INDOT Design Conference – June 29, 2021

Work Zone Policy

Katherine Smutzer

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MOT and TMP Submittal Items in Chapter 14 (Design Memo 21-08)

Katherine Smutzer, INDOT

Design Memo 21-08

Indiana Design Manual Chapter 14 Updates:

- For all projects, Significant and Non-Significant, MOT plans will need to be completed by stage 2,

- For all Significant projects, draft TMP reports will need to be completed at certain stages of the project to help designers submit the final TMP at Stage 3.

Effective for Projects with a Stage 1 Submittal Date On or After August 2021

MOT Plan Submittal Updates to Chapter 14

All Plan Submittal Sections have been updated to reflect the completion of MOT plans at Stage 2 or equivalent. (Section 14-2.03 Road Plans, Partial 3R Project, a group is currently working on updating this section to Stage Submittal format)

- Prior to Stage 1 or Grade Review Submittal:
  - Determine if your project is non-significant or significant, this can be found in the scope or if not provided in the scope, the designer should complete the Determination of Significant Work Impacts Worksheet per IDM Section 503-2.02. (see next slide for more information)
  - A preliminary MOT strategy selected (via an alternatives analysis)
    - Complete Road Closure with Detour,
    - Runaround,
    - Crossover,
    - Lane Closure
    - Etc. see IDM 503-2.05

MOT Plan Submittal Updates to Chapter 14

Where the scope has not determined if the project is non-significant or significant, the designer should complete the Determination of Significant Work Impacts Worksheet per IDM Section 503-2.02. Once the worksheet is completed:

- it should be reviewed and approved by the District Scoping Manager, and
- included in the TMP for significant projects and in the project correspondence files for non-significant projects.
  - District Scoping Managers:
    - Crawfordsville, Mike Eubank
    - Fort Wayne, Susan Doell
    - Greenfield, Aschalew Aberra
    - LaPorte, Paul South
    - Seymour, Abby Mantsch
    - Vincennes, Duane Decker

MOT Plan Submittal Updates to Chapter 14

Stage 1- Traffic-Maintenance Details should have a conceptual MOT strategy and phasing details.

- The MOT strategy should be chosen
- Phasing for the MOT strategy should be detailed, for example
  - Shoulder closures
  - Lane closures to strengthen shoulders or setup of crossovers
  - Lane closures to build half at a time or to cross over traffic or phase switches
  - Pedestrian or bicycle flow through the project or detour detailed
- For interstate projects a queue analysis should have been run to determine if any queuing will occur and if an exception will be needed

Phase switches should also be considered when determining effects on the travelling public. It may be necessary to close a lane to switch traffic patterns. Coordination with the Area Engineer and running queue analysis may require that additional plans details should be added or a USP written to detail switches in traffic patterns, i.e. directing a given time of day to complete a traffic switch, requesting ISP or LEO hours, or queue trucks.

MOT Plan Submittal Updates to Chapter 14

Preliminary Field Check- again Traffic-Maintenance Details should have a MOT strategy and phasing detailed but should also have been reviewed in the context of other projects.

- Is your detour running through another project?
- Is your project a detour for another project?

Designers should also complete the plans to satisfy the requirements of the Constructability Review in the Project Development Process (PDP) Manual. (this is not a new request)

MOT Plan Submittal Updates to Chapter 14

- Stage 2, All MOT details should be completed, for example
  - All timing of other project considered
  - All phasing details completed
    - Typical Sections
    - Layout of Signs
    - Layout of Temporary Traffic Barrier, if needed
    - Construction Areas
    - Traffic Patterns
    - Layout of Temporary Pavement Markings
    - Pedestrian MOT, detailed through phases or detour confirmed and detailed, coordination with the ADA Technical Advisory Committee (TAC).
    - Layout of Erosion Control Measures
  - All traffic mitigation details
  - All right of way needed to complete the phasing and erosion control shown on the plans
  - Draft IHCP Exception Submitted
  - All RSP and USP submitted for review

The need for an exception is not based on if a project is significant or non-significant.

MOT Plan Submittal Updates to Chapter 14

- Stage 3, All MOT details should be finalized
  - All Stage 2 review comments addressed
  - Final Approved IHCP Exception Request
  - All mitigation measures that may have been requested through the IHCP Exception approval process should be added to the plans and other documents.
  - Final TMP Report, samples see (Design Memo 21-05)

  https://ops.fhwa.dot.gov/wz/resources/final_rule/tmp_examples.htm

Transportation Management Plan (TMP)

All projects, Significant and Non-Significant require a Transportation Management Plan (TMP). This is not new, just getting more publicized.

