



Work Zone Design Training Basic

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Statewide Work Zone Engineers

2023

Housekeeping

- Breaks (1-1.5 hours)
 - Lunch at 11:30am (60 min.)
- Silence cell phones
- Emergency Exits
- Course Evaluation



Self Introductions

- Name
- Region/Company
- Job Duties
- Experience



Course Objectives

- Participants will understand the Transportation Management Plan Process
- Participants will develop a temporary traffic control plan for:
 - a two-way two-lane roadway
 - an arterial roadway
 - a divided highway
- Participants will also learn how to develop a temporary pedestrian accommodation plan.



Course Contents

- Work Zone Crashes
- Work Zone Planning
- Work Zone Basics
- Work Zone Geometrics
- Two-Way Two-Lane Highways w/ Exercise
- Multi-Lane & Divided Highways w/ Exercise
- Freeways & Expressways w/ Exercise
- Temp Ped Accommodations

Home > Web Applications > TMP

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Wisconsin TMP System - Transportation Management Plans




Wisconsin TMP System LIVE Site
Enter the Wisconsin TMP System **live** site.

WisTMP User Manual and Documentation
WisTMP User Manual and other training resources.

Wisconsin TMP System Training Site
Enter the Wisconsin TMP System **training** site.

New User Account Request Form
Online form to request a WisTMP login account.

WisTMP Contact Information
WisDOT regional contacts and technical support.

WisDOT 4/3/2023

Work Zone Impact Assessment

Project ID: 1058-25-32/62 Highway: STH 29

Title: Shawano - Green Bay

Limits: Slope Stabilization B-58-0075

Length (miles): 0.34 County: Shawano Project Cost: \$2,400,000

Project Description

The project proposes to construct a heavy riprap toe berm along the west bank of the Wolf River and re-grade the slope up to the WIS 29 WIS Wolf River west abutment.

Additionally, other project work includes:

- add a parallel underdrain system along WIS 29 WB and a french drain west of the Wolf River structure to control subsurface drainage
- address asphalt shoulder replacements and failed concrete pavement and joints between WIS 22 and the WIS 29 WIS Wolf River structure as well as on the WIS 29 WB exit ramp to WIS 22.

Work Zone Alternatives							
Alternative #	Main Work Zone Strategies	Feasible?	Justification of Nonfeasibility				
1*	Full Time Single Lane Closure	Yes					

Operational Considerations							
Alternative #, cont.	WZ Capacity (veh/h)	Expected Delay (min)	Expected Queue (miles)	Road User Costs (\$/day)	Duration (Days)	Total Road User Costs (\$)	Estimated # of Project Stages
1	1402	0	0	\$0	90	\$0	3

Other Considerations								
Alternative #, cont.	Est. WZ Road Erosion Impacts	Pedestrian Impacts	Utility Impacts	Transit Impacts	Environ. Issues with WZ	Constructability	Product Quality	Project Timeline Constraints
1	\$0	No	No	No	No	No	No	No

Recommendations			
Alternative #, cont.	Safety Considerations	Recommended Alternative	TMP Type
1	Unidirectional traffic	Yes	2

Comments on Alternative Analysis

Notes:



Groups for Exercises

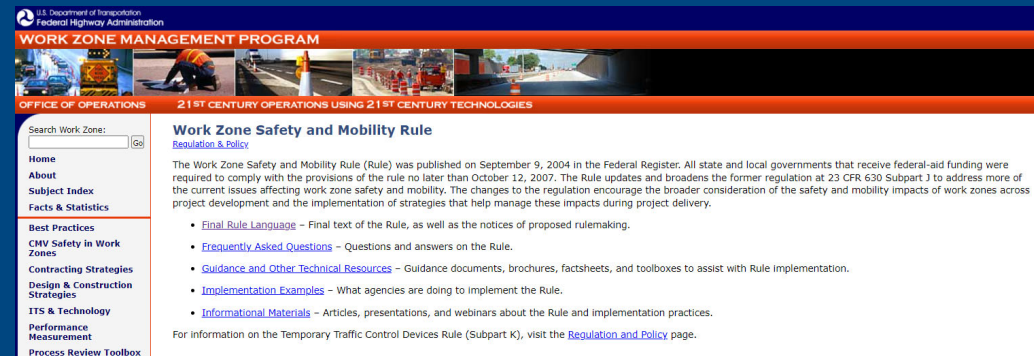
- Each row of tables will be a group for Exercise #6, #7 and #8



Work Zone Safety and Mobility

23 CFR 630


- Final Rule by FHWA published Sept. 9, 2004
- All states that receive Federal-aid highway funding
- Provide a systematic and structured approach to work zone traffic management
- Emphasize safety and mobility
- Development of TMPs and TCPs



Work Zone Safety and Mobility

23 CFR 630

- Consider WZ issues as early as possible
- Systematic and consistent consideration of WZ impacts
- Strategies to manage WZ impacts
- Monitor and assess WZ impacts
- Data-driven improvements to WZ policy/process/procedures

**Facilities Development Manual**
Chapter 11 Design
Section 50 Traffic Control

Wisconsin Department of Transportation

FDM 11-50-1 Work Zone Policy Statement May 15, 2019

See the [Traffic Engineering, Operations and Safety \(TEOpS\) Manual Chapter 6 Section 1](#) for the Work Zone Policy Statement.

FDM 11-50-5 Transportation Management Plan Process November 15, 2022

5.1 Introduction
The Federal Highway Administration (FHWA) published a final rule on Work Zone Safety and Mobility in the Federal Register on September 9, 2004. The rule took effect on October 12, 2007 and affects all states and local governments that receive Federal-Aid Highway funding. The purpose of the update is to address changing times of more traffic, more congestion, greater safety issues and more work zones on our highways. These challenges require a systematic and structured approach to ensure traffic management consistency statewide. The work zone policy statement in the [TEOpS 6-1](#), addresses the Department's goals and objectives as well as discussing where responsibilities lie when implementing the work zone rule.

5.1.1 Key Features of the Work Zone Rule

- The rule takes a policy-based approach to institutionalize work zone processes and procedures.
- Emphasizes safety and mobility impacts of work zones.

5.1.2 How the Work Zone Rule Works

- It advocates for work zone considerations to be initiated as early as possible in the project delivery process.
- It underscores the adoption of policy and procedures that support systematic consideration and management (consistency) of work zone impacts.
- It encourages states and local governments to develop and implement strategies to manage impacts.
- It requires monitoring and assessing work zone performance.
- It encourages the use of work zone safety and mobility data to improve policy, processes and procedures.

5.2 What is a TMP?
A transportation management plan (TMP) is a set of coordinated transportation management strategies and describes how they will be used to manage work zone impacts of a road project. Transportation management strategies for a work zone include temporary traffic control measures and devices, public information and outreach, and operational strategies such as transportation operations and incident management strategies. The scope, content, and level of detail of a TMP may vary based on anticipated work zone impacts of the project. A transportation management plan is required on all projects.
DOT needs to minimize traffic impacts by balancing costs and attempt to limit stages for maximum value. Occasionally, short closures can eliminate multiple stages and make the job more efficient. The public may be receptive to short closures if it reduces the total construction timeline.

Work Zone Crashes



Total Number of WZ Crashes/Year

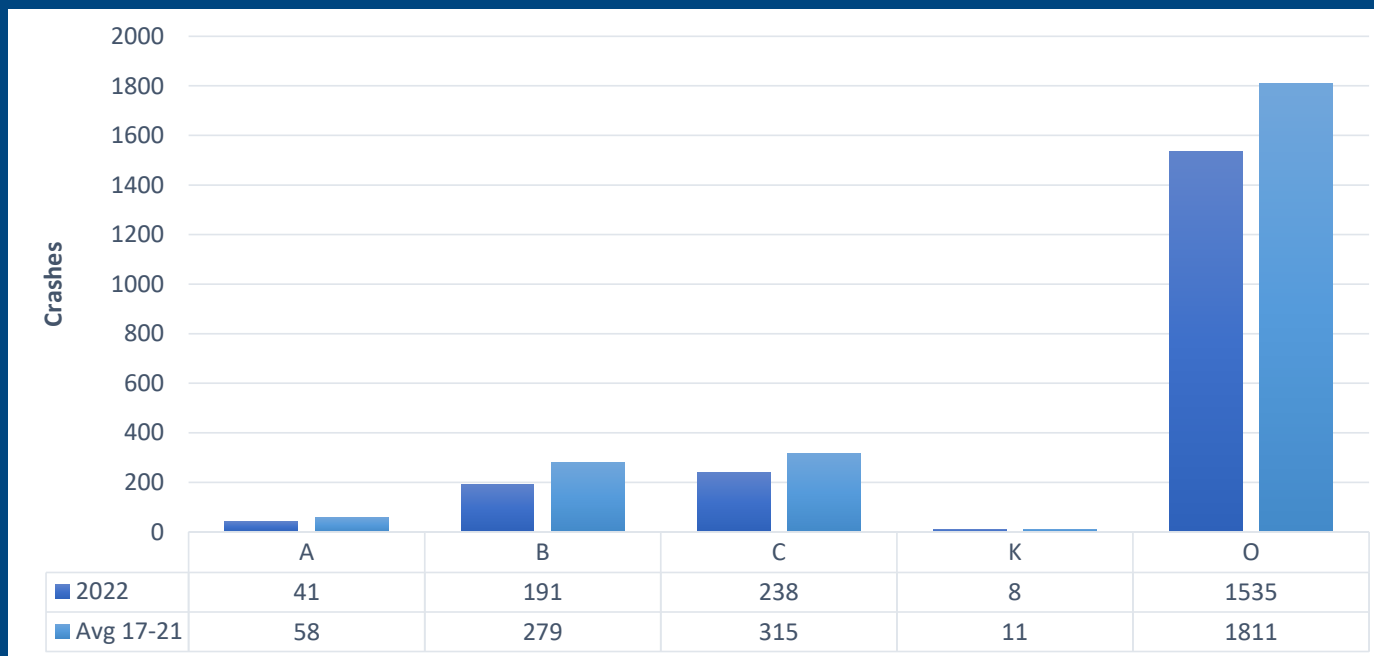


Year	Total
2017	2,775
2018	3,157
2019	2,473
2020	1,794
2021	2,172
2022	2,013
Grand Total	14,384



*2022 Data is Preliminary. Data does not include parking lot or private property crashes.

2022 WZ Crash Severity

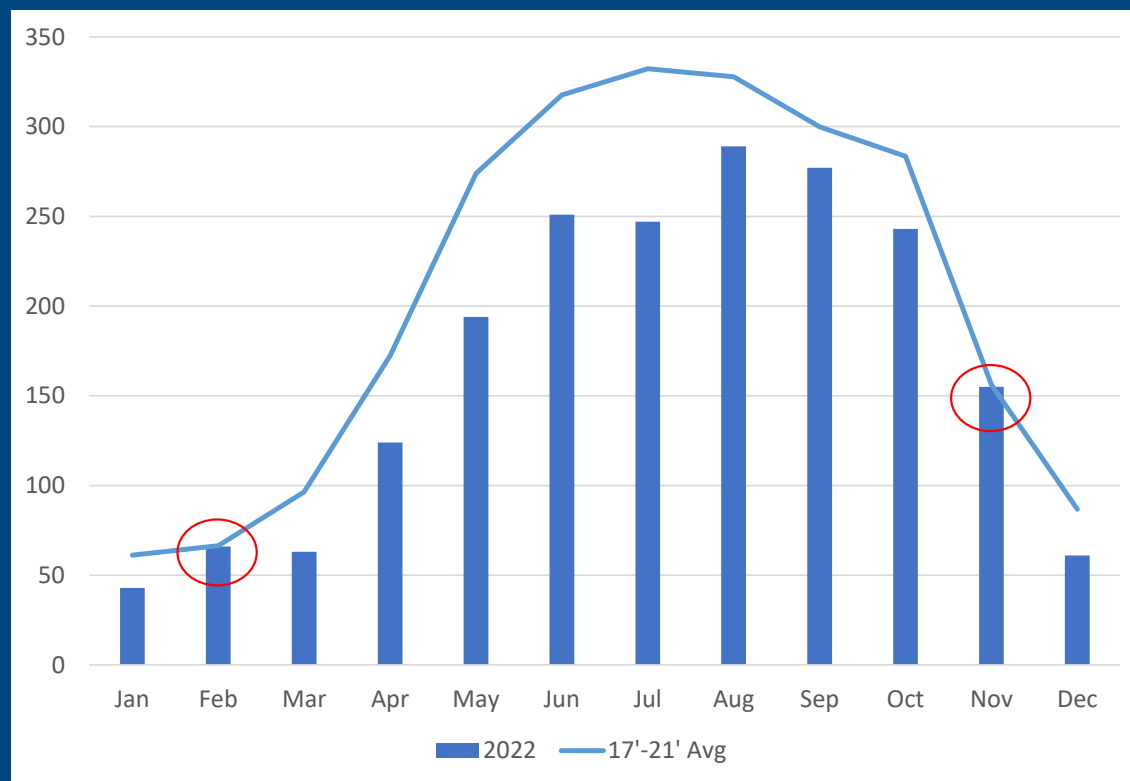
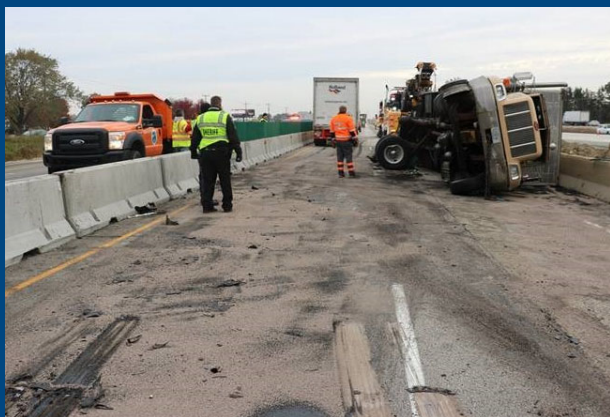


K: Fatality
 Type A: Incapacitating Injury
 Type B: Non-Capacitating Injury
 Type C: Possible Injury
 Type O: Property Damage Only



*2022 Data is Preliminary. Data does not include parking lot or private property crashes.

2022 WZ Crashes by Month

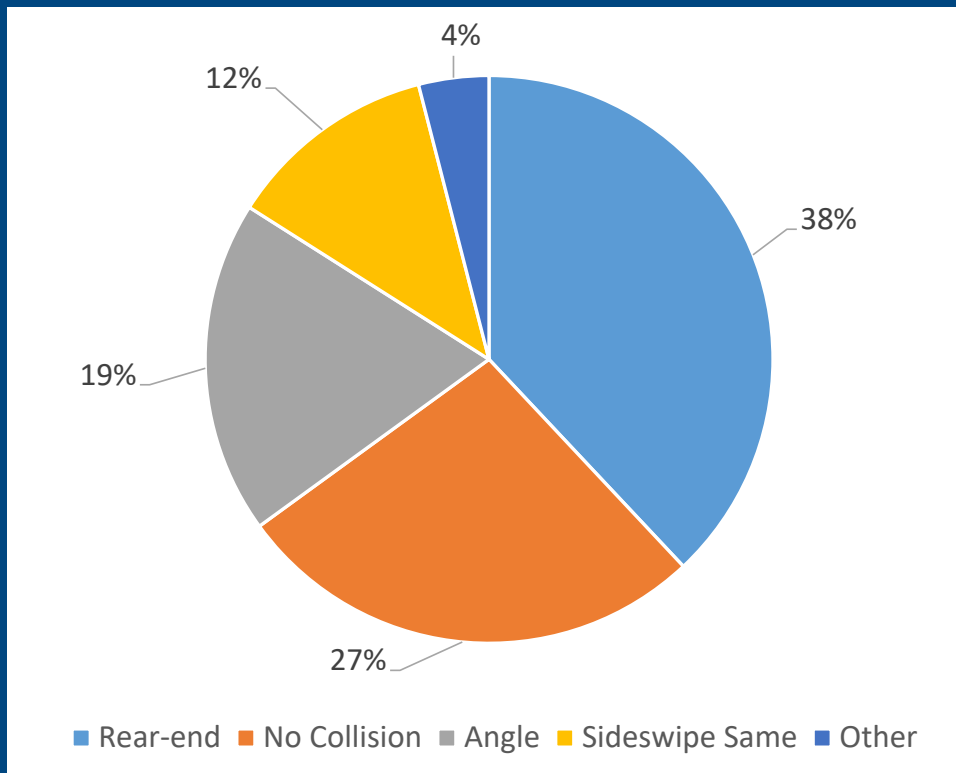


*2022 Data is Preliminary. Data does not include parking lot or private property crashes.

2022 WZ Crashes by Manner of Collision

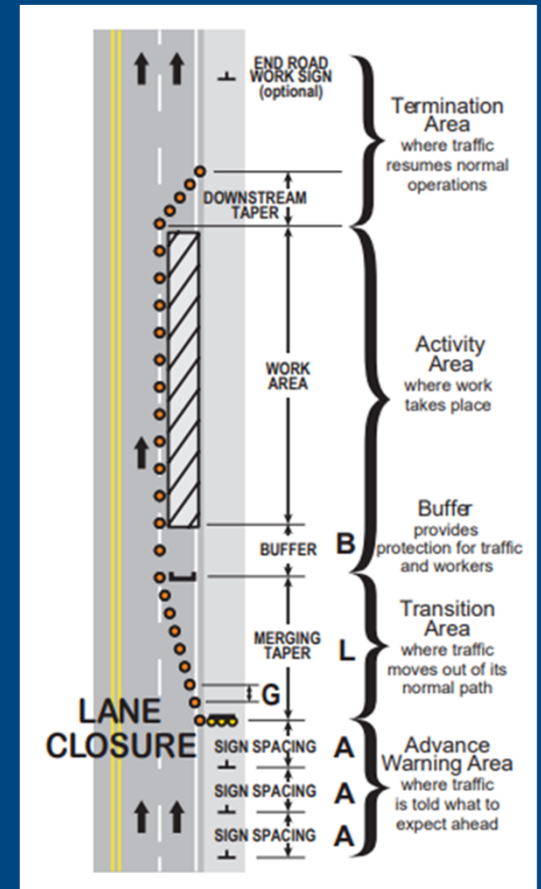
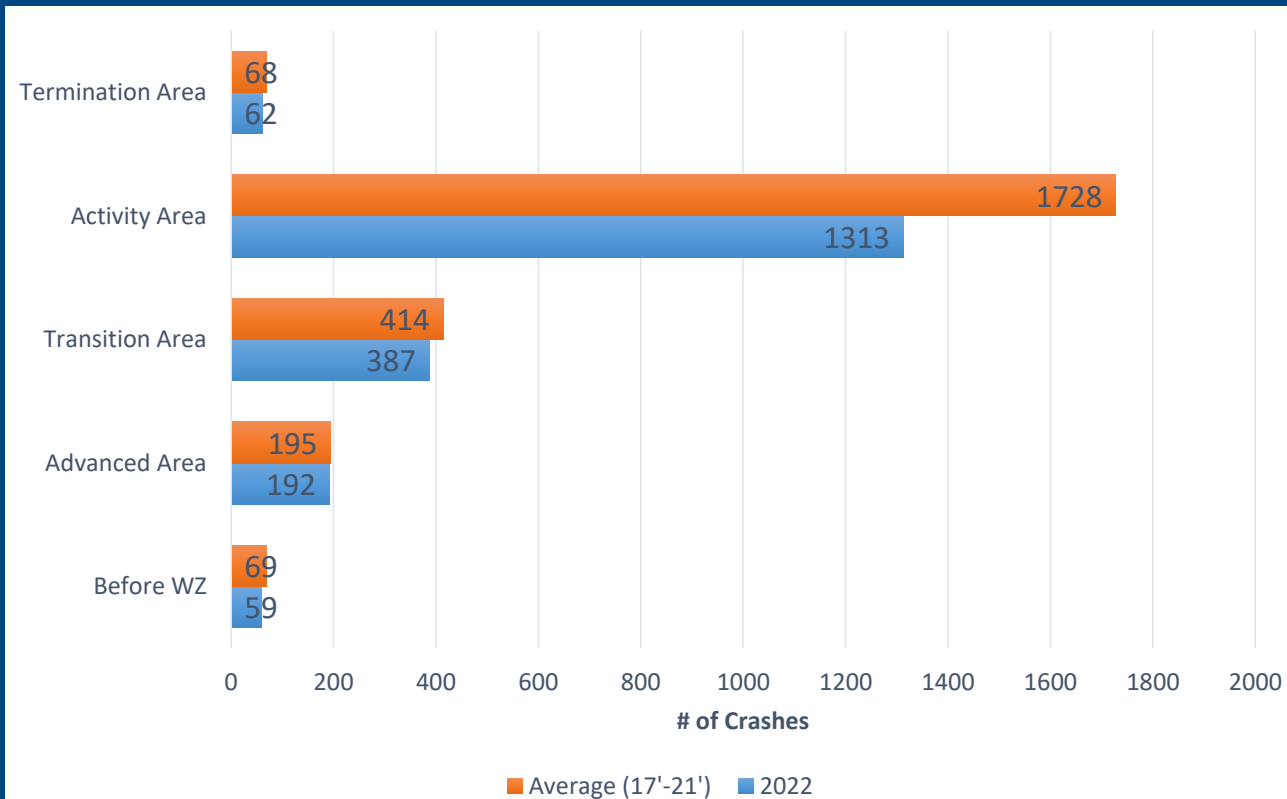


Manner of Collision	17'-21'Avg
Rear-end	40%
No Collision	28%
Angle	12%
Sideswipe Same	16%
Other	4%



*2022 Data is Preliminary. Data does not include parking lot or private property crashes.

2022 WZ Crashes by Location



*2022 Data is Preliminary. Data does not include parking lot or private property crashes.





2022 WZ by Type



Wisconsin Work Zone Fatal (K) Crashes

1 worker killed in 2022
1 worker killed in 2021

2 workers killed in 2020
1 worker killed in 2019

2022	8	5 Year Comparison (2017-2021)		
			Count	%
2021	13	Decrease from Last Year	-5	-38.46%
2020	15	Increase from Low Year of Last 5 yrs.	2	33.33%
2019	15	Decrease from High Year of Last 5 yrs.	-7	-46.67%
2018	9	Decrease from 5 Year Average	-3.6	-31.03%
2017	6	Average fatalities per year (2017-2021)		11.6



*2022 Data is Preliminary. Data does not include parking lot or private property crashes.

Work Zone Crash Facts - Summary

- Most work zone crashes occurred in 2022....
 - Between May and November
 - Between 10 AM and 6 PM
 - Weekdays
 - Majority of work zone fatalities are the drivers and their passengers, not the workers.

Crash Information

- The WisTransportal System: <https://transportal.cee.wisc.edu/applications/>

Wisconsin Traffic Operations and Safety Laboratory
The WisTransPortal System
The WisTransPortal system serves the computing and data management needs of the [Wisconsin Traffic](#) support for ITS data archiving, real-time traffic information services, transportation operations applicati

Home > Web Applications

Web Applications
This page provides access to WisTransPortal systems and data organized by category. Access leve

Safety Data

- **Wisconsin Crash Data Analysis Tools**
Web-based query and analysis tools for Wisconsin police reported crash data and crash rep
- **Community Maps - TSC Crash Mapping**
Online crash map populated by county TSCs and local agencies. Based on Google Maps API.

Work Zones

- **WisLCS Wisconsin Lane Closure System**
WisDOT lane and ramp closure request and acceptance system.
- **WisTMP Wisconsin TMP System**
WisDOT Transportation Management Plan (TMP) routing and approval system.

Search Results
Collection: **Wisconsin DT4000 Crashes**

There were **31** total crashes reported resulting in **1** fatalities and **5** injuries. Of this total, **31** crashes are mapped. [\[More\]](#)

Sort By: **Crash Date** Display: **Points**

Map Satellite

Community Maps - Wisconsin County TSC Crash Mapping
View the [Spring 2023 Community Maps User Group Zoom Recording](#) See the [Release Notes](#) for important updates. [About Community Maps crash data.](#)

About Search Advanced Predictive Analytics Dashboard TSC Resources Admin Contact Help

Welcome, schwarke | Manage Account | Logout | Contact | Help | Release Notes

Search Results

Check ALL | Uncheck ALL | Zoom To Selected

Sort By: **Crash Date** Display: **Points**

☒ **KRL1CR2KRT**
094 AT 094
AZTALAN (T), JEFFERSON County
(O) No Apparent Injury
01/20/2023
Flags: Lane Depart 1U 1

☒ **KRL0J6DKSO**
094 AT A
LAKE MILLS (T), JEFFERSON County
(O) No Apparent Injury
01/25/2023
Flags: Government Property, Speed, Winter Road, Lane Depart 1U 2

☒ **KRL0SP14NJ**
094 AT ZIEBEL RD



Work Zone Crash Video



I-41/94 @ RYAN RD



Resources

- Standard Spec.
 - <https://wisconsindot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrces/rdwy/stnds-spec.aspx>
- Construction Materials Manual
 - <https://wisconsindot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrces/rdwy/cmm.aspx>
- Standard Detail Drawings
 - <https://wisconsindot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrces/rdwy/sdd.aspx>
- Wisconsin MUTCD
 - <https://wisconsindot.gov/Pages/doing-bus/local-gov/traffic-ops/manuals-and-standards/wmutcd/wmutcd.aspx>
- 2020 Wisconsin Flagging Handbook
 - <https://wisconsindot.gov/dtsdManuals/traffic-ops/manuals-and-standards/flagger.pdf>
- Sign Code Manual
 - <https://wisconsindot.gov/dtsdManuals/traffic-ops/manuals-and-standards/signcode/signcode.pdf>
- Sign Plate Manual
 - <https://wisconsindot.gov/Pages/doing-bus/local-gov/traffic-ops/manuals-and-standards/signplate/signplate.aspx>



Module 2: Work Zone Planning



Work Zone Planning

Work Zone Impact Assessments(WZIA) & Transportation Management Plans(TMP)

- Promote safety for traveling public and workers
- Minimize congestion and adverse traffic impacts
- Improved public satisfaction
- Balance the needs of the public and the project



Work Zone Impact Assessment

FDM 11-50-5.4

- Analysis of Alternatives
 - How do we balance the work and traffic?
- How can the project be built?
- What can we do with traffic?
- Determine TMP type
- Mitigation strategies based on traffic conditions
- Alternative contracting strategies
- Estimated costs



Work Zone Impact Assessment

Project Information

Work Zone Impact Assessment		
Project ID:	Highway:	
Title:		
Limits:		
Length (miles):	County:	Project Cost:
Project Description		



Work Zone Impact Assessment

Work Zone Alternatives

Work Zone Alternatives			
Alternative #	Main Work Zone Strategies	Feasible	Justification of nonfeasibility
1*			
2			
3			
4			
5			

- Defaults

- Multi-lane facilities, Continuous Lane Closure
- Two-lane, two-way, Full Closure with a Detour



Work Zone Impact Assessment

Operational Considerations

Operational Considerations								
Alternative # Continued	WZ Capacity (vphpl)	Expected Delay (min.)	Expected Queue (miles)	Road User Costs (\$/day)	Duration (Days)	Total Road User Costs (\$)	Est. WZ Capital/TMP Cost (\$)	Estimated # of Project Stages
1								
2								
3								
4								
5								

- Coordinate with Region Traffic



Work Zone Impact Assessment

Other Considerations

Other Considerations								
Alternative # Continued	Est. WZ Real Estate Impacts	Pedestrian Impacts	Utility Impacts	Transit Impacts	Environ. Issues with WZ	Construct- ability	Product Quality	Project Timeline Constraints
1								
2								
3								
4								
5								



Work Zone Impact Assessment

Recommendations

Recommendations			
Alternative # Continued	Safety Considerations	Recommended Alternative	TMP Type
1			
2			
3			
4			
5			



Work Zone Impact Assessment

Notes and Comments

Comments on Alternative Analysis	
Notes:	
Pedestrian	
Impacts:	

- Comments populate when yes selected



Transportation Management Plans



Transportation Management Plans

11-50-5.5

- A set of coordinated strategies that describes how they will be used to manage work zone impacts of a road project
- Living document that starts with the WZIA and is completed at the end of the project construction
- Required for all WisDOT projects




Transportation Management Plans

Section 1 – Project Info

- Basic project information
- Design and Construction ID required
- Location of project in both directions

* TMP Type: 2	
* Region: SE	
* Local Program: No	
Created Comment:	
* Federal Oversight: No	
* Design ID: 1229-03-01	
Project Title: NORTH-SOUTH FREEWAY	
* County: OZAUKEE	
* Highway: I-43	
Construction Year: 2025	
Mainline AADT: 47020	
Crossroad AADT:	
Construction ID(s): 1229-03-71	
Project Type: RESURFACING (OVERLAY >= 4 INCHES)	
Project Limits: STH 60 TO STH 32	
Project Length: 1.7 miles	

Section 1B - Project Impacts	
Anticipated Begin: 05/2024	
Anticipated End: 09/2024	
OSOW Route: Yes	
OSOW Type: OSOW-TR	
Section 1C - Location	
Location Number: 1	
Begin County: OZAUKEE	
End County: OZAUKEE	
Highway: I-43 SB	
Closure Type: Mainline and Ramp	
Begin Landmark: ON RAMP FROM COUNTY V I-43 SB/WIS 32 SB/WIS 57 SB OZAUKEE	
Direction From: At Landmark	
Distance From: 0.0 mile(s)	
End Landmark: WIS 60 (B-45-0015 BEGIN) I-43 SB/WIS 32 SB/WIS 57 SB OZAUKEE	
Direction From: At Landmark	
Distance From: 0.0 mile(s)	



Transportation Management Plans

Section 2 – Project Description

- What is this project attempting to accomplish?
- Brief explanation
- Attach WZIA at 60%

Section 2 - Project Description


 (Section Comment Available | Last updated by James Schumacher on 04/19/22 03:50 PM)

Brief description of work activities:

This project is a resurfacing project of IH 43 from STH 60 to STH 32 located in Ozaukee County. The IH 43 from STH 60 to STH 32 and the IH 43 ramps north of STH 60 are scoped for mill and overlay. Additional work includes culvert repairs near Arrowhead Road and replacing the outdated median cable barrier and beam guard.

The WisDOT Park and Ride 45-40 at STH 32/CTH V will get an overlay. Additional work includes replacement of the driveway culvert and lighting upgrades.

Construction will be completed with staging and full closures.

 [Work Zone Impact Assessment Form.pdf](#)



Transportation Management Plans

Section 3 – Existing Conditions

- Queuing and delay
- Pedestrians
- Commercial waterway
- Railroads
- Selecting Yes, will open additional questions in Section 5

Section 3 - Existing Conditions

Within the project limits are there:

Pedestrians:

No

Bicyclists:

No

Transit Service:

No

Railroads:

No

Airports:

No

Commercial waterway:

No

Controlled intersections:

No

Dynamic message boards:

No

What are the current traffic conditions:

Posted speed (mph):

70

Normal travel time

(min):

2

Current capacity

(vphpl):

2100

Truck %:

15

Queueing present:

No

Queueing when:

 [ForecastSummary.docx](#)

Add Comment

Transportation Management Plans

Section 4 – Work Zone Strategies

- Lane closures/full closures/shifts
- Temporary widening
- Detours
- Day/Night
- Justification/Comments
- Cost of the temp. items

Section 4 - Work Zone Strategies (Section Comment Available Last updated by Andrew Heidtke on 06/28/23 10:33 AM)		
List of chosen strategies:		
Strategy	Justification/Comment	Cost
Construction phasing/staging	Construction staging for mill & overlay of IH 43 from STH 60 to STH 32 and the STH 60 NB On Ramp and SB Off Ramp, mill & overlay of the Park and Ride at STH 32, cable barrier and beam guard replacement, culvert work at Arrowhead Rd, and lighting and driveway culvert replacement at the STH 32 Park and Ride.	\$100000
Off-Peak/Night/Weekend Full Closure	The mill & overlay work is required to be done at night so that the full closure does not disrupt daytime traffic. The full closure is required due to the greater cost of shoulder improvement need to shift traffic onto the shoulders for single lane closures.	\$73750
Lane closures	Potentially needed for cable barrier and median work along IH 43 from STH 60 to STH 32.	\$44600
Shoulder Closure	The closure of the NB outside shoulder will be needed to perform culvert rehabilitation work at Arrowhead Road. Inside shoulder closures may also be utilized during median barrier work.	\$20600
Ramp Closures	The closure of the STH 60 NB On and SB Off Ramps are required for mill & overlay as it is too narrow to be staged and alternate routes are sufficient to maintain access.	\$35000



Transportation Management Plans

Section 5 – Work Zone Impacts

- Special Events
- Holidays
- Impacts from Section 3
- Consider nearby projects

Section 5 - Work Zone Impacts

Describe how access to traffic generators (businesses, schools, etc.) and everyday services will be maintained:

Access will be maintained throughout the project using detours, shoulder closures, and nighttime full closures. Outreach to various traffic generators will occur to provide information in advance of closures. The proposed staging concept will be coordinated and discussed with key stakeholders. Consecutive entrance or exit ramps may not be closed at the same time. Ramps utilized as an active detour route may not be closed.

Are there anticipated traffic impacts from the proposed project on other road/routes in the region/corridor?

No

Does the project affect other regions/states?

No

List holidays or major special events that occur during the project:

Holiday/Special Event	Begin Date	End Date
Memorial Day	05/24/2024 12:00 PM	05/28/2024 06:00 AM
Independence Day	07/03/2024 12:00 PM	07/08/2024 06:00 AM
Labor Day	08/30/2024 12:00 PM	09/03/2024 06:00 AM
Green Bay Packers Games	07/31/2024 12:00 PM	10/01/2024 12:00 PM

How will traffic disruptions be minimized during listed events and holidays?

Work will not be performed on, nor materials hauled of any kind along or across any portion of the highway carrying IH 43 traffic. The traveled way and shoulders of such portions of the highway will be entirely cleared of equipment, barricades, signs, lights, and any other materials that might impede the free flow of traffic during the Holiday periods.

On days with a Green Bay Packer home game at Lambeau Field, maintain two lanes open on IH-43 northbound four hours prior to the start of a game and IH-43 southbound until four hours after the end of a game.

[Add Comment](#)



Transportation Management Plans

Section 6 – Traffic Analysis

- Work with Region Traffic Section
- Software use depends on roadway
 - Freeway/expressways – WZTAT
 - Everything else – Synchro, HCS, etc
- Work Zone Capacity, Delay, Queuing

Section 6+ - Traffic Analysis				
What is the anticipated travel delay during the project for each impacted roadway?				
#	Location Description	WZ Capacity (vphpl)	Delay (min)	Queue (mi)
1	I-43 SB from ON RAMP FROM COUNTY V to WIS 60 (B-45-0015 BEGIN)	0	3	0.1
2	I-43 NB from WIS 60 (B-45-0015 BEGIN) to OFF RAMP TO WIS 32	0	3	0.1

How was the work zone capacity determined?
The IH-43 work zone will be closed to through traffic during the nighttime work and will utilize a detour route. Therefore, a work zone capacity was not calculated for this project.



Transportation Management Plans

Section 6+ – Lane Closure Hours

- Describe the lane closure hours that will be used for the project
- An attachment may be used to show the typical lane closure hours

Section 6+ - Lane Closure Hours

a) Are there restrictions on when lane closures are allowed?

Yes

b) What hours/days are lane closures permitted?

Full closures will be required to perform the base patching and mainline mill and overlay. Additionally, single-lane closures may be used for shoulder rehabilitation and median work (cable/beam guard). Based upon existing traffic volumes, the allowable closure times are as follows:

*Weekday Peak Hours Northbound - 2:00 PM - 7:00 PM Monday, Tuesday, Wednesday, Thursday - 12:00 PM - 10:00 PM Friday Southbound - 6:00 AM - 9:00 AM Monday, Tuesday, Wednesday, Thursday, Friday - 3:00 PM - 7:00 PM Monday, Tuesday, Wednesday, Thursday, Friday

*Weekend Peak Hours Northbound - No Restrictions Saturday, Sunday Southbound - No Restrictions Saturday - 10:00 AM - 7:00 PM Sunday

*Full Freeway and System Ramp Closure Hours - 9:00 PM - 5:00 AM (Sunday PM to Monday AM, Monday PM to Tuesday AM, Tuesday PM to Wednesday AM, Wednesday PM to Thursday AM, Thursday PM to Friday AM) - 9:00 PM - 6:00 AM (Friday PM to Saturday AM, Saturday PM to Sunday AM) *Service Ramps Closure Hours - 6:30 PM - 6:30 AM (Sunday PM to Monday AM, Monday PM to Tuesday AM, Tuesday PM to Wednesday AM, Wednesday PM to Thursday AM, Thursday PM to Friday AM) - 8:30 PM - 6:30 AM (Friday PM to Saturday AM) - No Restrictions (Saturday PM to Sunday AM) Do not close freeway lanes or shoulders (including auxiliary lanes, system ramps and service ramps) and ensure the roadway is entirely clear for traffic during Weekday Peak Hours and Weekend Peak Hours. One freeway lane and/or shoulder may be closed on the freeway and system ramps, during Weekday Off-Peak hours and Weekend Off-Peak Hours but it must be approved by the engineer.

c) If the project is reporting zero delay, show the delay incurred if the lane closures hours identified are not followed:

Minimal delay will be incurred during the nighttime hours due to the full mainline and ramp closures. If work is extended beyond the restricted work times into the weekday AM Peak Period, congestion and local inconvenience will occur along the detour route. A summary of Road User Costs (NB/SB) is shown attached for a scenario where the full closure extends from 5-8am.



Transportation Management Plans

Section 6+ – Detours

- List any detour routes that will be used for mainline or ramp traffic
- Determine the length of the detour and the amount of time it will take to drive
- Attach detour route plans

Section 6+ - Detour Route			
Detour Information			
Detour Route	Normal Travel Time (min)	Detour Travel Time (min)	Detour Distance (mi)
IH 43 NB: STH 60 to CTH W to STH 32	2	5	2.9
IH 43 SB: STH 32 to CTH W to STH 60	2	5	2.6



Transportation Management Plans

Section 6+ – Intersection/Signals

- When intersections are impacted or temporary signals used document if there are any changes for timing.

Section 6+ - Intersection/Temporary Signal

Are any intersection traffic control changes proposed?

Changes to existing traffic signal timings will be required during construction to account for the loss of through lane capacity along STH 36/STH 83 and when loop detectors are being replaced. Green time splits should be adjusted to provide acceptable operations for all traffic movements. A summary of the construction peak hour delay at the 4 traffic signal intersections with adjusted signal timings is provided in the attachments.



Transportation Management Plans

Section 6+ – Road User Costs

- Required at 60% for
 - Lane Rentals – Hourly cost for occupying a lane
 - Interim Liquidated Damages – Daily cost for a closure, in the middle of a project
 - Enhanced Liquidated Damages – Daily cost for a closure at the end of a project above the standard rates listed in Spec. 108



Transportation Management Plans

Section 6+ – Road User Costs

- Show the difference between normal conditions and delay conditions to justify cost recovery
- New Jersey Spreadsheet for ramps, detours, flagging
- WZTAT for freeways and expressways
- List daily road user cost in text box

Section 6+ - Road User Costs

What are the road user costs for the project?

Road User Cost Calculations are shown attached for the Overnight Mainline Full Closures. For the NB/SB closure (Site 45-1003), the RUC is up to approximately \$5,640 per day total for the 9p-5am period.

