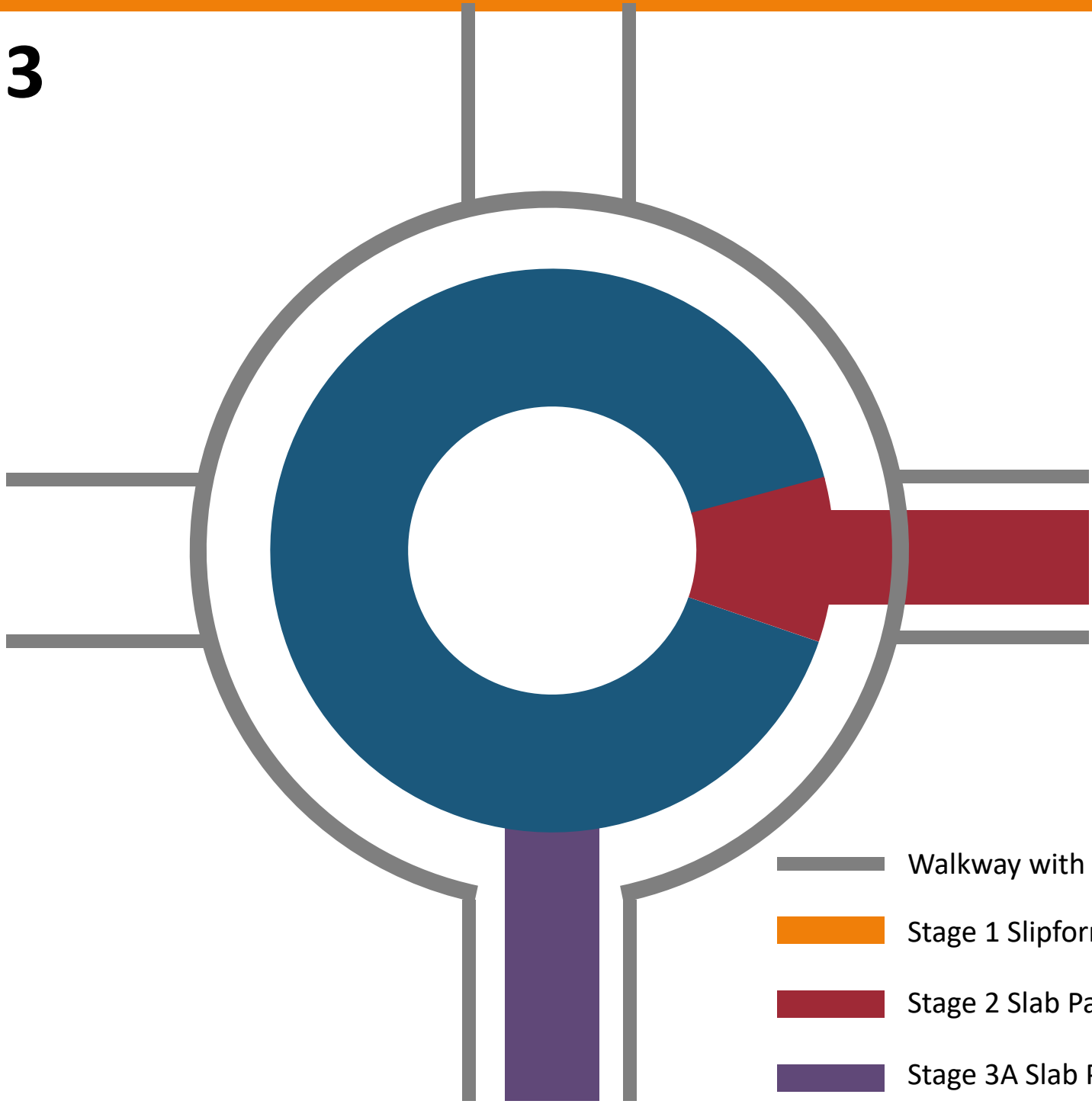
2



- Walkway with Temporary Fences
- Stage 1 Slipform Paving
- Stage 2 Slab Paving

