



TRAFFIC CONTROL STRATEGIES FOR SHORT- TERM, SHORT-DURATION, AND MOBILE WORK ZONES

Training Program

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OUTLINE

- 🚧 Background
- 🚧 Purpose and Objectives
- 🚧 Unique characteristics of Short-Term, Short-Duration, and Mobile (STSDM) Work Zones
- 🚧 Temporary traffic control strategies
- 🚧 Example plans
- 🚧 Example problem



BACKGROUND

- 🚧 Aging infrastructure = More work zones
- 🚧 Two work zone traffic control objectives:
 - ▶ Maintain safety
 - ▶ Maintain acceptable levels of mobility
- 🚧 Objectives don't necessarily go hand-in-hand
- 🚧 Careful planning, design, and implementation of work zone traffic control



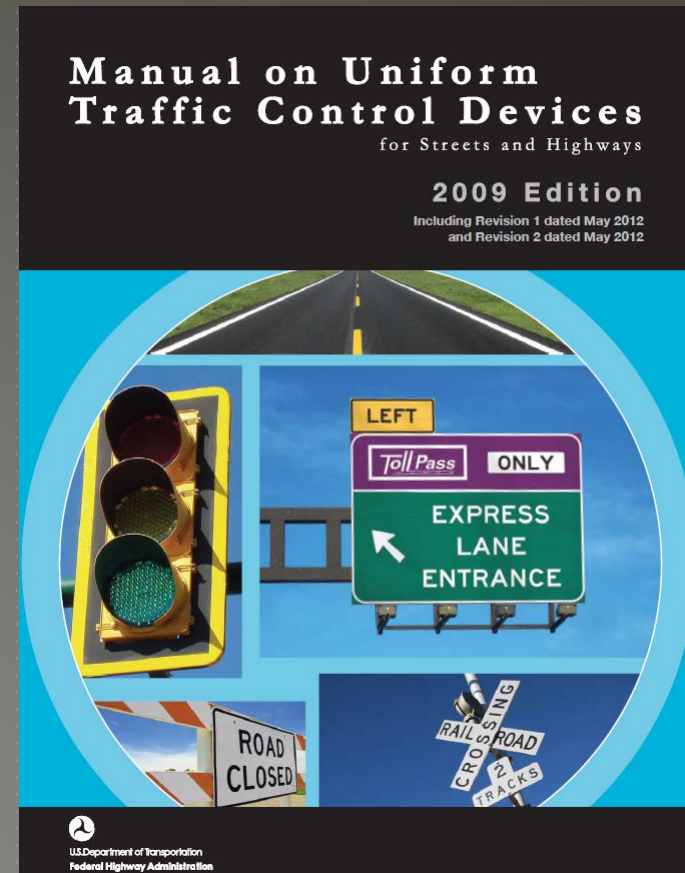
THE MUTCD

🚧 MUTCD Chapter 6

- ▶ **Temporary traffic control (TTC)** for work zones, incidents, etc.
- ▶ **Typical Applications (TAs)** of common work zone TTC scenarios

🚧 Adjust TAs to fit actual conditions

- ▶ What aspects may be modified?
- ▶ Under what conditions?



PURPOSE AND NEED

- 🚧 MUTCD gives limited TA modification guidance
 - ▶ Need for additional detail beyond the MUTCD
- 🚧 This training session provides:
 - ▶ Issues to expect with STSDM
 - ▶ Strategies to address these issues
 - ▶ How to select and modify a TA
 - ▶ Examples of modified traffic control plans

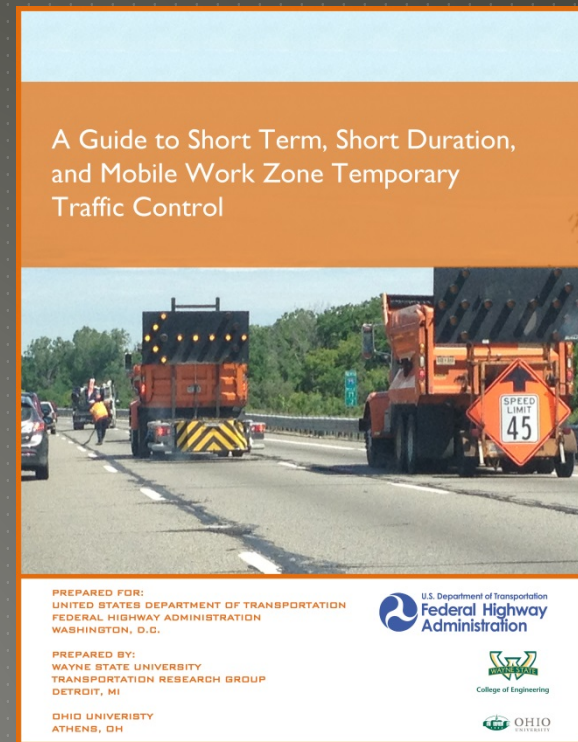


A GUIDE TO STSDM WORK ZONES

- 🚧 Developed as part of 2011 FHWA Work Zone Safety Grant
- 🚧 Supplement to MUTCD
- 🚧 Strategies and examples associated with STSDM work zones
- 🚧 Streamlined setup and removal processes
- 🚧 TTCP development for STSDM work zones



U.S. Department of Transportation
Federal Highway Administration



Source:

<http://workzone.eng.wayne.edu/GuidetoSTSDMWorkZoneTrafficControl.pdf>

MUTCD WORK DURATIONS COVERED HERE

- 🚧 Short-term stationary occupies location > 1 hr within a single daylight period
- 🚧 Short-duration occupies location ≤ 1 hr
- 🚧 Mobile moves intermittently or continuously



MUTCD WORK DURATIONS NOT COVERED HERE

- 🚧 Intermediate-term stationary occupies location
 - ▶ 1 - 3 days (daytime work) or
 - ▶ >1 hr (nighttime work)
- 🚧 Long-term stationary occupies location >3 days



OTHER GUIDELINES AND TRAINING

- Other guidelines/training developed under this grant
 - Urban Work Zone TTC
 - Utility Work Zone TTC
 - Temporary Traffic Control Plan Selection Software



CONCERNS WITH SHORTER DURATIONS

⚠️ Primary concern noted in MUTCD:

“It often takes longer to set up and remove the temporary traffic control zone than to perform the work. Workers face hazards in setting up and taking down the temporary traffic control zone. Also, since the work time is short, delays affecting road users are significantly increased when additional devices are installed and removed” – 2009 Federal MUTCD

⚠️ Paradox

- ▶ Don't put workers at risk with lengthy TTC setup
- ▶ Don't compromise safety by using inadequate TTC setup

⚠️ How can we minimize worker exposure while providing adequate TTC?



CHARACTERISTICS AND ISSUES

Short-Term, Short-Duration, and Mobile Work
Zones

OVERVIEW



🚧 STSDM work possesses unique characteristics

- ▶ Typically related to the nature of the work
- ▶ Issues must be addressed during TTC layout

🚧 UPCOMING SLIDES

- ▶ Characteristics and associated issues

🚧 LATER ON

- ▶ Methods for addressing issues with appropriate TTC

UNIQUE CHARACTERISTICS OF STSDM

- ⚠ Work may be unanticipated and/or urgent
 - ▶ Perhaps very urgent or emergency
- ⚠ Associated lack of available planning time prior to implementation of TTC
- ⚠ Setup and removal of TTC may take longer than performing the actual work

UNIQUE CHARACTERISTICS OF STSDM (CONTINUED)

- ▲ Lack of traffic barriers, temporary pavement markings, or other longer-duration TCDs
- ▲ Use of specialized vehicles or equipment
 - ▶ Especially for WZs which move intermittently or continuously
- ▲ Specific accessibility issues may occur
- ▲ Heavy reliance on field personnel
- ▲ Emphasizing safety over mobility

UNANTICIPATED OR URGENT WORK

🚧 Certain events require immediate attention:

- ▶ Utility failures or damage
- ▶ Fallen trees or branches
- ▶ Traffic signal failures
- ▶ Damaged signs
- ▶ Damaged guardrail/barriers
- ▶ Localized pavement failures



UNANTICIPATED OR URGENT WORK

- ⚠ Crews must quickly mobilize to perform the fix
 - ▶ Little time for preparation
 - ▶ TTC aspects may be overlooked
- ⚠ Adequate advance notification may not be possible
 - ▶ Drivers will not expect work zone
 - ▶ Agencies may not be prepared
 - ▶ Police
 - ▶ Fire/rescue
 - ▶ Transit



SHORT-TERM STATIONARY WORK

🚧 Daytime work occupying a location for more than one hour within single daylight period

- ▶ Utility Work
- ▶ Traffic Hardware Installation
- ▶ Roadside Maintenance
- ▶ Placement of overhead structures
- ▶ Bridge/Structure Inspection



SHORT DURATION WORK

🚧 Work occupying a location up to one hour

🚧 Examples:

- ▶ Tree trimming
- ▶ Debris clearing
- ▶ Localized pavement maintenance
- ▶ Surveying
- ▶ Graffiti removal from signs
- ▶ Pavement markings (stop lines, legends)



SHORT DURATION WORK

- ⚠ Some work zones take longer to setup than the actual work
 - ▶ Single setup
 - ▶ Moving work area with several stops
- ⚠ Minimize TTC setup and removal time
 - ▶ Minimize delays and worker exposure
- ⚠ Ensure adequate TTC regardless of duration
 - ▶ Tendency to become complacent as duration decreases
 - ▶ Drivers will not expect such short duration work
- ⚠ Simplification of TTC is key



LACK OF LONGER-DURATION TRAFFIC CONTROL DEVICES

- ⚠ Use of certain TCDs may be impractical for STSDM WZs
- ⚠ Complication of reducing TTC implementation time
 - ▶ Simplification of TTC
- ⚠ Traffic barriers
- ⚠ Temporary pavement markings
 - ▶ Other lane delineation devices
- ⚠ Other more dominant TCDs
 - ▶ Barricades, PCMS, etc.