- [RUC_1229-03-01_NB-SB FullClos \(Nightly\)_Rev1.pdf](#)
- [RUC_1229-03-01_NB-SB FullClos \(Nightly\)_ExtHrs.pdf](#)
- [027001_dt.pdf](#)



Transportation Management Plans

Section 7 – Public Information Strategies

- Public information and outreach plan
 - Webform/Attachment
- How and what are we telling the public while the work is occurring
 - 511, project websites, mailers
 - Not for information on design of the project

Section 7 - Public Information Strategies
[\(Section Comment Available | Last updated by James Schumacher on 04/19/22 03:51 PM\)](#)

Choose strategies that will be used to mitigate the impacts to the public:

Strategy	Intended Audience	Comments
511 Traveler Information Website (project website, lane closures, motorist information, public information)	Traveling Public	
Freight travel information/Lane Closure System (LCS)	Traveling Public; Freight/Trucking	
Traffic Management Center (TMC)	Traveling Public	
Region Weekly Construction Update	Emergency services; adjacent project coordination	

[2021 Project Public Information Plan Form 2.docx](#)



Transportation Management Plans

Section 8- Incident Management Strategies

- Law enforcement mitigation
 - Discussion with Region Traffic
- Emergency construction access
- Notifying local first responders
 - Let them know about timing of closures

Section 8 - Incident Management Strategies (Section Comment Available Last updated by Tom Boyke on 05/23/22 09:12 AM)		
List of chosen strategies:		
Strategy	Comments	Cost
Incident/Emergency Response Plan and Coordination with Emergency Responders		\$0
Standard RIMC Process		\$0
Cost of chosen strategies (sum of strategy costs):		\$0
EmergencyContactList.pdf		




Transportation Management Plans

Section 9- Staging

- How is the project built?
- What is the plan for traffic?
- How are pedestrians able to move?
- Show us the most up to date staging plans

Section 9 - Staging Plans

 (Section Comment Available | Last updated by James Schumacher on 04/20/22 08:24 AM)

Briefly describe the staging planned for maintaining traffic:

Staging consists of a long term shoulder closure allowing all regular traffic movements for work alongside the roadway and overnight full closures with detour for resurfacing of the roadway. A left lane closure during daytime off-peak hours will be provided to allow additional space for contractor during median cable barrier work.

Park and ride will be fully closed for one week (Monday to Friday) to complete HMA paving, lighting upgrades, and driveway culvert replacement, with the condition that the park and ride at IH 43 & CTH C is fully reopened prior to the full closure. A minimum of 25 parking stalls should be available at all other times.

Vehicle Size Restrictions:

#	Location Description	Min lane width to maintain (ft)	Min lane width plus shoulder (ft)	Min Height (ft)	Min shy distance to CBTP (ft)
1	I-43 SB from ON RAMP FROM COUNTY V to WIS 60 (B-45-0015 BEGIN)				
2	I-43 NB from WIS 60 (B-45-0015 BEGIN) to OFF RAMP TO WIS 32				

 025101_tc.pdf



Transportation Management Plans

Section 10 – Nonstandard Mitigation

- This section is required when a Nonstandard Mitigation strategy is selected in Section 4 or 8
- See process 11-50-5
- Requires Request for Non-Standard Mitigation Strategies Approval form



Exercise #1

- Open the WisTMP Website
- Go to the Training Site link
 - US 51 in Oneida County, between Tomahawk and Minocqua
 - Create a new TMP
 - Use the WZIA and the exercise packet
 - Fill out Sections 1-5 as much as possible
 - 25 min. to complete



BREAK



Module 3: Work Zone Devices



Work Zone Duration

WMUTCD Part 6 Section 6G.02

Standard:

The five categories of work duration and their time at a location shall be:

- A. Long-term stationary is work that occupies a location more than 3 days.**
- B. Intermediate-term stationary is work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour.**
- C. Short-term stationary is daytime work that occupies a location for more than 1 hour within a single daylight period.**
- D. Short duration is work that occupies a location up to 1 hour.**
- E. Mobile is work that moves intermittently or continuously.**



Road Open to Traffic/Road Closed to Traffic

Is traffic maintained?

- Do we have to worry about regular vehicle traffic in the work zone?
- What do we do with the pedestrians?
- 104.6.3/4



If the road is closed...

SS 104.6.3 Road Closed to Traffic

- Still need to maintain local access
- Temporary Traffic Control for closure points
- Some devices needed in the work area to protect structures
- Detour routes posted for through traffic



If the road is open...

How do we maintain traffic?

- Where is the through traffic going?
- How wide will the traveled way be?
- Will there be a reduction in capacity?
- Turn lanes, access points
- Pedestrians



If the road is open...

Strategies for maintaining traffic

- One-Lane, two-way
- Lane shifts
 - Shoulder condition?
- Lane closures
 - Continuous
 - Off-peak/Nightly/Weekly
- Temporary roadway



If the road is open...

How do we determine the strategy?

- We need to determine the capacity of the roadway (pcphpl)
 - Work Zone Traffic Analysis Tool (WZTAT) – Free flow facilities
 - Synchro/Highway Capacity Software for signalized corridors
 - Flagging nomograph
- Region Traffic should assist with this during the 60% TMP development
- Iterative process based on balancing traffic/construction/safety



Closure #3	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Start of Closure							
End of Closure							

- WZTAT Input/Output

EB Queue Miles																										
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
April																										
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	1.69	3.89	7.50	11.4	14.1	14.1	12.1	9.80	6.72	3.21	0.00		
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.15	0.12	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.79	1.63	3.07	4.47	6.30	8.48	10.7	11.9	11.7	10.4	7.46	3.35	0.00	0.00		
4	0.00	0.00	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.77	2.07	2.33	0.55	0.00	0.00	0.00	0.00	0.00		
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67	2.77	4.07	2.18	0.00	0.00	0.00	0.00	0.00		
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.05	2.93	3.69	2.63	0.00	0.00	0.00	0.00	0.00		
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	2.12	4.37	6.06	4.86	1.96	0.00	0.00	0.00	0.00		
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	1.65	4.13	7.34	9.20	8.36	6.55	4.17	0.69	0.00	0.00		
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.82	1.35	2.03	2.58	2.97	3.27	3.00	1.90	0.01	0.00	0.00	0.00	0.00		
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.95	2.23	3.50	5.29	6.82	9.03	10.1	9.94	9.14	6.97	3.50	0.00	0.00		
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	2.65	3.31	1.50	0.00	0.00	0.00	0.00	0.00		
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.03	2.41	4.47	3.46	0.61	0.00	0.00	0.00	0.00		
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.84	2.42	3.73	2.14	0.00	0.00	0.00	0.00	0.00		
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73	1.67	3.01	5.04	7.27	8.94	7.96	6.26	3.66	1.64	0.00	0.00		
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	1.24	3.41	6.79	11.6	16.3	19.4	19.6	18.2	16.2	13.2	9.52	5.11		
16	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.99	2.41	4.07	5.59	7.38	9.91	10.1	9.69	8.29	6.53	3.82	0.42	0.00	0.00		
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.18	8.43	11.5	13.0	15.4	18.5	22.3	26.0	28.0	29.2	28.4	25.7	22.5	18.6		
18	15.3	9.79	4.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	1.71	3.47	6.19	9.25	5.87	3.43	0.29	0.00	0.00	0.00	0.00	0.00		
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.43	4.49	6.25	4.99	2.17	0.00	0.00	0.00	0.00		
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.18	3.10	4.51	3.38	0.84	0.00	0.00	0.00	0.00		
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.56	2.32	5.34	6.68	5.85	4.06	1.44	0.00	0.00	0.00		
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.34	1.25	3.25	6.33	9.11	11.1	10.0	9.77	7.31	3.94	1.07	0.00	0.00		
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	1.64	3.03	4.01	4.56	5.96	6.51	7.76	7.73	7.24	5.74	3.59	0.77	0.00		
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	3.83	6.95	10.1	12.6	15.7	18.6	20.5	21.4	20.0	17.6	14.3	9.99	6.03		
25	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.57	2.07	3.83	4.51	2.96	0.35	0.00	0.00	0.00		

How do we communicate the strategy with the public?



Temporary Traffic Control Devices

- Signs
- Barricades
- Arrow Boards
- Portable Changeable Message Boards (PCMS)
- Temporary Markings
- Speed radar trailers
- Channelizing Devices
 - Drums, 42-inch cones, flexible tubular markers
 - Concrete Barrier Temporary Precast



Traffic Control Signs

Spec. 643.2.3 FDM 11-50-21

- Temporary Traffic Control Signs

- 48x48 inch warning diamonds
- Detour route guide signs
- Regulatory
- Supports are incidental
- Covering incidental



Traffic Control Signs

Spec. 643.2.3 FDM 11-50-21

- Fixed Message Signs
 - Custom signs
 - Signs with a single dimension over 60 inches
 - Supports are incidental
 - Covering incidental
 - Send requests for FMS details to:
dotbtosigndetails@dot.wi.gov



Traffic Control Signs

Spec. 643.2.3 FDM 11-50-21

- Signs with Distances
 - G-Series
 - Round to nearest whole number
 - Regulatory & W20 series
 - Use fractions
 - Never use decimals



Traffic Control Signs

Sign supports

- Portable
 - Less than 7 continuous days
- Post Mounted
 - 7 days or more



SIGN ON PERMANENT SUPPORT



SIGN ON TEMPORARY SUPPORT



Traffic Control Signs

Spec. 643.2.3

FDM 11-50-21

- Sign Covering
- Existing permanent signs
- Must fully cover existing message



Table 21.1 Covering Signs for Traffic Control Example Table

Stage	643.0910			643.0920		
	Traffic Control Covering Signs Type I			Traffic Control Covering Signs Type II		
	Each	Number of Cycles	Number of Signs	Each	Number of Cycles	Number of Signs
Stage 1	$a * b$	a	b	$x * y$	x	y
Stage 2	$a * b$	a	b	$x * y$	x	y
Stage 3	$a * b$	a	b	$x * y$	x	y
Stage 4	$a * b$	a	b	$x * y$	x	y
TOTAL						

How do we pay for sign covers

COVERING SIGNS					
STAGE	LOCATION	DESCRIPTION	643.0920 TRAFFIC CONTROL COVERING SIGNS TYPE II		
			EACH	NUMBER OF CYCLES	NUMBER OF SIGNS
PROJECT 1130-72-60					
1A	IH 41 NB INSIDE LANE CLOSURE	70 MPH SPEED LIMIT		7	4
1B	IH 41 NB OUTSIDE LANE CLOSURE	70 MPH SPEED LIMIT		8	4
2A	IH 41 BB INSIDE LANE CLOSURE	70 MPH SPEED LIMIT		7	4
2B	IH 41 SB OUTSIDE LANE CLOSURE	70 MPH SPEED LIMIT		8	4
TOTALS					

643.0920		
TRAFFIC CONTROL COVERING SIGNS TYPE II		
NUMBER OF SIGNS	NUMBER OF CYCLES	EACH
2	4	
4	4	
-	-	
-	-	
2	1	
STAGE 2B TOTAL		

CATEGORY	STAGE	LOCATION	STAGE DURATION DAYS
1000	2B	IH 43 NB	4
		IH 43 SB	4
		LAYTON AVE - RAMP D	1
		IH 43 NB ON RAMP FROM STH 100	1
		W-E RAMP	1
STAGE 2B TOTAL			



Barricades

Type III

- Three panels, 8 feet wide
- Diagonal sheeting pointed down toward traffic
- Used in closed lanes
- Typically have a sign
- WisDOT typically only uses Type III Barricades



Arrow Boards

- Only used for lane/shoulder closures
 - Don't use for lane shift
 - Don't use for added lane closure (SDD 15d50)
- Lane Closure: Use flashing arrow
- Shoulder Closure: Use flashing bar or 4 corners



Arrow Boards



Flashing Arrow Boards

		Required Flashing Arrow Boards			
		Undivided		Divided	
		Lanes closed	40 mph and less	45 mph and greater	45 mph and less
Stationary	1	Optional*	1	1	2
	2			2	3
	3			3	4
Mobile	1	2	3	3	4
	2	3	4	4	5
	3	4	5	5	6

*When Flashing Arrow Board is optional, a Type III Barricade with a WO1-6 may be used in lieu.

*Take traffic volumes and duration of work into account to determine if a Flashing Arrow Board is needed.

Portable Changeable Message Signs (PCMS)

TEOpS 6-2-55

- Use for prewarn
- New travel conditions
- Do not replicate messages used by standard warning signs
- PCMS message plan
- Consider available Dynamic Message Signs



Portable Changeable Message Signs (PCMS)

TEOpS 6-2-55

- 8 Characters per line
- 3 lines per frame
- 2 frames total
- No filler or blank frames



PCMS Message Quiz

Is this acceptable

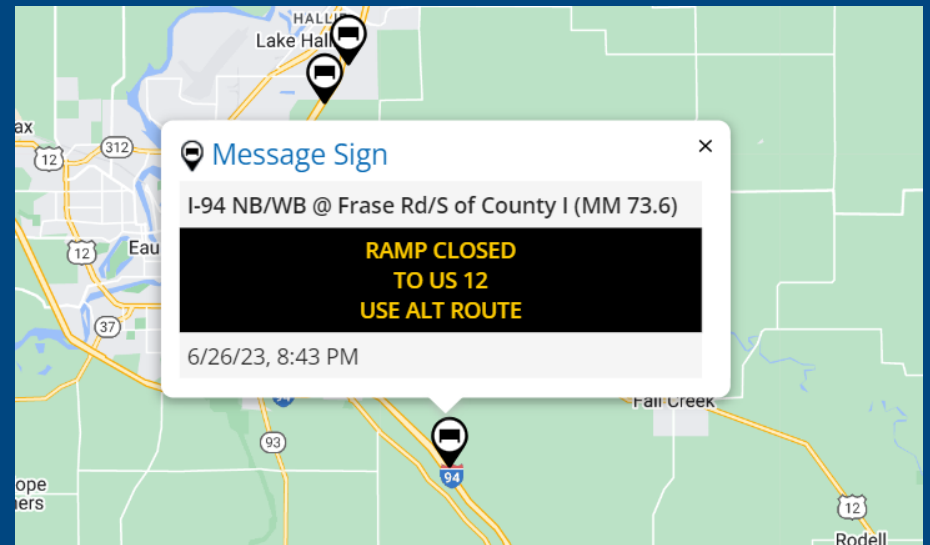
	PCMS #1	PCMS #2	PCMS #3	PCMS #4
Frame 1:	SHOULDER CLOSED AHEAD	RAMP TO CLOSE	LANE CLOSED AHEAD	NEW TRAFFIC PATTERN
Frame 2:	USE CAUTION	THURSDAY 10PM- 6AM	WATCH FOR BACKUPS	LANES NARROW



Dynamic Message Signs (DMS)

TEOpS 17-1-1

- Consider if a DMS is located in an area we would place a PCMS
 - 511 Wisconsin has all WisDOT DMS located on a map
- Coordinate with the TMC during project design
 - TMC@dot.wi.gov

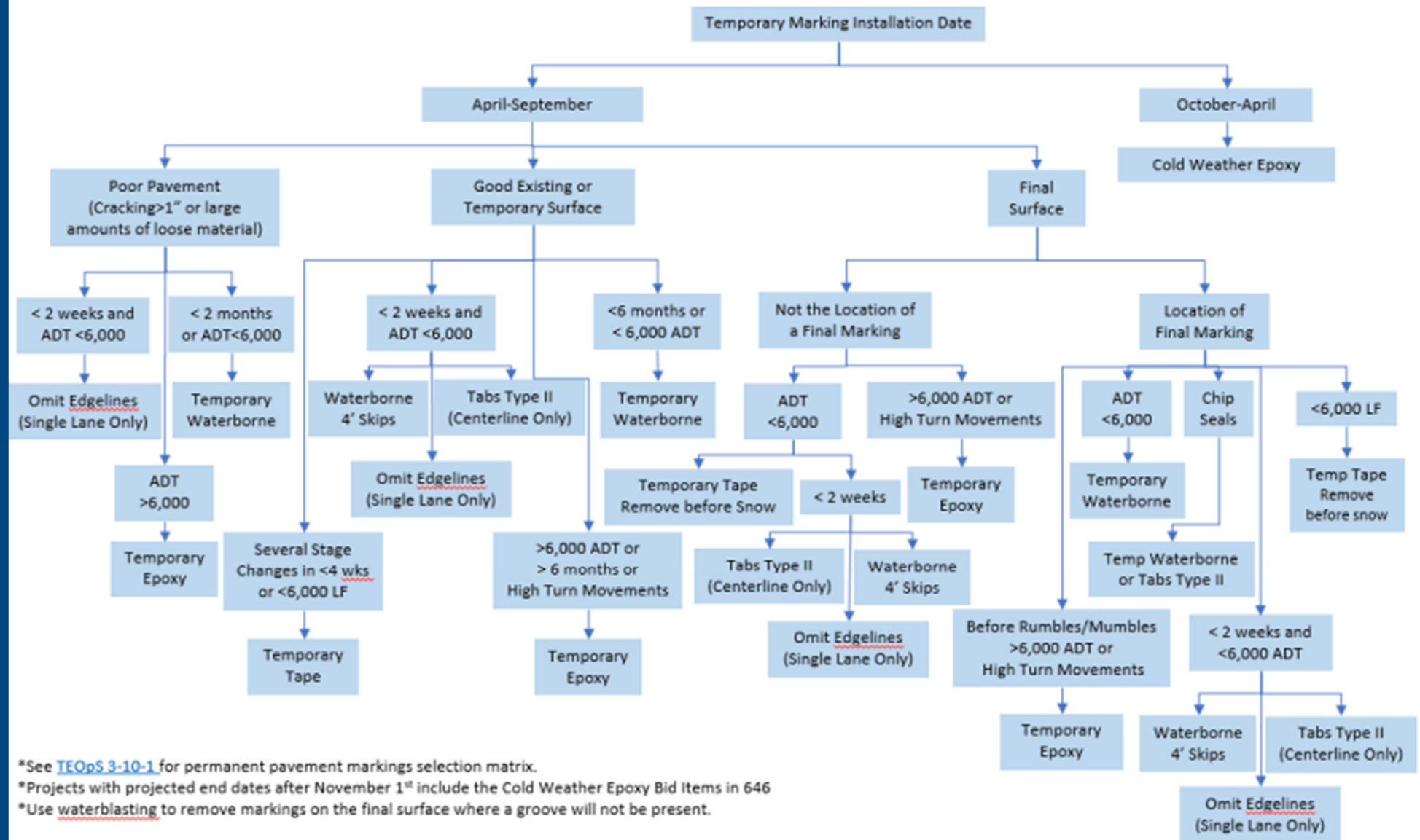


Pavement Markings (TEOpS 3-15-5)

Permanent/Existing

- Remain in place for up to 3 continuous days
- Need removal item





Pavement Markings

Temporary Liquid

- Temporary Epoxy
 - Long durations
 - High volumes
 - Permanent will be applied over
- Cold Weather Epoxy
 - Applied in winter
 - Used in winter shutdown
 - On winter staging



Pavement Markings

Temporary Liquid

- Paint
 - Most other applications
- Removal incidental to temporary liquid marking items



Pavement Markings

Temporary Tape

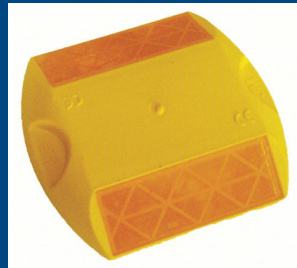
- New pavement surfaces
 - Limits scarring/ghost lines
- Cannot be used in winter



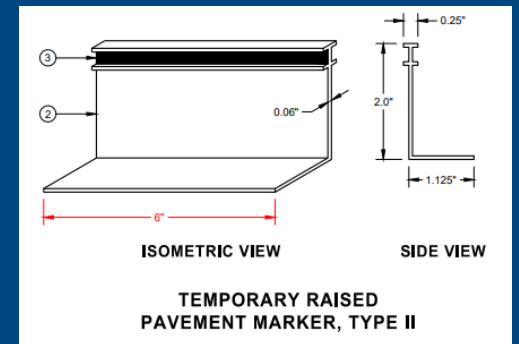
Pavement Markings

Raised Pavement Markings (RPM)

- Type I (Pucks)
- Use:
 - Shifting Tapers
 - Lane Closure Tapers
- Use for 7+ continuous days



- Type II (Tabs)
- Use:
 - Chip Seals
- Use for up to 14 days



Pavement Markings

- When will the permanent markings get installed?
 - May need cold weather marking item
- Consider for July/August letting with a late season completion



Pavement Markings

CATEGORY	STATION	TO	STATION	MARKING TYPE	LOCATION	643.3105	643.3120	646.1020	646.1040	646.3040	646.6120	648.0100	REMARKS
						TEMPORARY MARKING LINE PAINT 4-INCH YELLOW	TEMPORARY MARKING LINE EPOXY 4-INCH YELLOW	MARKING LINE EPOXY 4-INCH YELLOW	MARKING LINE GROOVED WET REF EPOXY 4-INCH WHITE	MARKING LINE GROOVED WET REF EPOXY 8-INCH WHITE	MARKING STOP LINE EPOXY 18-INCH WHITE	LOCATING NO-PASSING ZONES YELLOW	
						LF	LF	LF	LF	LF	LF	MI	
0010	356+13.90	-	724+77.84	-	STH 23	-	-	-	-	-	-	6.980	
0010	356+13.97	-	401+00	CL MARKINGS	STH 23	4,005	-	-	-	-	-	-	MILLED SURFACE
0010	356+13.97	-	401+00	CL MARKINGS	STH 23	1,707	2,298	-	-	-	-	-	W/B OVERLAY
0010	356+13.97	-	401+00.00	CL MARKINGS	STH 23	-	1,707	-	-	-	-	-	E/B OVERLAY
0010	401+00.00	-	724+77.84	CL MARKINGS	STH 23	40,826	-	-	-	-	-	-	MILLED SURFACE
0010	401+00.00	-	724+77.84	CL MARKINGS	STH 23	40,826	-	-	-	-	-	-	CIR SURFACE
0010	401+00.00	-	724+77.84	CL MARKINGS	STH 23	40,826	-	-	-	-	-	-	W/B HMA LOWER LAYER
0010	401+00.00	-	724+77.84	CL MARKINGS	STH 23	-	-	-	-	-	-	-	E/B HMA LOWER LAYER
0010	401+00.00	-	724+77.84	CL MARKINGS	STH 23	20,290	20,536	-	-	-	-	-	W/B HMA UPPER LAYER
0010	401+00.00	-	724+77.84	CL MARKINGS	STH 23	-	20,290	-	-	-	-	-	E/B HMA UPPER LAYER



Exercise #3

What type of temporary marking is going to be placed?

Scenario #1

- County: Waukesha
- Highway: I-94
- AADT: 117,000
- Poor surface
- Start Date: April 15th
- End Date: June 21st

Scenario #2

- County: Door
- Highway: WIS 42
- AADT: 13,300
- Good surface
- Start Date: October 1st
- End Date: November 15th



Exercise #3

What type of temporary marking is going to be placed?

Scenario #1 – Temporary Epoxy

- County: Waukesha
- Highway: I-94
- AADT: 117,000
- Poor surface
- Start Date: April 15th
- End Date: June 21st

Scenario #2 – Cold Weather Epoxy

- County: Door
- Highway: WIS 42
- AADT: 13,300
- Good surface
- Start Date: October 1st
- End Date: November 15th



Speed Radar Trailers

- Used to advise traffic of its speed
- Useful for up to 2 weeks in a single location



Channelizing Devices

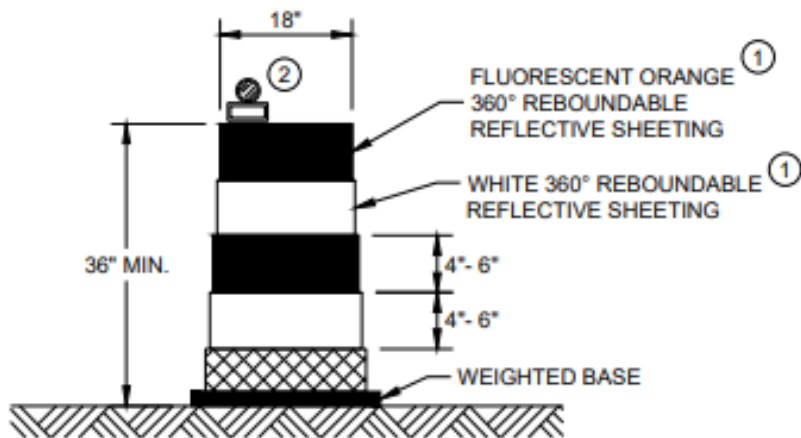
This is how we tell traffic where to go

- Drums
- Flexible Tubular Markers
- 42-inch Cones
- Channelizing Curb
- Vertical Panels



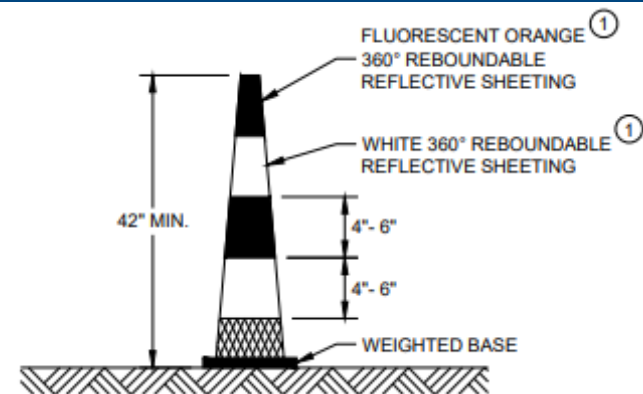
Channelizing Devices

Device Width



DRUM

BALLAST WIDTHS
RANGE FROM 24"-36"



42" CONE

DO NOT USE IN TAPERS
 $\frac{1}{2}$ SPACING OF DRUMS

BALLAST WIDTHS
RANGE FROM 14"-20"

Channelizing Devices/Positive Protection

When do we use need positive protection? 11-50-35

- Bridge deck replacements >48 hours
- Bridge painting projects
- Counter directional traffic with 2 or more lanes in each direction 45 mph or greater
- Crossovers with more than 20,000 AADT
- Spot locations – ensure correct length of need



Temporary Signals

Spec 661

- Trailer mounted
- Post/Span wire mounted
- Centered over lane



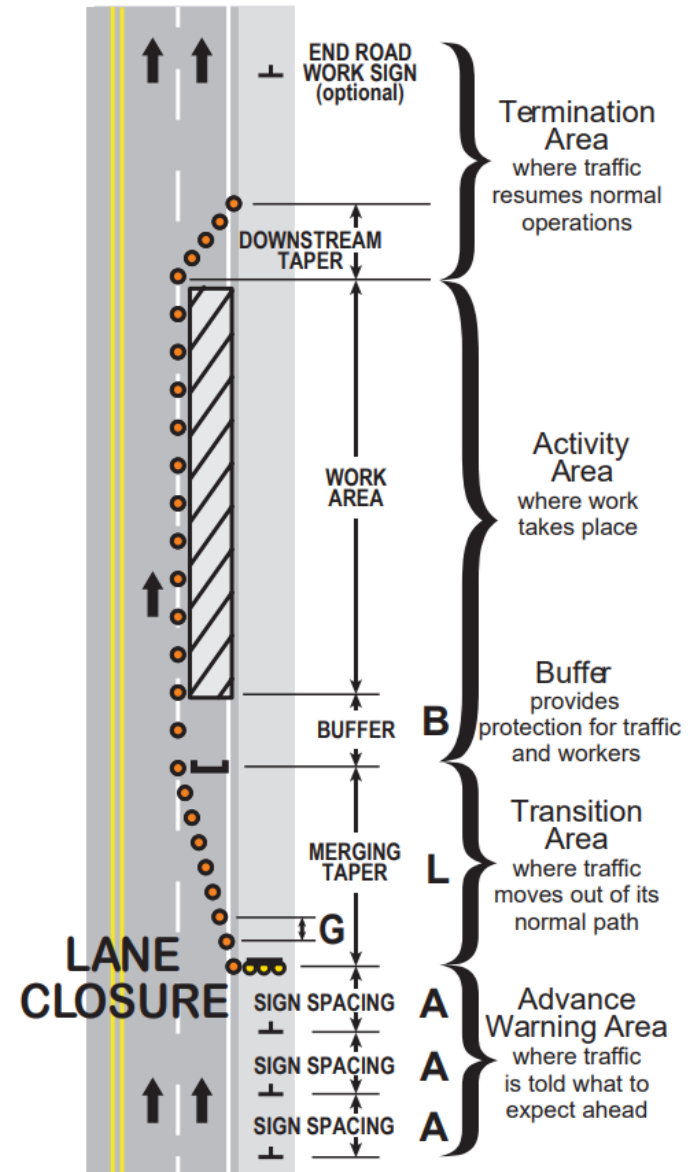
Module 4: Work Zone Geometrics



Work Zone Geometrics

- Advance Warning Area
- Transition Area
- Activity Area
 - Buffer Space
 - Work Area
- Termination Area

WMUTCD 6C.03



Work Zone Geometrics

WMUTCD Part 6

Table 6C-3. Taper Length Criteria for Temporary Traffic Control Zones

Type of Taper	Taper Length
Merging Taper	at least L
Shifting Taper	at least 0.5 L
Shoulder Taper	at least 0.33 L
One-Lane, Two-Way Traffic Taper	50 feet minimum, 100 feet maximum
Downstream Taper	50 feet minimum, 100 feet maximum

Note: Use Table 6C-4 to calculate L

Table 6C-4. Formulas for Determining Taper Length

Speed (S)	Taper Length (L) in feet
40 mph or less	$L = \frac{WS^2}{60}$
45 mph or more	$L = WS$

Where:

- L = taper length in feet
- W = width of offset in feet
- S = posted speed limit, or off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph



Exercise #4

How long should the taper be? How many drums are needed?

Scenario #1

- Speed: 70 mph
- Lane width: 12 ft
- Lane Closure

Scenario #2

- Speed: 55 mph
- Lane width: 12 ft
- Lane Shift
- Offset: 6 ft



Exercise #4

How long should the taper be? How many drums are needed?

Scenario #1

- Speed: 70 mph
- Lane width: 12 ft
- Lane Closure

Answer:

$$L = WS = (12)(70) = 840 \text{ ft}$$

$$\text{Drums} = \frac{L}{50} = \frac{840}{50} = 16.8 \approx 17 \text{ drums}$$

Scenario #2

- Speed: 40 mph
- Lane width: 12 ft
- Lane Shift
- Offset: 6 ft

$$L = \left(\frac{WS^2}{60} \right) / 2 = \left(\frac{(6)(40^2)}{60} \right) / 2 = 80 \text{ ft}$$

$$\text{Drums} = \frac{L}{50} = \frac{80}{50} = 1.6 \approx 2 \text{ drums}$$

***3 drums needed (start of taper, middle of taper, end of taper)



Staged Construction

Moving traffic lanes to get work done

- Move traffic to one space to work in another space
- Balances traffic and work that needs to be done



Work Zone Geometrics

Where to start?

- Generally, matches existing:
 - Cross-slopes
 - Horizontal Curves/Super-elevation
 - Vertical Curves
- Intersection sight triangles
- Drainage consideration



Work Zone Geometrics

Lane Widths

- Desirable 12 feet
- 11 feet
- 10 feet minimum
 - Short distances - bridges
- Vehicle legal width: 8 ft 6 in



Work Zone Geometrics

Shoulder Width



- The width of the shoulders will be dependent on the type of work and total width of the roadway
- Consideration for channelizing devices width
- Provides some room for vehicle recovery and emergency parking
 - Avoid long work zones without a shoulder

Work Zone Geometrics

Clear Zone

- That roadside border area which is made available for safe use by errant vehicles.
- Clear zones start at the edges of the traveled ways and consist of the shoulders, auxiliary lanes, recoverable slopes, and any traversable but non-recoverable slopes with clear run-out areas at the toes of the slopes.
 - Do we have the space in work zones for a clear zone?
 - Consider construction equipment, storage
 - Will there be a need for CBTP in the work zone?



Work Zone Geometrics

Clear Zone – Spec 104.6.1.2.4

104.6.1.2.4 Hazard Protection on Roads Open to All Traffic

- (1) On roads open to all traffic; remove construction debris, stored materials, and equipment not in use; or if the engineer allows, delineate and shield with concrete barrier for the following:
 - Posted speeds 45 mph or less: within 8 feet of the travelled way.
 - Posted speeds from 45 mph to 55 mph inclusive: within 10 feet of the travelled way.
 - Posted speeds above 55 mph: within 15 feet of the travelled way.
- (2) On roads open to all traffic; use temporary traffic control drums to delineate bridge abutments, concrete barrier blunt ends, sign bridge foundations, drainage structures, and slopes exposed by removing permanent protective measures. Eliminate the need for delineation within 5 calendar days or before noon on the Friday after removing permanent roadside safety devices.



Work Zone Geometrics

Clear Zone – FDM 11-50-35.6.1

35.6 CBTP End Treatments

35.6.1 Clear Zone

For determining the need for end treatment for temporary precast concrete barrier in work zones, the following clear zones are appropriate. Where a range of values for clear zone is noted, consider traffic volume, speed, and duration of exposure to determine appropriate clear zone for the project. For stage switches and short-term work operations of no more than 24 hours duration, lesser clear zone than the minimum noted may be allowed.

Page 6

FDM 11-50 Traffic Control

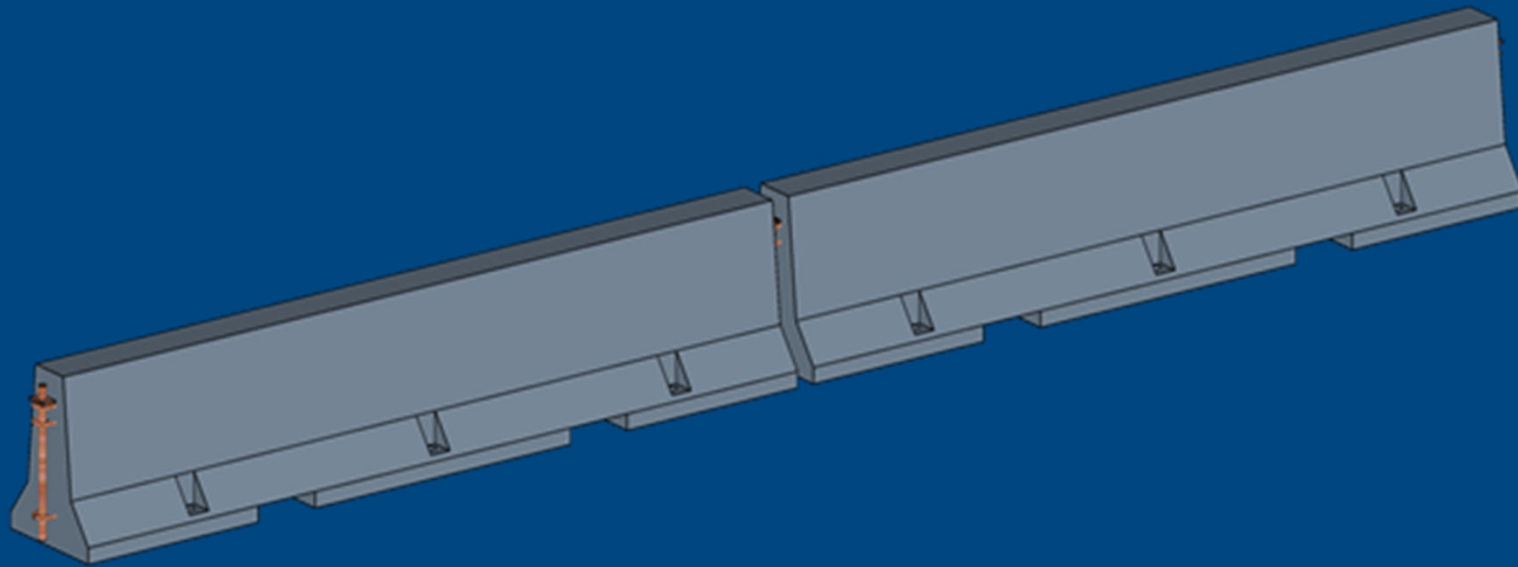
For end treatment barrier installations in place for extended length of time (e.g., more than 2 months), a greater clear zone should be considered.

- Posted speed limits above 55 mph: 15 ft lower minimum, 20 ft typical
- Posted speed limits from 45 mph to 55 mph inclusive: 10 ft lower minimum, 15 ft typical
- Posted speed limits of 45 mph or less: 8 ft lower minimum, 10 ft typical
- Bridge projects with temporary traffic signals, one open lane shared by both directions: 12 ft from the open traffic lane



Temporary Barrier

Erik Emerson



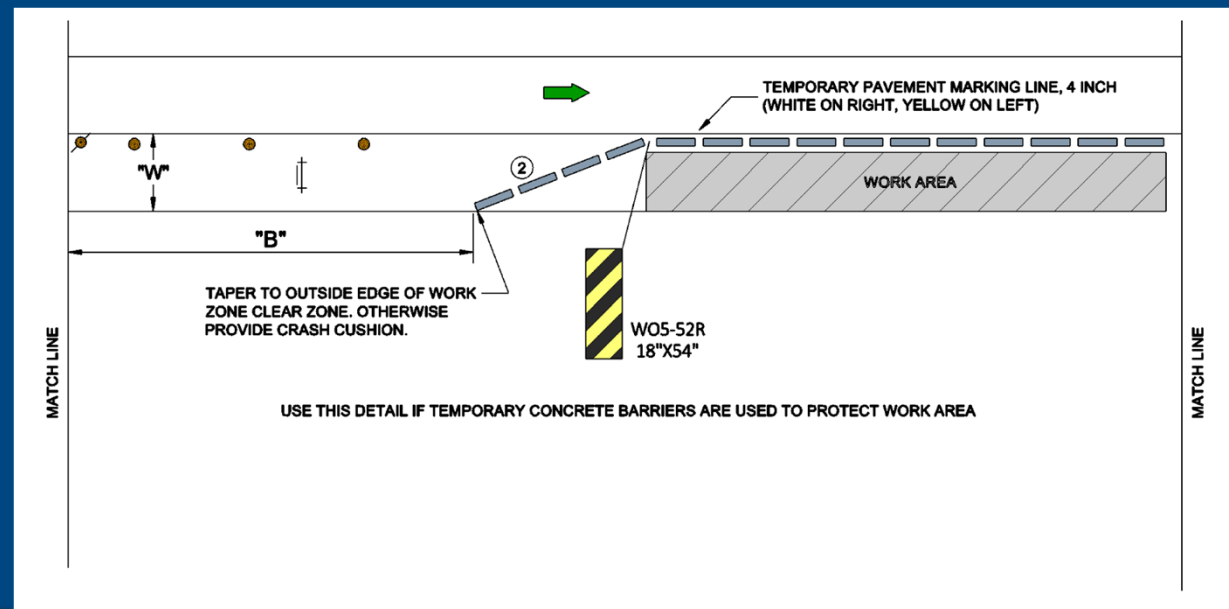
Here are the topics we will cover

- Temporary Barrier
 - Flare
 - Sloped Ends
 - Length of Need
 - Operational Length



Here is what can happen...

- Here is a detail from the SDDs.
 - Flaring the barrier can reduce the length of need.
 - Technically this could work.



What was also similar in all the crash tests.

- Contractor wants access to the work area, so they don't flare the concrete barrier enough
 - So, they don't flare the barrier enough.