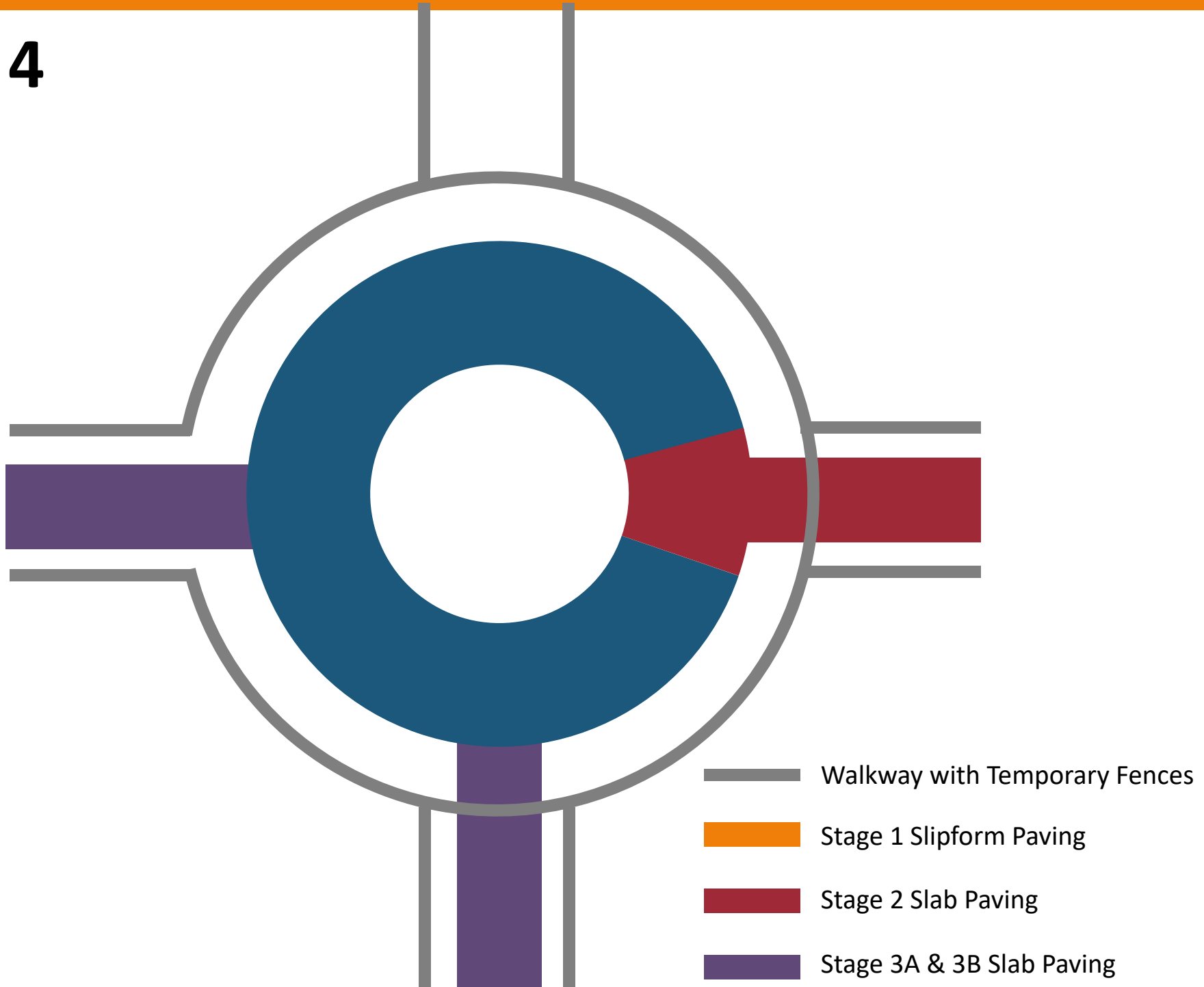


3

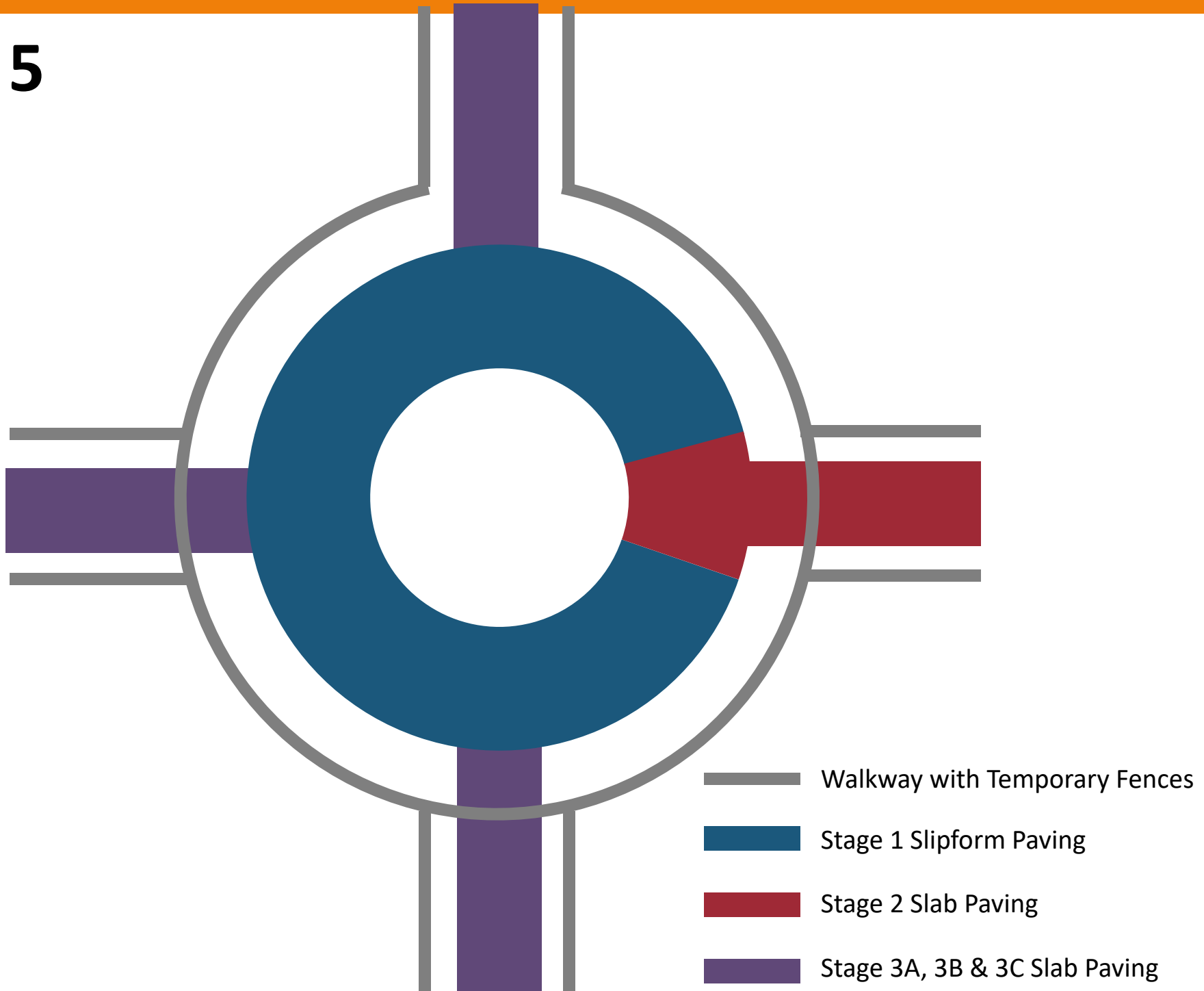


- Walkway with Temporary Fences
- Stage 1 Slipform Paving
- Stage 2 Slab Paving
- Stage 3A Slab Paving

4



5



# Discussion

- What ped/bike design issues are you currently experiencing?
- What solutions are you considering?