SPECIALIZED VEHICLE OR EQUIPMENT

🚧 Specialized equipment is often necessary to minimize the work duration and/or provide worker protection

- ▶ Striping trucks
- ▶ Aerial lift trucks
- ▶ Pavers
- ▶ Convoys

🚧 These vehicles may require special TTC when in use



MOBILE WORK

Continuous movement examples (in vehicle):

- ▶ Roadway striping
- ▶ Certain paving operations
- ▶ Street sweeping
- ▶ Mowing



Intermittent movement examples (on foot or in vehicle):

- ▶ Pavement crack or joint sealing
- ▶ Pothole filling
- ▶ Debris cleaning after a storm
- ▶ Storm drain cleaning



ACCESSIBILITY ISSUES

⚠ Although STSDM work period is short, it may still impact:

- ▶ Pedestrians
- ▶ Bicyclists
- ▶ Access to homes and businesses
- ▶ On-street parking
- ▶ Public transit stops

⚠ Users may not know how to proceed if access is blocked

⚠ Workers should be prepared to deal with these issues



RELIANCE ON FIELD PERSONNEL

- 🚧 Short-term and short-duration work may involve:
 - ▶ Limited time to plan and prepare
 - ▶ Limited use of many dominant TCDs intended for use in longer-duration work
 - ▶ Increased risk for both road users and workers
- 🚧 Field personnel can help to mitigate these concerns
 - ▶ Situational awareness of changing field conditions
 - ▶ Wearing proper equipment
 - ▶ Ensuring proper use of TCDs

EMPHASIZING SAFETY OVER MOBILITY

- 🚧 Advance warning
- 🚧 Dominant TCD
- 🚧 Lane closure
- 🚧 Allowing temporary congestion due to lane closure to pass
- 🚧 Avoid peak period work at roads with high volume



TRAFFIC CONTROL STRATEGIES

Short-Term, Short-Duration, and Mobile Work Zones

TRAFFIC CONTROL STRATEGIES

- ▲ Unique issues may be addressed through proper TTC strategies
- ▲ Specific guidance is provided relating to:
 1. **Minimizing time to setup and remove TTC**
 2. **Managing TTC for unexpected or emergency work**
 3. **Managing continuous or intermittent movement**
 4. **Maintaining access to intersections, driveways, and parking**
 5. **Accommodating pedestrians and non-motorized users**
 6. **Temporary re-opening of travel lanes**
 7. **Accommodating special vehicles (striping trucks, aerial lifts)**

I. MINIMIZING TIME FOR SETUP/REMOVAL

- 🚧 As work duration decreases, so should TTC setup time
 - ▶ Minimize worker exposure
 - ▶ Minimize delays
- 🚧 Methods to minimize TTC setup time:
 - ▶ **Reduce the number of TCDs**
 - ▶ **Not cover/remove permanent TCDs**
 - ▶ **Reduce spacing of channelizing TCDs in lieu of covering permanent markings**
 - ▶ **Use lightweight signs and channelizing devices**
 - ▶ **Use work vehicles to place channelizing devices**
- 🚧 Certain criteria must be met



I. MINIMIZING TIME FOR SETUP/REMOVAL – USE OF VEHICLE-MOUNTED DEVICES

- ▶ Dominant vehicle-mounted devices may replace TTC devices for certain short-duration or mobile operations
 - ▶ High-intensity rotating, flashing, oscillating, or strobe lights
 - ▶ Does NOT include hazard flashers
 - ▶ Arrow boards or PCMS
 - ▶ Retro-reflective markings on appropriately colored vehicles



I. MINIMIZING TIME FOR SETUP/REMOVAL – USE OF VEHICLE-MOUNTED DEVICES (CONT.)



I. MINIMIZING TIME FOR SETUP/REMOVAL – ELIGIBLE CASES FOR VEHICLE MOUNTED DEVICES

🚧 Short Duration Work

- ▶ Shoulder Work without Encroaching Travel Lane
 - ▶ Ground-mounted signs and channelizing devices replaced by properly equipped vehicles
- ▶ Shoulder Work Encroaching Travel Lane
 - ▶ Taper and channelizing devices replaced by properly equipped shadow vehicle
- ▶ Intersection Work
 - ▶ Channelizing devices replaced by properly equipped vehicle
- ▶ Work Beyond Shoulder
 - ▶ Ground-mounted signs and channelizing devices replaced by properly equipped vehicles



🚧 Consider other short-duration work on case-by-case basis

I. MINIMIZING TIME FOR SETUP/REMOVAL – ALTERNATIVES TO COVERING PERMANENT TCDS

- ▲ Permanent signs/markings may provide conflicting messages
 - ▶ As work duration decreases, covering devices is not practical
 - ▶ Use high visibility devices which emphasize proper path
- ▲ Short-term work
 - ▶ Use channelizing devices with closer spacing
 - ▶ Spacing (in feet) = $0.5 * \text{speed (in mph)}$
 - ▶ Taller cones (42 inches or greater) may be used in lieu of drums
- ▲ Short duration/mobile work
 - ▶ No additional action necessary



WHAT IS WRONG WITH THIS SHORT-DURATION OPERATION?



SHORT-DURATION WORK ZONE ISSUES



**No Advance
Warning Signs**

**Incorrect
Taper Length**

**Improper
Cone Height**

**No Work
Vehicle
Warning Light**

**No Work Vehicle
retro-reflectivity
or conspicuity**

2. MANAGING URGENT/UNEXPECTED WORK

- ▲ Little time to plan/prepare for work zone setup
 - ▶ Details of site condition may be limited
 - ▶ Full compliment of TCDs may not be readily available
 - ▶ Use available devices until situation can be assessed
- ▲ React/respond to field conditions
 - ▶ Expand/move TTC as needed
 - ▶ Modify TTC if work takes longer than expected
 - ▶ Additional traffic control devices
 - ▶ Nighttime work
 - ▶ Overnight shutdown



3. MANAGING CONTINUOUS MOVEMENT - USING FULLY MOBILE TRAFFIC CONTROL

- 🚧 Often not practical to provide stationary TTC for
 - ▶ Advance warning messages
 - ▶ Channelization
- 🚧 MUTCD allows for dominant, vehicle-mounted TTC in lieu of stationary TTC devices
 - ▶ PCMS or Static Signs
 - ▶ Arrow Boards
 - ▶ High-intensity rotating, flashing, oscillating, or strobe lights



3. MANAGING INTERMITTENT MOVEMENT - MOBILE VS. STATIONARY TRAFFIC CONTROL

- 🚧 Moving short-duration operations
 - ▶ Some may be more well-suited for complete mobilization of TTC
 - ▶ Others may move so slowly that retrieving stationary devices is more efficient
- 🚧 Considerations for mobile vs. stationary work zone setup:
 - ▶ Duration of each stop
 - ▶ Time and distance between stops
 - ▶ Speed of the work zone while in motion
 - ▶ Overall distance covered by the operation during the work period
 - ▶ Speed and volume on the roadway



3. MANAGING MOVING WORK ZONES - VEHICLE CONVOYS

- 🚧 A convoy of multiple vehicles may be necessary
 - ▶ Typically use shadow vehicle especially at high speeds or volumes
 - ▶ Some operations require multiple vehicle convoy
- 🚧 Work convoys may provide several distinct advantages:
 - ▶ Additional protection of workers
 - ▶ Enhanced work zone conspicuity
 - ▶ Extended work area provides additional time for materials to dry
 - ▶ Staggering of vehicles allows for more effective channelization



3. MANAGING MOVING WORK ZONES - CAUTION WITH MOBILE CONVOYS

- 🚧 Protect convoy against unsafe passing and errant vehicles:
 - ▶ Appropriate buffer spacing and adequate shielding
 - ▶ Truck-mounted arrow boards or PCMS
 - ▶ Truck-mounted attenuators on all shadow vehicles
 - ▶ Proper roll-ahead distances (spacing between vehicles)
 - ▶ Pull over periodically to allow queues to pass
 - ▶ Perform work during off-peak hours or at night

WHAT IS WRONG WITH THIS MOBILE OPERATION?



MOBILE OPERATION SHADOW VEHICLE ISSUES

This mobile operation requires right lane closure

Shadow vehicle should be in right lane rather than shoulder

Note:
Arrow board shall indicate lane merge if shadow vehicle is moved to right lane

Shadow vehicle should have truck-mounted advance warning sign

Shadow vehicle should have truck-mounted attenuator

WHAT IS WRONG WITH THIS MOBILE OPERATION?