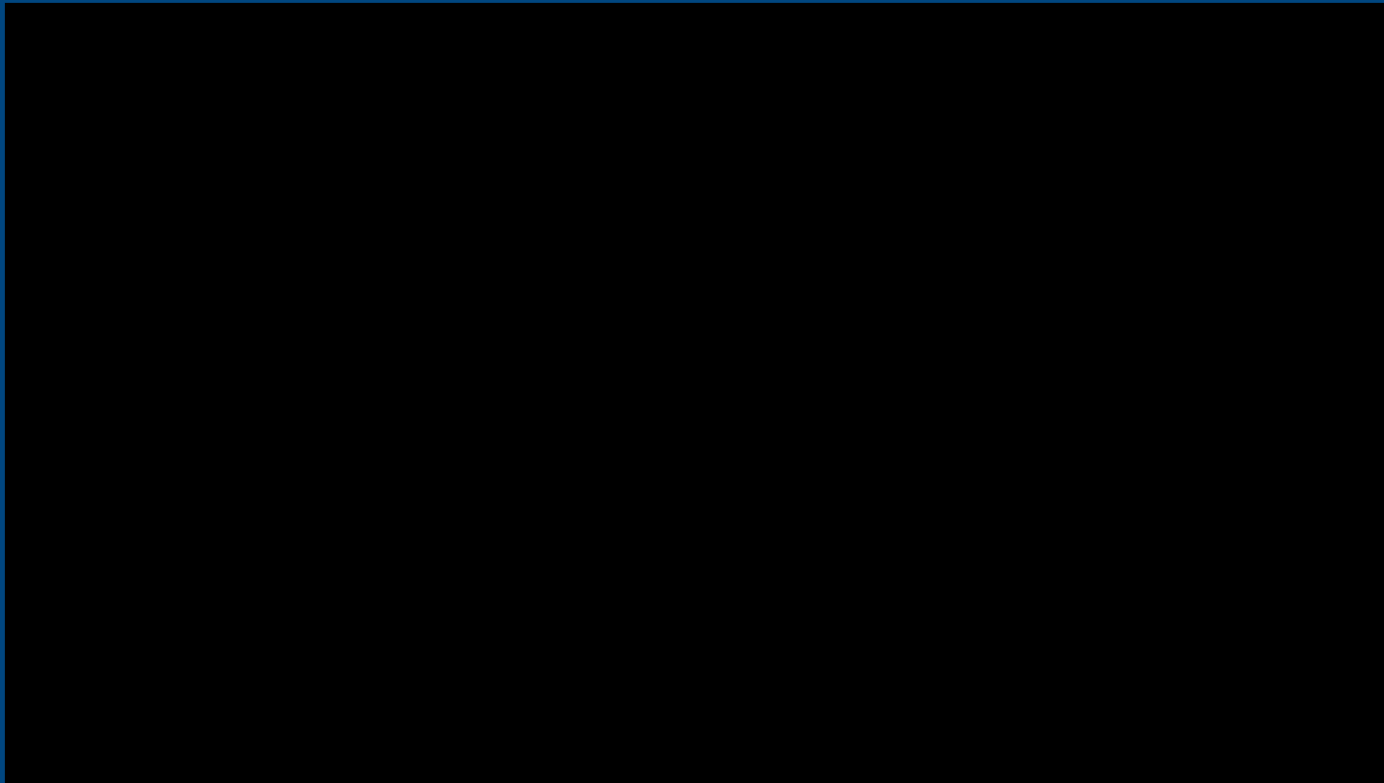


How does a sloped end work?

- If the barrier is not flared correctly, you can you could still have a head-on crash?
 - The 150 FT of vehicle flight?
 - The 100 some FT on the ground?
- Where would the vehicle be if there was a head-on crash?

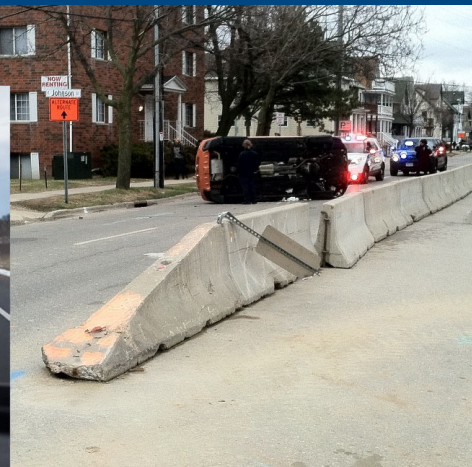
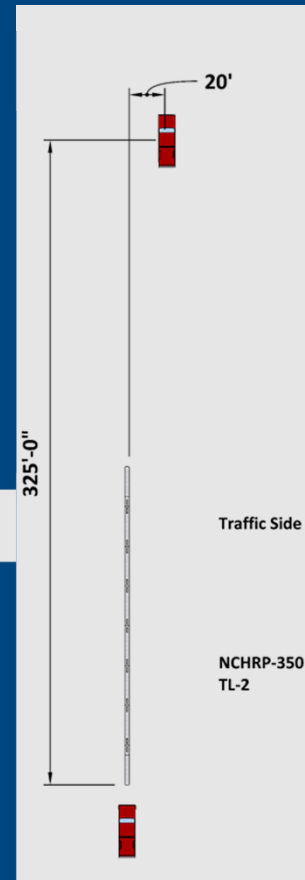


Here is something to “help” your imagination



How does a sloped end work?

- We have a lower speed, so a sloped end is not an issue?
 - Here is a drawing from a TL-2 crash test.
 - The test was run at 44 MPH.
- Here is a crash in a 30 MPH posted speed area.
- Where would the vehicle land in these work areas?



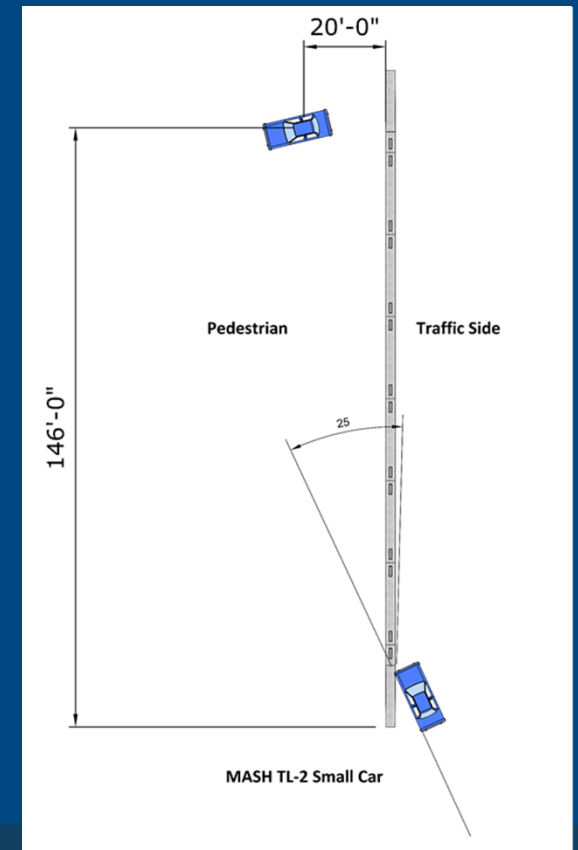
How does a sloped end work?

- A head-on crash is unlikely because the barrier is flared.
 - Here an angle impact into a sloped end.



How does a sloped end work?

- Here is the results of a TL-2 impact at 44 MPH.
- Where would the vehicle end up in this work zone?



Flaring barrier can have other issues

- Standard temporary barrier was tested on pavement.
 - Flared barrier can accidentally be installed on gravel or grass.
 - Temporary barrier can dig into gravel or shoulder and not move correctly.



Flaring barrier can have other issues

- Standard Temporary barrier was tested on flat ground.
 - Flared barrier can accidentally be installed on slopes.
 - Vehicle can hit the barrier too high.
 - The vehicle can roll over or vault over the barrier.



How much barrier is needed?



- There are different concepts that need to be looked at:
 - **Length of Need**
 - How much barrier is needed to prevent the majority of vehicle from hitting a hazard.
 - **Operation length**
 - How much barrier is needed to operate in a desirable manner.



Length of Need

- Temporary barriers should have adequate length of need.
 - FDM 11-45-30.3.1.2 has information on Length-of-Need.
 - Designers and field staff need to check Length-of-Need.



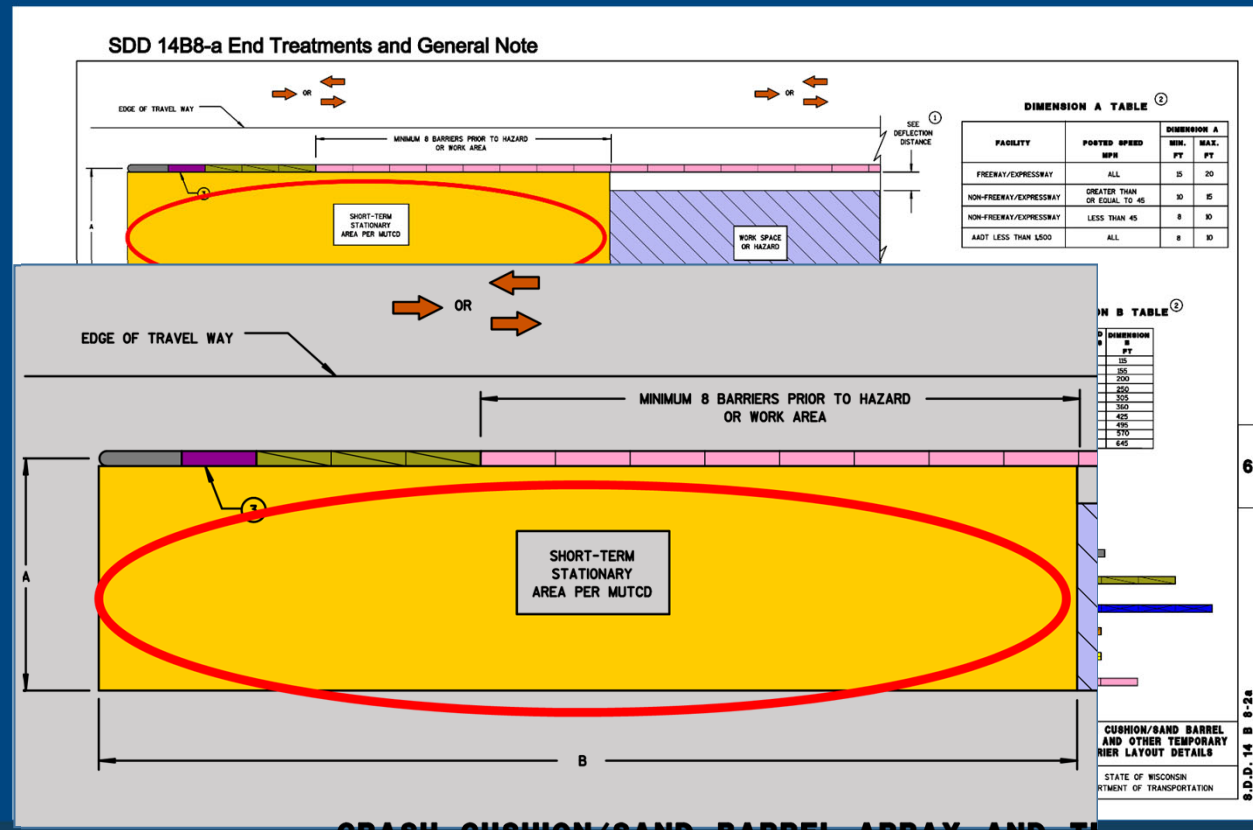
Don't let the contractor use the LON area for "Stuff"

- Crash cushions need room to work as well.



Don't let the contractor use the LON area for "Stuff"

- We cannot have people or things stored here.
- Short Term Station Area in the MUTCD is defined as
 - Daytime work that occupies a location for more than 1 hour within a single daylight period. (e.g. unloading a truck)



LON Example

- See FDM 11-45-30.3.1.2
- Design Speed 65 MPH
- AADT 4,500

Table 30.2 Runout Lengths for Barrier Design (LR)³²

Design Speed mph	AADT			
	10,000 or more	5,000 to 9,999	1,000 to 4,999	Less than 1,000
80	470 FT	430 FT	380 FT	330 FT
75	415 FT	380 FT	330 FT	290 FT
70	360 FT	330 FT	290 FT	250 FT
65	300 FT	250 FT	210 FT	200 FT
60	265 FT	220 FT	185 FT	175 FT
55	230 FT	190 FT	160 FT	150 FT
50	195 FT	160 FT	135 FT	125 FT
45	160 FT	130 FT	110 FT	100 FT
40	135 FT	110 FT	95 FT	85 FT
35	110 FT	90 FT	80 FT	70 FT

Equation 1

$$X = \frac{(L_A - L_2)}{L_A - L_R}$$

L_2 = Distance from edge of lane to barrier

L_A = Distance from edge of lane to back of hazard

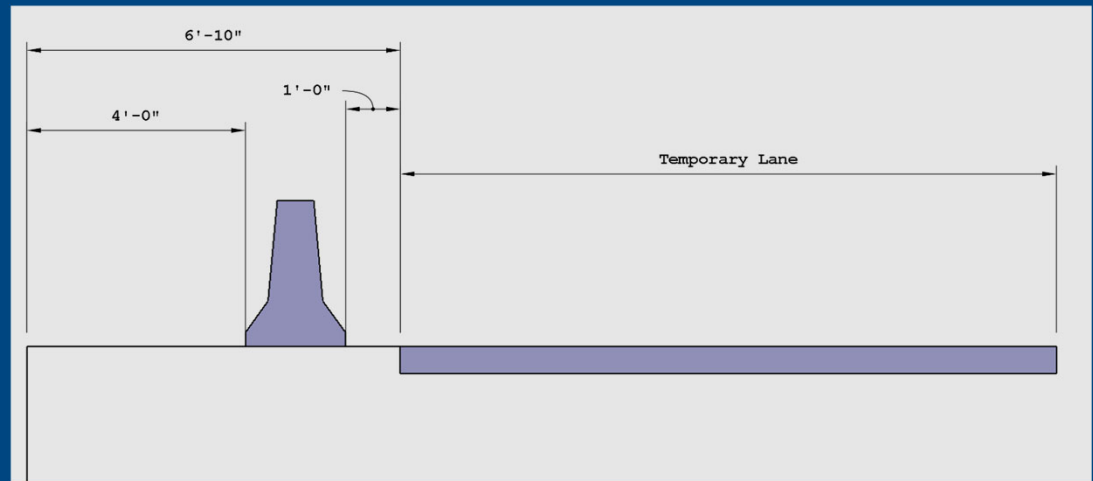
L_c = Distance from edge of lane to clear zone

L_R = Runout length per [Table 30.2](#)

X = LON = Minimum distance from hazard to the end of barrier need.

Example

- L_A = work zone clear zone
= 20 FT
- L_2 = 1 FT
- $X = \frac{(20-1)}{\left(\frac{20}{250}\right)} = 237.5$



Equation 1

$$X = \frac{(L_A - L_2)}{L_A / L_R}$$

L_2 = Distance from edge of lane to barrier

L_A = Distance from edge of lane to back of hazard

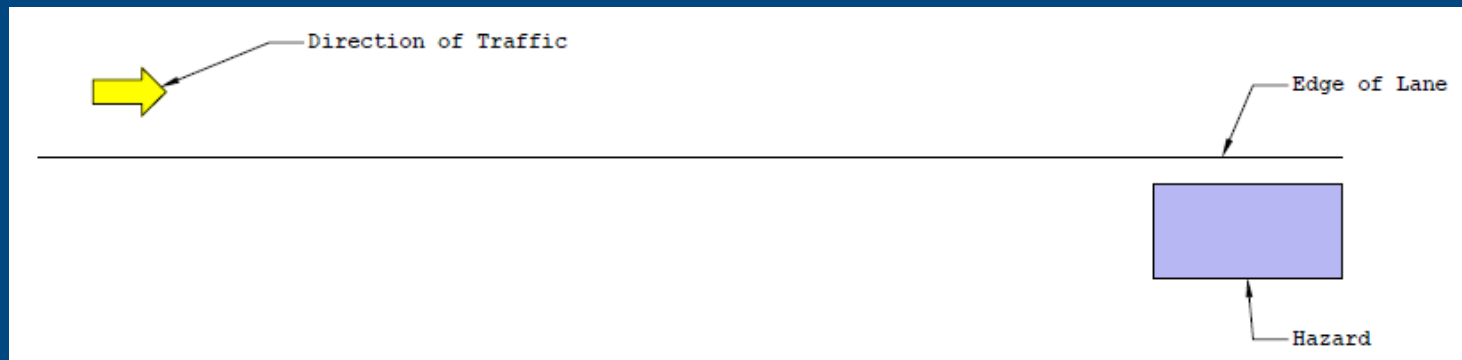
L_c = Distance from edge of lane to clear zone

L_R = Runout length per [Table 30.2](#)

X = LON = Minimum distance from hazard to the end of barrier need.

Example

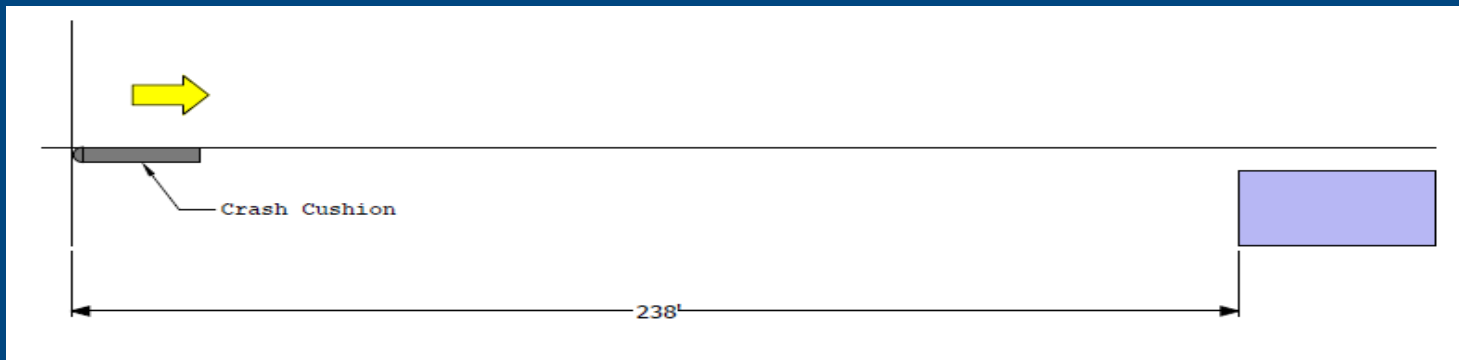
Plan Layout



Example

Length of Need

- Locate Crash Cushion

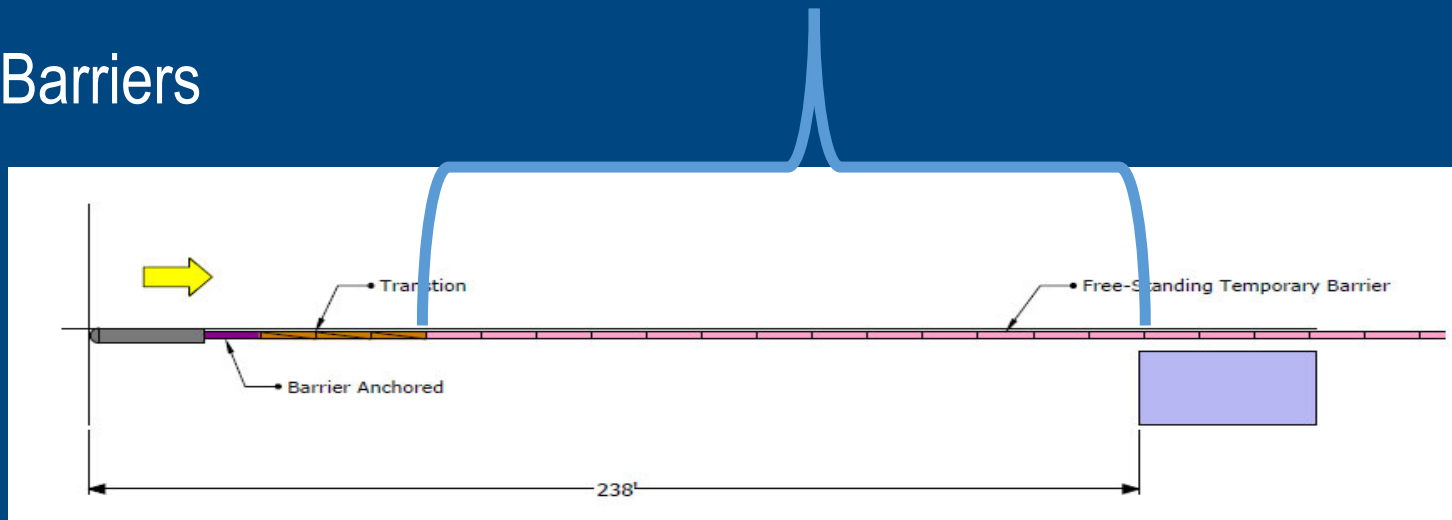


Example

Length of Need

- Place Barriers

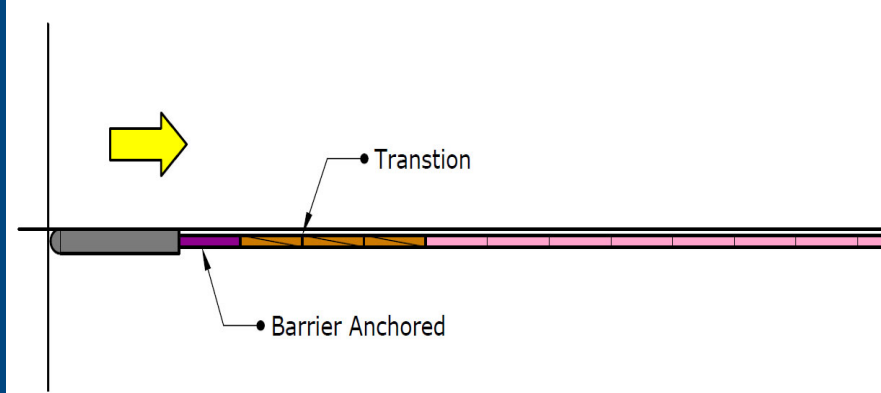
Do you have the minimum number of barriers?



Example

Anchoring 1st barrier

- SDD 14b08 has a note 3 for the 1st barrier after a crash cushion



Here is note 3

- ③ ANCHOR TEMPORARY BARRIER ACCORDING TO CRASH CUSHION OR SAND BARREL MANUFACTURER'S RECOMMENDATIONS. IF MANUFACTURER'S RECOMMENDATIONS ARE NOT PROVIDED, ANCHOR 3 PINS ON TRAFFIC SIDE.

**CRASH
ARRAY
BARR**

DEPAR



I recommend that staff ask contractor for the manufacturer's recommendation. Then document the recommendations in a diary.



Operational Length

- Operational length is the minimum amount of barrier needed for the barrier system to perform in a predictable manner.
 - Temporary barrier installations less than 9 full segments will likely not operate in a predictable manner.



What happens if you install a shorter run?

- This crash test is a failure because the vehicle rolled over.
- Shorter installations of temporary barriers have larger working widths.



What happens if you install at a steeper angle?

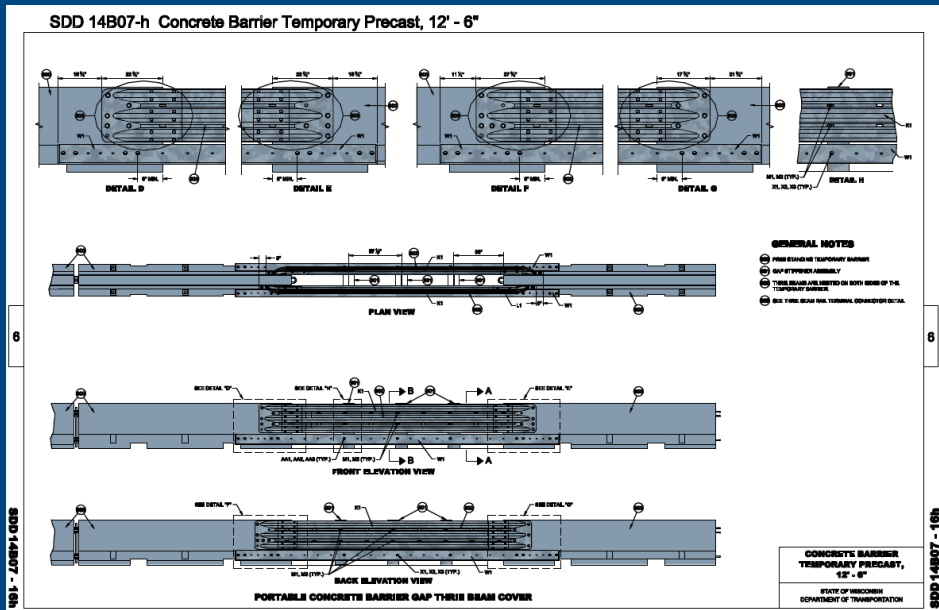
- Barriers are design to have a 25 degree impact.
- Steeper angles will not work the way we want it to.



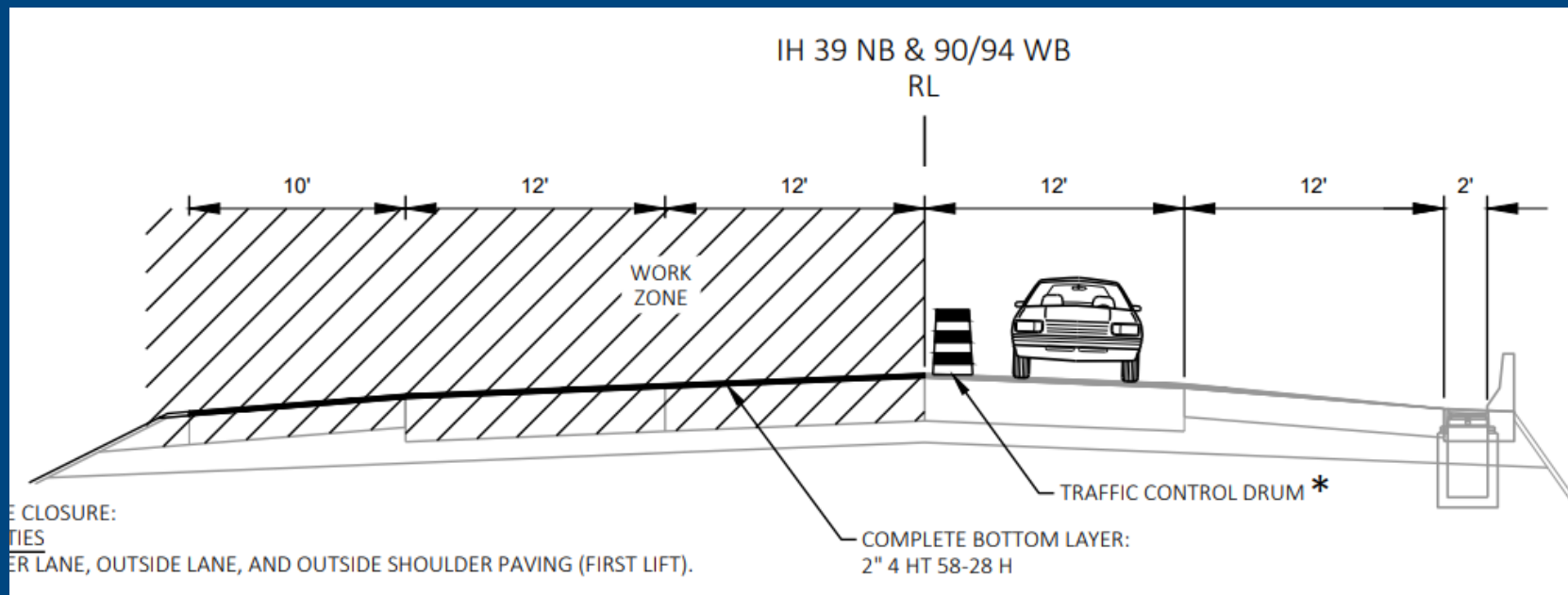
Gaps in Temporary Barrier are bad



Here is the test.



Work Zone Cross Sections



Work Zone Cross Section

Construction Equipment Size/Width

- Concrete repair $\geq 300'$
 - Slip form paver
- Cranes/screeds
- Material loading/offloading
- Material storage
- Internal movement

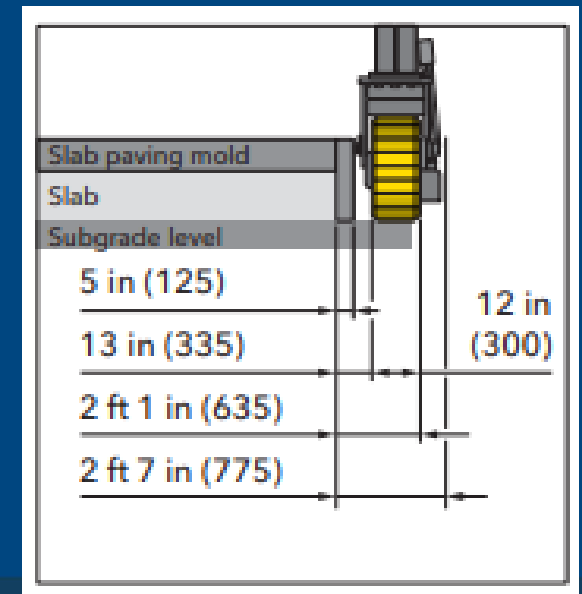


Image: Wirtgen-group



Work Zone Temporary Speed Declarations

TEOpS 13-5-6

- Interstates and Expressways with 70 or 65 mph speed limit

- If bi-directional traffic separated by tubular markers, then reduce to 55 MPH
- If workers are present within 12 feet of live traffic without positive protection for any length or work area, then reduce to 55 MPH
- If work area is less than or equal to 0.5 miles in length with lane shifts or narrowed travel lanes and has positive protection, then post warning signs with an advisory speed plaque
- If work area is less than or equal to 0.5 miles in length with no lane shifts or narrowed travel lanes and has positive protection, then do not lower the speed limit
- If work is taking place outside the clear zone, then do not lower the speed limit

During periods of no work activity when devices are pulled back and lanes re-opened, restore speed limit to normal posted speed. Such speed limit reduction **shall** be subject to documented approval by the BTO Work Zone Engineer. When a reduced work zone speed limit is recommended in the Transportation Management Plan (TMP), a temporary speed zone declaration **shall** be completed and sent to BTO for approval.

- All other facilities

- reduce only in situations that have a combination of extreme lane shifts, narrowed lanes, bi-directional traffic or milled surfaces.



Work Zone Temporary Speed Declarations

TEOpS 13-5-6

1. Dates – ensure this is correct, if dates change, go back and fix form
2. Reason – document the work zone geometrics. (i.e. – workers present without positive protection)
3. Speed limit should only be in effect when works are present for majority of the work zones.
4. Make sure to include language in the Contact to cover/uncover signs

TEMPORARY SPEED ZONE DECLARATION FORM

CONSTRUCTION PROJECT ID:

REGION:

COUNTY:

MUNICIPALITY:

HIGHWAY:

EXISTING SPEED LIMIT: PROPOSED SPEED LIMIT:

SPEED LIMIT LOCATION

FROM: TO:

SEGMENT LENGTH: MILE(S)

ANTICIPATED START DATE: ANTICIPATED END DATE:

REASON FOR TEMPORARY SPEED LIMIT DECLARATION:

EXCEPTIONS TO CONTRACT REQUIREMENTS (ENTER TEXT FROM SPECIAL PROVISIONS):

BTO Approval Required (All interstates and facilities with a normal posted speed of 65 mph or greater):
Region and BTO Approval Required at 90% TMP submittal.

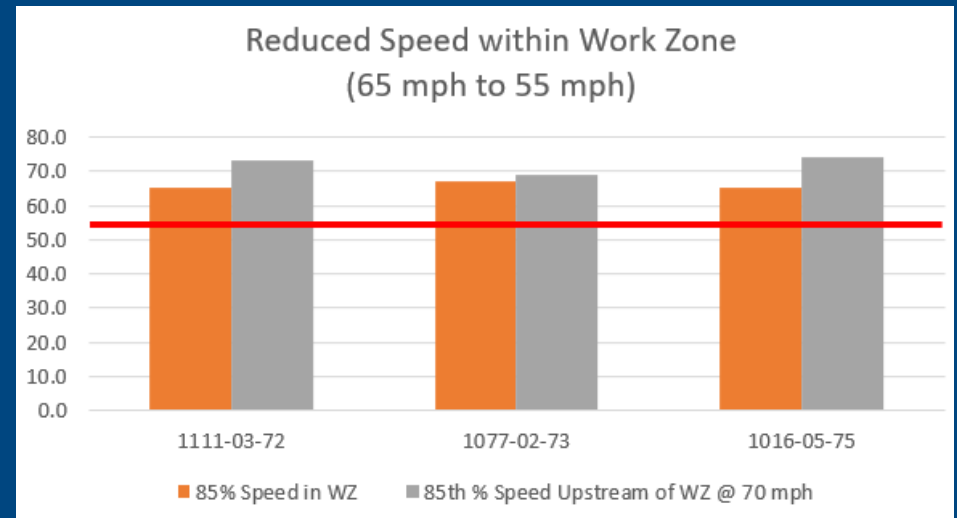
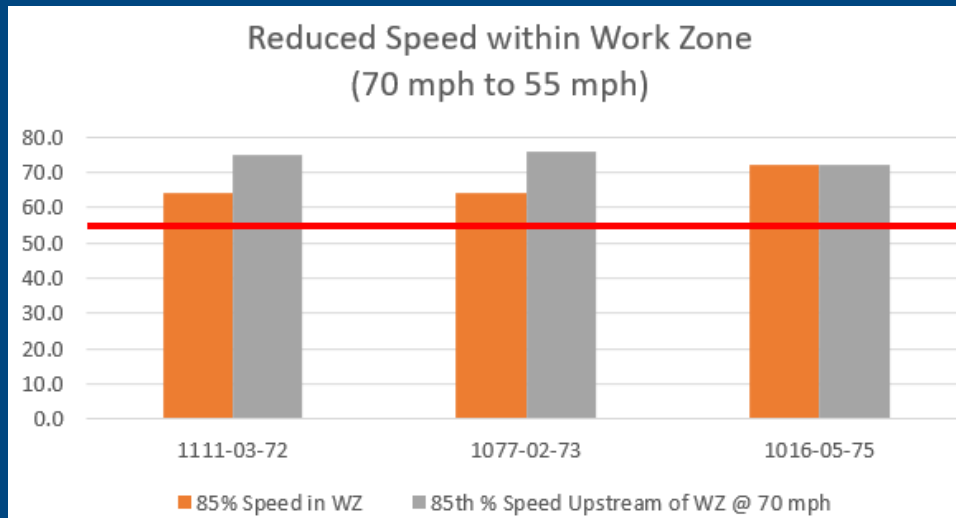
For additional guidance refer to the Traffic Engineering Operations and Safety Manual 13-5-6:
<https://wisconsin.gov/dtsdManuals/traffic-ops/manuals-and-standards/teops/13-05.pdf#13-5-6>

Or contact BTO Work Zone Operations Engineer



Work Zone Speed Data

- Drivers only slow down when they perceive the need to



Exercise #5

Determine the work zone speed limit

Scenario #1

- Speed: 70 mph
- Mill and overlay
- Nightly single lane closure
- Work Zone Length: 3 miles

Scenario #2

- Speed: 70 mph
- Bridge deck replacement
- Concrete Barrier Temporary Precast Present
- Long-Term Lane shift
- Work Zone Length: 0.40 miles



Exercise #5

Determine the work zone speed limit

Scenario #1

- Speed: 70 mph
- Mill and overlay
- Nightly single lane closure
- Work Zone Length: 3 miles

Answer: 55 mph when workers present, at all other times the speed limit should be 70 mph

Scenario #2

- Speed: 70 mph
- Bridge deck replacement
- Concrete Barrier Temporary Precast
- Work Zone Length: 0.40 miles
- Lane shift

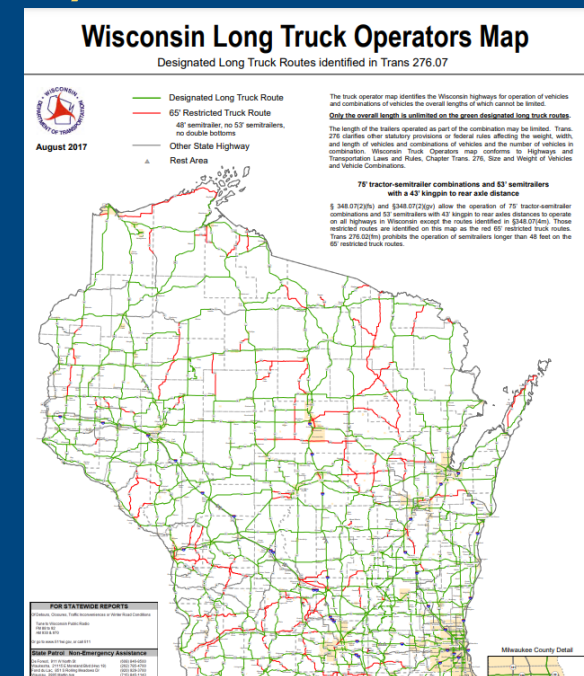
Answer: No temporary speed limit change since WZ is less than 0.5 miles and CBTP present, advisory only



Work Zone Freight Considerations

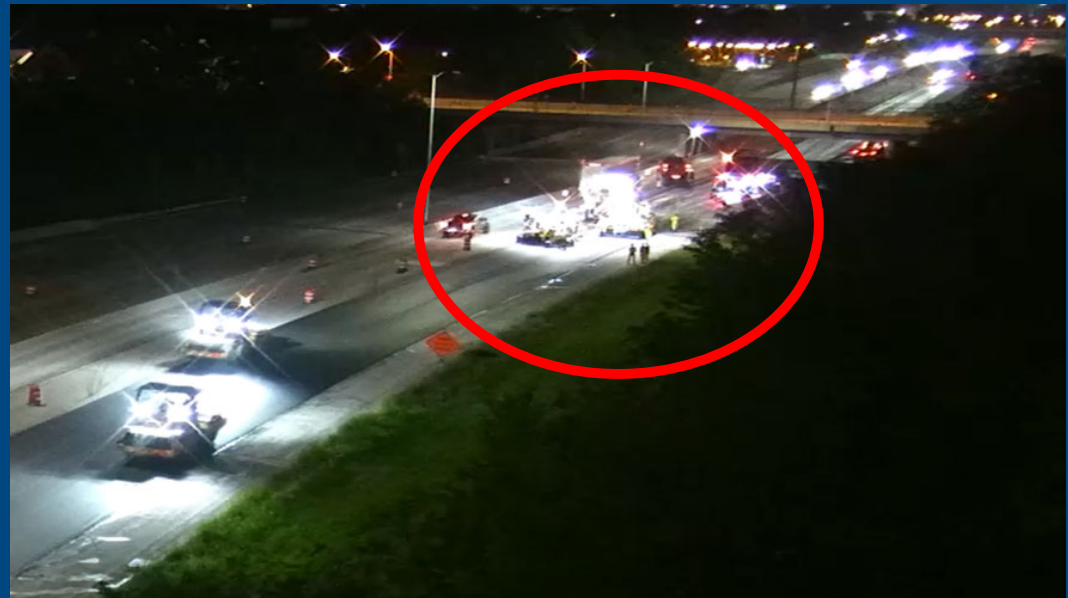
Over Size Over Weight (OSOW)

- Need to be able to communicate how wide the roadway is
- Need width restriction signs when available roadway width is less than 16 feet
- <https://wisconsindot.gov/Pages/doing-business/consultants/cnslt-rsrcs/tools/planning-maps.aspx>



Construction Access

- What type of work is happening?
- How often are trucks going to be making deliveries?
- Does the work area move?
- What about emergency access?



Work Area Ingress and Egress

How do contractor access the work site?

- Thru the drums
 - Shouldn't have to slow down in a live lane of traffic
- Designated locations
 - Bridge two-way one lane
 - Access Road
 - From a local road/side road
 - Other options?