- **Non-Significant Projects** – The TMP must include the Temporary Traffic Control Plan (TTCP), MOT detail sheets, localized to the work zone.
- **Significant Projects** – The TMP must include a:
  - TTCP ,
  - Transportation Operation Plan (TOP) (a regional plan to reduce the amount of traffic through the work zone, for example, extra signage farther away to suggest an alternate route or incident management),
  - Public Information Plans (PIP) (communication plan to keep the public informed of details of the project, for example, websites, newspaper articles, news media, social media) and
  - all the documentation of the coordination.

Given the TMP for Significant projects is more involved, chapter 14 now requires that certain items be submitted at particular stages of a **significant** project in the form of a Draft TMP Report.

TMP Submittals for Significant Projects

Significant Projects –
What could be included in a Transportation Management Plan Report?

- List of TMP Team
- TMP Meeting Minutes
- Determination of Significant Work Zone Impacts
- Approved Traffic Control Strategy Memo
- IHCP Exception
- Detour Worksheet
- Crossover and Runaround Viability Worksheet
- Contract Provisions Strategies
- Temporary Signal Type Determination
- Programming Information for Portable Changeable Message Sign
- Final Design Exception Approvals
- Final Mitigation Measures

The Stage submittal sections in chapter 14 list at what Stages these items should be included in the Draft TMP report submittal.

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TMP Submittals for Non-Significant Projects

Non-Significant Projects –

The TMP **must** include a Temporary Traffic Control Plan (TTCP) 503-3.01

- MOT Plan Detail Sheets, for example:
  - Typical sections
  - Phasing details, including phase switches
  - Detour layout
  - Pedestrian and bicycle MOT

The Stage submittal sections in chapter 14 list at what Stages TMP items should be included for significant projects, however they **may** also be used for guidance on non-significant projects.

However, it **Could** also include:

- Recurring Special Provisions (RSP) or Unique Special Provisions (USP)
- IHCP Exception
- PIP should still be considered, especially when there are plans to use a detour or ramp closure or road closure, i.e. USP for incident management or queue detection.

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TMP Submittals for Significant Projects

In short, a TMP is just a collection of the documentation of the communication between design, construction, work zone safety, the public, and other stakeholders (e.g. first responders) to make educated decisions to put together a well thought out work zone that minimizes adverse impacts, maximizes safety, and provides reasonable mobility.