Pothole patching

MOBILE OPERATION WORK VEHICLE ISSUES

**This mobile operation
requires right lane closure**

**Work vehicle should
be in right lane rather
than shoulder**

**Flaggers or spotters may be
used for mobile operations
involving frequent short stops**

Pothole patching

4. MAINTAINING ACCESS

- 🚧 Maintain access to intersections, driveways, and on-street parking if possible
- 🚧 Driveway/intersection closure
 - ▶ Consider the development of queues
 - ▶ Use flaggers
 - ▶ Divert to an alternative entry point if possible
 - ▶ Signed detours are impractical for such a short work period
- 🚧 On-street parking closure
 - ▶ Minimize the number of stalls closed in high-demand areas
 - ▶ Ensure shielding of workers with devices and buffer spaces
 - ▶ Special attention prior to work zone if metered



5. ACCOMMODATING PEDS, BIKES & TRANSIT

- 🚧 Identify presence of peds, bikes, and transit stops in work zone
- 🚧 Determine how work activity will impact ped/bike movement
 - Sidewalks/crosswalks
 - ADA accommodation
 - Bike lanes/paths
 - Transit stops
- 🚧 Use TCDs to provide safe diversion route
 - Even for short-duration operations
 - Separate motorized and non-motorized traffic streams



5. ACCOMMODATING PEDS, BIKES & TRANSIT (CONT.)

⚠ TTCP to recognize location of all transit stops

- ▶ Accommodation of bus and pedestrian access
- ▶ Clearly marked
- ▶ Transit agencies should be notified

⚠ TTC devices may not be practical

- ▶ Flagger may be used to guide pedestrians



6. TEMPORARY RE-OPENING OF TRAVEL LANES

Peak period lane restrictions

- ▶ Planned maintenance may be restricted to off-peak
- ▶ Re-open affected travel lanes during peak periods

If work is not complete:

- ▶ Move work crews, equipment, and devices off the roadway
- ▶ Cover or shield of any holes or other defects in the pavement.
- ▶ Maintain appropriate TCDs to alert motorists
- ▶ Work may be completed after peak period

7. USING AERIAL LIFT TRUCKS

- ⚠ Aerial trucks (bucket trucks, cherry pickers, or scissor lifts) are commonly used in STSD work zones
- ⚠ Often require specialized TTC
 - ▶ Refer to state and local standards
- ⚠ Buckets should not be extended over active traffic
 - ▶ Use flaggers to close lanes if necessary
- ⚠ Use TMA at non-intersection locations



HOW WOULD YOU LIKE TO BE
UNDERNEATH THIS?



SHORT-TERM WORK ZONE STRATEGIES

WORK SITE CHARACTERISTICS	CONDITIONS REQUIRING REVISIONS TO STANDARD TA AND/OR FIELD ADJUSTMENT	POSSIBLE MITIGATION STRATEGIES
Work on traveled way	Driveway access Turning movement at intersection Lane closure interferes with land access	Use flagger Turning movement prohibition Use alternate access where feasible Advance warning for lane closure, turn prohibition
Work in crosswalk or on sidewalk	Pedestrian facility continuity	Sidewalk detour ADA compliant Portable barrier
	Pedestrian crossing interruption	Pedestrian detour signs Use flagger
Work on traveled way requiring lane closure	Traffic congestion and unacceptable level of service	Consider advance warning Peak hour break for work Plan for off-peak work
Presence of grade/ horizontal curve	Sight distance problem due to grade	Move lane closure taper to top of vertical curve Use arrow board
	Sight distance problem at horizontal curve	Provide lane closure taper and arrow board at the tangent section

SHORT-TERM WORK ZONE STRATEGIES

WORK SITE CHARACTERISTICS	CONDITIONS REQUIRING REVISIONS TO STANDARD TA AND/OR FIELD ADJUSTMENT	POSSIBLE MITIGATION STRATEGIES
High speed, high volume roadway	Work requiring open cut adjacent to travel lane	Use mobile barriers for worker and road user protection Perform work during off-peak period
Roadways with driveway	Short-term paving operation blocking access to driveways	Use intermediate flagger to control limited access to driveways, as appropriate
Underground utility work on busy highway	Peak hour work infeasible due to congestion	Schedule off-period work Multiple phase short-term work Use steel plate to cover open portion of travel lane during work period

SHORT-DURATION WORK ZONE STRATEGIES

WORK SITE CHARACTERISTICS	CONDITIONS REQUIRING REVISIONS TO STANDARD TA AND/OR FIELD ADJUSTMENT	POSSIBLE MITIGATION STRATEGIES
Work beyond shoulder	Work vehicle placement	Work vehicle with dominant light Work vehicle with mounted arrow panel Lane closure with TCD if work vehicle on shoulder/travel lanes
Work on shoulder	Interrupts sidewalk	Provide sidewalk detour signs (portable)
Work on traveled way -At or near intersection	Work vehicle on traveled way	Lane protection by TCD Lane protection by flagger Provide advance warning as appropriate Shadow vehicle with TMA

MOBILE WORK ZONE STRATEGIES

WORK SITE CHARACTERISTICS	CONDITIONS REQUIRING REVISIONS TO STANDARD TA AND/OR FIELD ADJUSTMENT	POSSIBLE MITIGATION STRATEGIES
Workers on foot	Must properly protect field workers on foot	Work/shadow vehicle with dominant devices, arrow panel
High-speed traffic	Increased potential for errant vehicles and/or higher-speed collisions	Temporary rumble strips Shadow vehicle(s) with warning devices Dominant devices Arrow panel Provide law enforcement officers/vehicles
High-traffic volumes	Increased potential for errant vehicles and/or formation of queues	Consider staging of construction Off-peak period work Shadow vehicle(s) Portable changeable message sign Arrow board Provide alternate routes/diversions

MOBILE WORK ZONE STRATEGIES

WORK SITE CHARACTERISTICS	CONDITIONS REQUIRING REVISIONS TO STANDARD TA AND/OR FIELD ADJUSTMENT	POSSIBLE MITIGATION STRATEGIES
Lack of paved shoulders	Shadow and/or work vehicles often are intended to travel along shoulder	Consider staging of construction Off-peak period work Shadow vehicle(s) Portable changeable message sign Arrow board
Roadway includes significant horizontal and/or vertical curvature	Reduces sight distance or may impact vehicle stopping distance	Use dominant devices Position shadow vehicles with arrow board for visibility
Work includes closure of multiple lanes	Errant vehicle entering convoy	Off-peak work Consider staged work Shadow vehicle(s) Arrow board

MOBILE WORK ZONE STRATEGIES

WORK SITE CHARACTERISTICS	CONDITIONS REQUIRING REVISIONS TO STANDARD TA AND/OR FIELD ADJUSTMENT	POSSIBLE MITIGATION STRATEGIES
Roadway includes high frequency of intersections and/or driveways	Vehicles entering/exiting the traffic stream from additional access point	Shadow vehicle(s) Restrict turns Provide alternate access
Roadway includes significant pedestrian and/or bicycle traffic	Pedestrian and bicycle intrusion	Pedestrian detour signs ADA ramps Pedestrian barriers
Work expected to be performed during peak period	Peak period congestion	Detour or diversion Advance notification
Two-lane roadway with tree trimming operations	Mobile tree trimming operation along roadway with significant horizontal and vertical curvature	Maintain flagger stations at end of tangents approaching work zone rather than following work crew at fixed distance