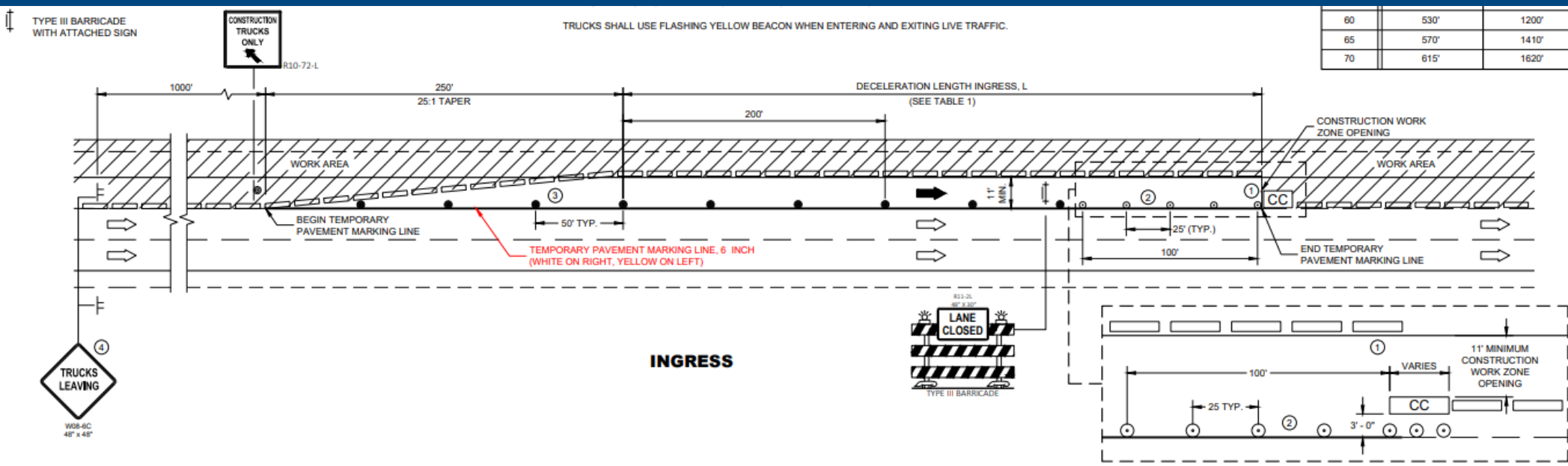
Truck Entering System

Smart Work Zone

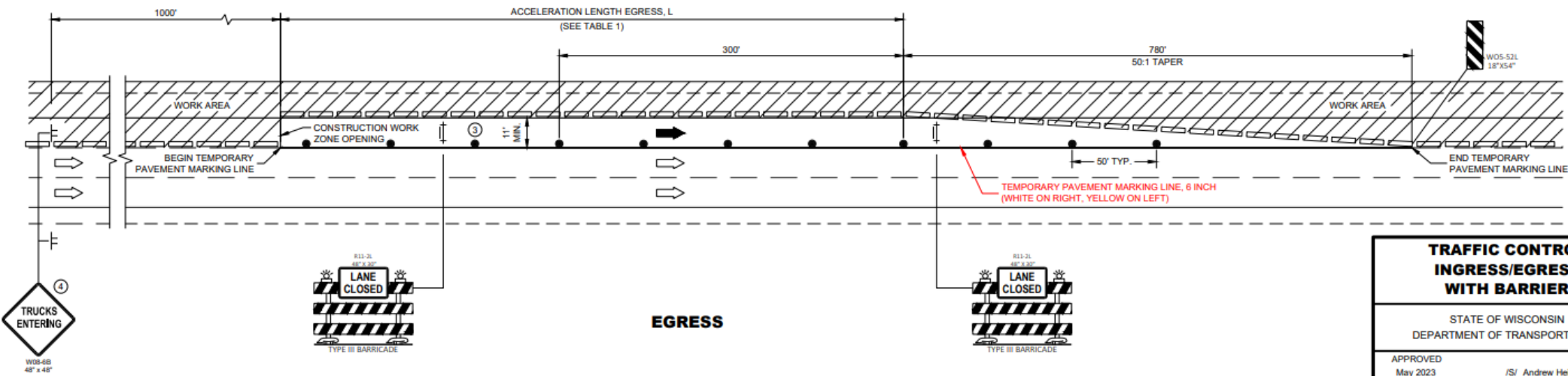
- FDM 11-50-25.5
- Special Provision
- Frequency of construction vehicles at some location for a long period of time
- Alert motorists of slow construction vehicles ahead
- Reduce rear-end crashes



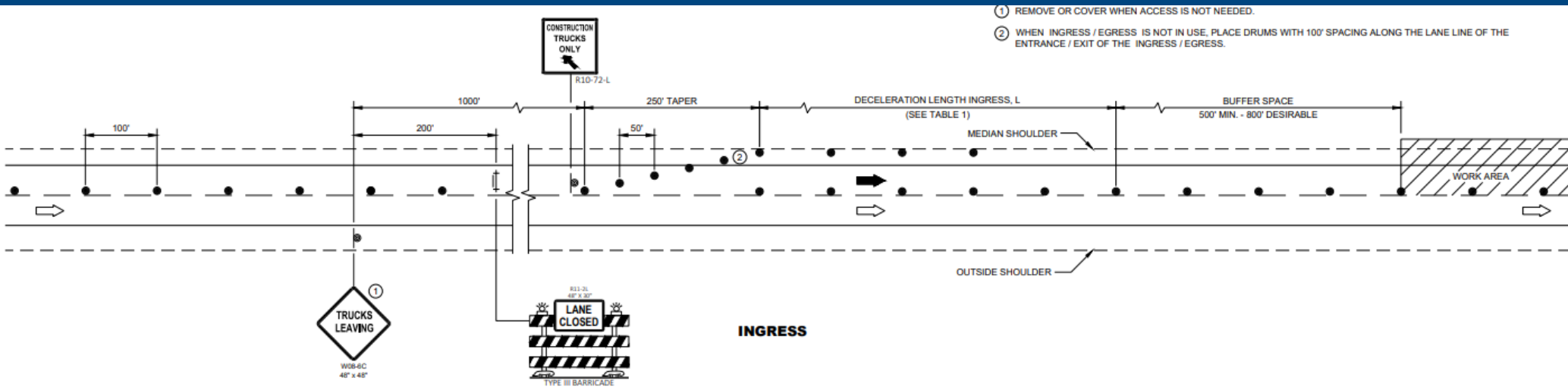
Ingress w/ Barrier



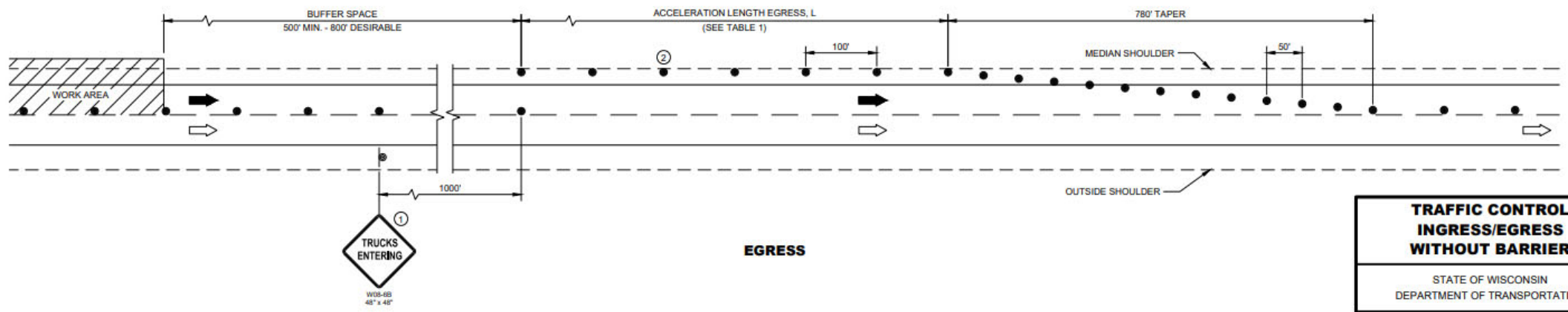
Egress w/ Barrier



Ingress w/o Barrier



Egress w/o Barrier



Detour Routes

Detour of a State Highway to Another State Highway

- Can it handle the traffic?
 - Review AADT of detoured road and along detour route
- What is the distance of the route?
 - Consideration for length of the detour and feasibility



Detour Routes

Detour of a State Highway to a Local Road

- If traffic is going to use the local road for the detour:
 - Ensure the local road up to standard
 - Need to get local municipalities approval
 - Need to keep track of detour condition
- The state will repair any damage



Detour Routes

Detour of a Local Road

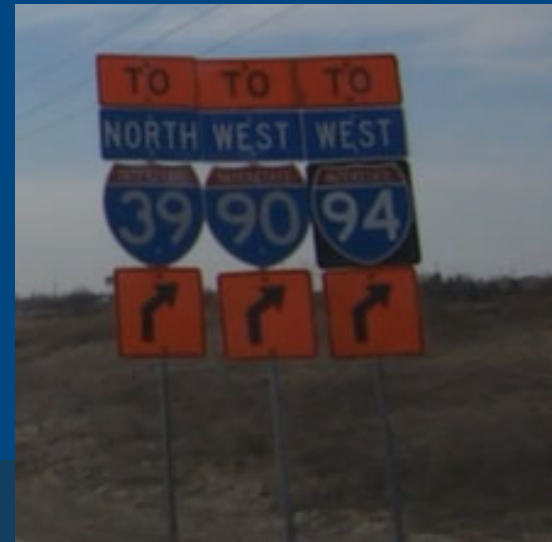
- Local entity needs to designate the detour route
- State generally does not pay for signing of detour route
- Example:
 - The department closes a rural bridge over the interstate



To Routes

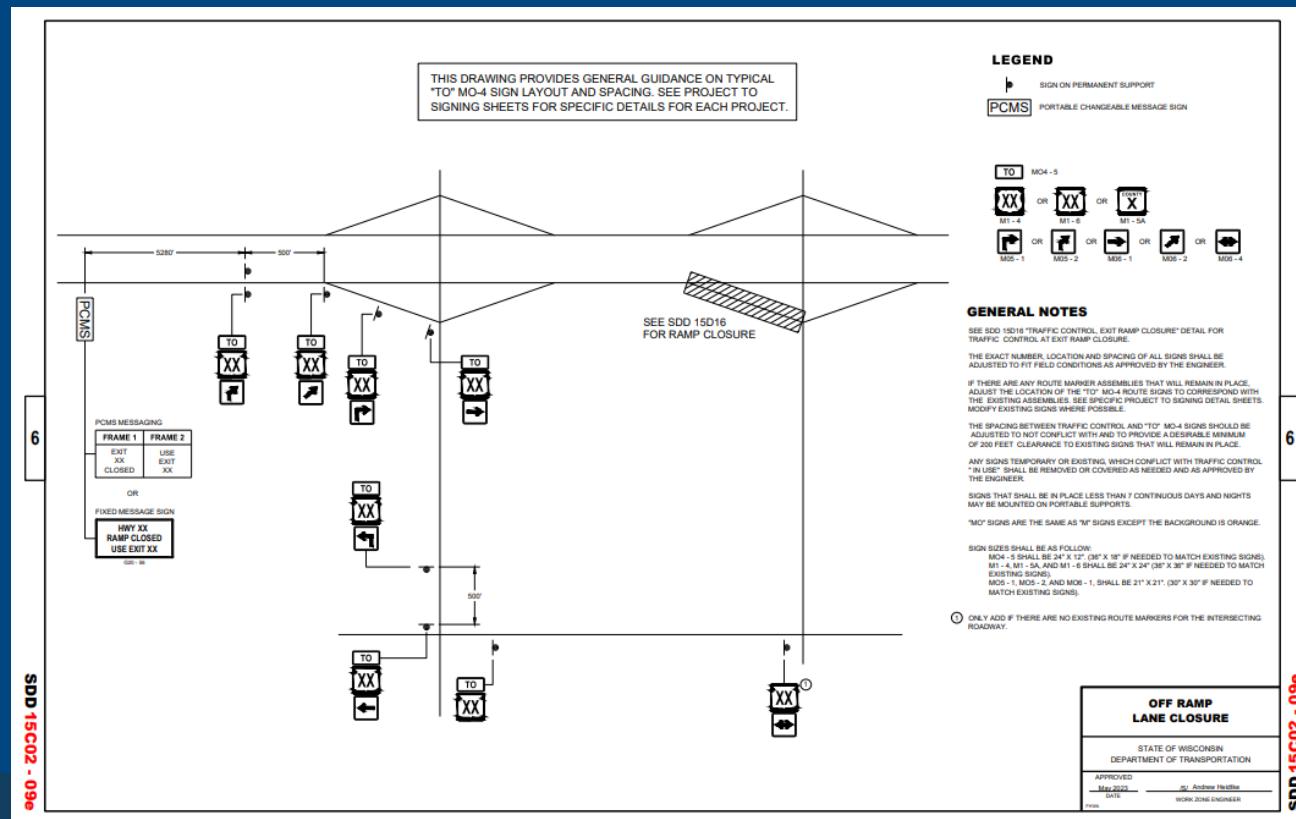
Access to mainline routes

- This is a route that provides access to another route
- Typically used for ramp closures



To Routes

Standard Detail Drawing (SDD 15C2)



LUNCH BREAK – 1 HOUR

- Quick Lunch Recommendations
 - Qdoba
 - Noodles
 - Panera
 - Subway
 - Jimmy John's
 - MetCalfe's Market
 - Forage Kitchen
 - Shake Shack
 - Fresh Finn
 - Dumpling Haus
 - Mc Donald's
 - Whole Food's
 - Bagel's Forever



Module 5: Two-Lane Two-Way Highways



Standard Detail Drawings

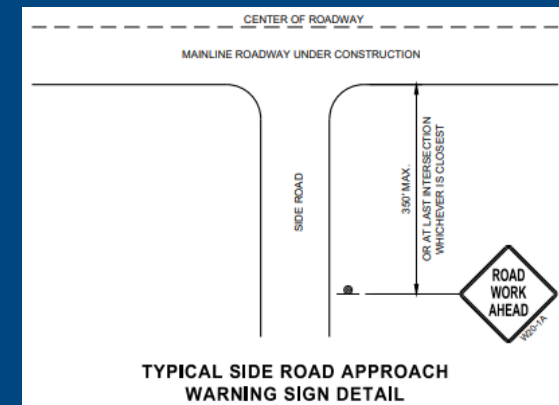
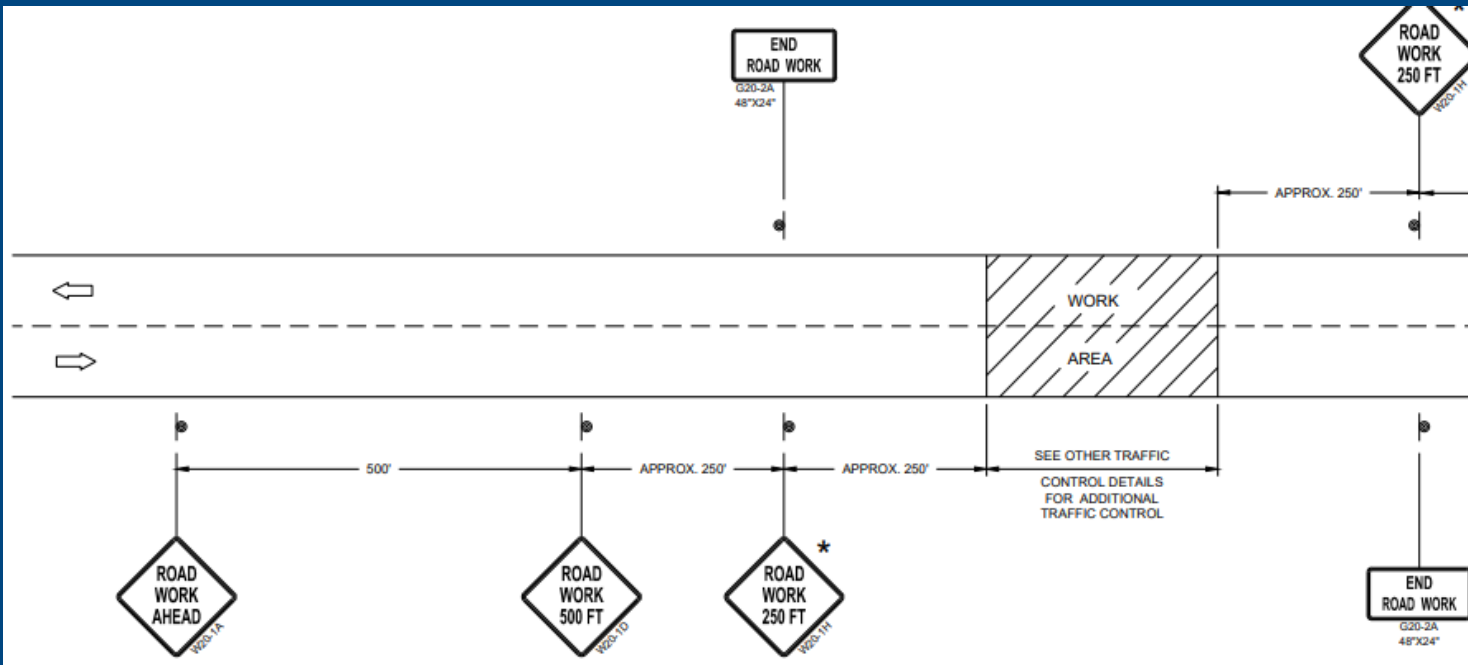
Purpose

- Show desired TTC in situations that occur commonly across the state
- Consistency across the state
- Guidance for situation that do not 100% fit
- Do not solely rely on SDD's
- Each location will have features that need to be accounted for
 - Vertical and horizontal alignment
 - Roadside elements
 - Ramps, Intersections, Driveways



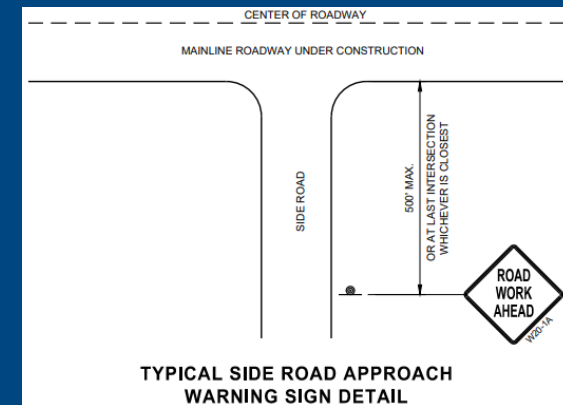
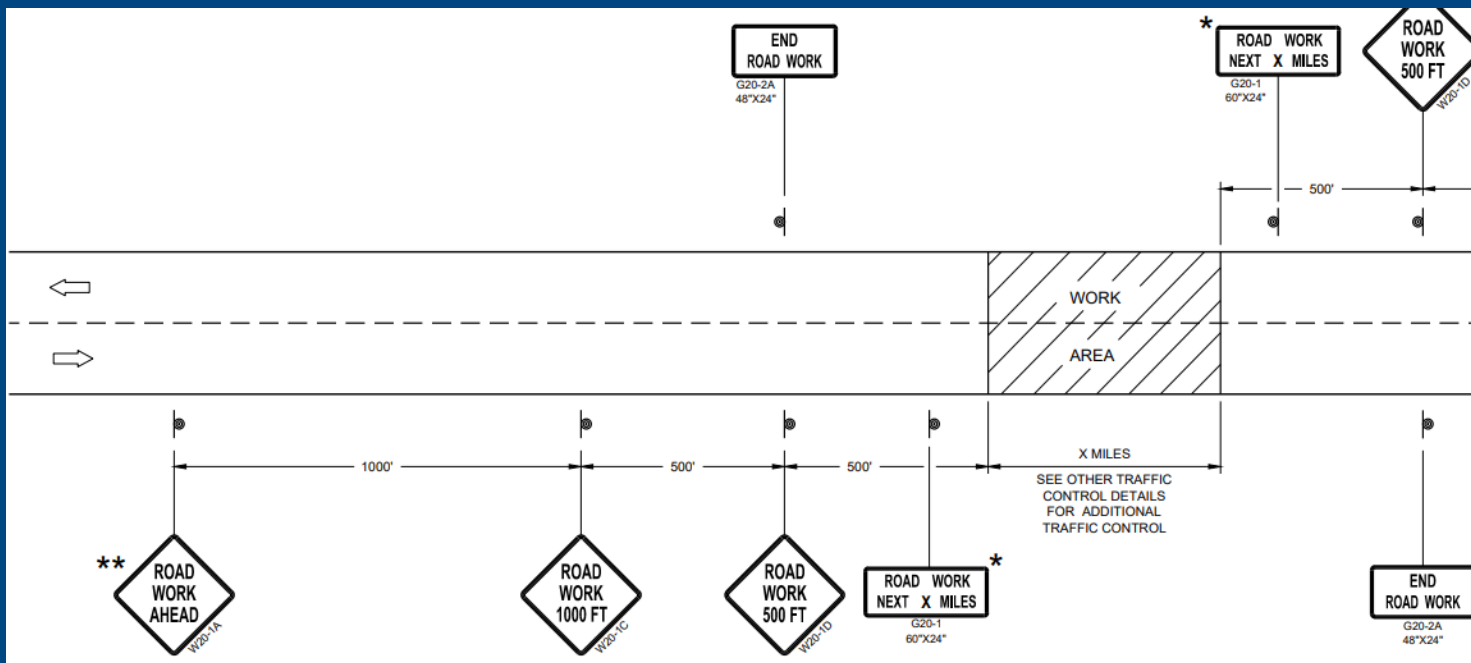
Two-Lane Two-Way (TLTW)

Advance Warning – 40 mph or less



Two-Lane Two-Way

Advance Warning – 45 mph or greater



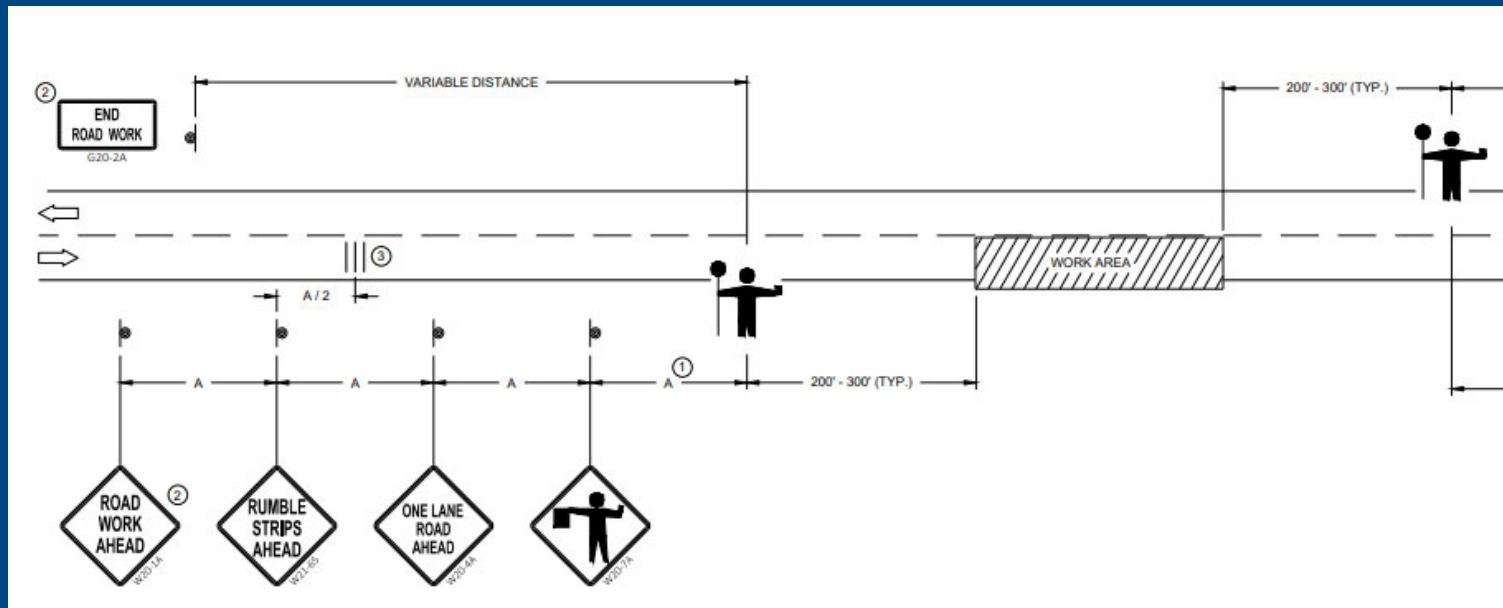
TLTW – One-Lane Two-Way

Flagging

- Typically found on two-lane two-way highways
- Considerations:
 - Hourly volumes are typically under 600 vph to avoid delays
 - Pilot car needed if the distance between flaggers is greater than 2 miles
 - Intersections will require additional flaggers
 - Usually takes place during the day and the road is fully open at night
 - If at night, lights are needed
 - Flagging is incidental to the contract, we do not directly pay for it

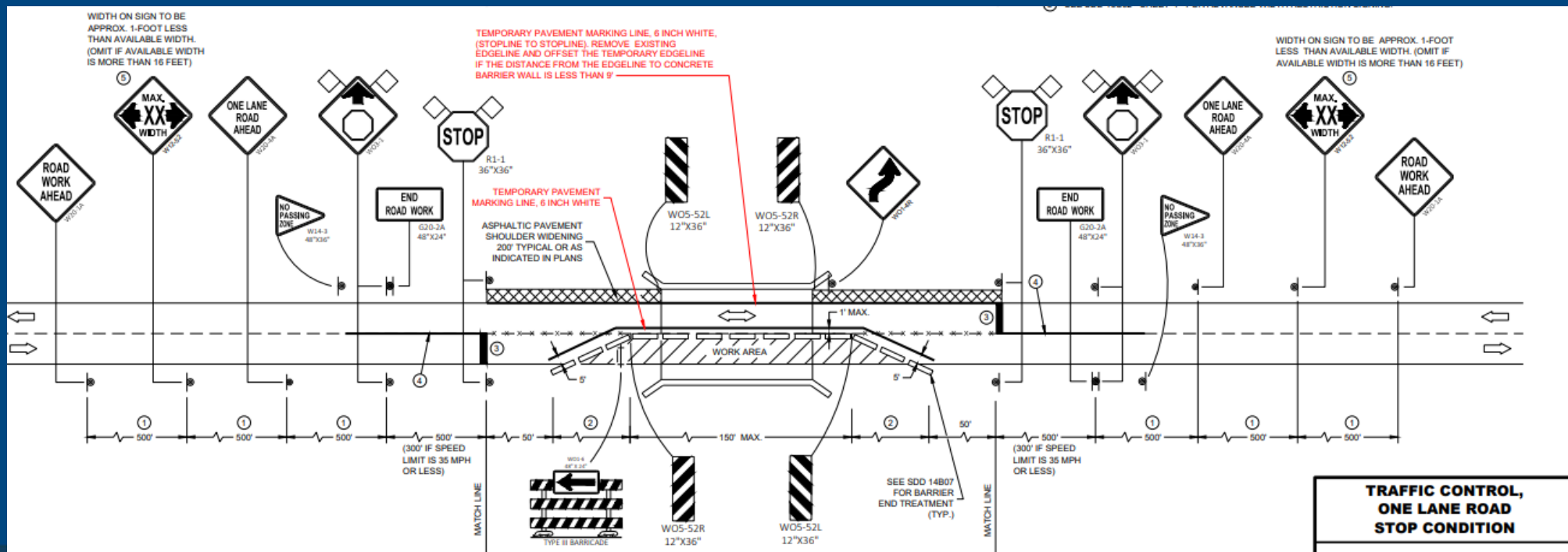


TLTW – One-Lane Two-Way Flagging



TLTW – One-Lane Two-Way

Stop Controlled



TLTW – One-Lane Two-Way

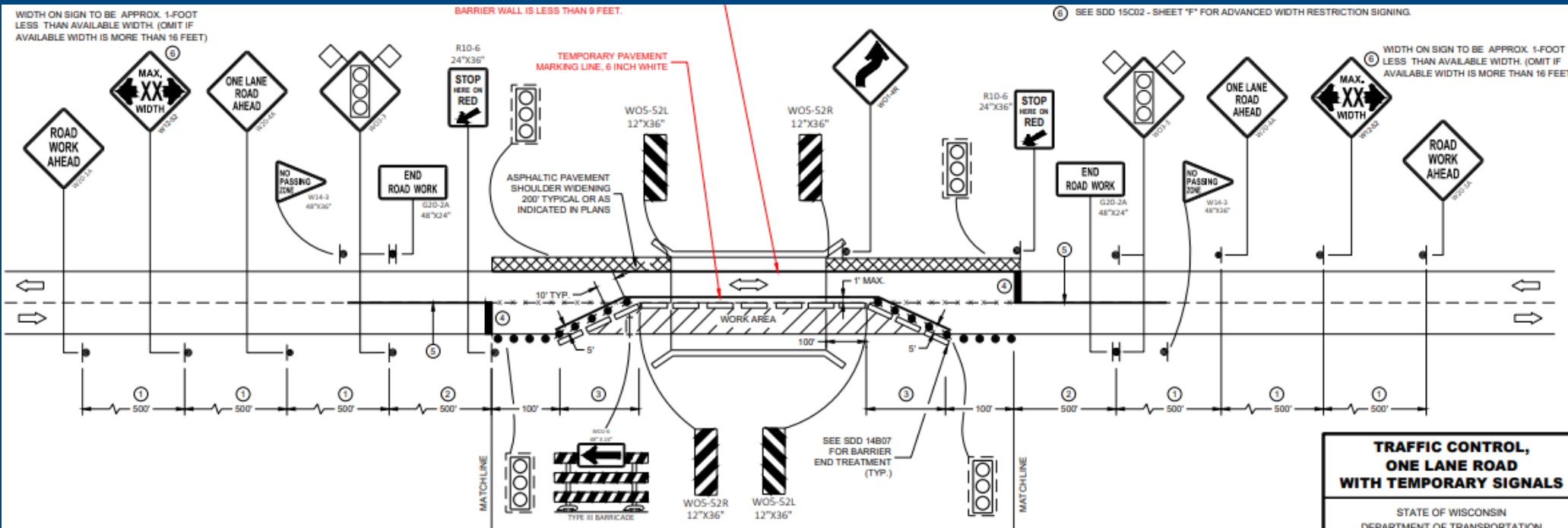
Stop Controlled

- Typically found on two-lane two-way highways
- Considerations:
 - Low volume roads, 1000 AADT or less, Consult with region traffic
 - Usually for bridges or culverts
 - Increase stop bar to CBTP if truck percentage is high (50 ft. to 75 ft.)
 - Width, will shoulder widening or reinforcement be needed?
 - Width, signing for OSOW



TLTW – Two-Lane One-Way

Signal Controlled



TLTW – Two-Lane One-Way

- Typically found on two-lane two-way highways
- Considerations:
 - Distance of closure will dictate signal times
 - AADT 3,000 and above
 - Usually for bridges or culverts
 - Width, will shoulder widening or reinforcement be needed?
 - Width, signing for OSOW



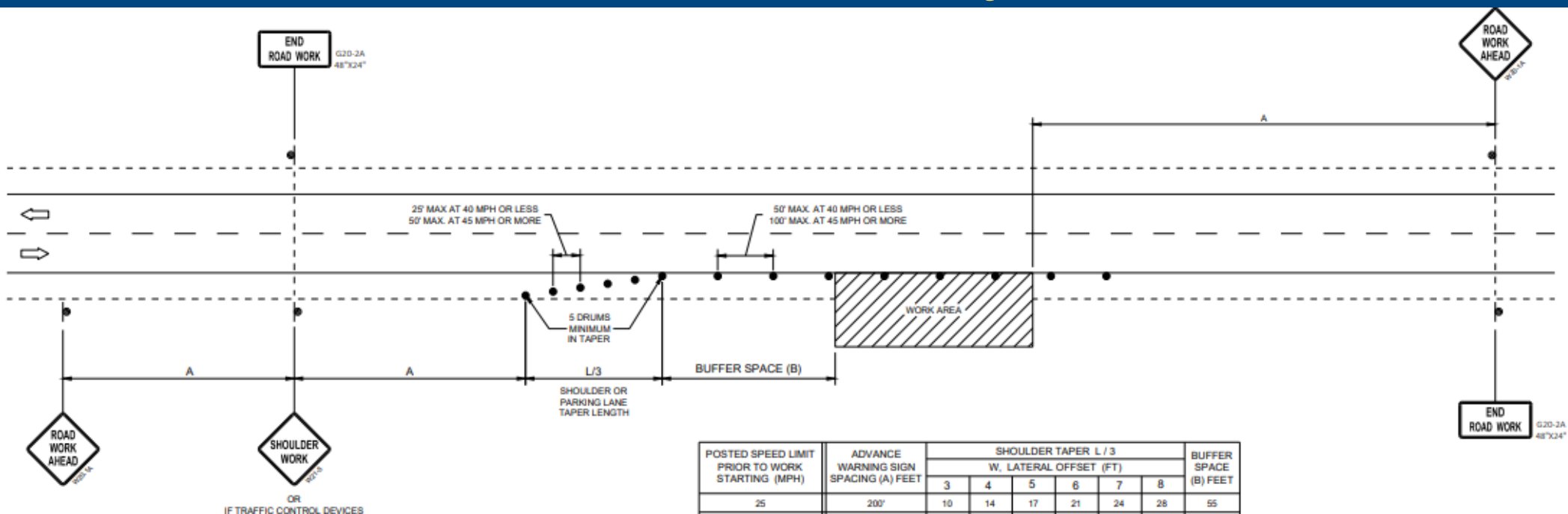
Exercise #6

- Build upon Exercise #1 TMP and layout the temporary traffic control for the chosen strategy.



TLTW - Shoulder Closure

Two-Lane Two-Way



OR
IF TRAFFIC CONTROL DEVICES



SDD 15d28

TLTW – Lane Shift

Signing

Table 6C-3. Taper Length Criteria for Temporary Traffic Control Zones

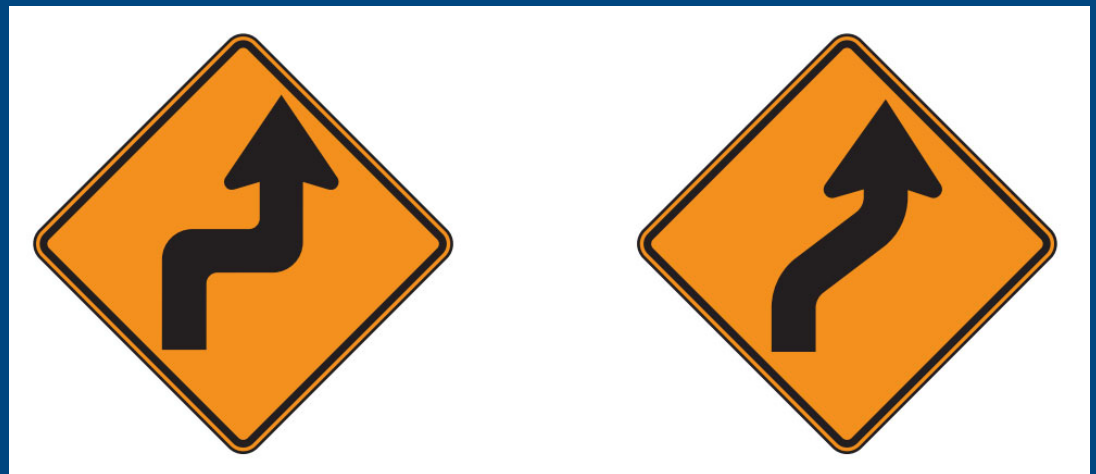
Type of Taper	Taper Length
Merging Taper	at least L
Shifting Taper	at least 0.5 L
Shoulder Taper	at least 0.33 L
One-Lane, Two-Way Traffic Taper	50 feet minimum, 100 feet maximum
Downstream Taper	50 feet minimum, 100 feet maximum

Note: Use Table 6C-4 to calculate L

Table 6C-4. Formulas for Determining Taper Length

Speed (S)	Taper Length (L) in feet
40 mph or less	$L = \frac{WS^2}{60}$
45 mph or more	$L = WS$

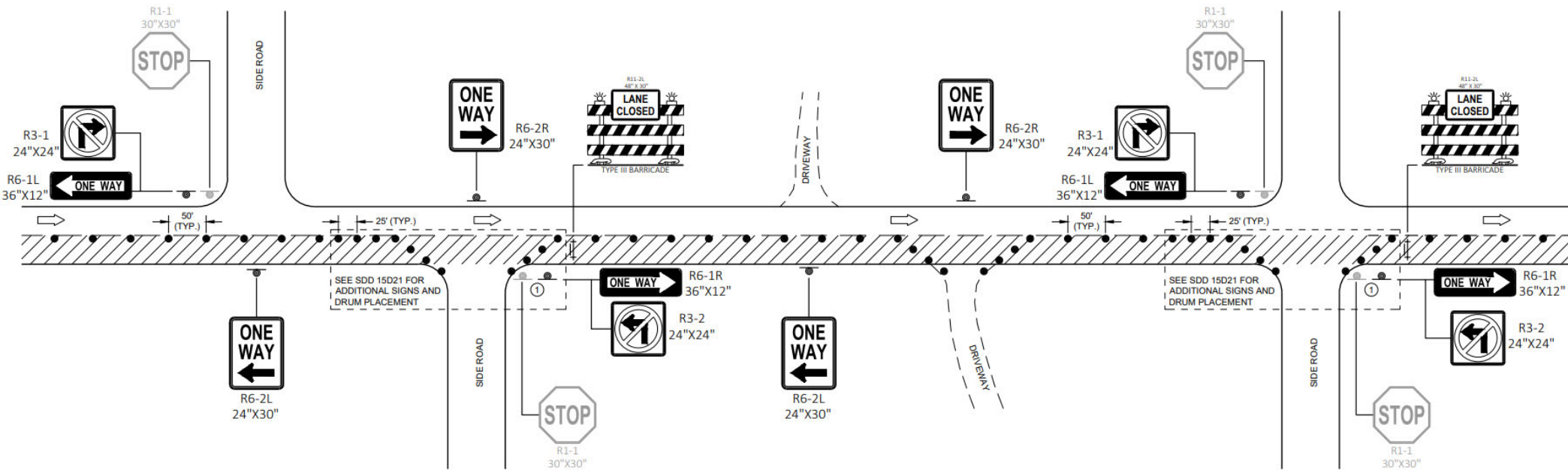
Where:
 = taper length in feet
 L = width of offset in feet
 W = posted speed limit, or off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph
 S =