Work Zone Policy – Part II

Mischa Kachler
WORK ZONE SAFETY SECTION SUPERVISOR

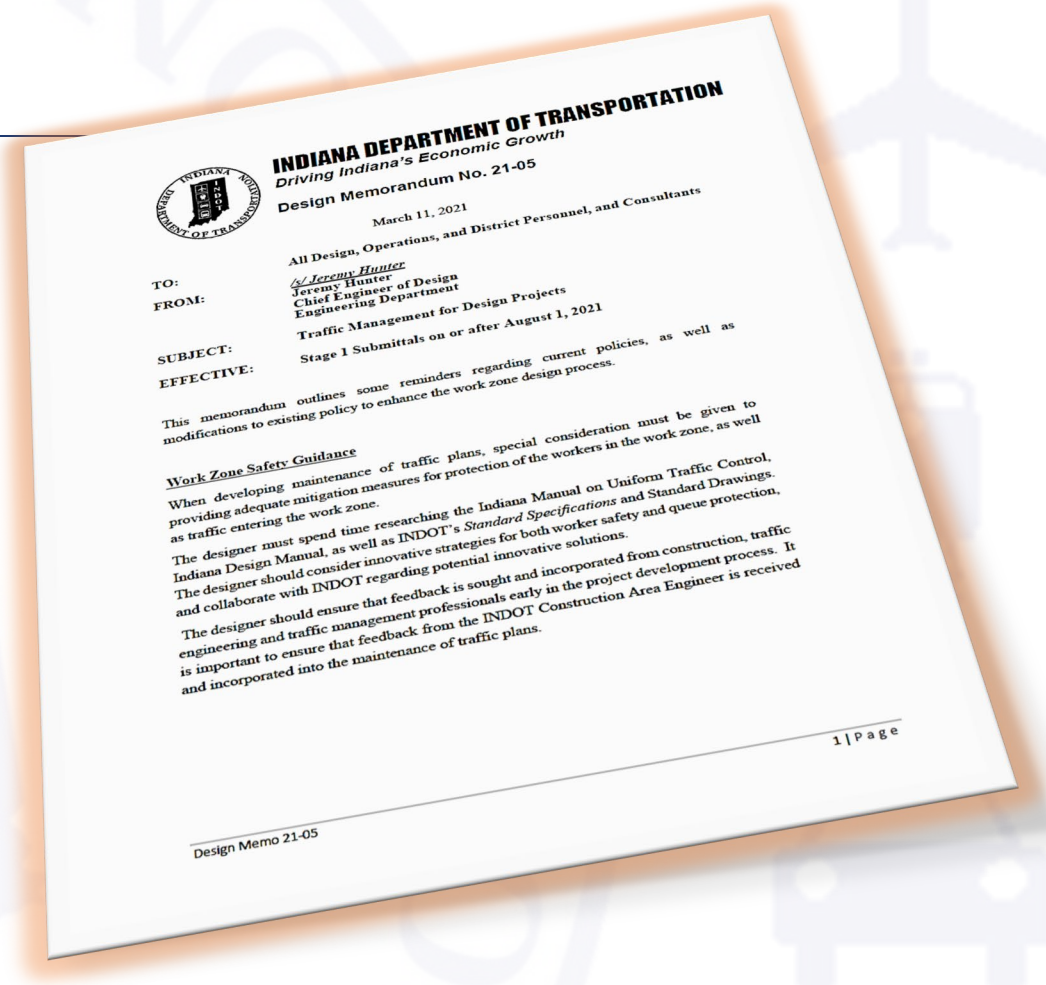
Work Zone Policy

- Design Memo 21-08:
  IDM Ch 14 Update – Addition of TMP Submittal Items for Significant Projects (Katherine Smutzer)

- Design Memo 21-05:
  Traffic Management for Design Projects

- Practice Pointers

- Issued March 11, 2021



INDIANA DEPARTMENT OF TRANSPORTATION
Driving Indiana's Economic Growth

Design Memorandum No. 21-05

March 11, 2021

TO: All Design, Operations, and District Personnel, and Consultants

FROM: */s/ Jeremy Hunter*
Jeremy Hunter
Chief Engineer of Design
Engineering Department

SUBJECT: Traffic Management for Design Projects

EFFECTIVE: Stage 1 Submittals on or after August 1, 2021

This memorandum outlines some reminders regarding current policies, as well as modifications to existing policy to enhance the work zone design process.

Work Zone Safety Guidance

When developing maintenance of traffic plans, special consideration must be given to providing adequate mitigation measures for protection of the workers in the work zone, as well as traffic entering the work zone.

The designer must spend time researching the Indiana Manual on Uniform Traffic Control, Indiana Design Manual, as well as INDOT's *Standard Specifications* and Standard Drawings.

The designer should consider innovative strategies for both worker safety and queue protection, and collaborate with INDOT regarding potential innovative solutions.

The designer should ensure that feedback is sought and incorporated from construction, traffic engineering and traffic management professionals early in the project development process. It is important to ensure that feedback from the INDOT Construction Area Engineer is received and incorporated into the maintenance of traffic plans.