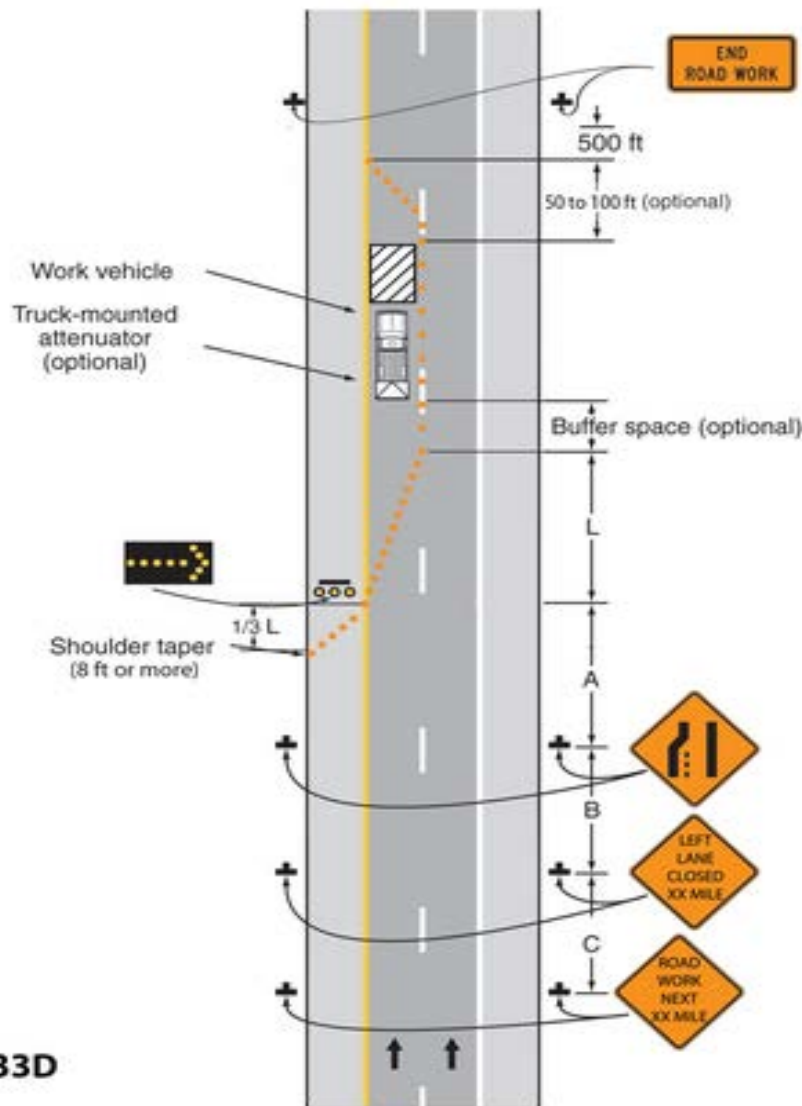
SHORT-TERM WORK ZONE EXAMPLES

Temporary Traffic Control Plans

SHORT-TERM WORK ZONES

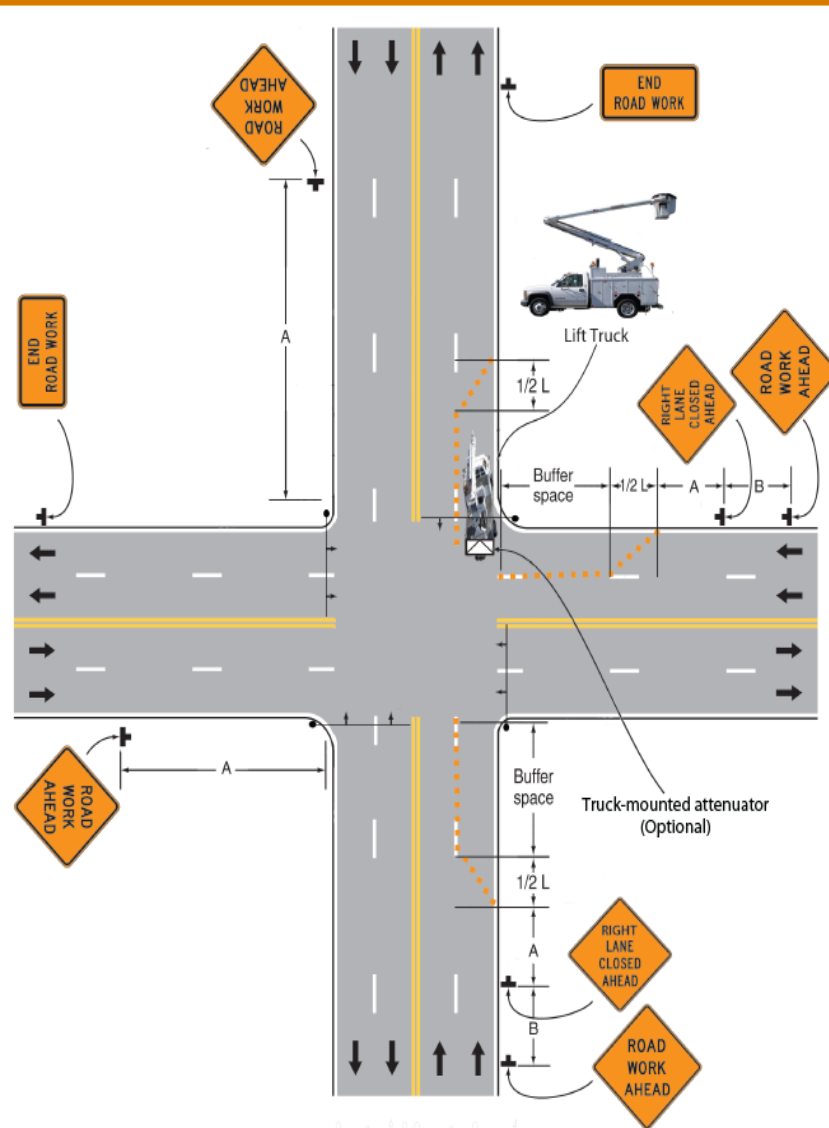
- 🚧 Work that occupies a location for more than 1 hour within a single daylight period
- 🚧 Some ambiguity between definition of “**short-term**” and “**short-duration**” work zones
 - ▶ Utility work zones
 - ▶ Various highway maintenance operations
 - ▶ Asphalt pavement patching and preventative maintenance operations
 - ▶ Traffic signal maintenance

ASPHALT PATCHING ON MULTI-LANE DIVIDED HIGHWAY



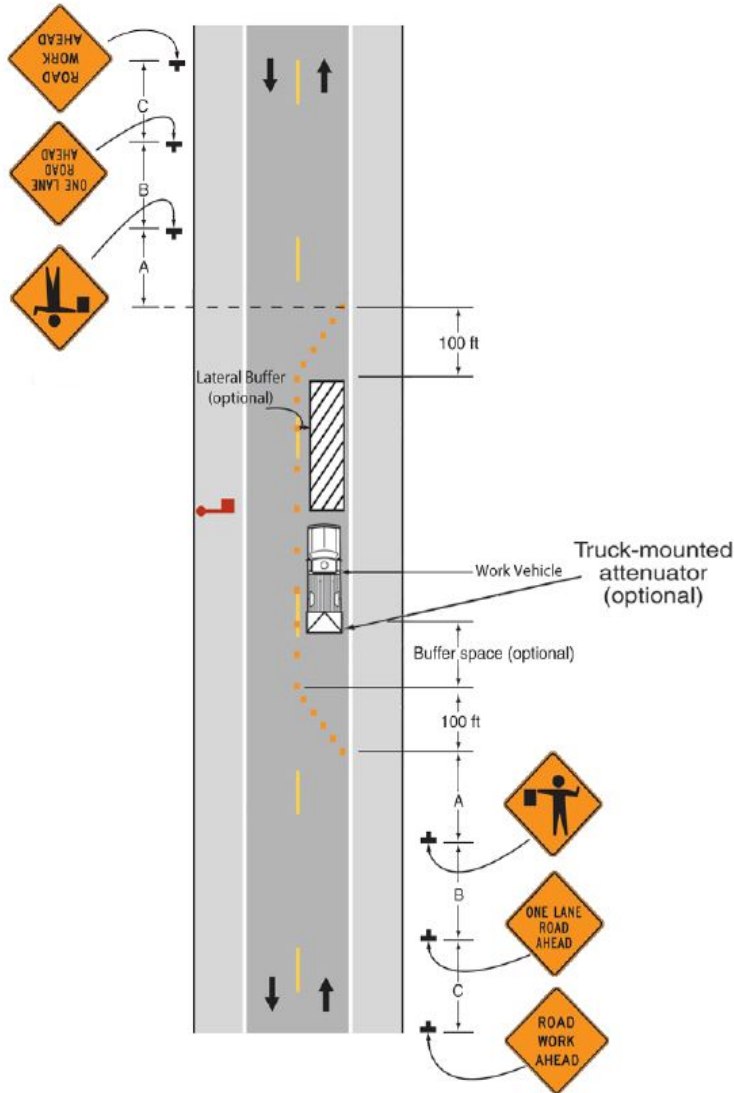
- Common short-term stationary work zone
- Consider roll-ahead distances of vehicles equipped with TMAs
- Use taller (42") cones instead of drums
- Keep vehicles and equipment to one side if possible
- Never assume shoulders are safe work areas

MAINTENANCE OPERATION NEAR SIGNALIZED INTERSECTION



- Do not extend bucket over active traffic lane
- Truck-mounted attenuator optional
- Work vehicle should be equipped with high-intensity warning lights
- Advance warning signs should be placed on portable supports

OPERATION REQUIRING FLAGGERS



- ⚠ May be necessary to close travel lanes on short notice
 - ▶ Use flagger to implement closure without more extensive TTC
- ⚠ Single flagger appropriate when visible to traffic from both directions
 - ▶ Add additional flagger where limited visibility
- ⚠ Reduce setup time
 - ▶ Portable warning signs
 - ▶ Taller (42") cones instead of drums
- ⚠ Buffer spaces may reduce risks to workers due to errant vehicles