WO1-3R

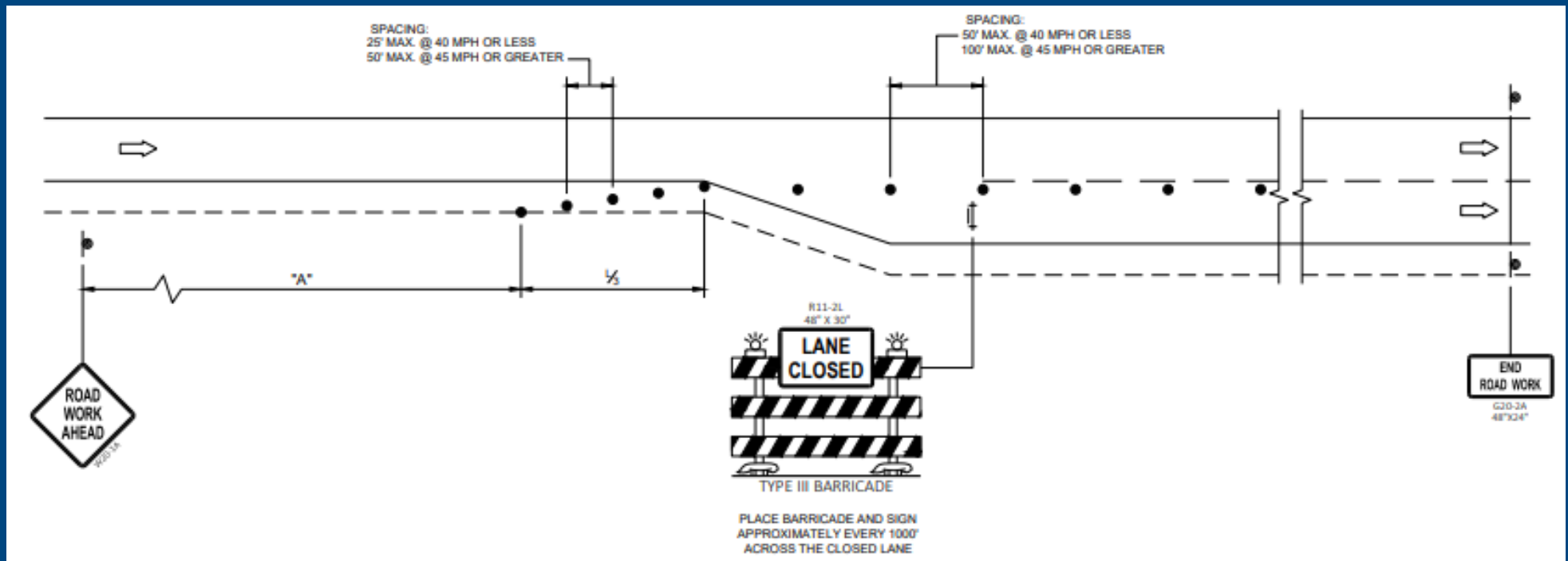
WO1-4R

TLTW – One Way Signing



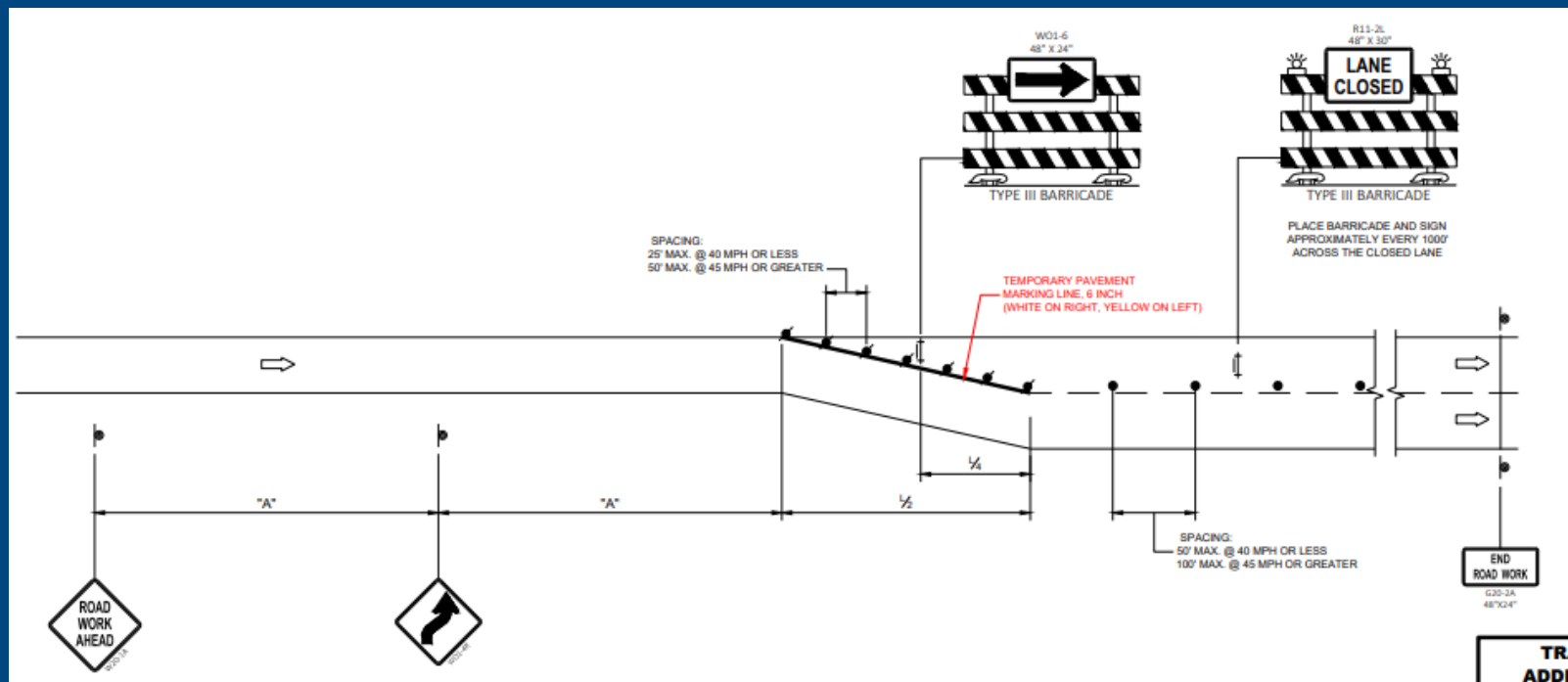
TLTW – Add Lane Closure

Lane Closed



TLTW – Add Lane Closure

Lane Shift

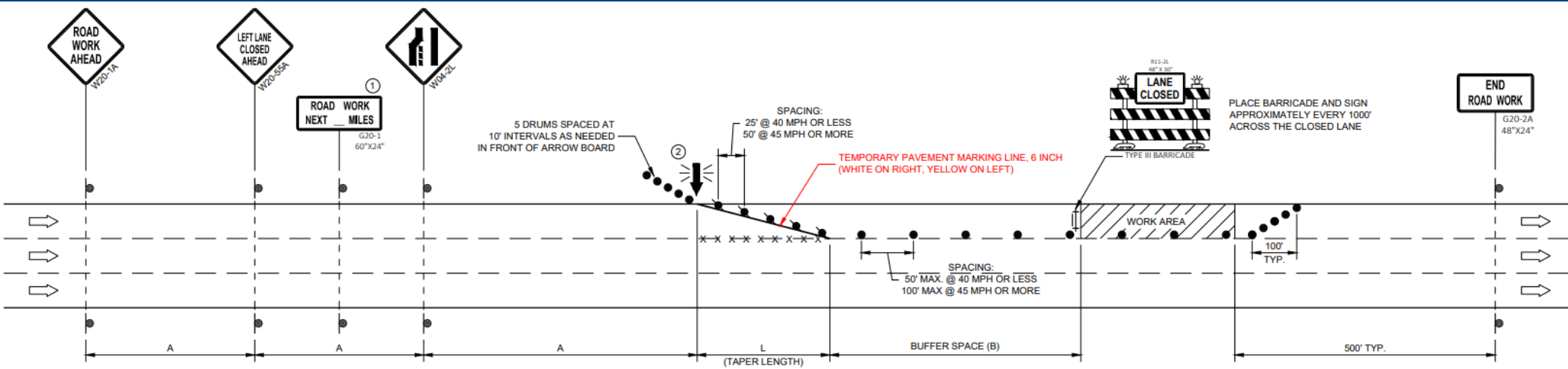


Module 6: Multilane & Divided Highways

Urban Arterials



Multilane Divided – 45 mph and under Lane Closure



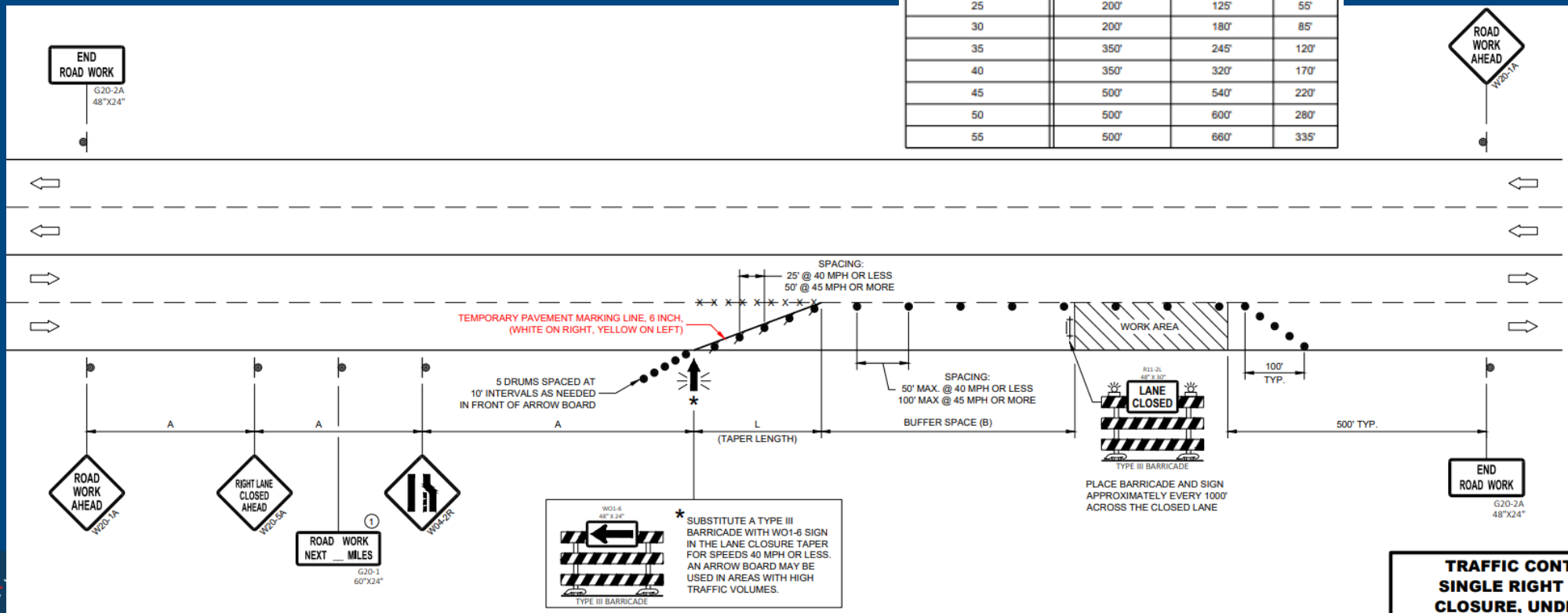
POSTED SPEED LIMIT PRIOR TO WORK STARTING (MPH)	ADVANCE WARNING SIGN SPACING (A) FEET	TAPER LENGTH (12 FT. LANE) (L) FEET	BUFFER SPACE (B) FEET
25	200'	125'	55'
30	200'	180'	85'
35	350'	245'	120'
40	350'	320'	170'
45	500'	540'	220'

SDD 15d20 Sheet A



Multilane Undivided – Lane Closure

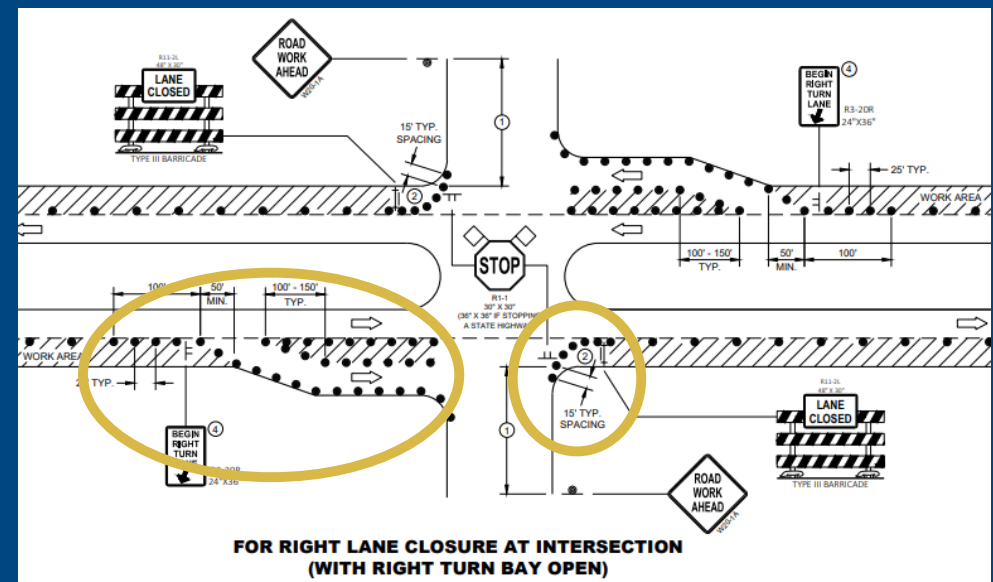
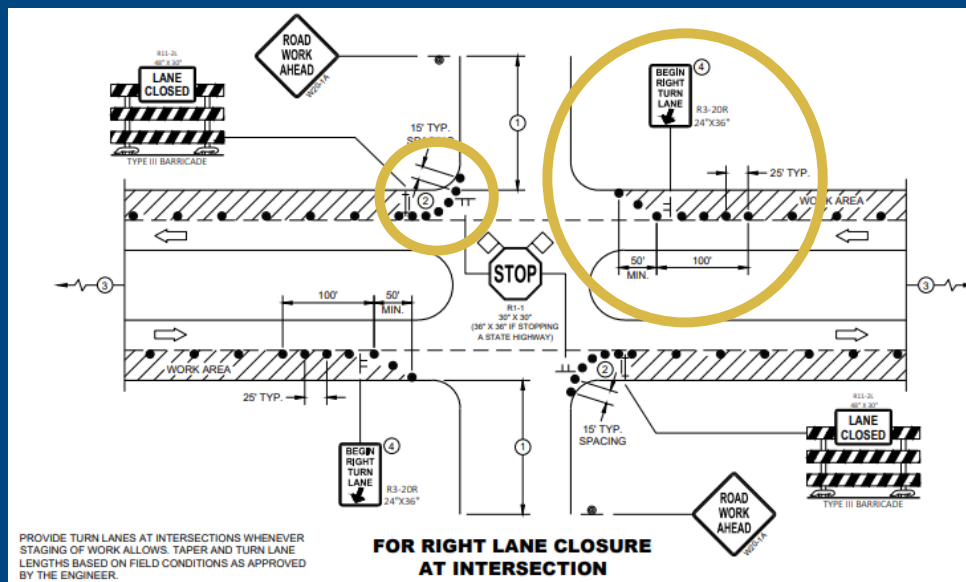
POSTED SPEED LIMIT PRIOR TO WORK STARTING (MPH)	ADVANCE WARNING SIGN SPACING (A) FEET	TAPER LENGTH (12 FT. LANE) (L) FEET	BUFFER SPACE (B) FEET
25	200'	125'	55'
30	200'	180'	85'
35	350'	245'	120'
40	350'	320'	170'
45	500'	540'	220'
50	500'	600'	280'
55	500'	660'	335'



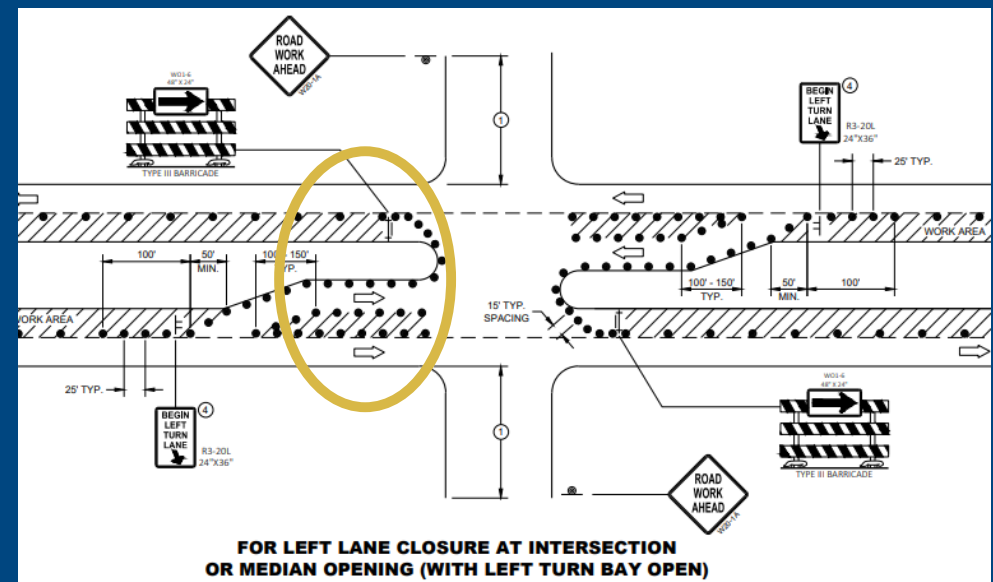
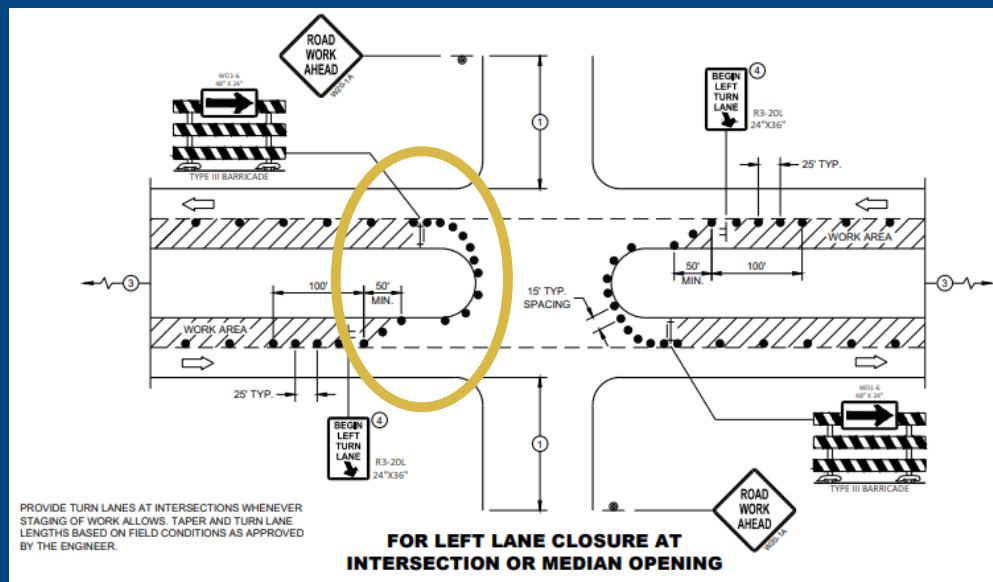
**TRAFFIC CONT
SINGLE RIGHT
CLOSURE, UNDI**

SDD 15d20 Sheet B

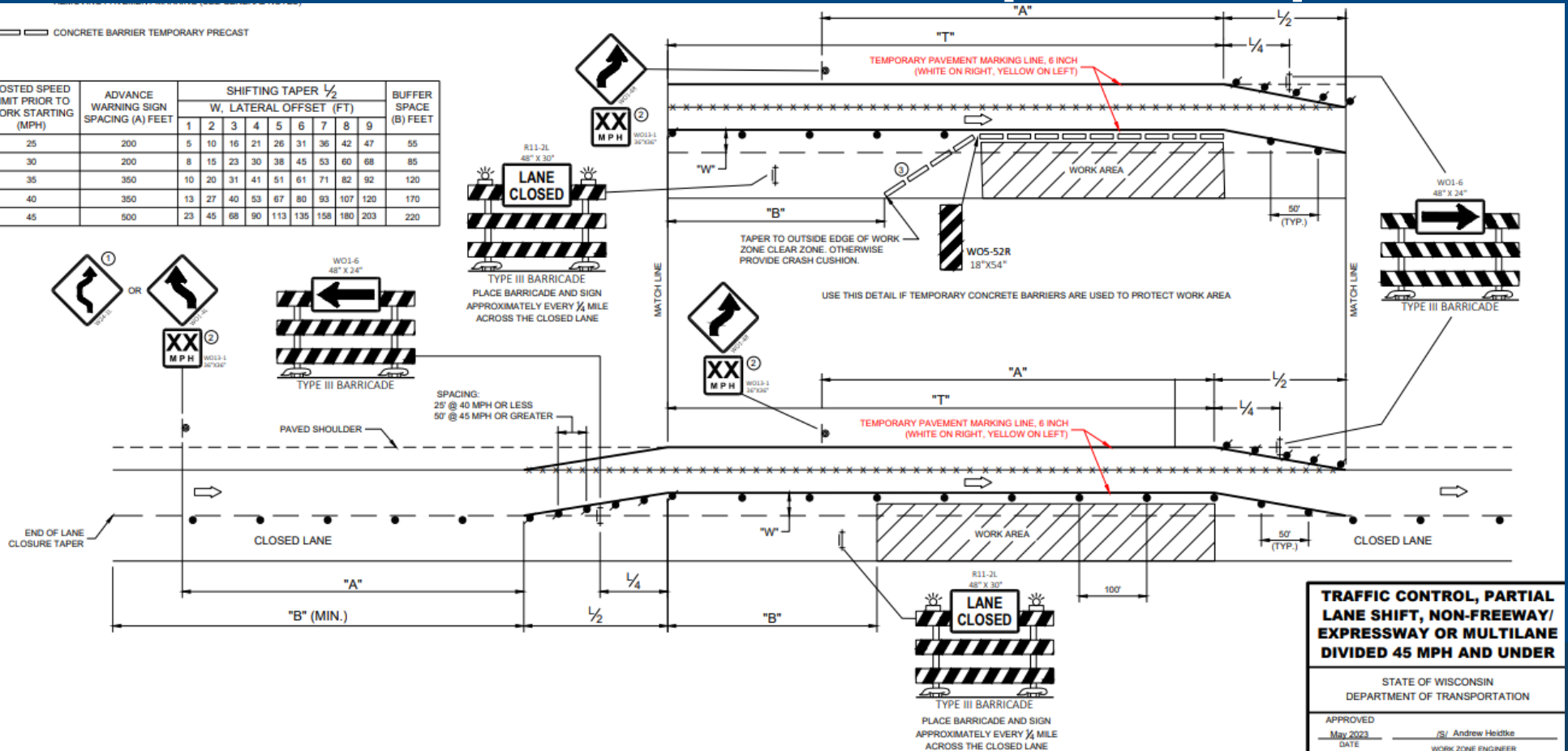
Intersections – Right Turn Lanes



Intersections – Left Turn Lanes

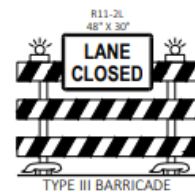


POSTED SPEED LIMIT PRIOR TO WORK STARTING (MPH)	ADVANCE WARNING SIGN SPACING (A) FEET	SHIFTING TAPER $\frac{1}{2}$ W. LATERAL OFFSET (FT)								BUFFER SPACE (B) FEET	
		1	2	3	4	5	6	7	8		9
		25	200	5	10	16	21	26	31		36
30	200	8	15	23	30	38	45	53	60	68	85
35	350	10	20	31	41	51	61	71	82	92	120
40	350	13	27	40	53	67	80	93	107	120	170
45	500	23	45	68	90	113	135	158	180	203	220

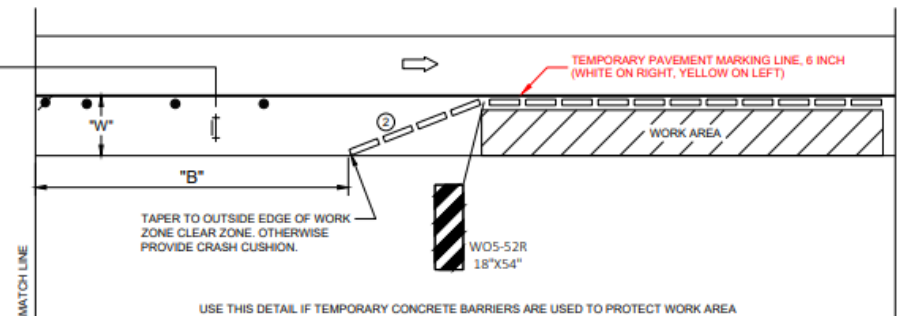


Lane Shifts - Full Lane up to 45 mph

POSTED SPEED LIMIT PRIOR TO WORK STARTING (MPH)	ADVANCE WARNING SIGN SPACING (A) FEET	SHIFTING TAPER $\frac{1}{2}$					BUFFER SPACE (B) FEET
		W, LATERAL OFFSET (FT)					
		10	11	12	13	14	
25	200	52	57	63	68	73	55
30	200	75	83	90	98	105	85
35	350	102	112	123	133	143	120
40	350	133	147	160	173	187	170
45	500	225	248	270	293	315	220

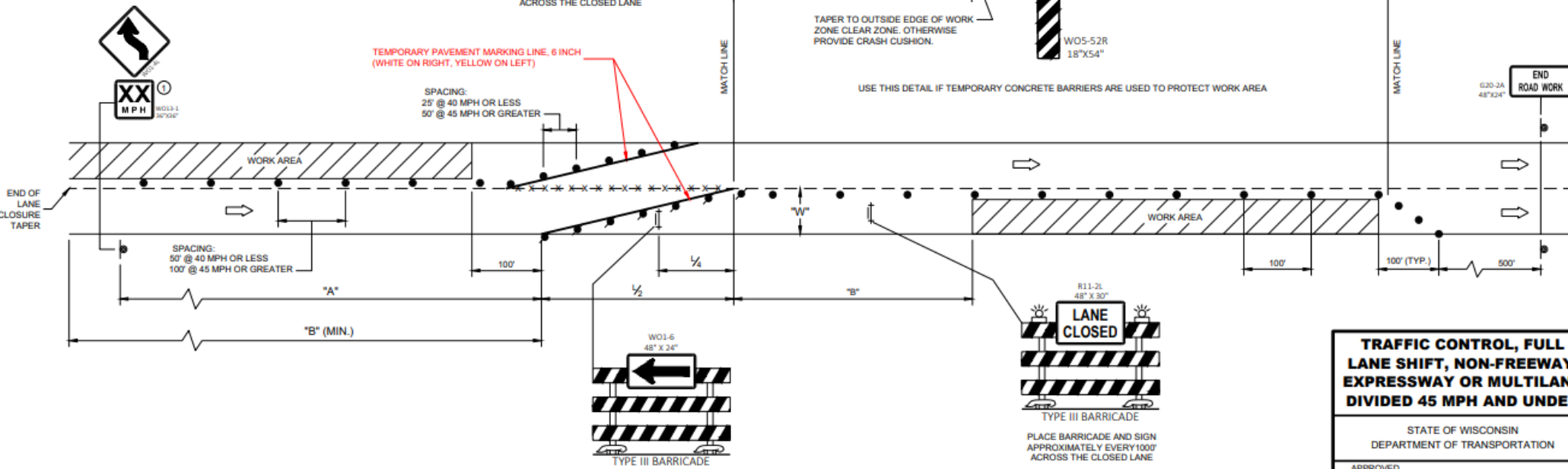


PLACE BARRICADE AND SIGN
APPROXIMATELY EVERY 1000'
ACROSS THE CLOSED LANE



USE THIS DETAIL IF TEMPORARY CONCRETE BARRIERS ARE USED TO PROTECT WORK AREA

END
ROAD WORK
G30-2A
48\"/>

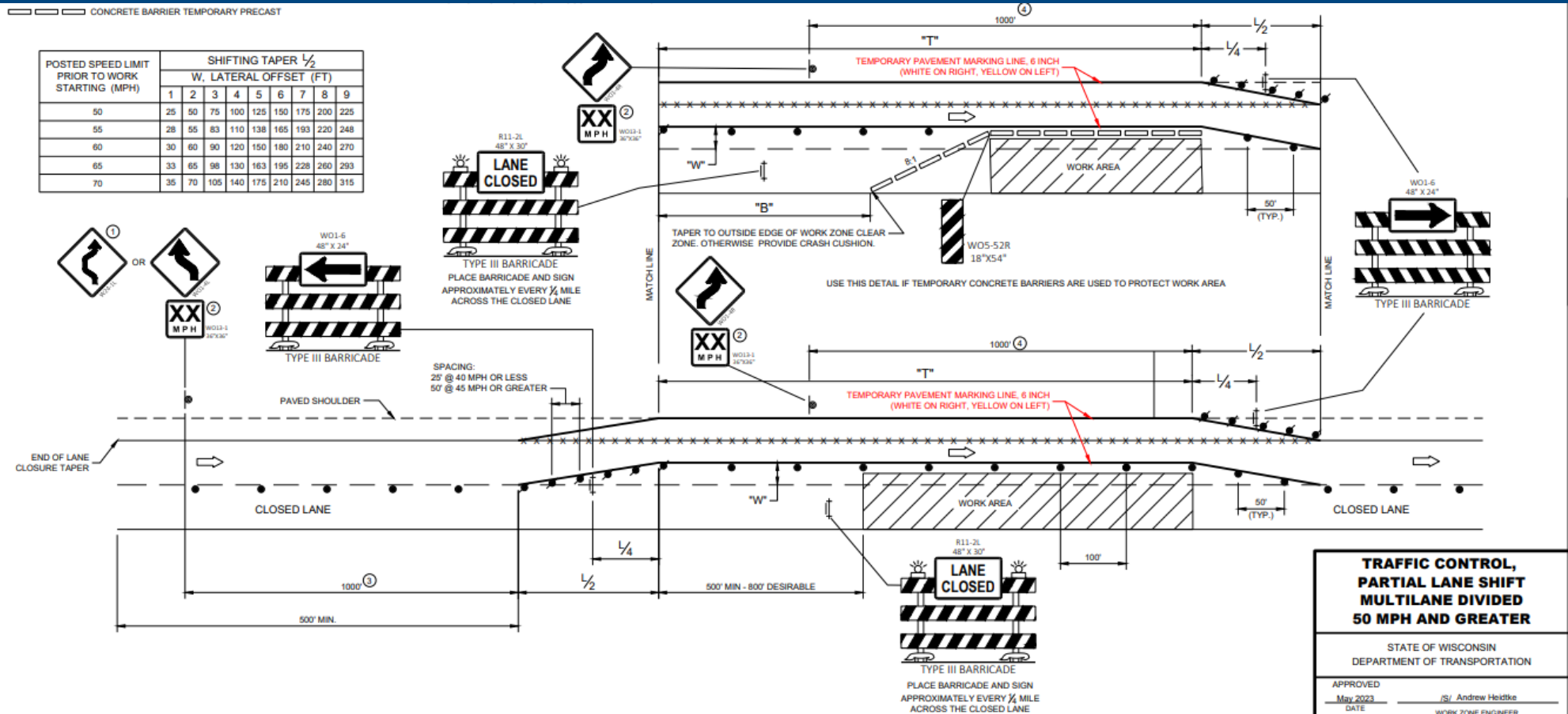


**TRAFFIC CONTROL, FULL
LANE SHIFT, NON-FREEWAY/
EXPRESSWAY OR MULTILANE
DIVIDED 45 MPH AND UNDER**

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

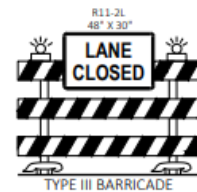
APPROVED

Lane Shifts – Partial Lane 50 or more

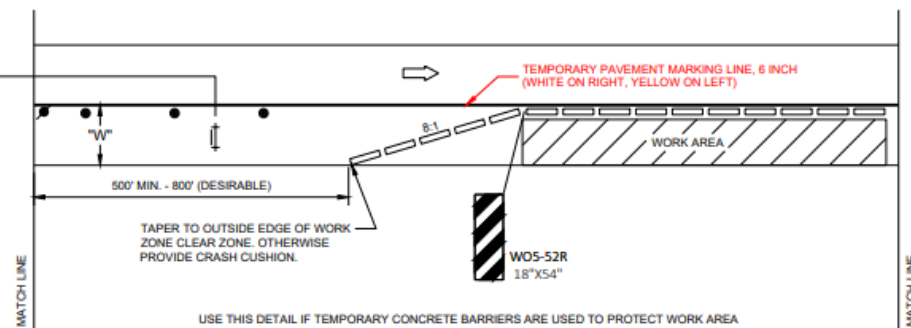


Lane Shifts – Full Lane 50 or more

POSTED SPEED LIMIT PRIOR TO WORK STARTING (MPH)	SHIFTING TAPER $\frac{1}{2}$				
	W, LATERAL OFFSET (FT)				
	10	11	12	13	14
50	250	275	300	325	350
55	275	303	330	358	385
60	300	330	360	390	420
65	325	358	390	423	455
70	350	385	420	455	490



PLACE BARRICADE AND SIGN
APPROXIMATELY EVERY 1000'
ACROSS THE CLOSED LANE



TAPER TO OUTSIDE EDGE OF WORK
ZONE CLEAR ZONE. OTHERWISE
PROVIDE CRASH CUSHION.



USE THIS DETAIL IF TEMPORARY CONCRETE BARRIERS ARE USED TO PROTECT WORK AREA



END
ROAD WORK

G20-2A
48\"/>



END OF
LANE
CLOSURE
TAPER

TEMPORARY PAVEMENT MARKING LINE, 6 INCH
(WHITE ON RIGHT, YELLOW ON LEFT)

50'

100'

1000'

500' MIN.

100'

100' (TYP.)

500' MIN. - 800' (DESIRABLE)

500' MIN. - 800' (DESIRABLE)

500' MIN. - 800' (DESIRABLE)

500' MIN. - 800' (DESIRABLE)

500' MIN. - 800' (DESIRABLE)

500' MIN. - 800' (DESIRABLE)

500' MIN. - 800' (DESIRABLE)

500' MIN. - 800' (DESIRABLE)

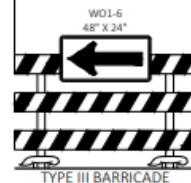
500' MIN. - 800' (DESIRABLE)

500' MIN. - 800' (DESIRABLE)

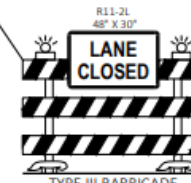
500' MIN. - 800' (DESIRABLE)

500' MIN. - 800' (DESIRABLE)

500' MIN. - 800' (DESIRABLE)



PLACE BARRICADE AND SIGN
APPROXIMATELY EVERY 1000'
ACROSS THE CLOSED LANE



PLACE BARRICADE AND SIGN
APPROXIMATELY EVERY 1000'
ACROSS THE CLOSED LANE

**TRAFFIC CONTROL, FULL
LANE SHIFT, MULTI-LANE
DIVIDED 50 MPH AND OVER**

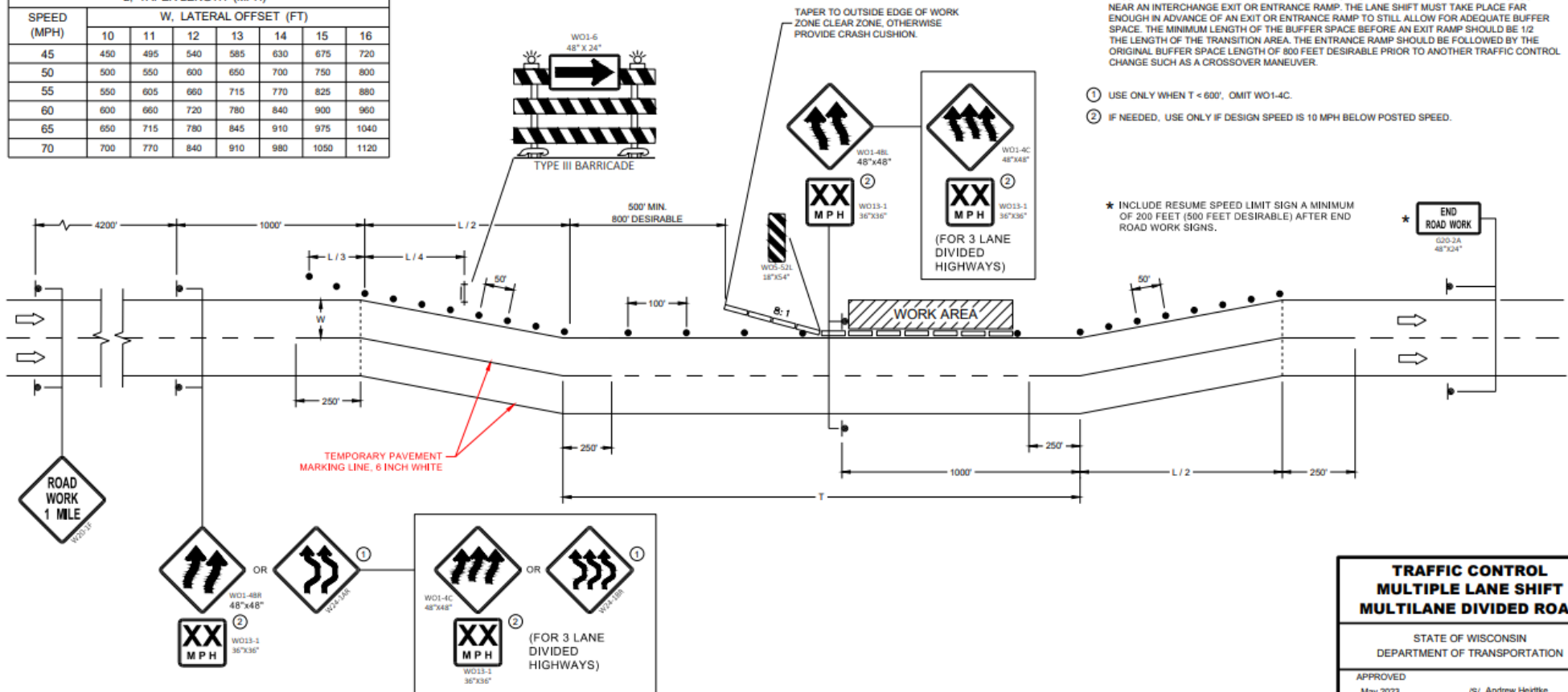
STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

APPROVED

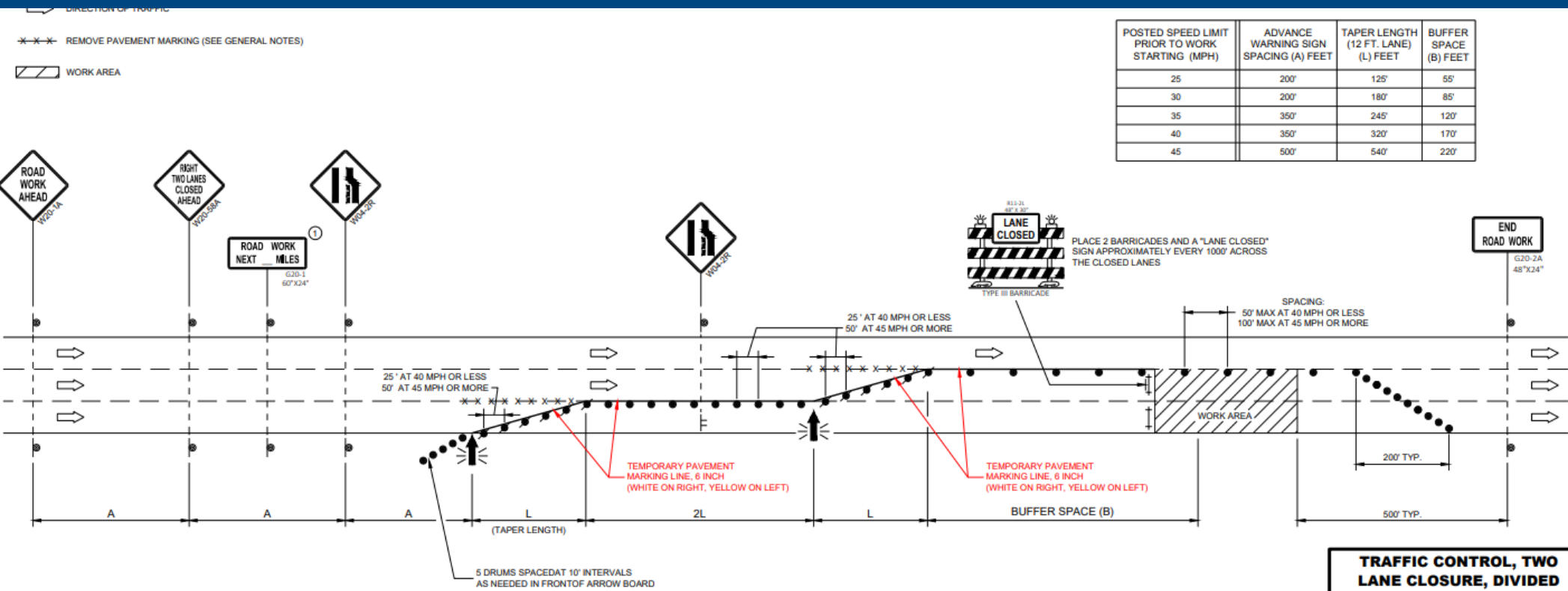
Lane Shifts – Multiple Lanes

SDD 15d41

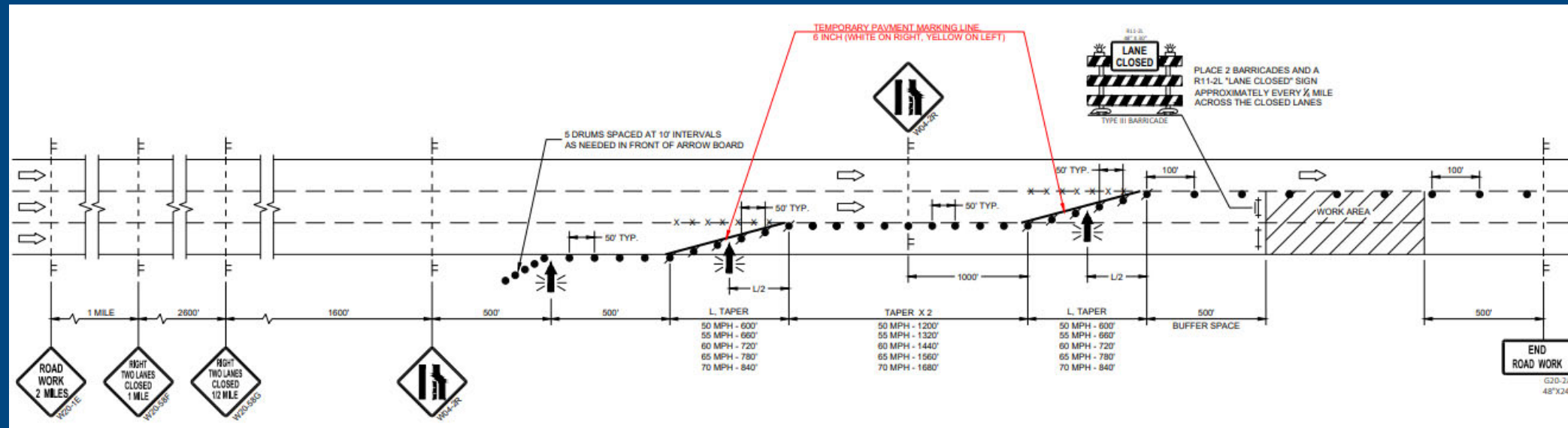
L, TAPER LENGTH (MPH)							
SPEED (MPH)	W, LATERAL OFFSET (FT)						
	10	11	12	13	14	15	16
45	450	495	540	585	630	675	720
50	500	550	600	650	700	750	800
55	550	605	660	715	770	825	880
60	600	660	720	780	840	900	960
65	650	715	780	845	910	975	1040
70	700	770	840	910	980	1050	1120