Design Memo 21-05: Traffic Management for Design Projects

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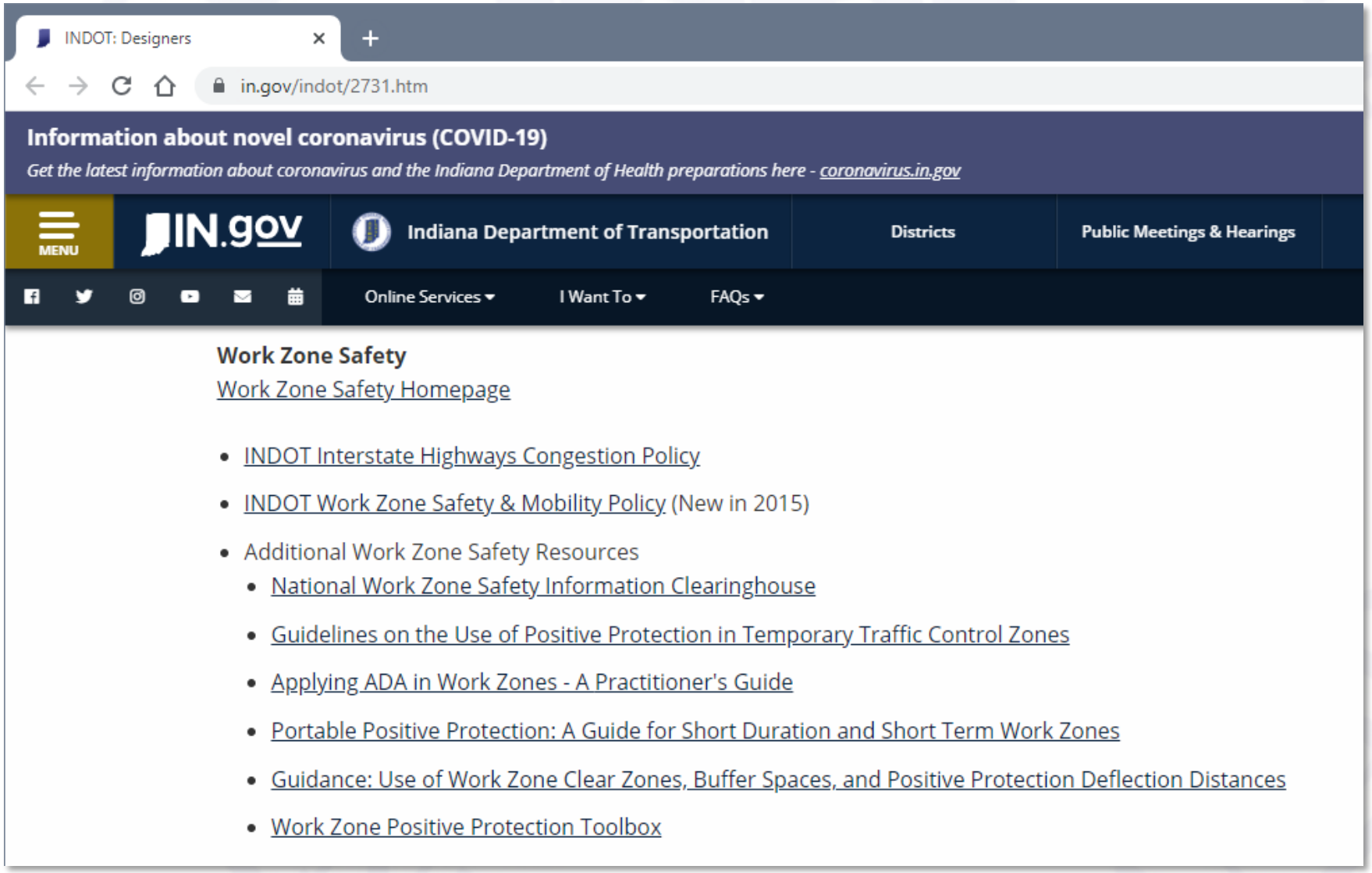
Work Zone Safety Guidance

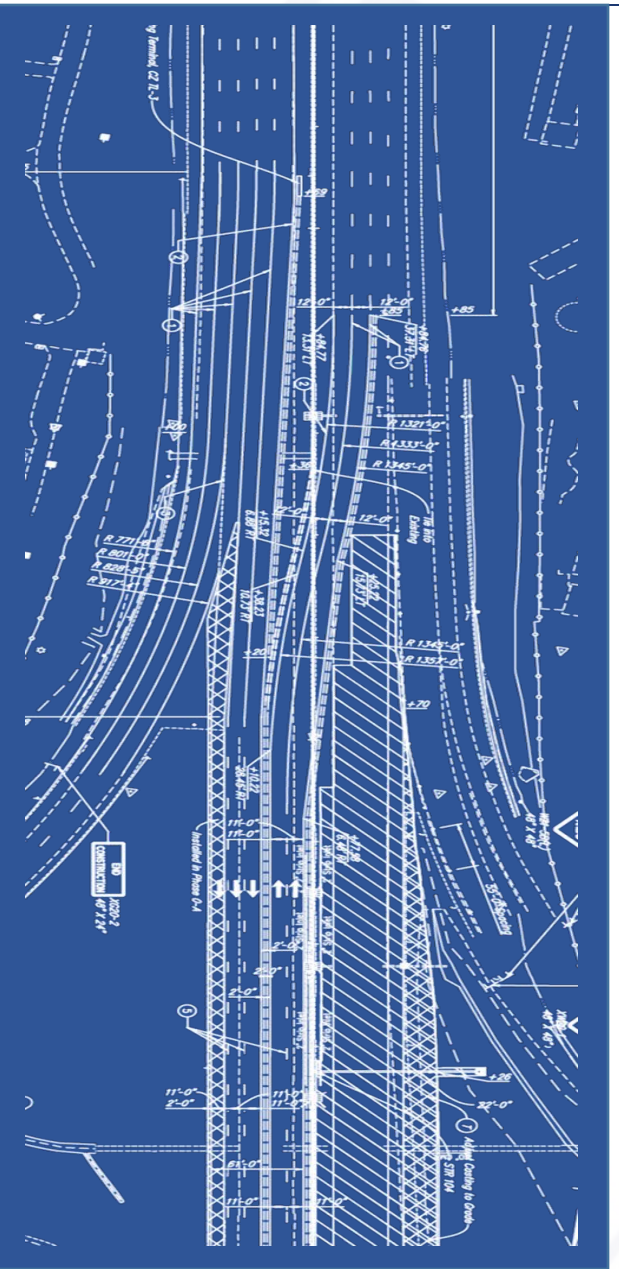
- Mitigate for the protection of **workers** and **traffic**
- **Research** guidance documents for strategies and solutions, including:
  - IMUTCD (Indiana Manual on Uniform Traffic Control Devices)
  - IDM (Indiana Design Manual)
  - Standard Specifications
  - Standard Drawings
- **Collaborate** with INDOT on potential innovative solutions
- Seek **feedback** early in the project development process and incorporate it into the Maintenance of Traffic (MOT) Plans