SHORT-DURATION WORK ZONE EXAMPLES

Temporary Traffic Control Layout

SHORT-DURATION WORK ZONES

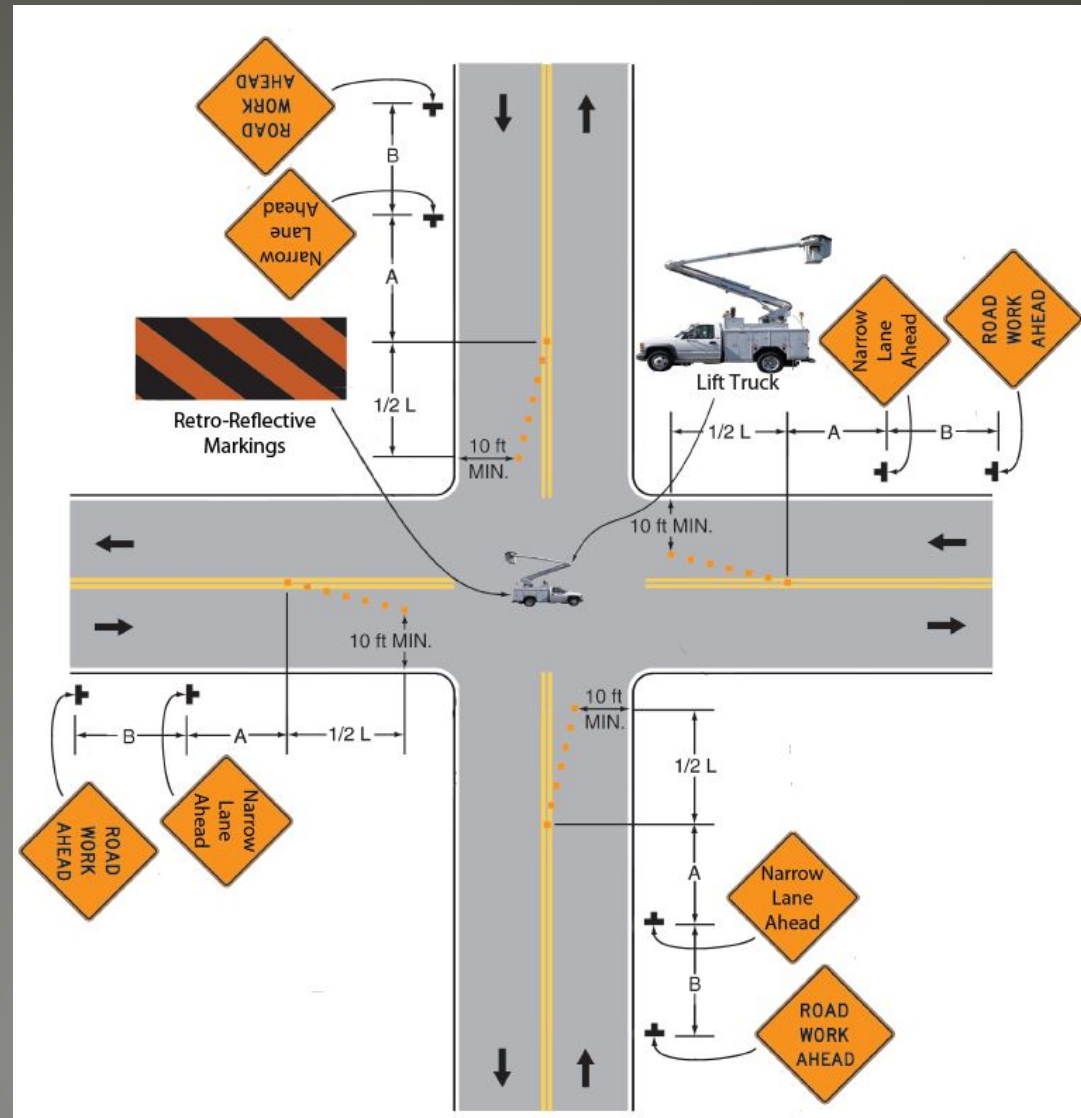
- ▶ Work that occupies a location up to one hour
 - ▶ Traffic signal maintenance
 - ▶ Pavement patching or other repair operations
 - ▶ Surveying operations
 - ▶ Bridge or other highway element inspections
 - ▶ Loading or unloading equipment or other pre-work operations
 - ▶ Utility work zones
 - ▶ Tree trimming operations



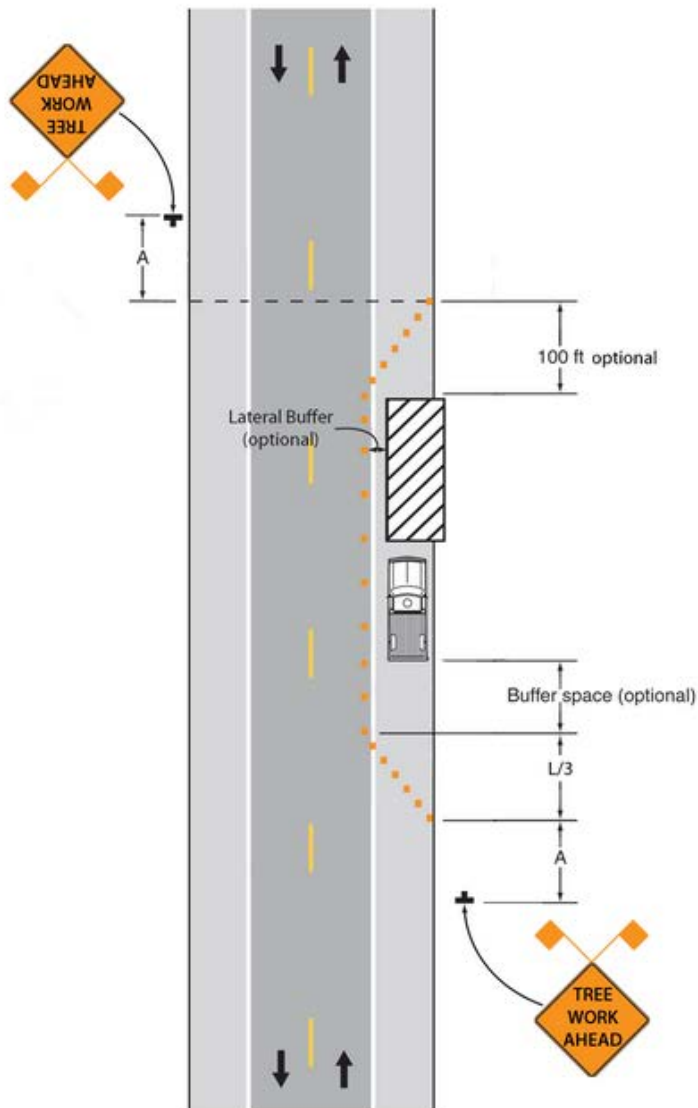
TRAFFIC SIGNAL MAINTENANCE AT CENTER OF INTERSECTION



- High-intensity warning lights and retro-reflective markings on work vehicles to provide 360° warning
- 10 feet of paved traveled way must remain
- Advance warning signs should be on portable stands
- Buckets should not be extended over active traffic



TREE TRIMMING OR REMOVAL OPERATIONS

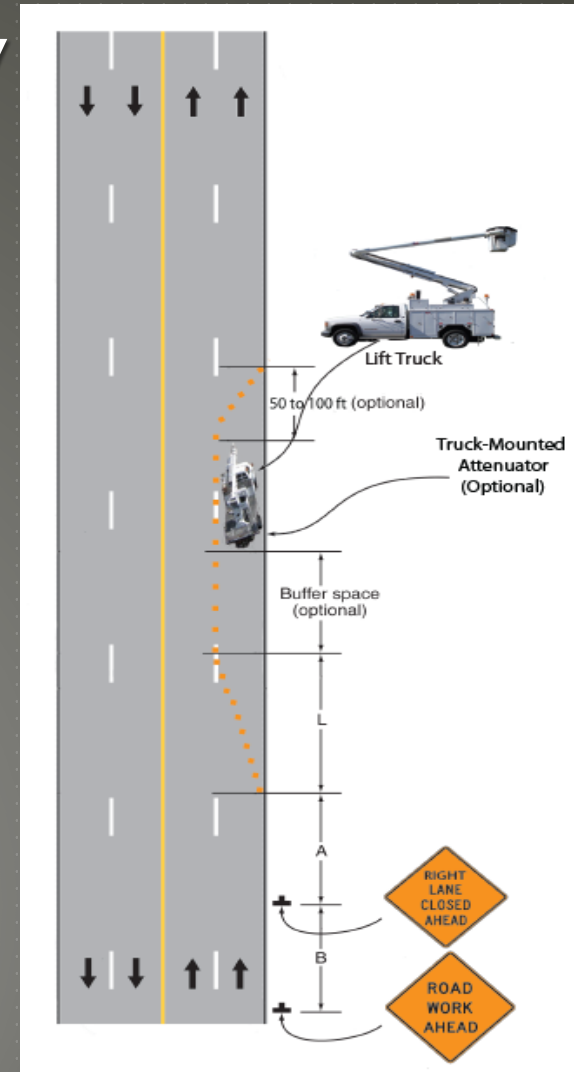


- ⚠ **DO NOT** assume shoulders areas are automatically safe work areas
- ⚠ Traffic cones should be utilized to reduce setup/removal time
- ⚠ 10 feet minimum lane width required
- ⚠ Prevent falling limbs from injuring workers, pedestrians or motorists
 - ▶ Use of flaggers to temporary stop traffic may be necessary.

MID-BLOCK MAINTENANCE OPERATION



- Examples include tree trimming or utility work
- Truck-mounted attenuator is optional in this example
 - Include on high speed and/or high volume roadways
- Advance warning signs should be on portable stands to reduce setup time
- 10 feet minimum lane width is required
- Buckets should not be extended over active traffic





MOBILE WORK ZONE EXAMPLES

Temporary Traffic Control Layout

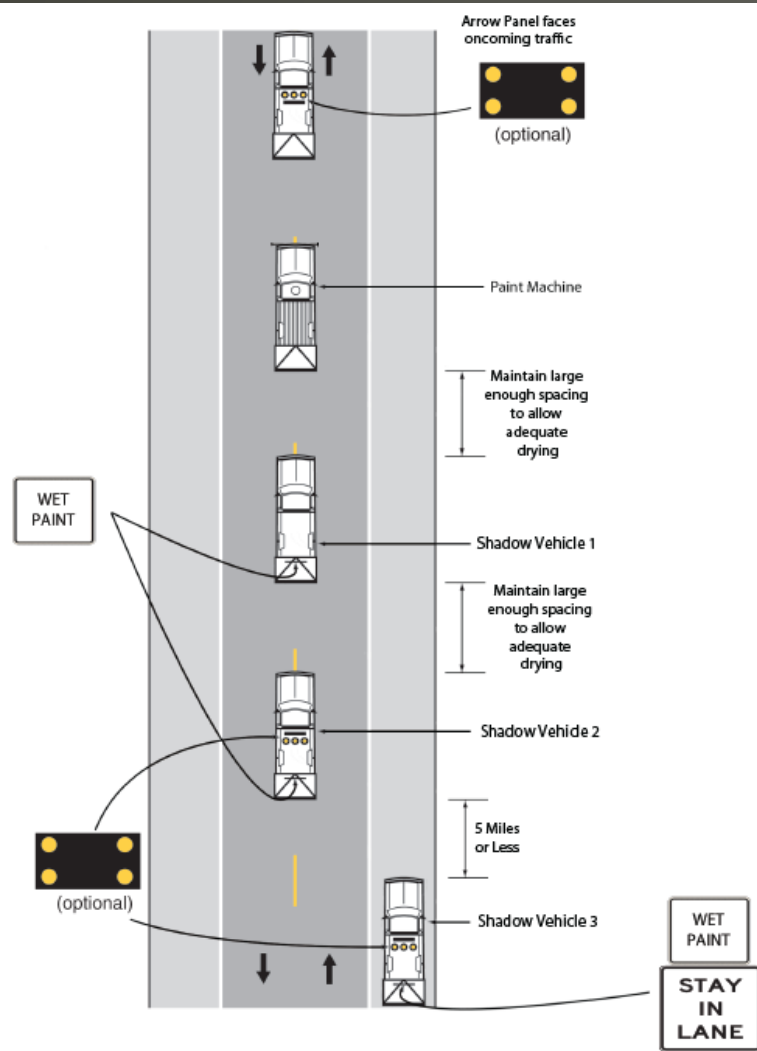
MOBILE WORK ZONES

🚧 Work that moves **intermittently** or **continuously**

- ▶ Sweeping, debris removal, or other cleaning activities
- ▶ Pavement marking installation or removal
- ▶ Asphalt cold patching operations
- ▶ Rumble strip installation
- ▶ Various preventative maintenance operations