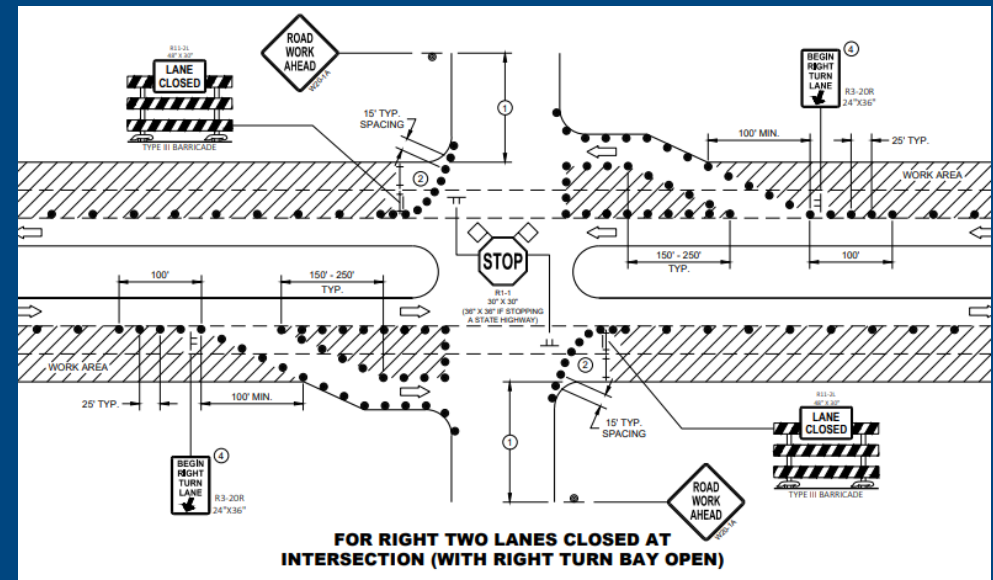
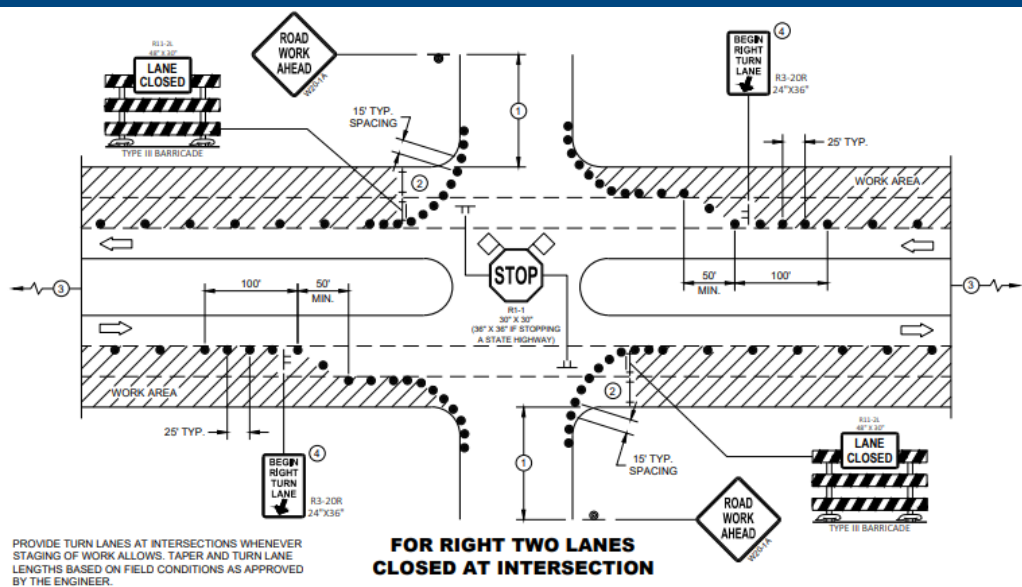
Multi-Lane Closures up to 45 mph



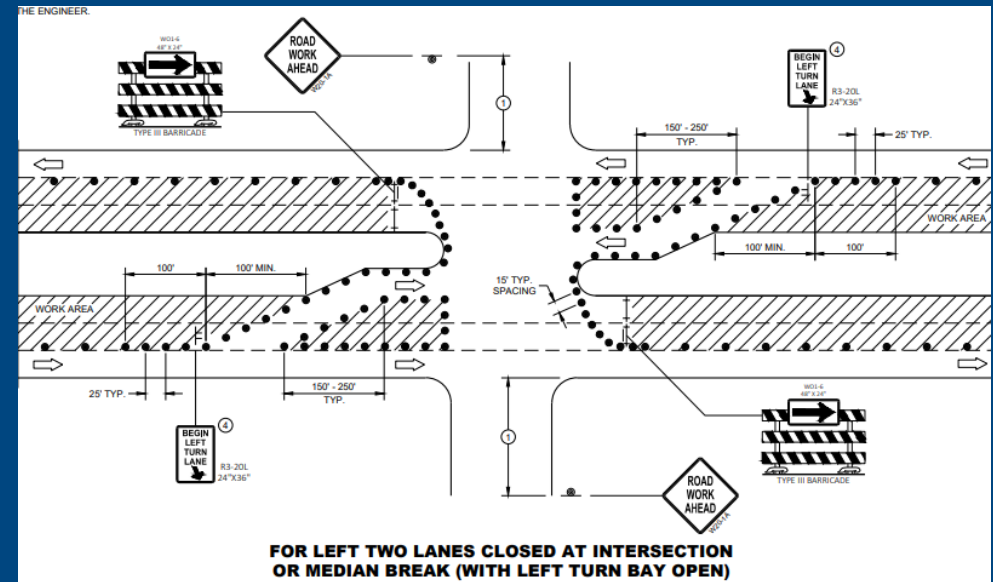
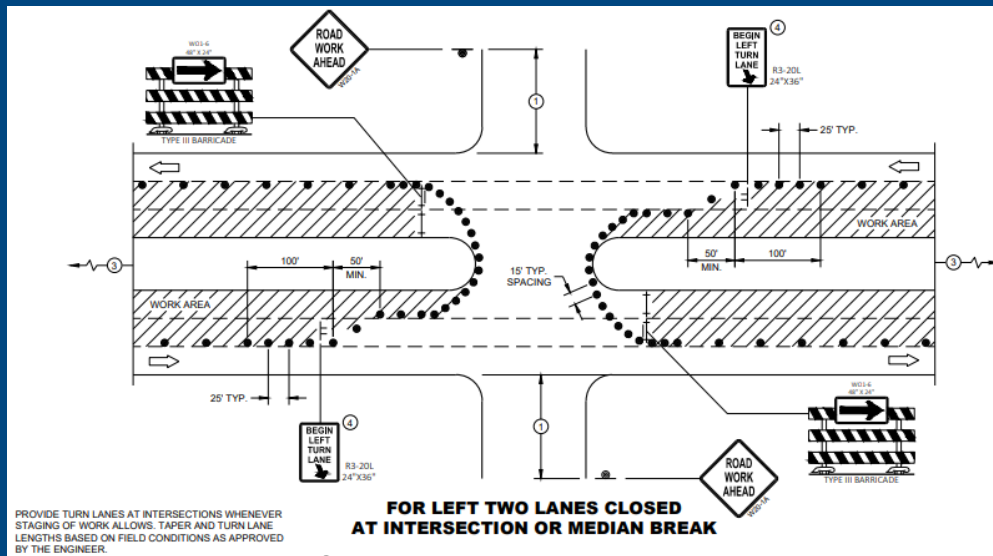
Multi-Lane Closures 50mph or higher



Intersections – Right Turn Lanes



Intersections – Left Turn Lanes



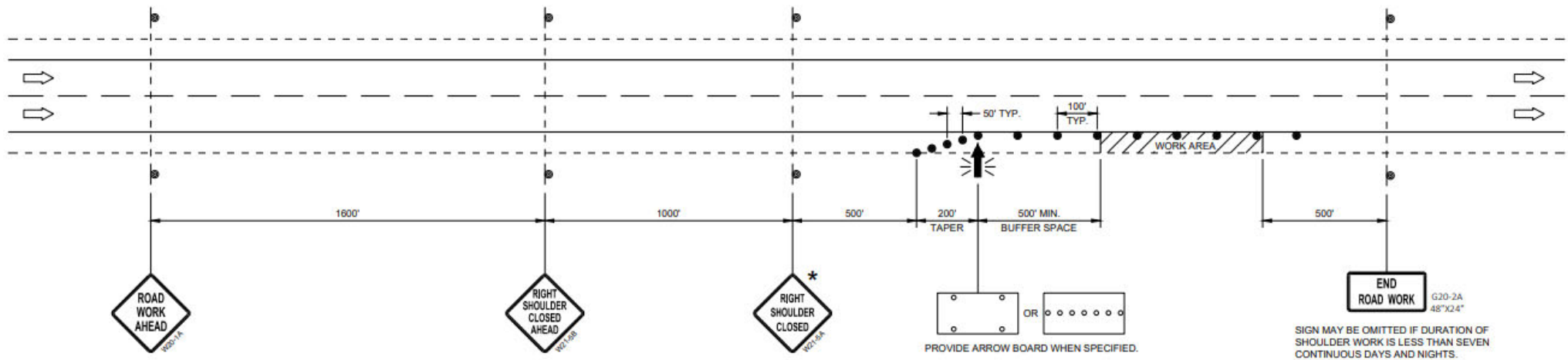
Intersections – Signal Considerations

Will modifications be needed?

- Work with Region traffic for signal timing changes
- Consider how a temporary signal will be installed?
 - Under flagging(one lane each direction)?
 - Lane closures?



Shoulder Closure greater than 40 mph



Exercise #7

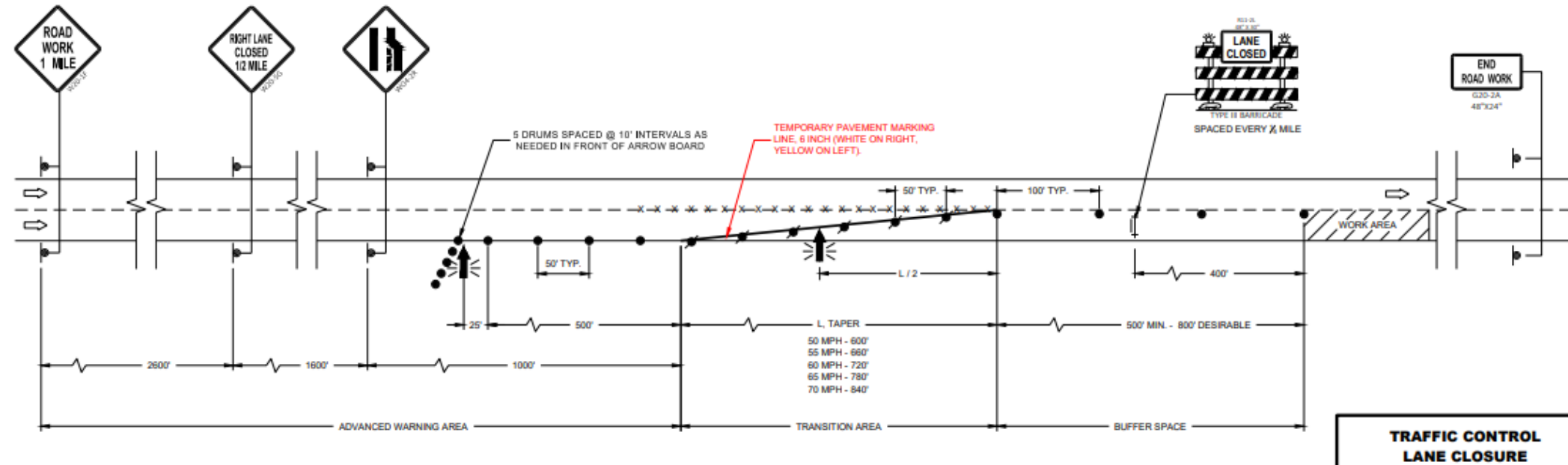
- US 12 in Eau Claire
- 40 mph
- 36,000 AADT
 - Must maintain 2 lanes
- Base patching in right lane
- Must allow right turns



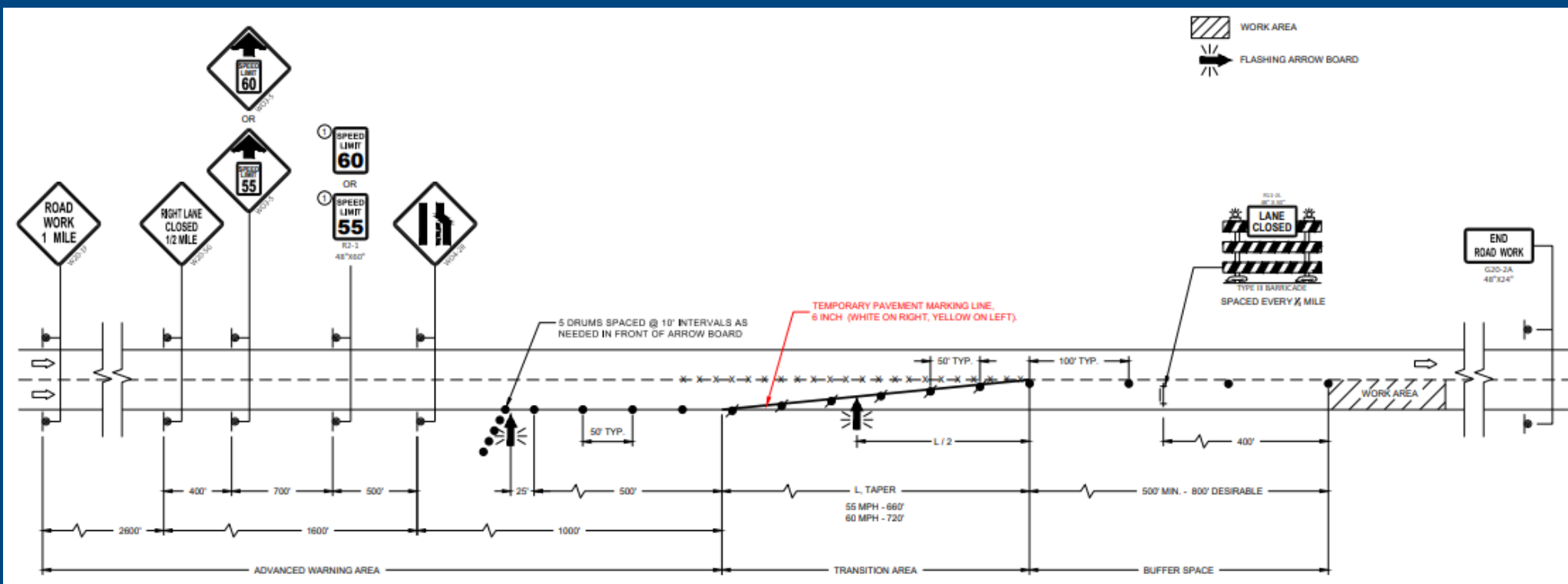
Module 7: Freeways & Expressways



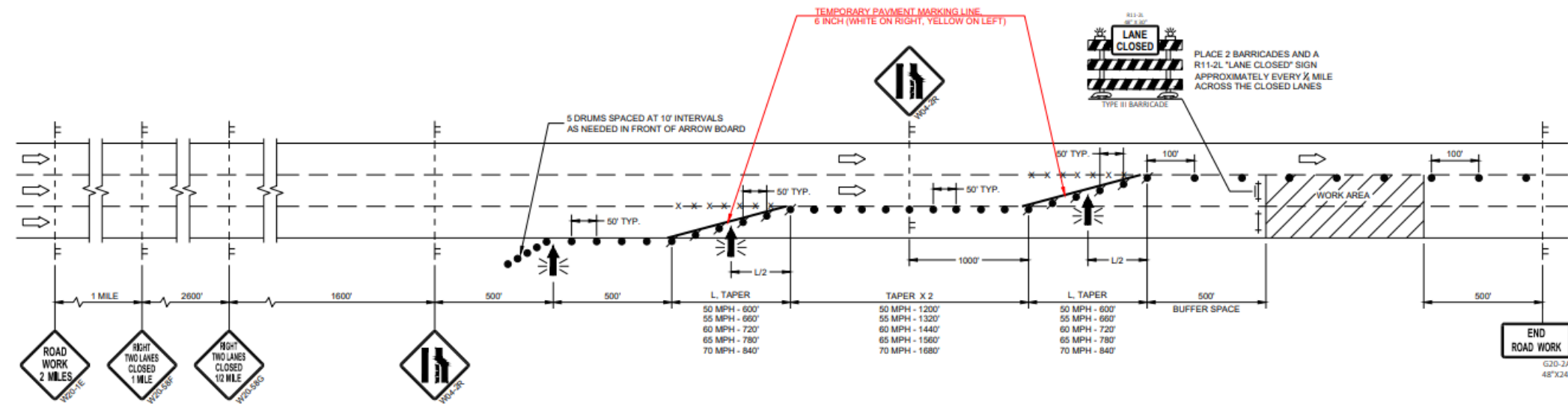
Single Lane Closure



Single Lane Closure with Speed Reduction



Freeway/Expressway Multilane Closure



Smart Work Zones

FDM 11-50-25, SDD 15D12, STSP 643-040, 643-045, 643-046

- What is a smart work zone?
 - A system that provides motorists with reliable, real-time information about upcoming traffic conditions in the work zone.
- What do they consist of?
 - Portable Traffic Sensors, Portable Changeable Message Signs, Flashing Beacon Signs, Automated System Manager, Probe Data, Dynamic Message Signs



Dynamic Late Merge System (DLMS) or Zipper Merge

- Used when regular recurring congestion will occur as part of a lane closure in a work zone
- Benefits
 - Increase in overall throughput
 - Lane Utilization
 - Reduction in maximum queue length
- SDD 15C12, STSP 643-040



DLMS – MQ's Table

- Miscellaneous Quantities - **IMPORTANT**

Table 25.1 DLMS Miscellaneous Quantities Reference

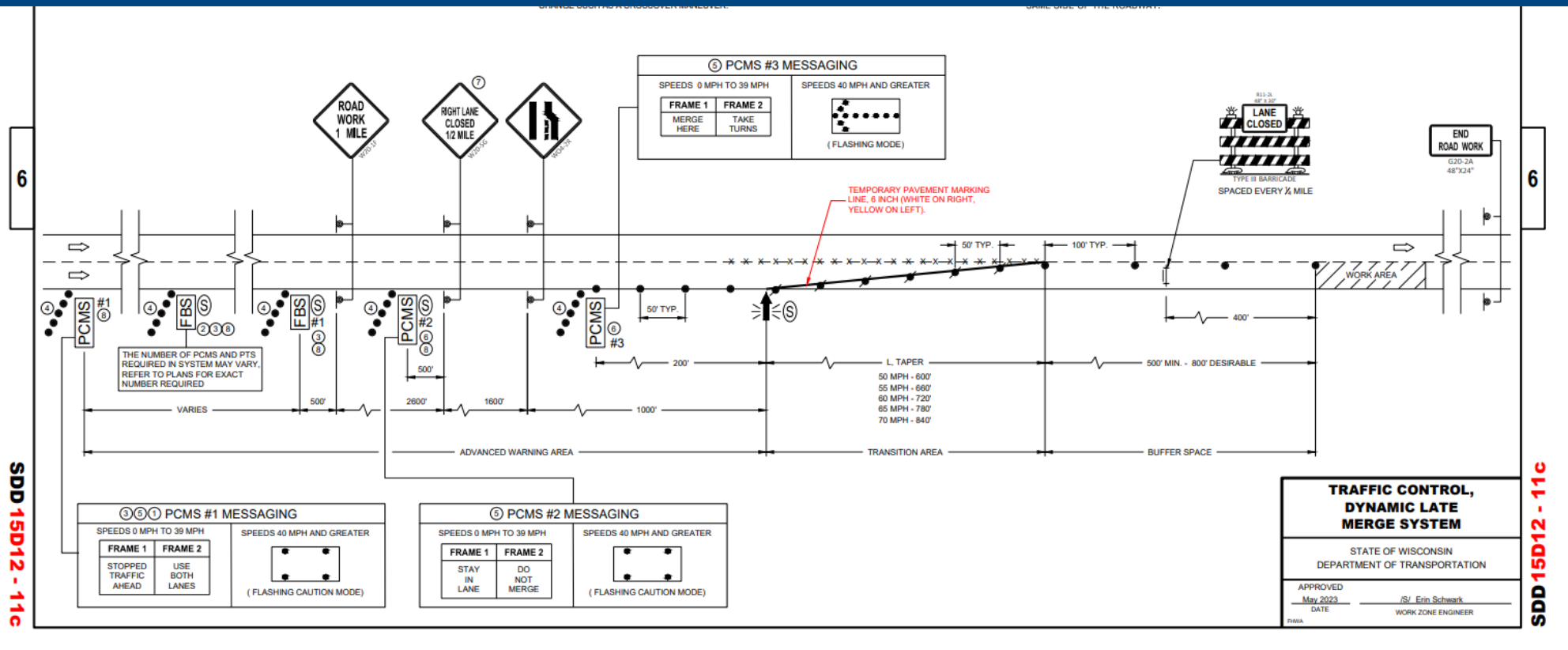
DYNAMIC LATE MERGE SYSTEM (DLMS ITEM 643.1100.S)					
Location	Stage	FLASHING BEACON SIGNS (FBS)	PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS)	PORTABLE TRAFFIC SENSORS (PTS)	DYNAMIC LATE MERGE SYSTEM (DAY)
IH 94 EB	1	6	2	9	100
IH 94 EB	2	6	2	9	70
IH 94 WB	1	4	2	6	100
IH 94 WB	2	4	2	6	70

* These items are part of the DLMS and are paid for one complete system per roadway



DLMS – SDD 15D12c

- SDD may be modified to create a construction detail for unique scenarios



Portable Real-Time Traffic Queue Warning Systems (QWS)

- Used when regular recurring congestion will occur as part of the work zone.
- Benefits
 - Reduction of end of queue crashes by up to 45%
 - Possible Diversion onto alternate routes
- SDD 15D12e, 643-045



QWS - MQ's Table

- Miscellaneous Quantities - IMPORTANT

Table 25.2 QWS Miscellaneous Quantities Reference

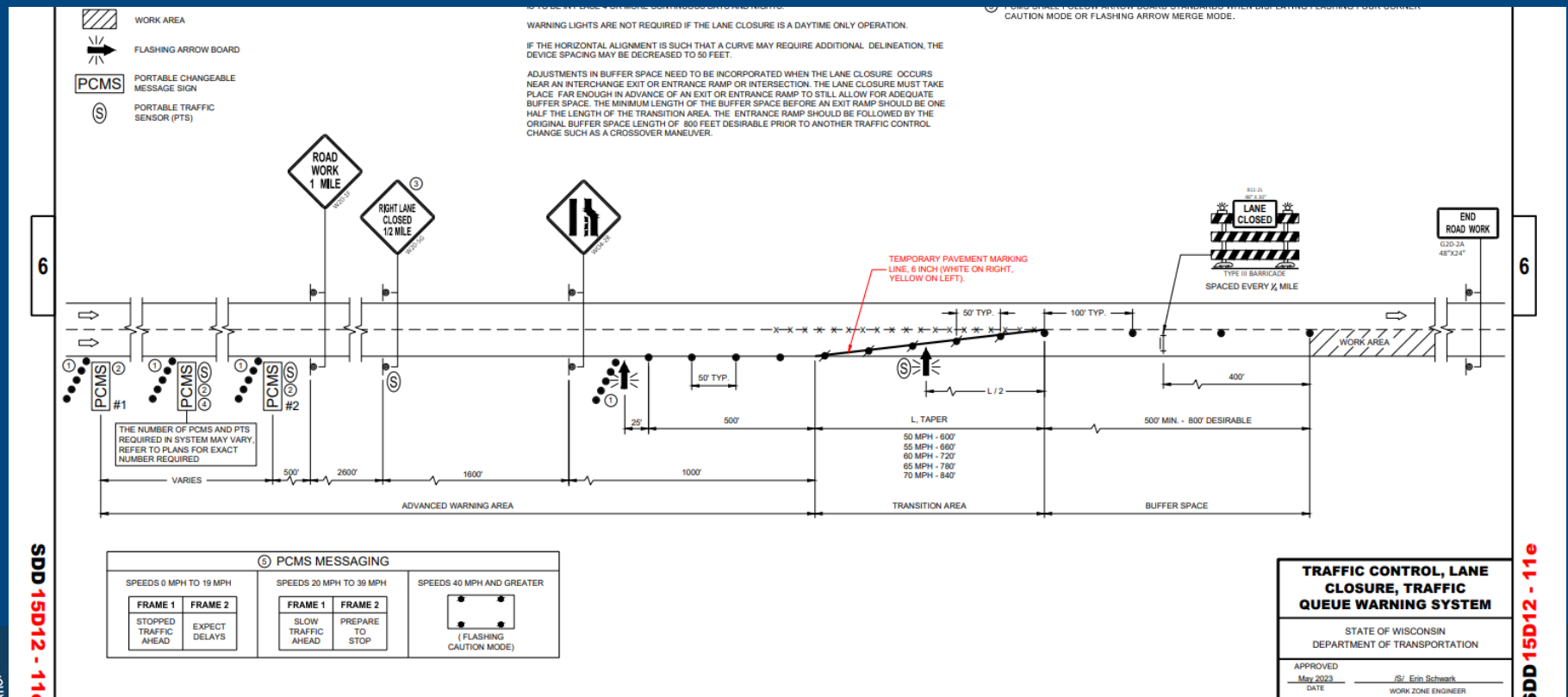
PORTABLE AUTOMATED REAL-TIME TRAFFIC QUEUE WARNING SYSTEM (QWS ITEM 643.1200.S)				
Location	Stage	PORTABLE CHANGEABLE MESSAGE SIGNS (PCMS)	PORTABLE TRAFFIC SENSORS (PTS)	QUEUE WARNING SYSTEM (DAY)
IH 94 EB	1	5	5	100
IH 94 EB	2	5	5	70
IH 94 WB	1	4	4	100
IH 94 WB	2	4	4	70

* These items are part of the QWS and are paid for one complete system per roadway



QWS – SDD 15D12e

- SDD may be modified to create a construction detail for unique scenarios



Basic Queue Warning System (BQWS)

- Used to alert traffic of stopped or slow traffic ahead
- Same benefits as QWS
- If another Smart Work Zone System is not being used on projects lasting longer than 4 weeks:
 - Consider installing BQWS on projects with AADT 20,000-25,000
 - Install BQWS if AADT is great than 25,000
- SDD 15D12d, 643-046



Basic Queue Warning System (BQWS)

- Miscellaneous Quantities - IMPORTANT

Table 25.3 BQWS Miscellaneous Quantities Reference

BASIC TRAFFIC QUEUE WARNING SYSTEM (QWS ITEM 643.1205.S)				
Location	Stage	FLASHING BEACON SIGNS (FBS)	PORTABLE TRAFFIC SENSORS (PTS)	BASIC QUEUE WARNING SYSTEM (DAY)
IH 41 NB	3	6	3	150
IH 41 SB	3	6	3	150

* These items are part of the QWS and are paid for one complete system per roadway

Ex: IH 41 has 3 lanes in each direction, therefore requiring FBS on both sides of the roadway.

BASIC TRAFFIC QUEUE WARNING SYSTEM (QWS ITEM 643.1205.S)

Location	Stage	FLASHING BEACON SIGNS (FBS)	PORTABLE TRAFFIC SENSORS (PTS)	BASIC QUEUE WARNING SYSTEM (DAY)
IH 94 EB	3	3	3	150
IH 94 WB	3	3	3	150

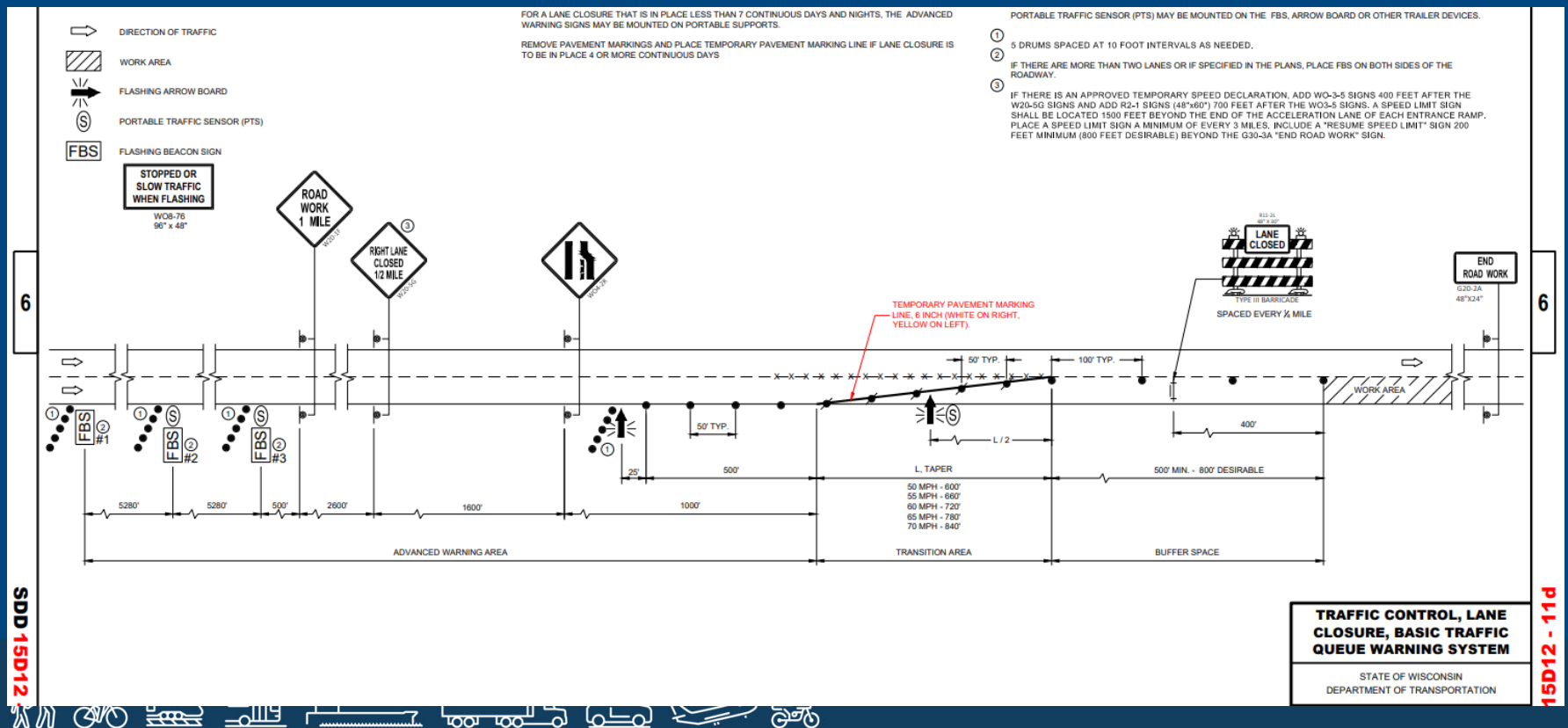
* These items are part of the QWS and are paid for one complete system per roadway

Ex: IH 94 has 2 lanes in each direction, therefore requiring FBS on only one side of the roadway.



BQWS – SDD 15D12d

- SDD may be modified to create a construction detail for unique scenarios

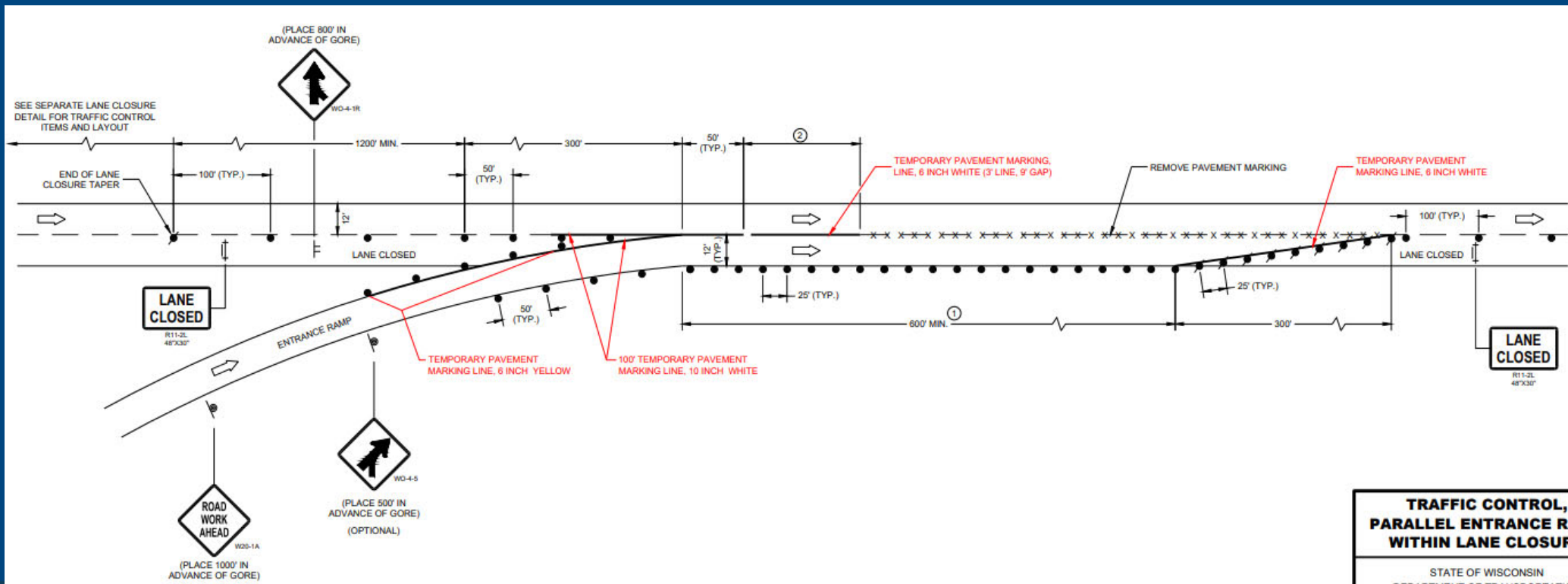


Other Smart Work Zone Systems

- Truck Entering
- Travel Time System
- Digital Speed Limit Trailers
- Speed Wizard
- Temporary Rumble Strips