INDOT Designers Webpage

- https://www.in.gov/indot/2731.htm under “Work Zone Safety”



Plan Development Requirements



- MOT Plans complete by Stage 2 submittal
  → Should include all proposed work zone safety and queue mitigation measures
- All Level One Design Exceptions
  → Should be submitted ASAP, but no later than Stage 2 submittal
- If applicable, Interstate Highways Congestion Policy (IHCP):
  - Review at Stage 1 to determine need for an exception (queue analysis)
  - Final Approval for exception must be received by Stage 3 submittal
  - All mitigation measures required by the exception must be incorporated into the plans and contract documents

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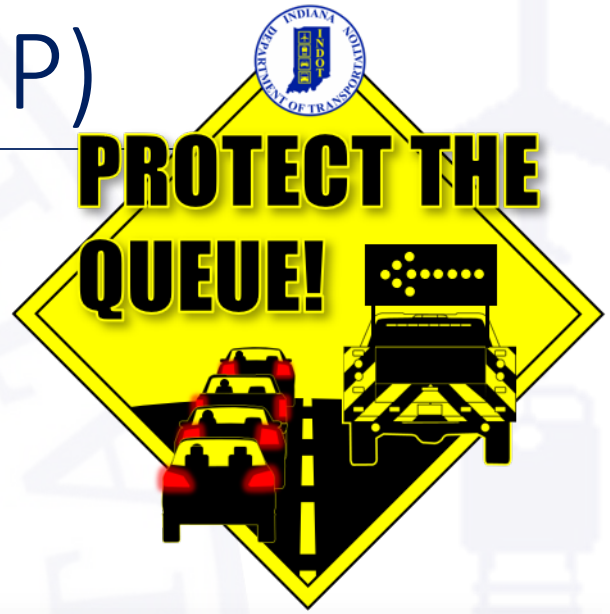
Transportation Management Plan (TMP)

- **Early** communication and collaboration between work zone stakeholders
- Per the IDM, all projects require a TMP…but the requirements are based on work zone impacts
  - Project with **Non-significant** Work Zone Impacts:
    - TTCP (Temporary Traffic Control Plan – aka MOT Plan) — Required
    - TOP (Transportation Operations Plan) — Optional
    - PIP (Public Information Plan) — Optional
  - Project with **Significant** Work Zone Impacts:
    - TTCP (Temporary Traffic Control Plan – aka MOT Plan) — Required
    - TOP (Transportation Operations Plan) — Required
    - PIP (Public Information Plan) — Required

Transportation Management Plan (TMP)



- TTCP (Temporary Traffic Control Plan – aka MOT Plan)
  - See IDM 503-3.0
- TOP (Transportation Operations Plan)
  - See IDM 503-4.0
  - Strategies to **mitigate adverse impacts** to the public and workers during construction
  - E.g., Smart WZ technologies; WZ Incident Management; regional detour planning; queue trucks; law enforcement in WZs; etc.

- PIP (Public Information Plan)
  - See IDM 503-5.0
  - Strategies to **communicate** WZ information to the traveling public and stakeholders
  - E.g., ITS messaging; news media releases; social media; web site; etc.