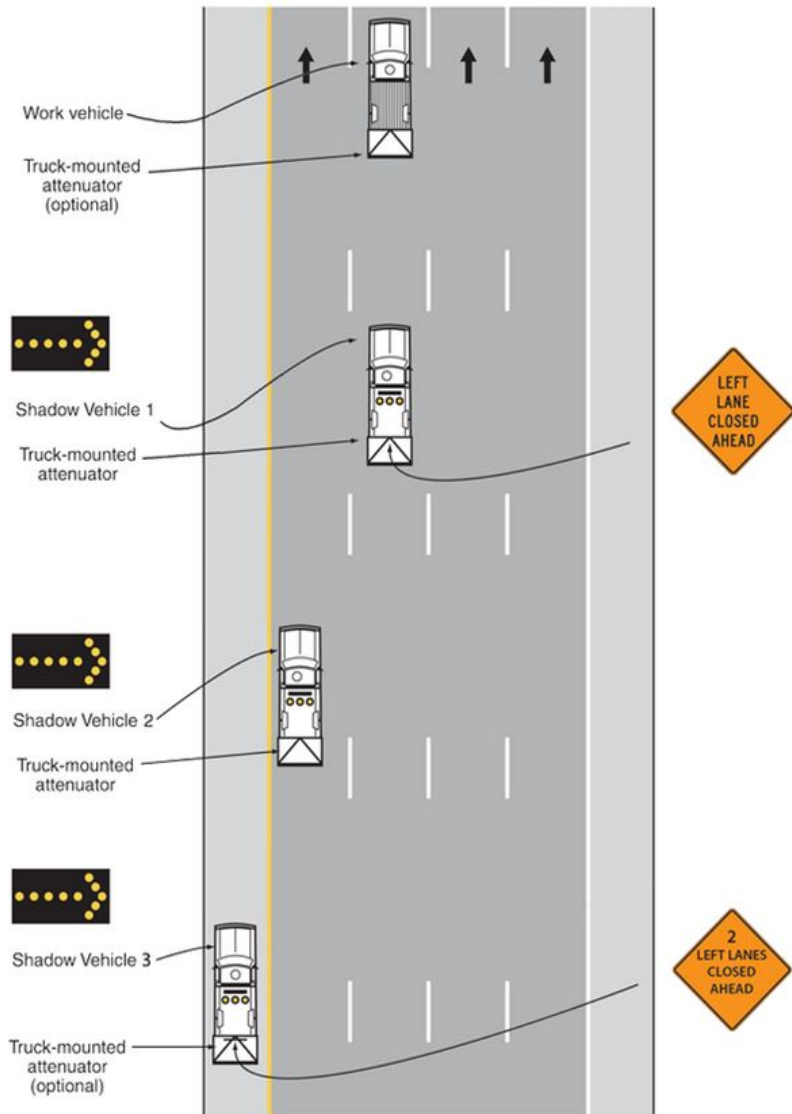
MOBILE STRIPING OPERATION



Note: All truck-mounted attenuators are optional, refer to notes for number of vehicles and spacing

- ⚠ Truck-mounted attenuators are optional, but should be used on high speed roadways
- ⚠ Optional arrow boards and portable changeable message signs may help alert road users
- ⚠ Work vehicles should pull off roadway periodically to allow queues to dissipate

POTHOLE PATCHING OPERATION



- ⚠ Pothole patching may require closure of more than one lane
- ⚠ Space between vehicles should be minimized
 - ▶ Deter road users from driving in between convoy
- ⚠ Vehicle-mounted signs are not to be obstructed by other work vehicles, equipment, or supplies
- ⚠ Work should be performed during off-peak daylight hours depending on traffic volumes
- ⚠ One arrow board should be used for each lane closed

OTHER RESOURCES FOR SHORT-TERM, SHORT-DURATION, AND MOBILE WZ

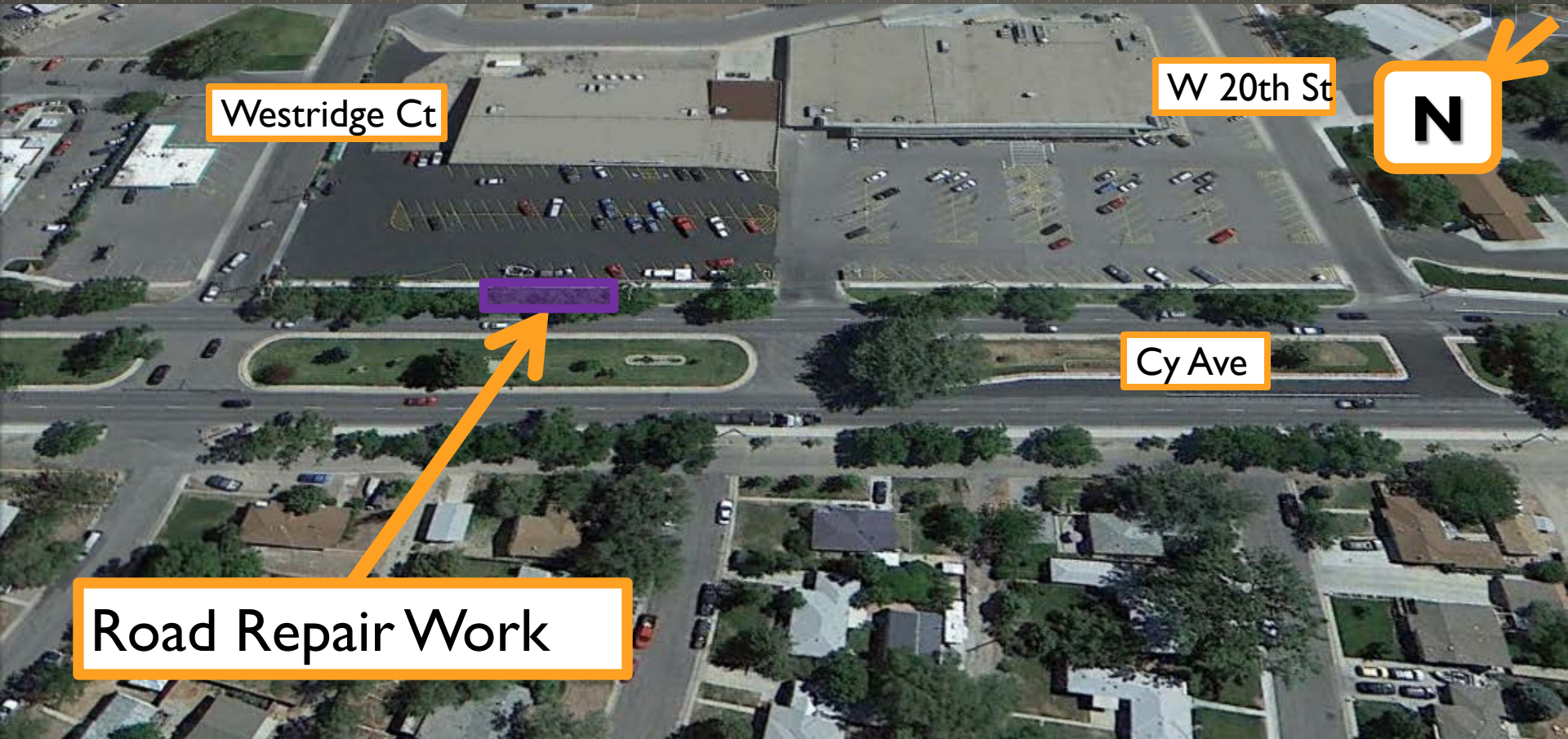
Further information on highway work zone safety can be found through the following organizations:

- ▶ Federal Highway Administration - Work Zone Safety: <http://safety.fhwa.dot.gov/wz/>
- ▶ National Work Zone Safety Information Clearinghouse: <http://www.workzonesafety.org/>
- ▶ Manual on Uniform Traffic Control Devices: <http://mutcd.fhwa.dot.gov/>
- ▶ FHWA Work Zone Safety and Mobility Rule: http://www.ops.fhwa.dot.gov/wz/resources/final_rule.htm
- ▶ American Road and Transportation Builders Association: <http://www.artba.org/>
- ▶ American Traffic Safety Services Association: <http://www.atssa.com/>
- ▶ Institute of Transportation Engineers: <http://www.ite.org/>
- ▶ National Highway Institute: <http://www.nhi.fhwa.dot.gov/home.aspx>
- ▶ National Work Zone Safety Information Clearinghouse: <http://www.workzonesafety.org/>
- ▶ Occupational Safety and Health Administration: <http://www.osha.gov/>
- ▶ Texas Transportation Institute: <http://tti.tamu.edu>
- ▶ Transportation Research Board: <http://www.trb.org/>