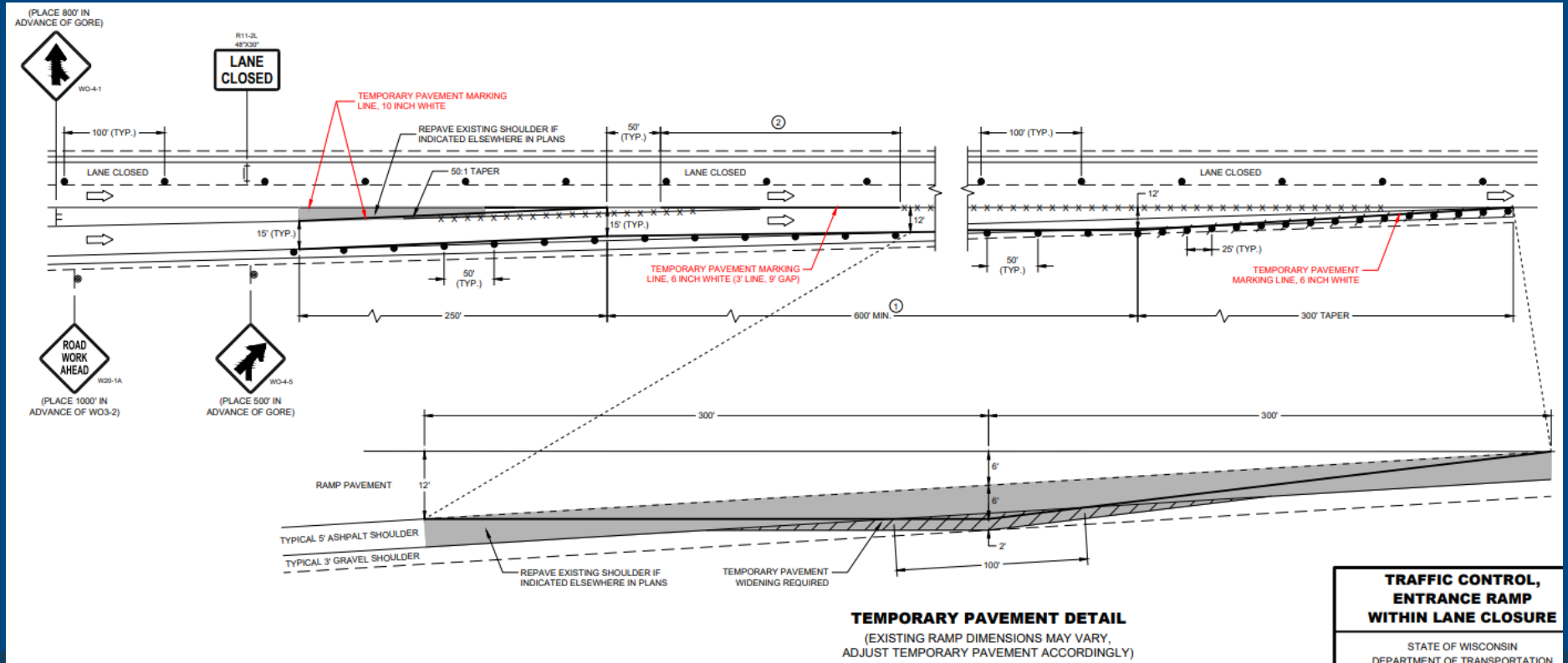


Entrance Ramps – Parallel, Right Lane Closure

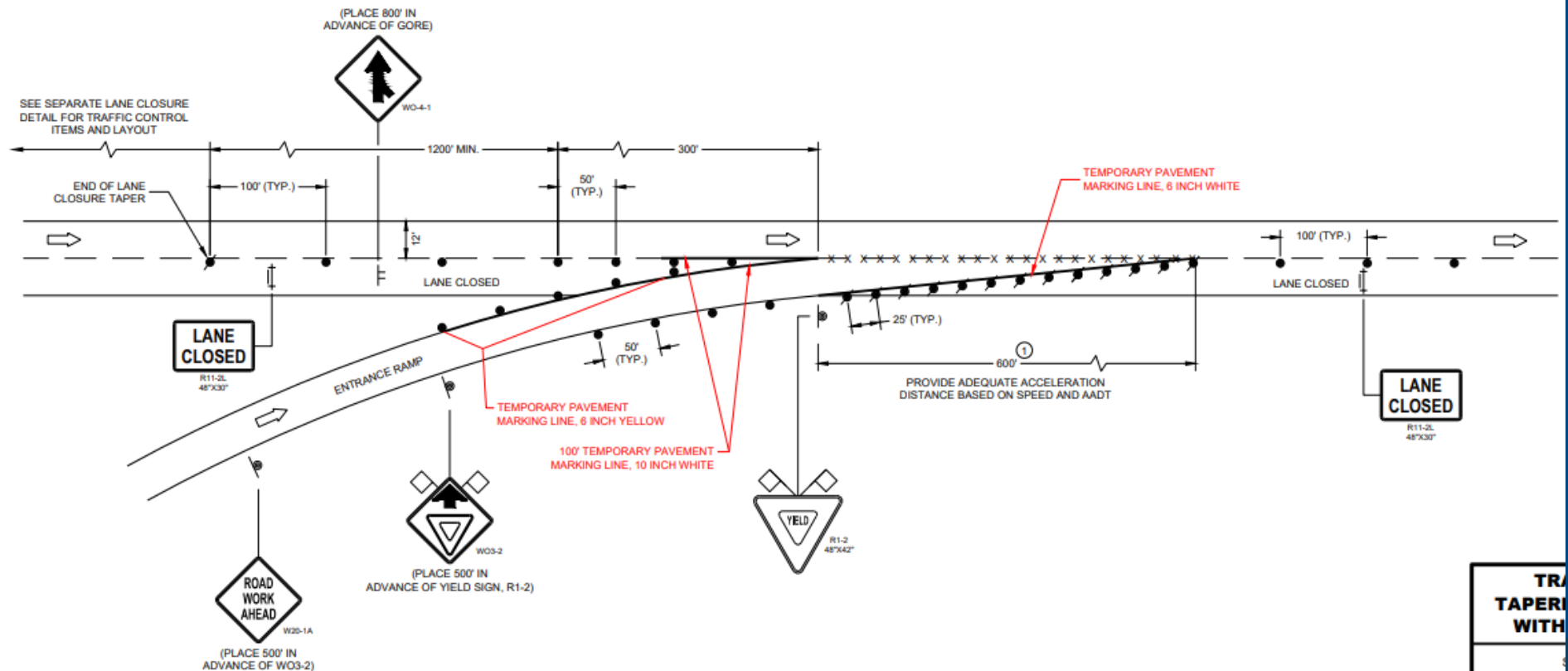


SDD 15d15 Sheet A

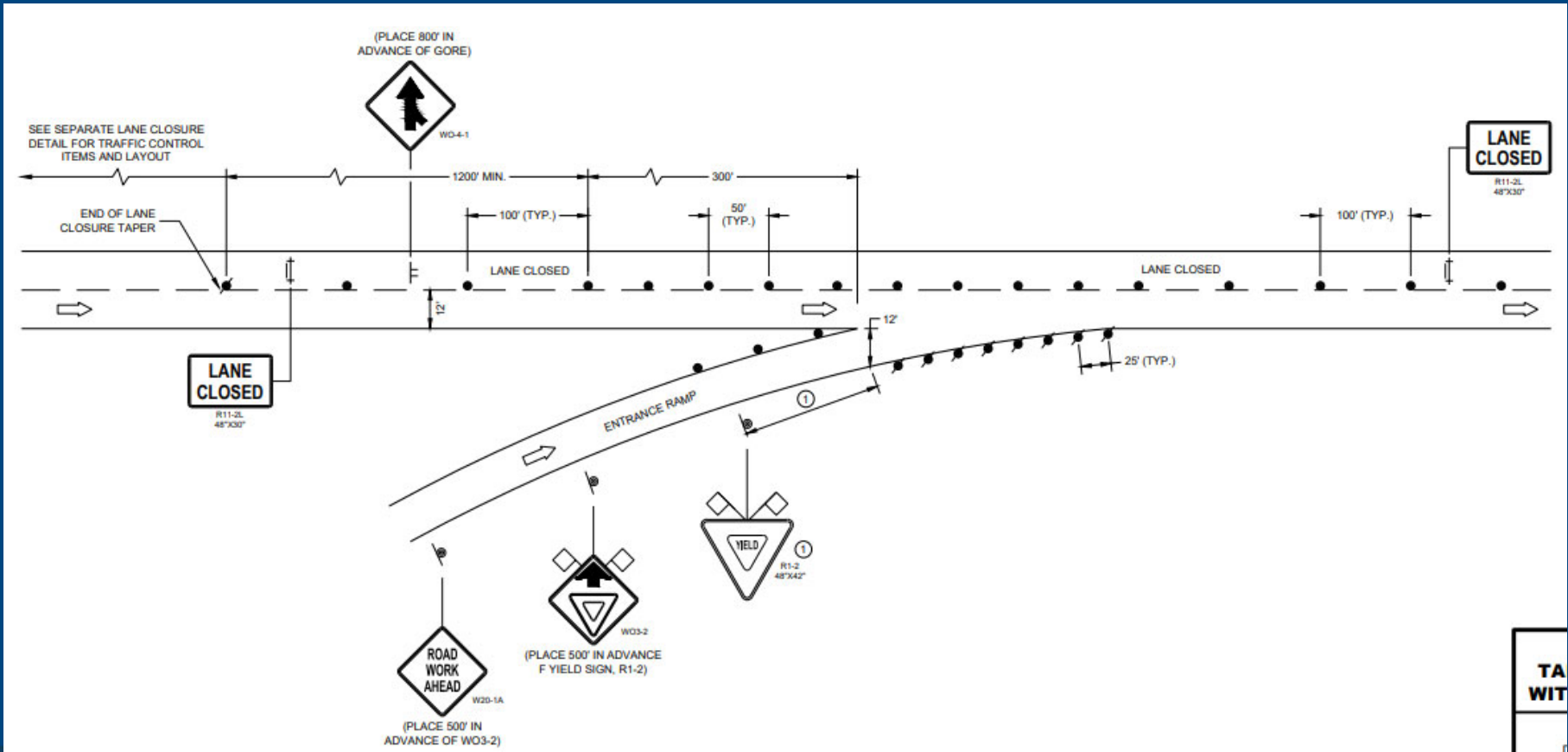
Entrance Ramps – Parallel, Left Lane Closure



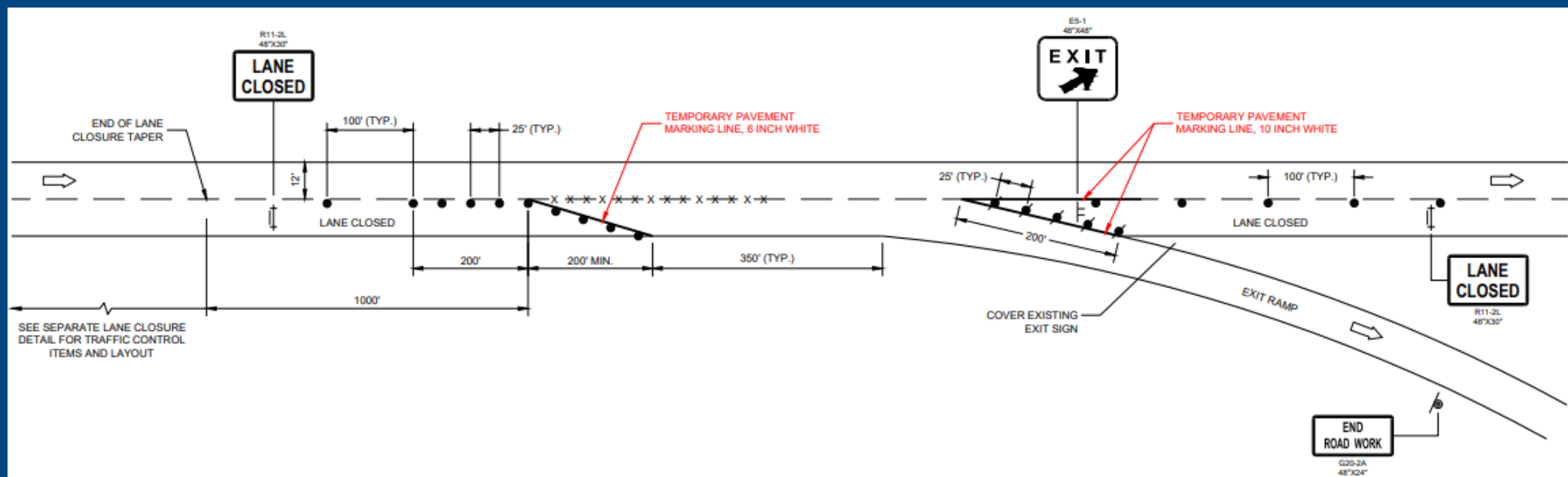
Entrance Ramps



Entrance Ramps

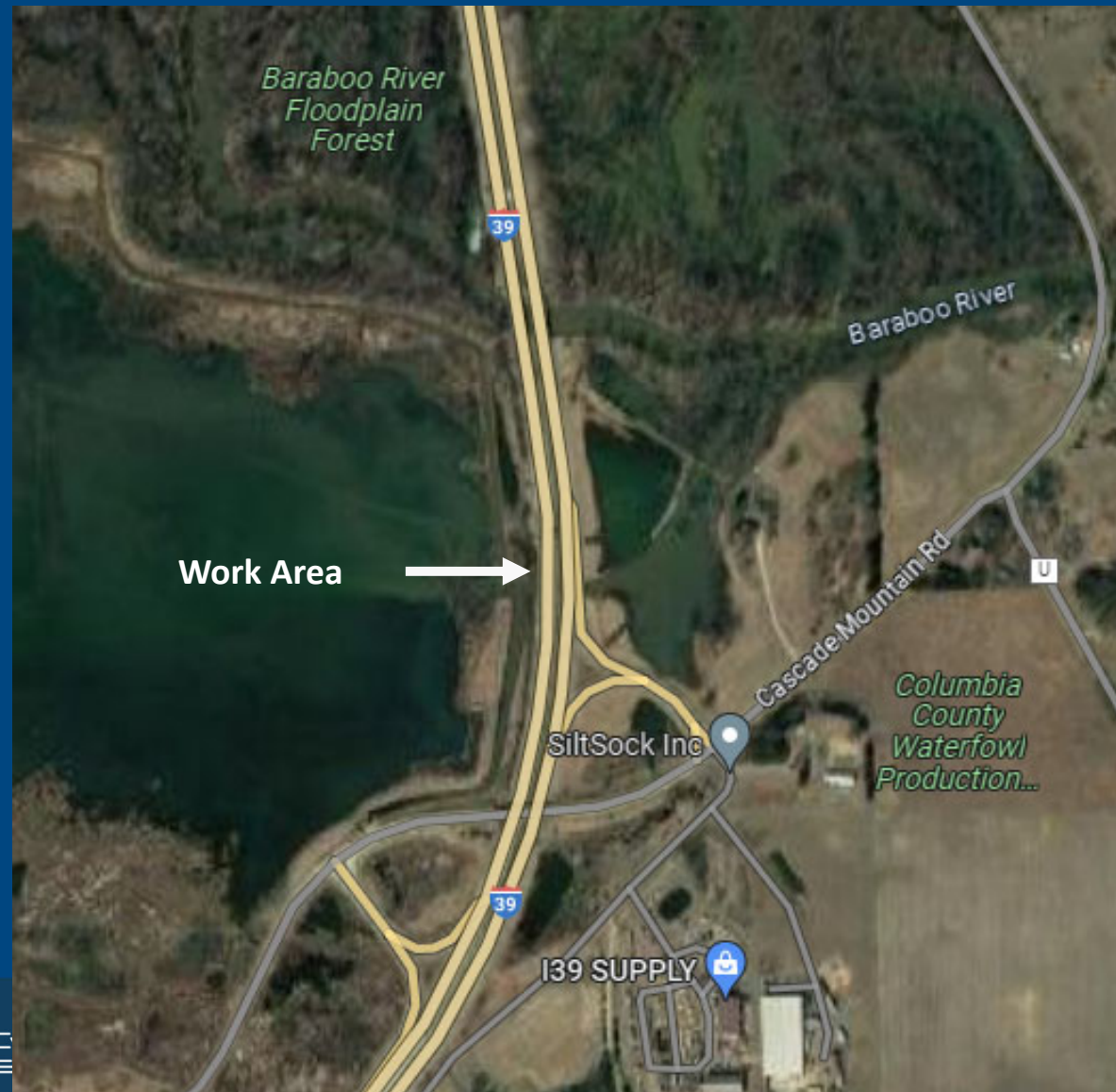


Exit Ramps



Exercise #8

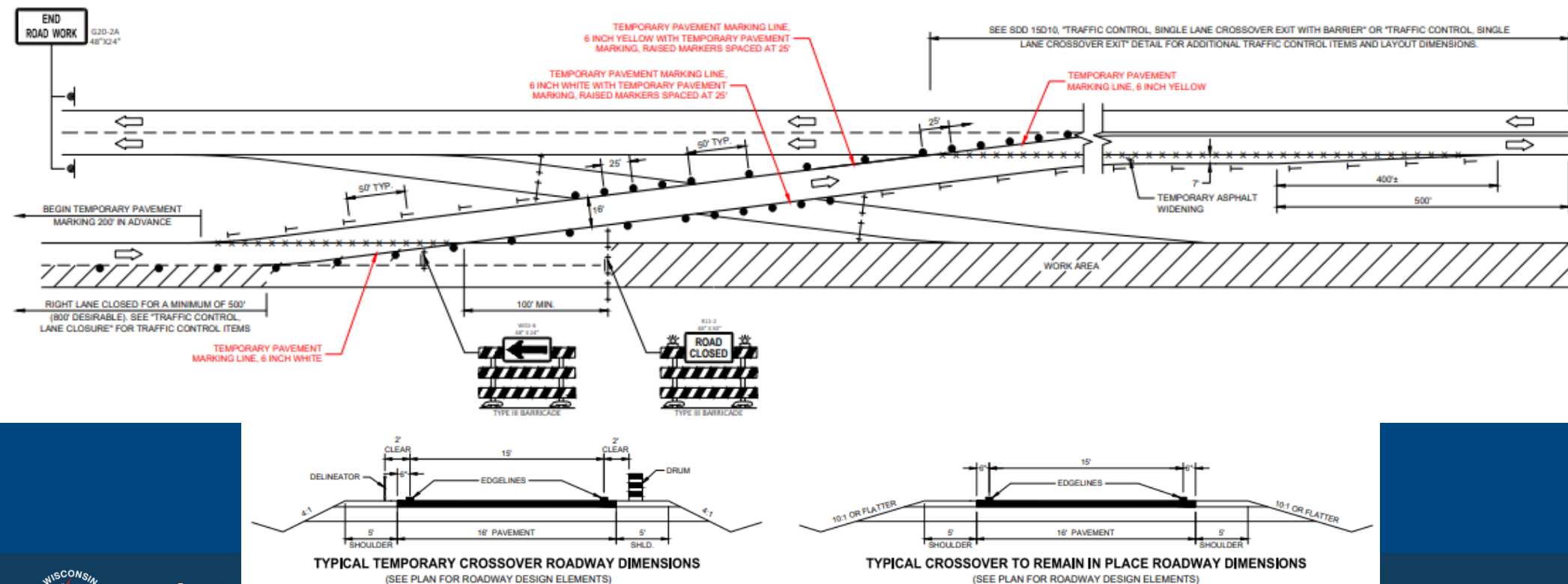
- I-39SB Columbia Co.
- Work on right side requiring a lane closure



Crossovers



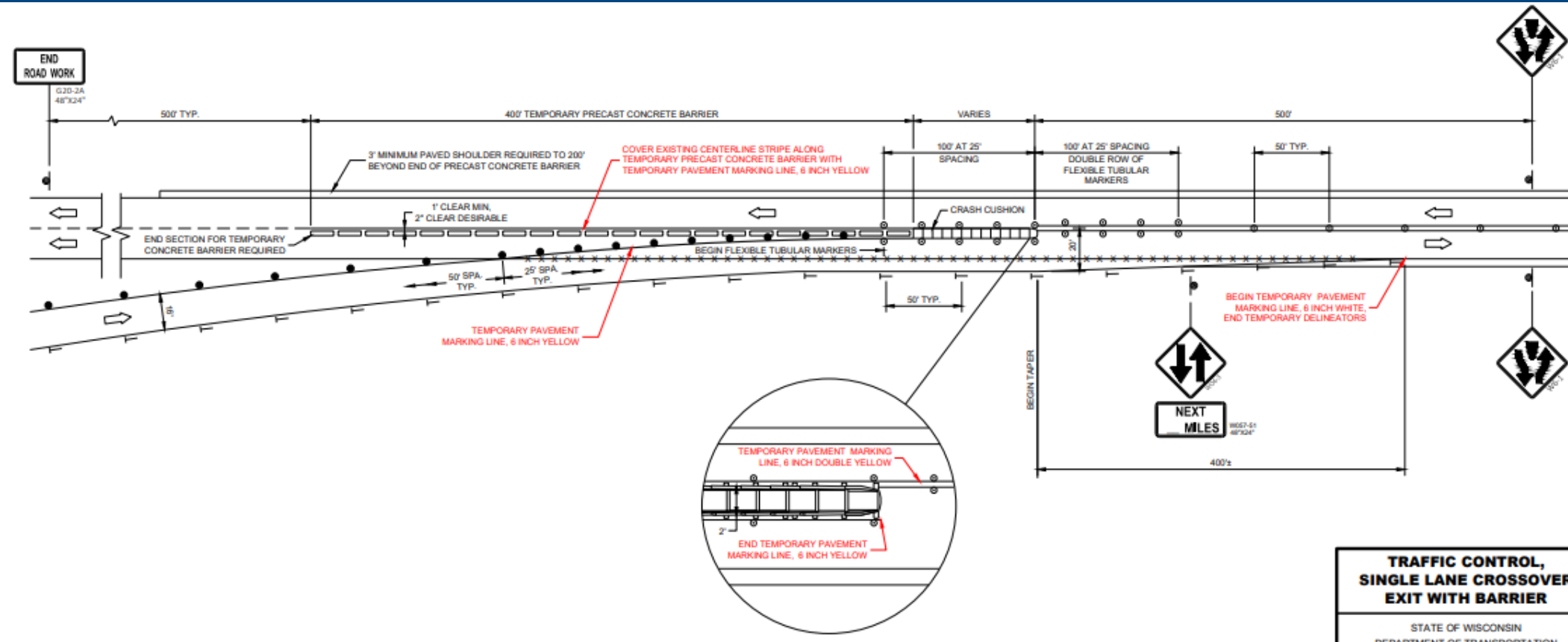
Crossovers





SDD 15d5

Crossover Exit w/ Barrier



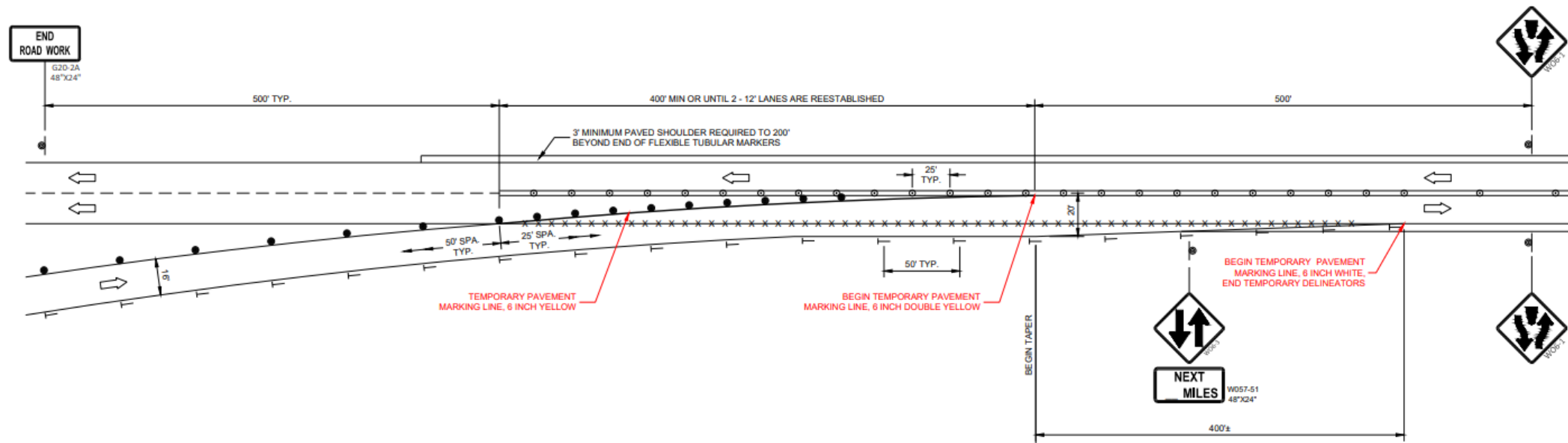
**TRAFFIC CONTROL,
SINGLE LANE CROSSOVER
EXIT WITH BARRIER**

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

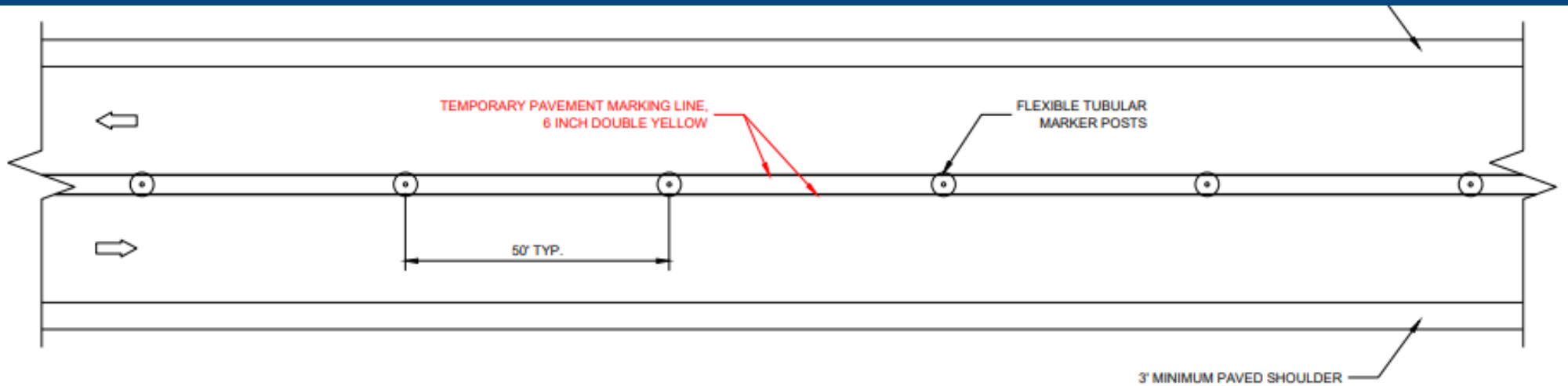


SDD 15d10

Crossover Exit w/o Barrier



Crossover TLTW



TWO LANE, TWO WAY OPERATION



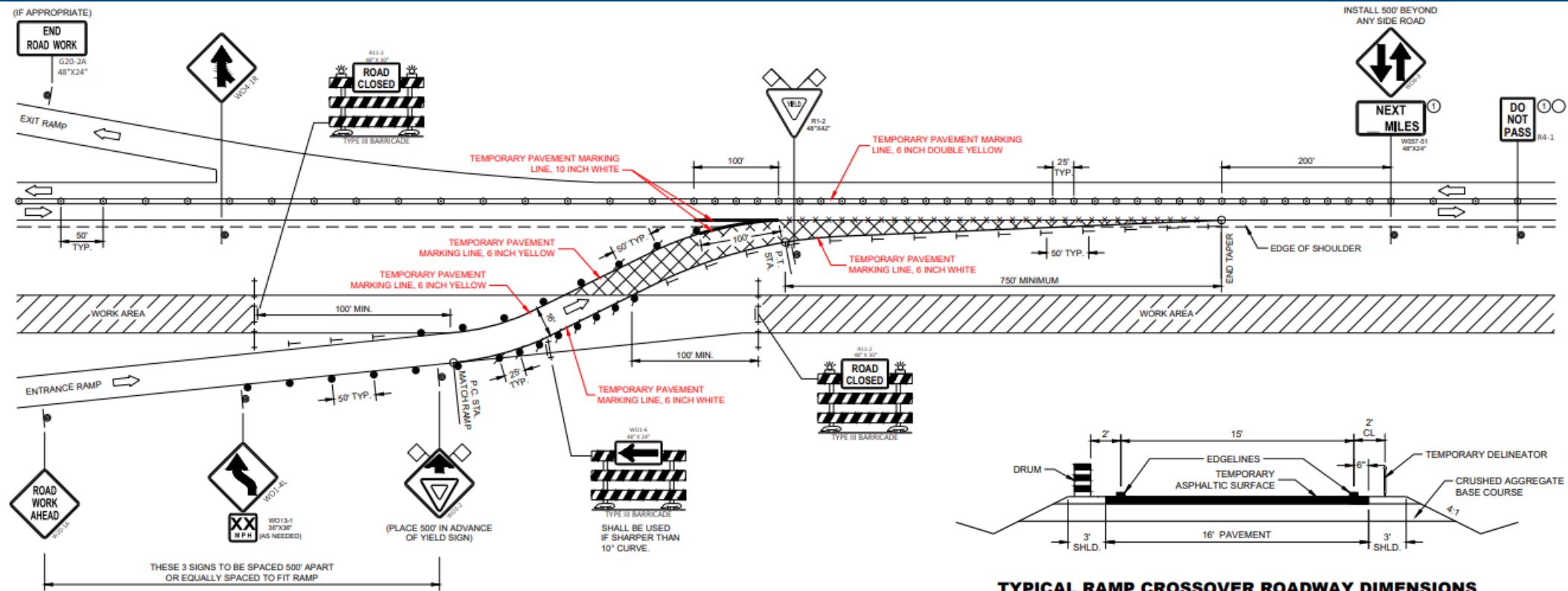
① THE W06-3 AND W057-51 SHALL BE LOCATED 200 FEET BEYOND THE END OF THE ACCELERATION LANE OF EACH ENTRANCE RAMP AND / OR 500 FEET BEYOND ANY SIDE ROAD. THE R4-1 SHALL BE LOCATED 1000 FEET BEYOND THE W06-3 AND THE W057-51 AND THE SIGNS SHALL BE ALTERNATED WITH ONE MILE INTERVALS BETWEEN THE SIGNS.

② CONVENTIONAL: 24" X 30"
FREEWAY AND EXPRESSWAY: 36" X 48"



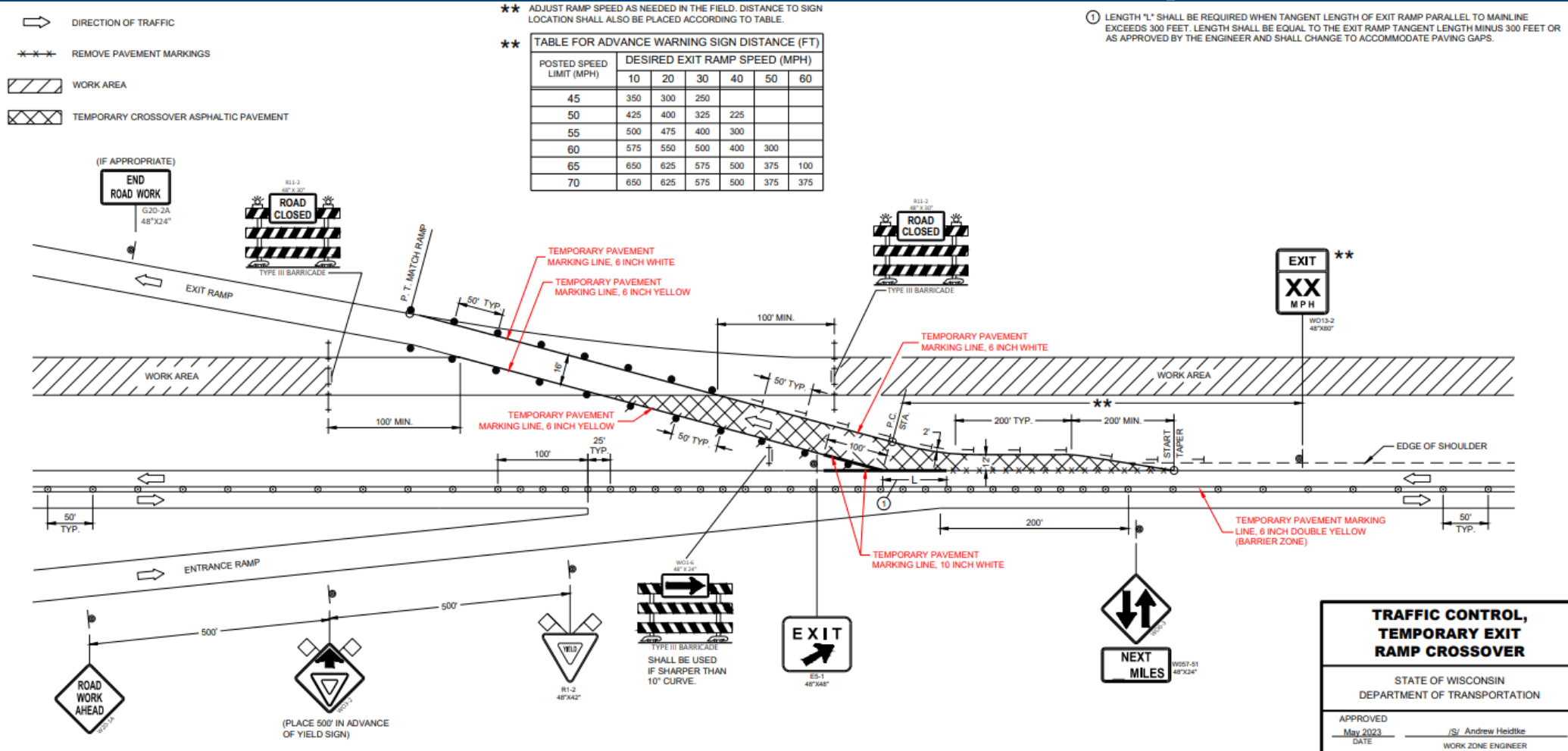
SDD 15d6

Crossover TLTW – Entrance Ramp

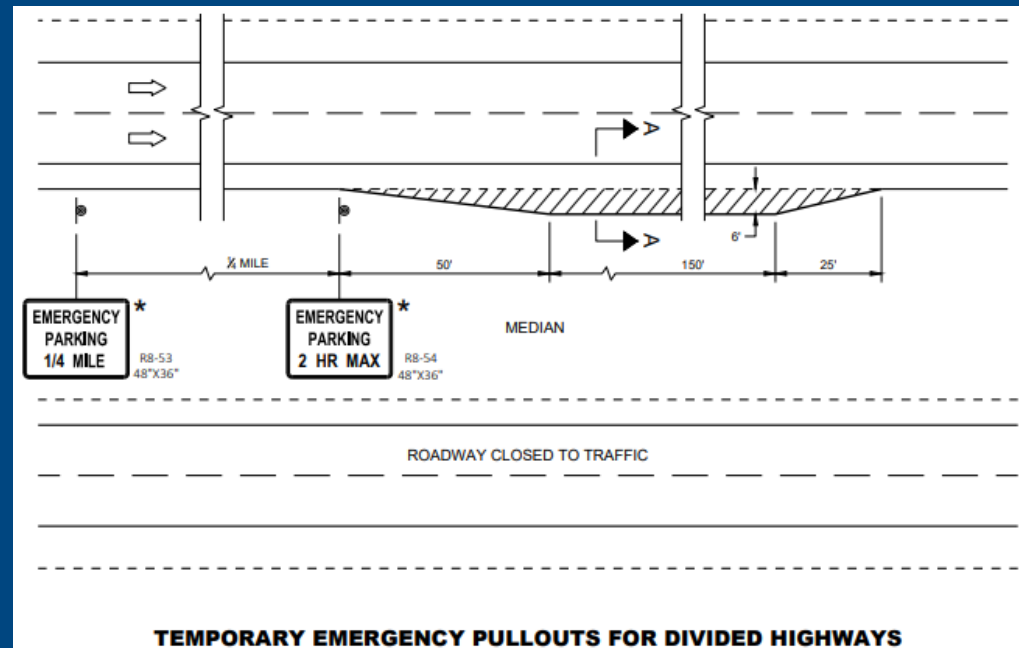


TYPICAL RAMP CROSSOVER ROADWAY DIMENSIONS

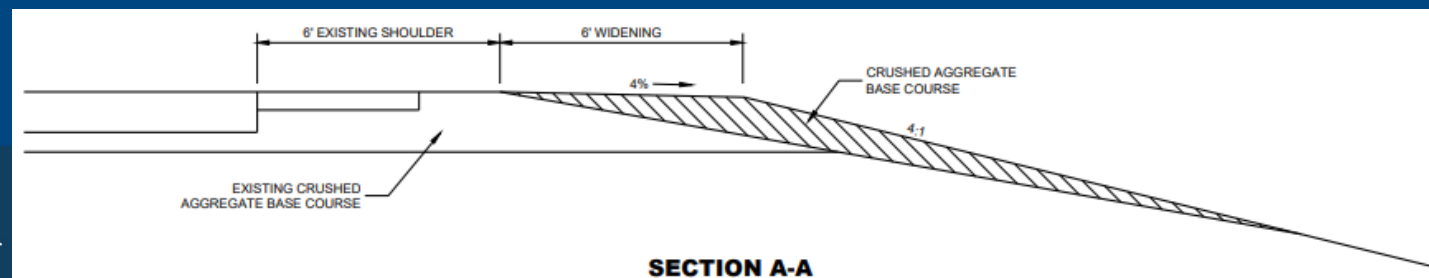
SDD 15d7



Crossover TLTW – Emergency Pullout

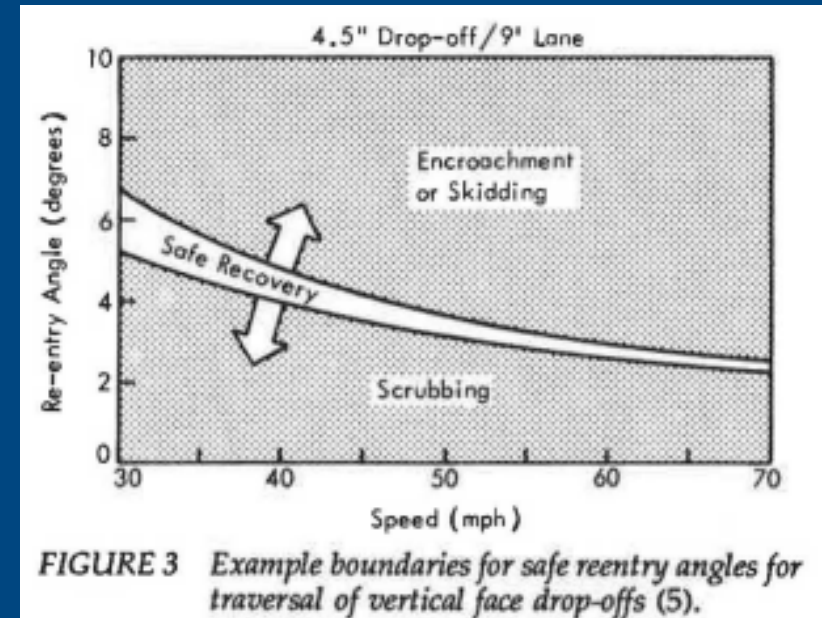
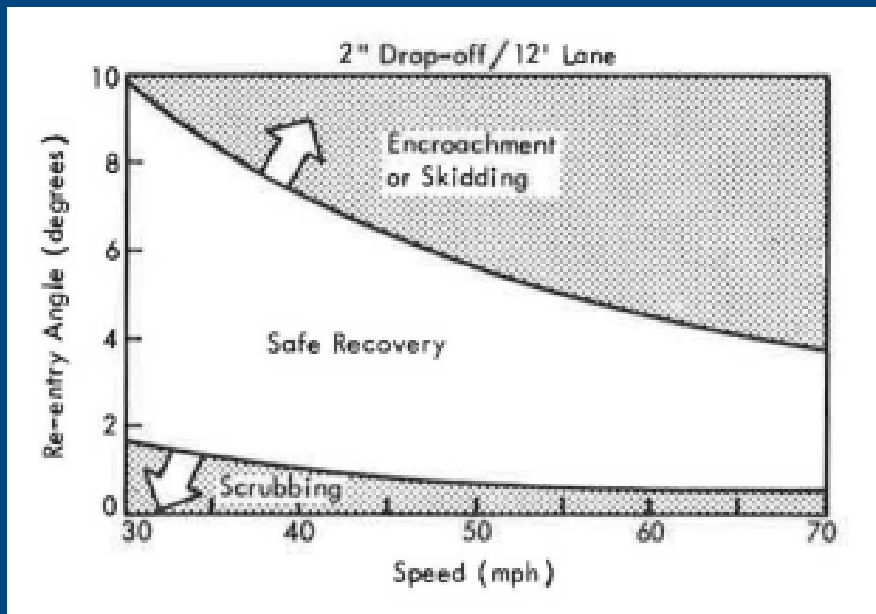


SDD 15d13



Drop-offs

Why are we worried?



Module 8: Temporary Pedestrian Accommodations



Requirements for Pedestrians

WMUTCD 6D.01 Pedestrian Considerations

Standard:

- 2 The various TTC provisions for pedestrian and worker safety set forth in Part 6 shall be applied by knowledgeable (for example, trained and/or certified) persons after appropriate evaluation and engineering judgment.
- 3 Advance notification of sidewalk closures shall be provided by the maintaining agency.
- 4 If the TTC zone affects the movement of pedestrians, adequate pedestrian access and walkways shall be provided. If the TTC zone affects an accessible and detectable pedestrian facility, the accessibility and detectability shall be maintained along the alternate pedestrian route.



Requirements for Pedestrians

28 CFR 35.133

§ 35.133 Maintenance of accessible features.

- (a) A public entity shall maintain in operable working condition those features of facilities and equipment that are required to be readily accessible to and usable by persons with disabilities by the Act or this part.
- (b) This section does not prohibit isolated or temporary interruptions in service or access due to maintenance or repairs.
- (c) If the 2010 Standards reduce the technical requirements or the number of required accessible elements below the number required by the 1991 Standards, the technical requirements or the number of accessible elements in a facility subject to this part may be reduced in accordance with the requirements of the 2010 Standards.



Requirements for Pedestrians

28 CFR 35.133

US Access Board Clarification:

“An example of an isolated or temporary interruption in the public right-of-way is a watermain break that requires the sidewalk to be temporarily closed due to maintenance activity on the watermain.”



Are pedestrians present in the project location?

What facilities exist for pedestrian traffic?

- Is there sidewalk?
 - One or both sides?
- Curb ramps and crosswalks?
- Signals with push buttons?
- Bus stops?
- Where are they going?



What extent will pedestrians be disrupted?

- Blocking or encroaching
 - The facility still exists
- Reconstructing
 - Existing facility removed
 - Replaced with temporary facility
 - Assess and mobility maintained

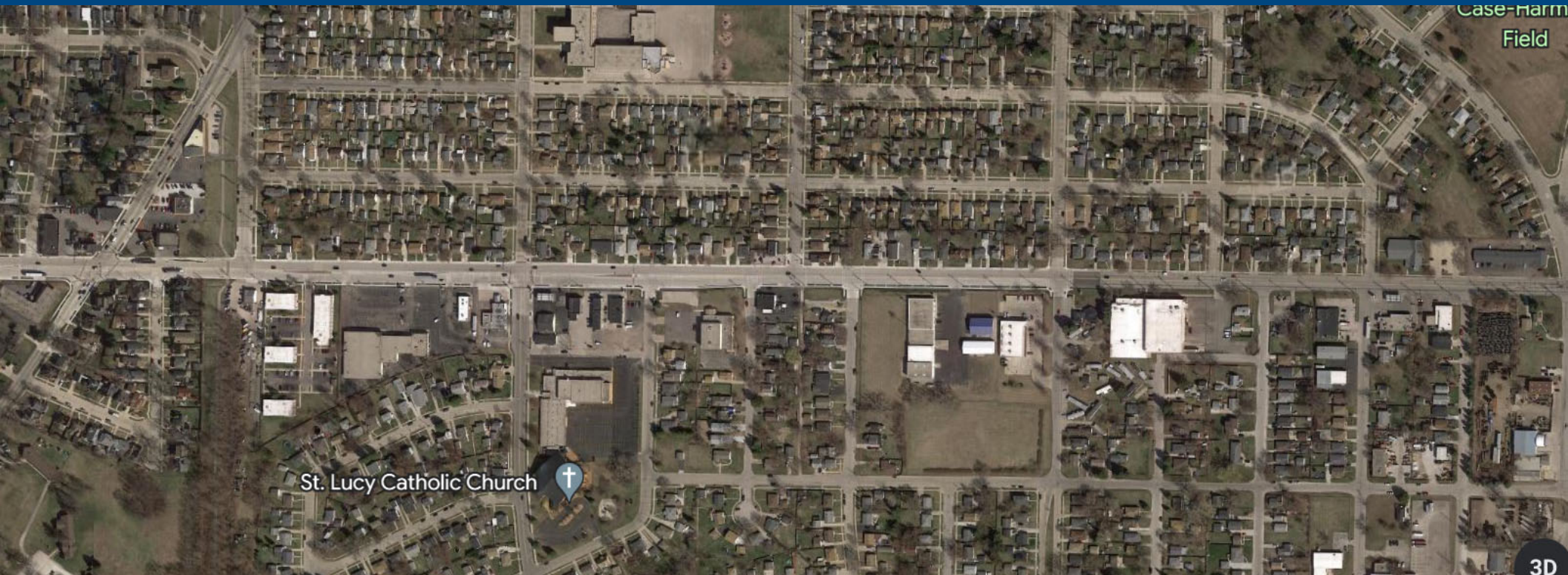


Can temporary facilities be disrupted or closed?