**WORK
ZONE**

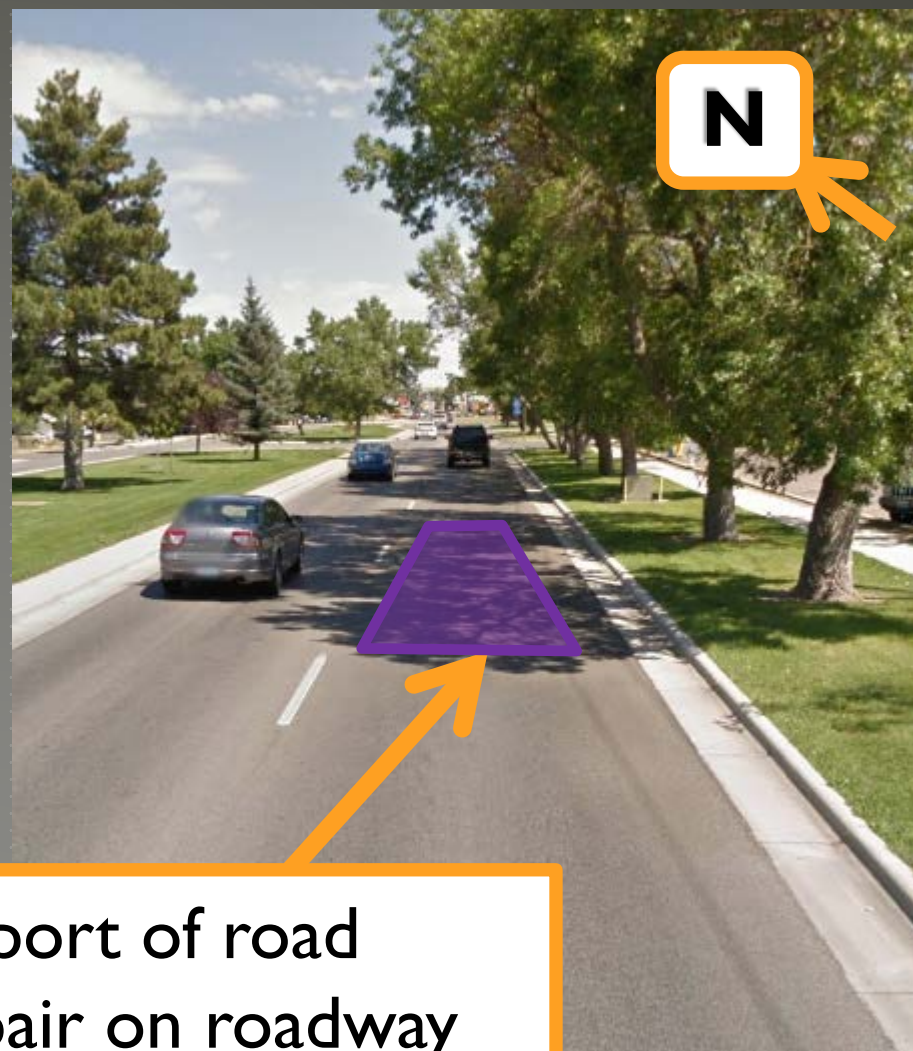
Short-Term Example #1

SHORT-TERM WORK ALONG MID-BLOCK DIVIDED ROADWAY



SHORT-TERM WORK EXAMPLE

- ⚠ Road repair on right travel lane causing disruption to traffic
- ⚠ Work duration expected to last at least 1 hour



Report of road
repair on roadway

STEP 1: COLLECT AND IDENTIFY NECESSARY SITE AND WORK CHARACTERISTICS

Site Characteristics

- ▶ Mid-block location along a divided roadway
- ▶ 30 MPH posted speed limit
- ▶ Affected roadway includes four travel lanes (11' wide lanes)
- ▶ No paved shoulder and curb and gutter
- ▶ Commercial driveways and vegetation within TTC area
- ▶ Moderate traffic volumes
- ▶ Site includes pedestrian facilities (sidewalks & crosswalks), however pedestrian volume is expected to be relatively low

STEP 1: COLLECT AND IDENTIFY NECESSARY SITE AND WORK CHARACTERISTICS

Work Characteristics

- ▶ Work duration expected to last 1 to 3 hours
- ▶ Work vehicles for asphalt cold mix and materials for road repair
- ▶ Expect workers on foot within the work area
- ▶ Activities likely to include:
 - ▶ Shallow excavation
 - ▶ Spot cleaning
 - ▶ Cold mix patching

STEP 2: SELECT APPROPRIATE TYPICAL APPLICATION

⚠ Temporary Traffic Control Plan Selection Software

- ▶ Follow the flowchart logic towards the appropriate plan
- ▶ Be sure to check for state-standards first!



⚠ **OR** select an appropriate typical application from the MUTCD without using the software

⚠ Which plan is the **most appropriate** for this scenario?

STEP 2: SELECT APPROPRIATE TYPICAL APPLICATION

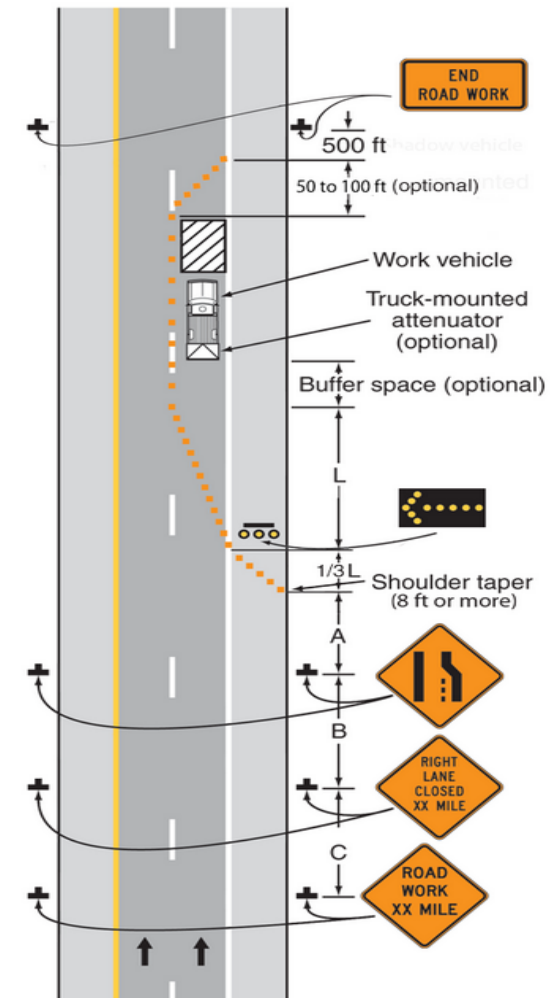
Using the **TTCP Selection Software**, Figure 6H-33C is the most appropriate

- ▶ Figure 6H-33 could also be selected from the MUTCD

Dimensions and supplementary notes are also provided

DIMENSIONS	FEET
A (Distance Between Signs)	100
B (Distance Between Signs)	100
C (Distance Between Signs)	100
L (Merging Taper Length)	165
1/3 L (Shoulder or Parking Lane Taper Length)	55
Maximum Taper Channelizing Device Spacing	30
Maximum Tangent Channelizing Device Spacing	60

Example Stationary Right Lane Closure on a Divided Highway (Short Term)



STEP 3: MODIFY TA BASED ON ADDITIONAL CONSIDERATIONS

- ⚠ Having selected a typical application or example plan, it must still be modified to fit the **specific work/site conditions**
- ⚠ What is unique/different about the given scenario vs. the selected TA?

STEP 3: MODIFY TA BASED ON ADDITIONAL CONSIDERATIONS

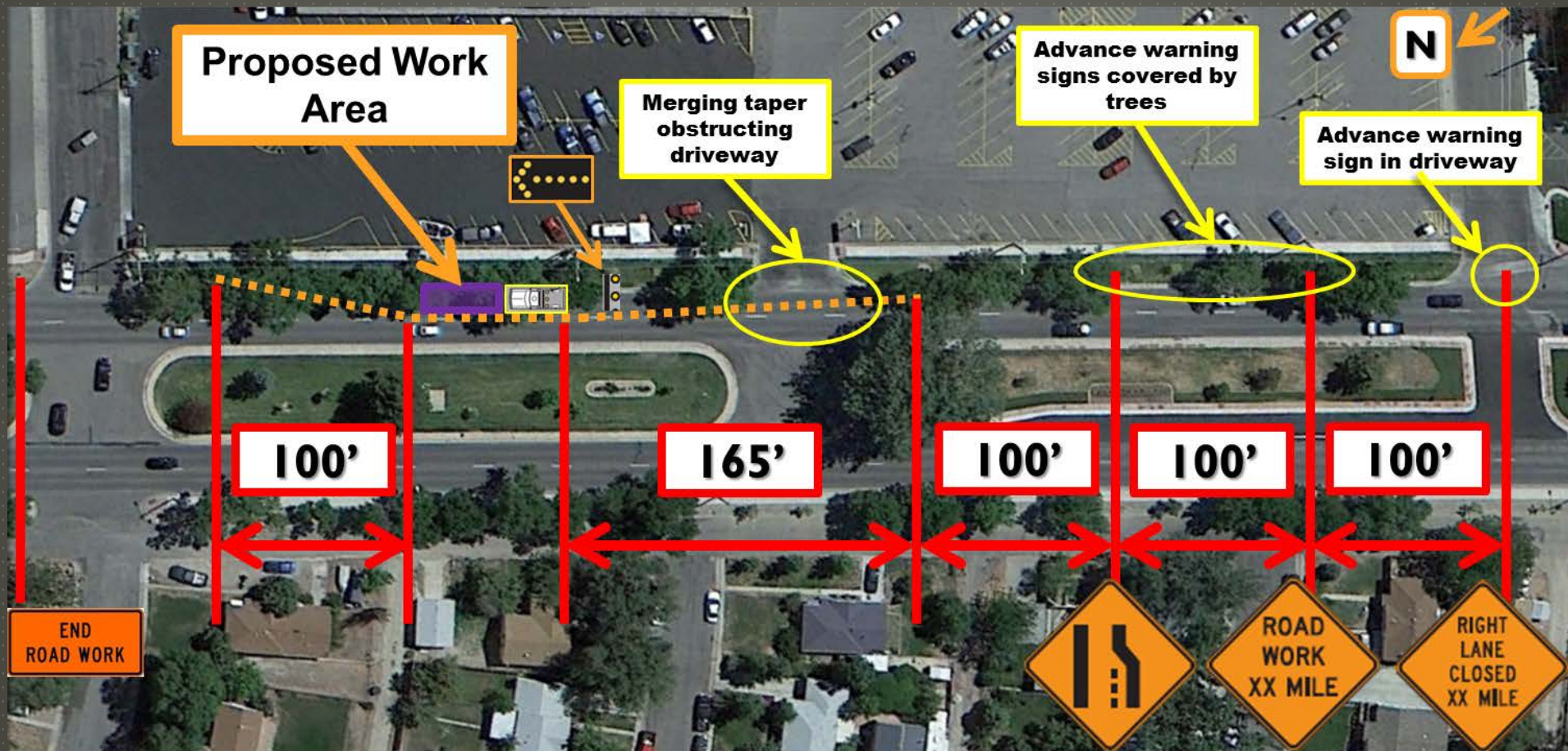
🚧 What is unique/different about the given scenario vs. the selected TA?

- ▶ Expected short-term nature of the work activity
- ▶ Presence of commercial driveways and vegetation along the TTC area
- ▶ Presence of non-motorized facilities (sidewalks & crosswalks)
- ▶ Presence of series of trees covering the right lane which may obscure TTC components

STEP 3: MODIFY TA BASED ON ADDITIONAL CONSIDERATIONS

🚧 What are the conflict points?

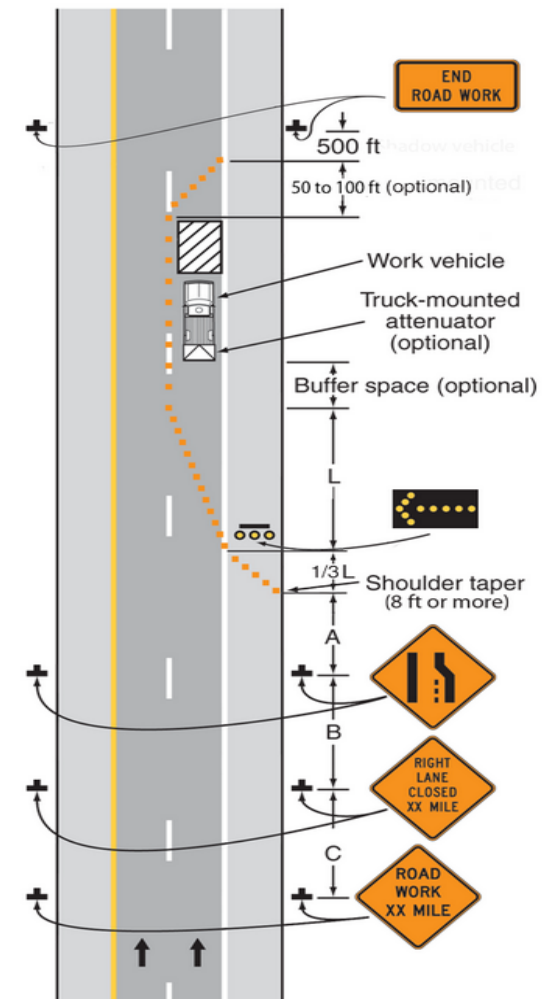
👉 **Conflict Point**



STEP 3: MODIFY TA BASED ON ADDITIONAL CONSIDERATIONS

- Remove optional end taper
- Remove optional TMA
- Shoulder taper not applicable
- Extend buffer space up to driveway
- Shift merging taper and advance warning signs accordingly

Example Stationary Right Lane Closure on a Divided Highway (Short Term)

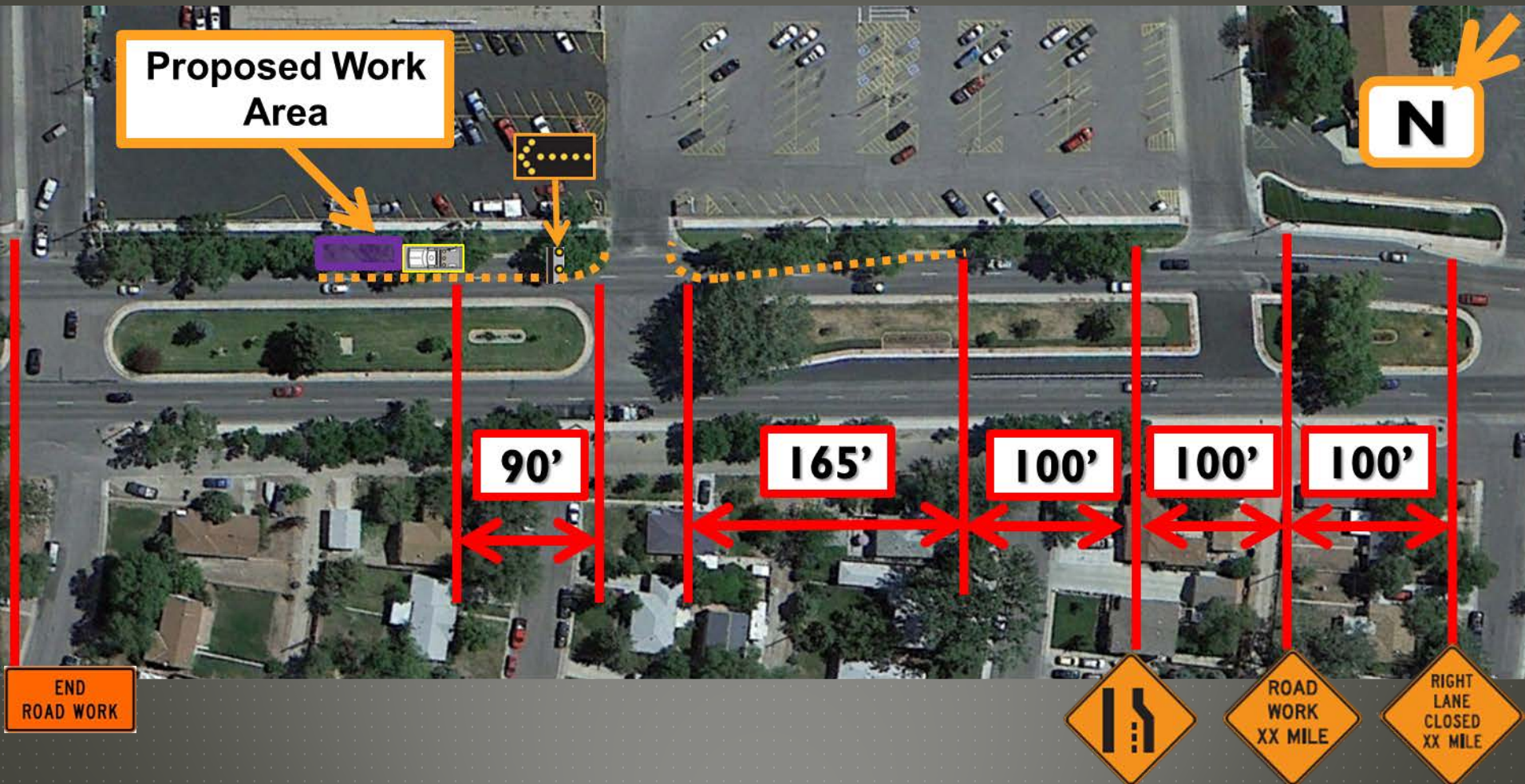


STEP 4: DEVELOP APPROPRIATE TEMPORARY TRAFFIC CONTROL PLAN

🚧 Final TTCP should include:

- ▶ Schematic drawing of the modified plan including:
 - ▶ All necessary temporary traffic control devices
 - ▶ Dimensions / layout of devices
- ▶ Supplementary notes or guidance for field personnel
 - ▶ Instructions on how to modify TTC for various field conditions

STEP 4: DEVELOP APPROPRIATE TEMPORARY TRAFFIC CONTROL PLAN



STEP 5: PERFORM FIELD REVIEW OF TTCP AS APPROPRIATE

- ⚠ Field conditions may vary from expectations
 - ▶ Especially for unexpected or emergency work
- ⚠ Ensure TTC in place is appropriate for actual conditions
 - ▶ Heavier than expected vehicular or pedestrian volumes
 - ▶ More expansive work area than anticipated
 - ▶ Duration exceeding one daylight period
 - ▶ Other considerations

THANK YOU

🚧 Work Zone Safety Website

▶ <http://workzone.eng.wayne.edu/>