Yes

- If work needs to be done in an area that has temp. ped facilities as long as mobility is maintained
- Communicate with residents
- Return temp. facilities when complete





3D



Do we have options for pedestrians?



		Duration				
WMUTCD→		Mobile	Short Duration	Short-term	Intermediate	Long-term
		Always moving	Up to 1 hour	More than 1 hour within a single daylight period	Up to 3 days	More than 3 days
Construction Impact to Pedestrian Travel	No impacts Pedestrian Paths either do not exist on a project or work from a project does not impact pedestrian travel	Nothing required for pedestrians	Nothing required for pedestrians	Nothing required for pedestrians	Nothing required for pedestrians - Confirm during construction	Nothing required for pedestrians - Confirm during construction
	Encroachment Restricting the pedestrian path to less than the normal existing width but leaving at least 4 feet of width	Move object/work encroaching, pedestrian flagging	Move object/work encroaching, pedestrian flagging	Pedestrian Flagging Detour	Pedestrian Flagging Detour	Pedestrian Flagging Detour Temp. Facility
	Blockage The existing pedestrian path is intact but is not passable because of the following: existing path has less than 4 feet of width or work on the pathway or to something off of the pathway. Material or equipment is easily moved.	Move object/work encroaching, pedestrian flagging	Pedestrian Flagging Detour	Pedestrian Flagging Detour Temp. Facility	Pedestrian Flagging Detour Temp. Facility	Pedestrian Flagging Detour Temp. Facility
	Reconstruction The existing path has been removed and is being reconstructed. The facility is not passable.	N/A - Unlikely a pathway is able to be reconstructed in this timeframe		May not be feasible Detour Temp. Facility	Detour Temp. Facility	Detour Temp. Facility

Pedestrian Flagging

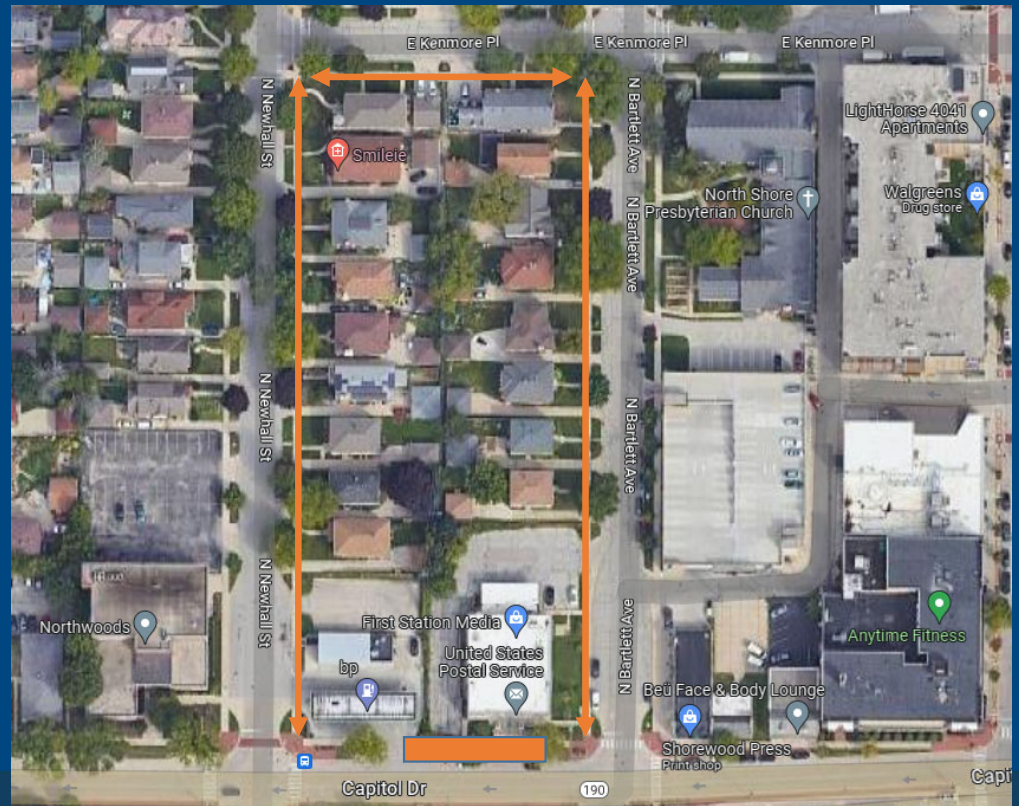
Shepherding

- Contractors stop pedestrians from entering the work area
- Work stops
- Contractors let pedestrians pass
- Work resumes



Pedestrian Detour

- Allows peds a way around
 - Opposite side
 - Around the block
- Requires blocking work area
- Advance warning



Question

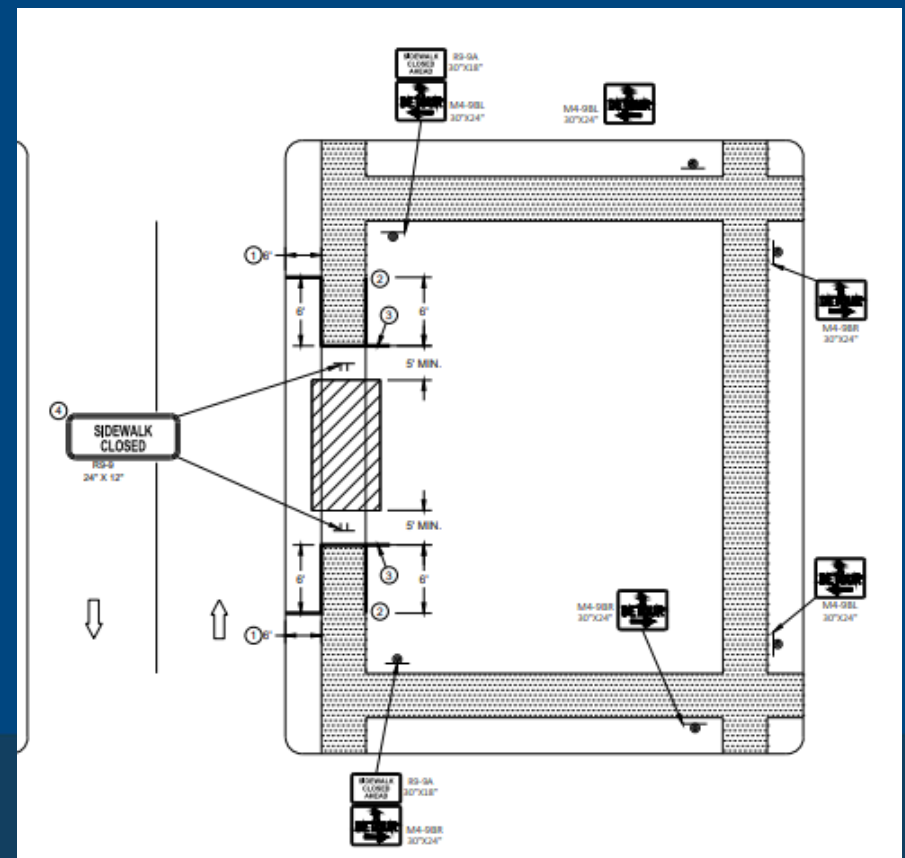
How far out of the way would you go for a pedestrian detour?

- a) Across the street
- b) Around the block
- c) $\frac{1}{4}$ mile
- d) $\frac{1}{2}$ mile
- e) 1 mile



Pedestrian Detour Requirements

- Same characteristics
 - Visually impaired
 - Using wheel chair
- Routing Signs
- Temporary Pedestrian Barricades
 - To close off work area
 - Space for ballast



Temporary Pedestrian Facilities

Items we place to maintain access

- Diversion
 - Temporary Surface
- Temporary Curb Ramps
- Temporary Bus Stops
- Temporary Crosswalks



Temporary Pedestrian Plans

Materials

- Temp. Ped. Surfaces
 - Matting on lawns, across work areas
 - Asphalt on built up areas
 - Multi-year accommodations



Temporary Pedestrian Barricade

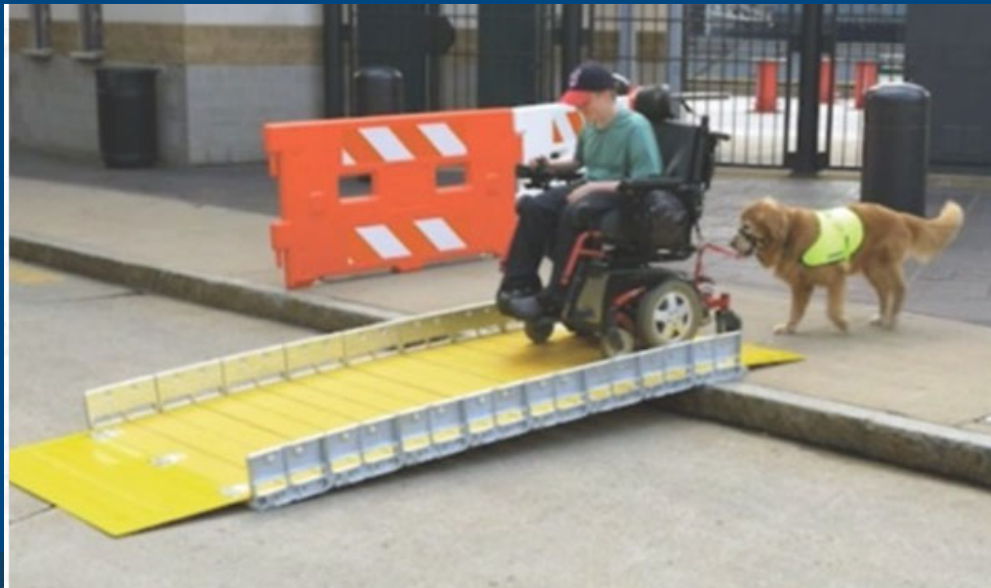
Channelizing Device for Pedestrians

- Devices are from the APL
- Hand-trailing at the top
- Bottom railing for long-cane
- Needs space for support ballast on the back



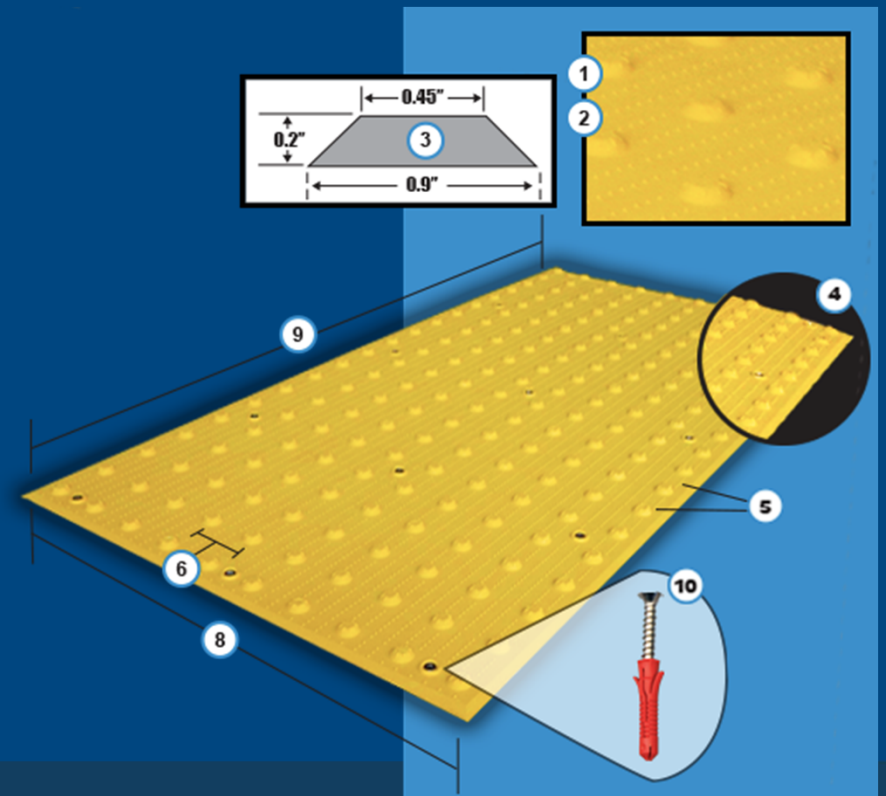


Temporary Curb Ramp



Temporary Detectable Warning Field

- Placed in advance of crossing into traffic
- Surface applied
- May not be needed on all ramps

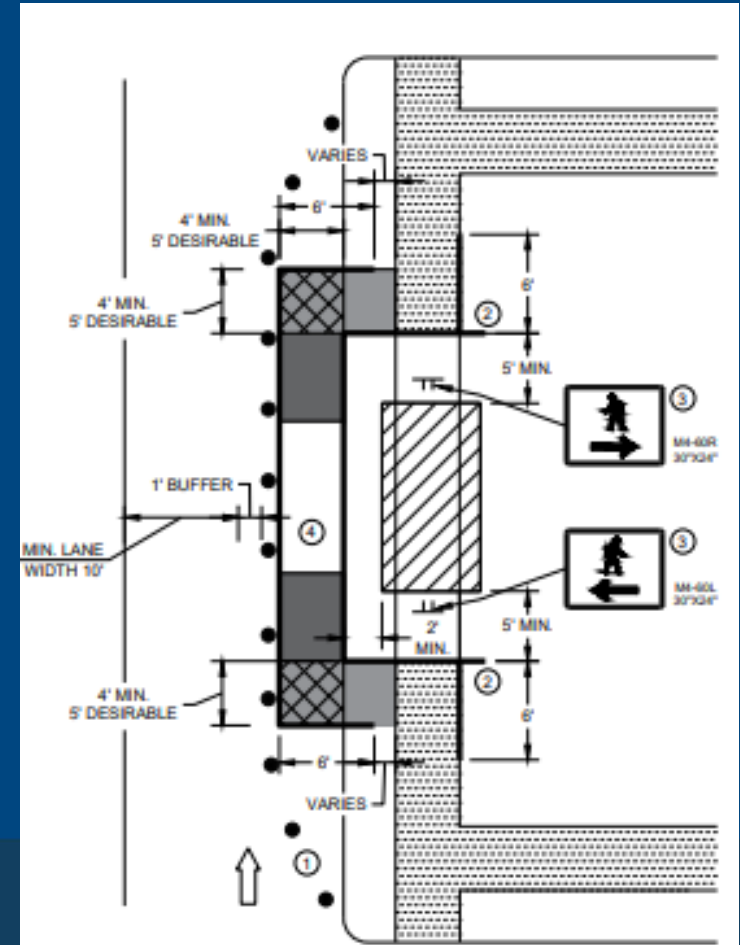


Sidewalk By-Pass

On street

Requires:

- Space in the road
- Temp. Curb Ramps
- Surface to cover terrace area
- Temporary Pedestrian Barricade



Concrete Barrier Temporary Precast

Type of Barrier Required Between Vehicle Traffic and Pedestrians

Speed (mph)	45 and greater	None*	Temporary Pedestrian Barricade	Temporary Concrete Barrier	Temporary Concrete Barrier
	40 to 30	None*	Temporary Pedestrian Barricade	Temporary Pedestrian Barricade	Temporary Concrete Barrier
	25 and less	None*	Temporary Pedestrian Barricade	Temporary Pedestrian Barricade	Temporary Pedestrian Barricade
		<1	Up to 3	Up to 14	14<
		Duration (Days)			

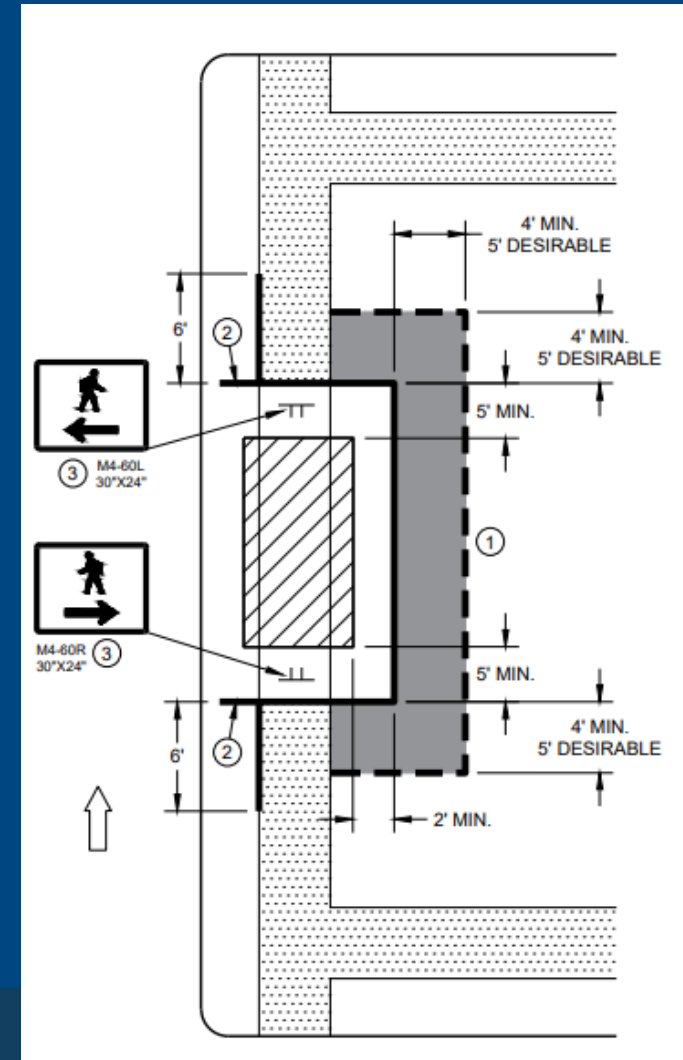
*If the work is moving and pedestrian shepherding is being used. If a detour route has been established the normal route should be blocked with temporary pedestrian barricades on each end of the closure.

Sidewalk By-Pass

Temporary Easement

Requires

- Temporary Limited Easement
- Temp. Surface
 - Possible fill for level surface
- Temporary Pedestrian Barricades



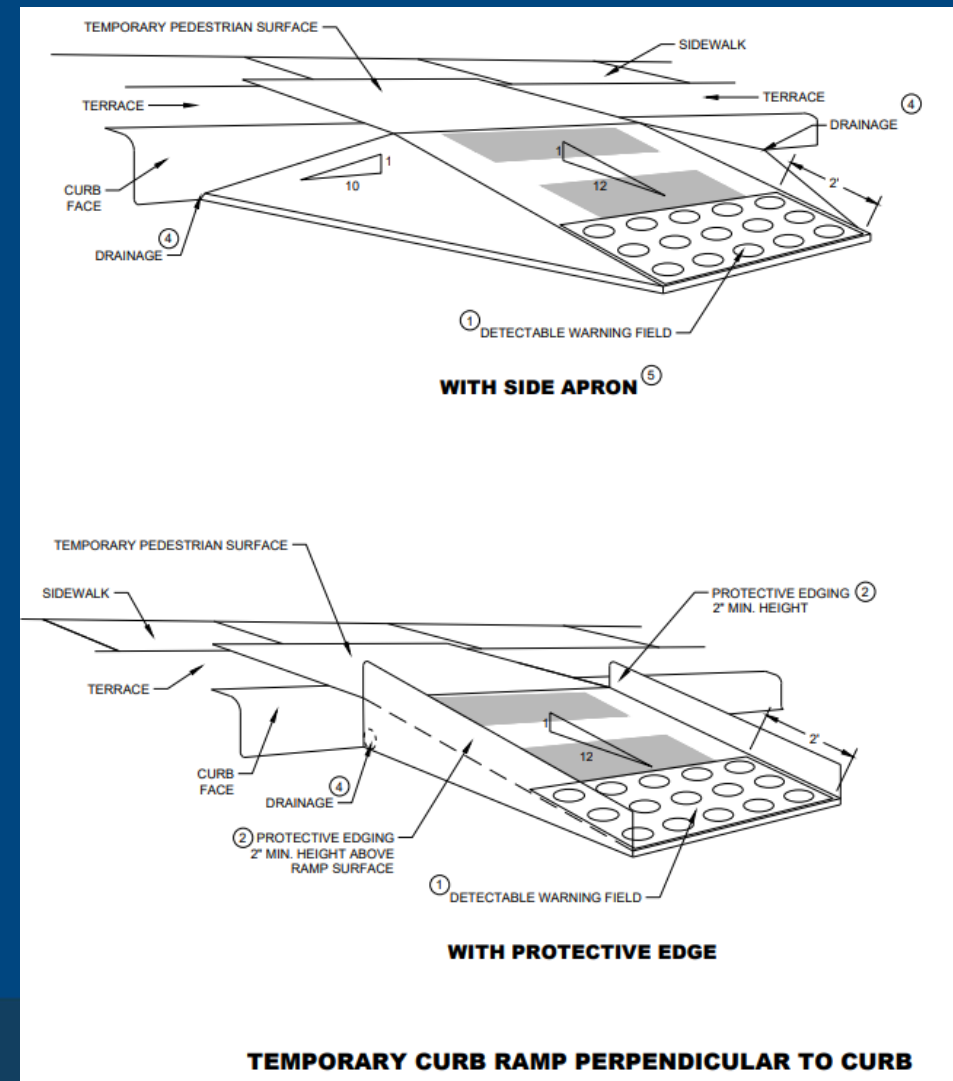
Parallel

- [illegible]

Temporary Curb Ramps

Perpendicular

- Slope 12:1
- Width min. 4 ft.
- Landing area
- Detectable warning field
 - When intersecting traffic



Temporary Pedestrian Devices

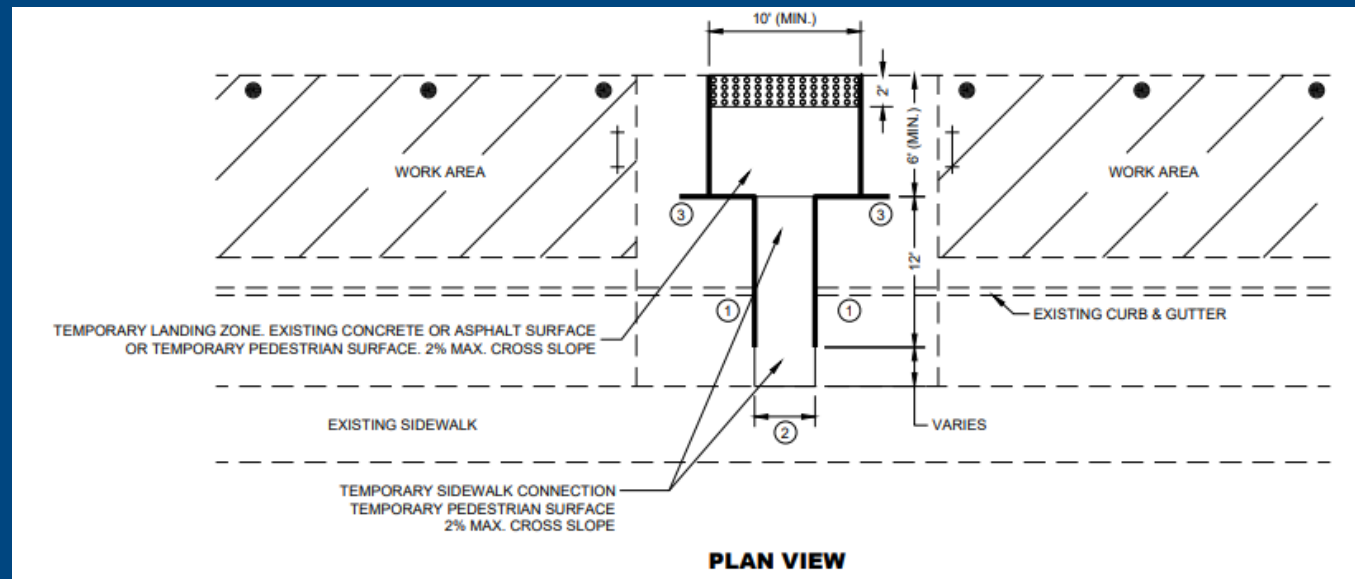
Quantities

- Temporary Pedestrian Surface – SF
- Temporary Pedestrian Barricade – LF
- Temporary Curb Ramp – Each
- Temp. Detectible Warning Field - SF



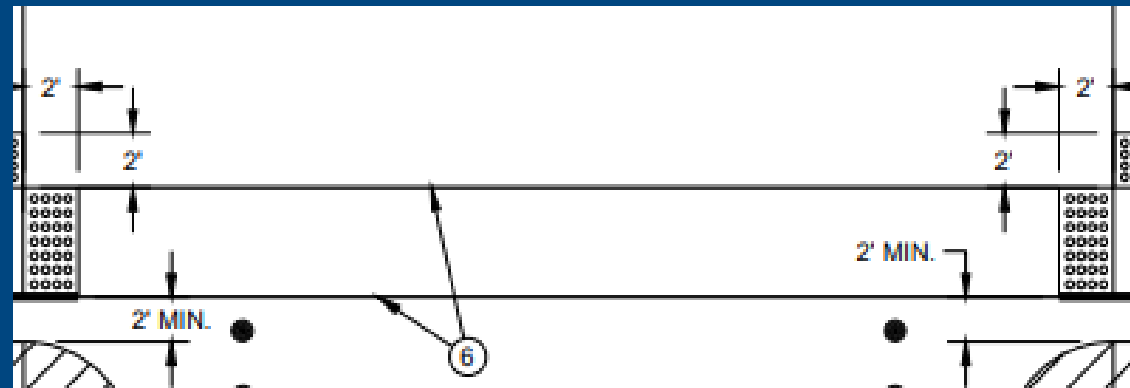
Temporary Bus Stop

- Temp. Ped. Surface
- Temp. Barricade
- Work with transit provider



Temporary Crosswalks

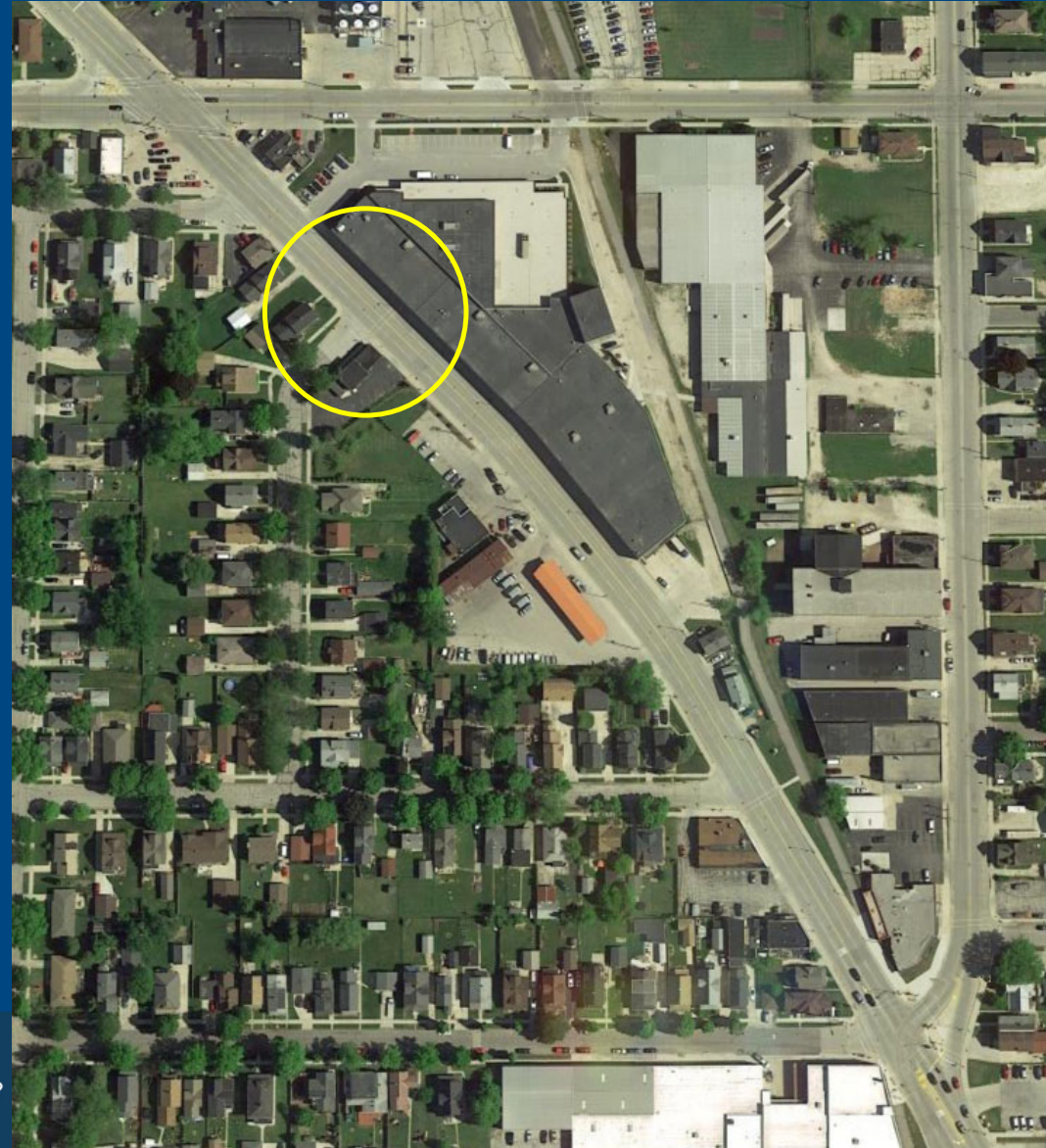
- 6-inch white temp. markings
 - Tape if on existing/permanent surface
- Preceded by temporary detectable warning fields if necessary
- Temp. Ped Surface if crossing work areas



Exercise #9a

WIS 42

- Curb ramp replacement only
- Sidewalk on both sides
- Some opportunity for detours





Exercise #9b

WIS 42

- Curb ramp replacement only
- Sidewalk on both sides
- Some opportunity for detours





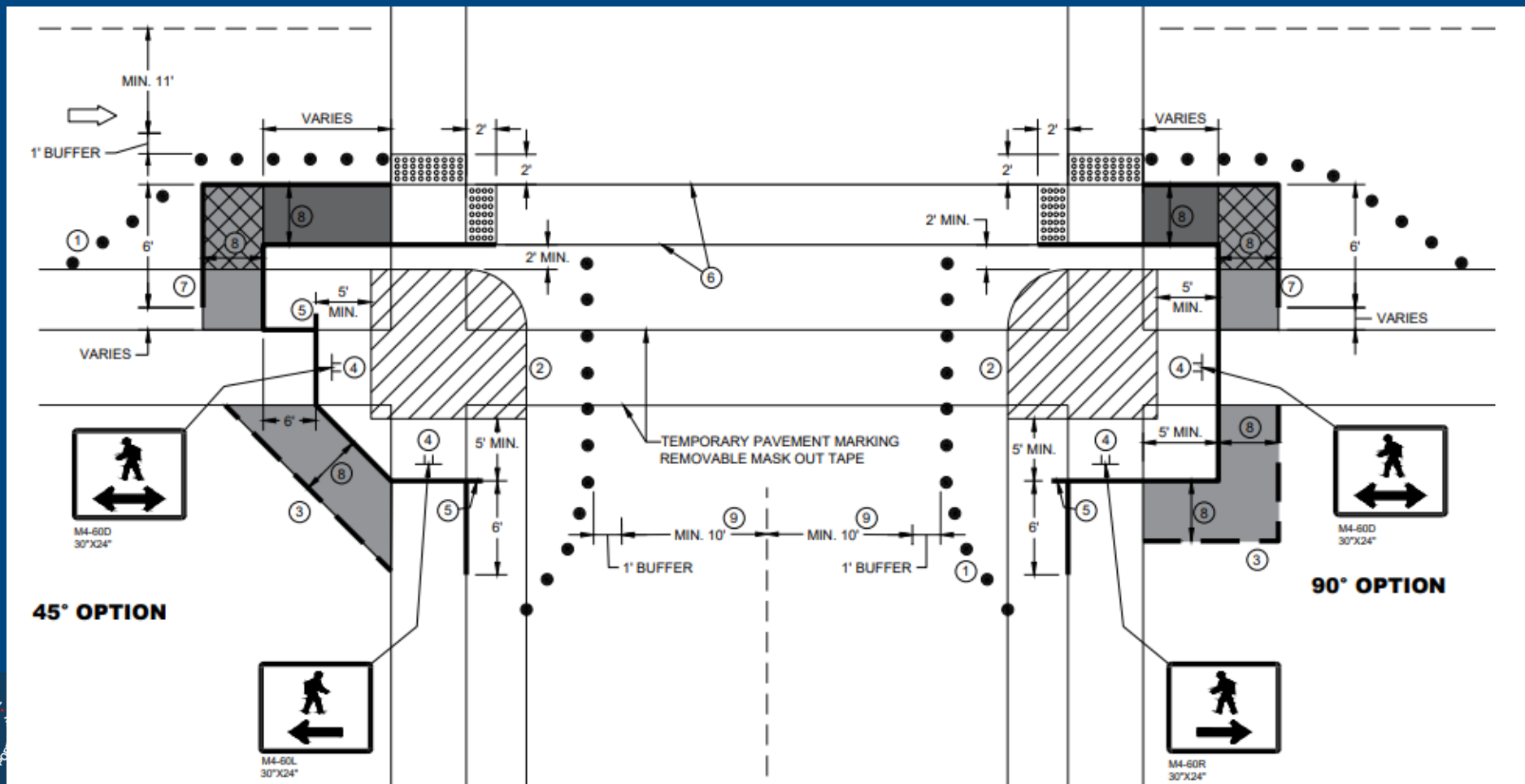
What do we think are options are?

Would we need temporary ramps?

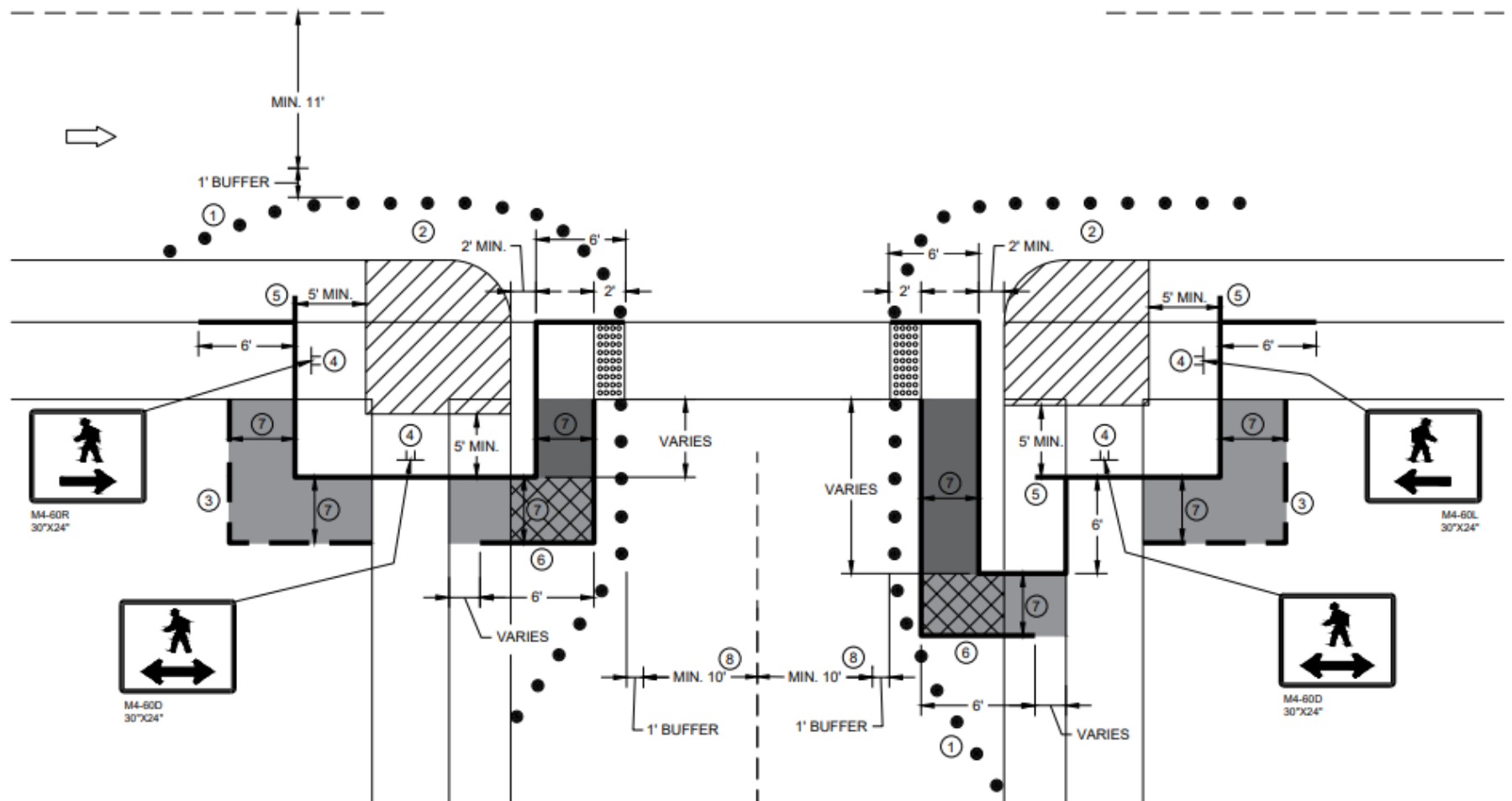
- Where do we place the ramps?
 - What are the challenges?
 - Skew corners
 - No parking or shoulder
 - Do we need a lane closure?



Temporary Crosswalk - Mainline



Temporary Crosswalk – Side street



Mode Switch

Can pedestrians become riders?

- Are transit routes available?
- County resources?
- Taxi services?
- Dedicated shuttle



Temporary Pedestrian Plans

DO NOT JUST INSERT SDD's

- Think about how to treat each location
- Incorporate into the staging
- Think about the work taking place
- Cost cannot be used as a reason not to provide



No options available?

Document that we have made a good faith effort to provide

1. Determine where the existing pedestrian facilities and routes are. This includes sidewalks, curb ramps, bus stops. (Attach map/drawing)
 - Highlight existing sidewalks and walkways
 - Highlight crosswalks
 - Call out curb ramps
 - Show bus stops
2. Identify where the pedestrian facilities will be disrupted during construction on map/drawing.



No options available?

Document that we have made a good faith effort to provide

3. Determine how pedestrian access and mobility can be maintained. Document the reasons why something cannot (is impractical?) be used.

- a) Can pedestrian shepherding maintain access and mobility?
- b) Can a detour of the pedestrian route maintain access and mobility?
- c) Will a by-pass for the pedestrian route maintain access and mobility?
 - a) Will the by-pass use the street or the property?
- d) Will a mode change maintain access and mobility?
 - a) Are there any local resources such as, County or Municipal Aging and Disability Centers, that have been contacted?
 - b) Are there any taxi services in the area that can provide an on-call service? (The area would be the immediate service area for a taxi.)



No options available?

Document that we have made a good faith effort to provide

4. What non-standard options can maintain access and mobility?

- At this step all standard methods for maintaining accessibility must be **exhausted and documented**. Determine the most reasonable methods for maintaining access and mobility.