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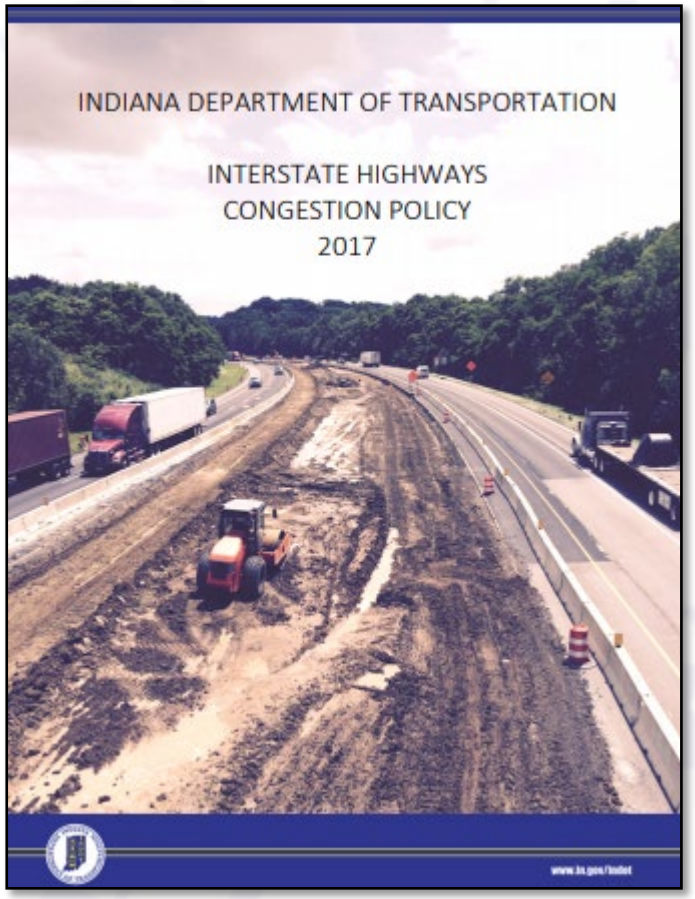
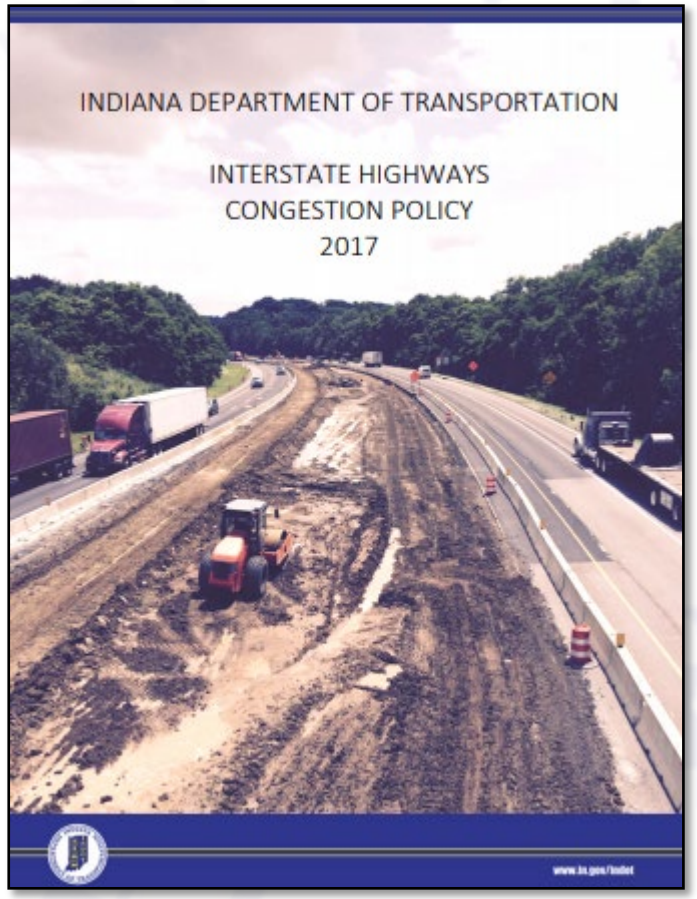
Interstate Highways Congestion Policy (IHCP)

- https://secure.in.gov/indot/3383.htm
- Purpose of the Policy
  "…to ensure that work zones provide optimal safety for workers and all other users of the work zone. To achieve this goal, work zone restrictions […] shall be scheduled to maximize efficiency by the appropriate selection of work hours [and by implementing] appropriate countermeasures […] to provide the best level of service achievable for motorists…"



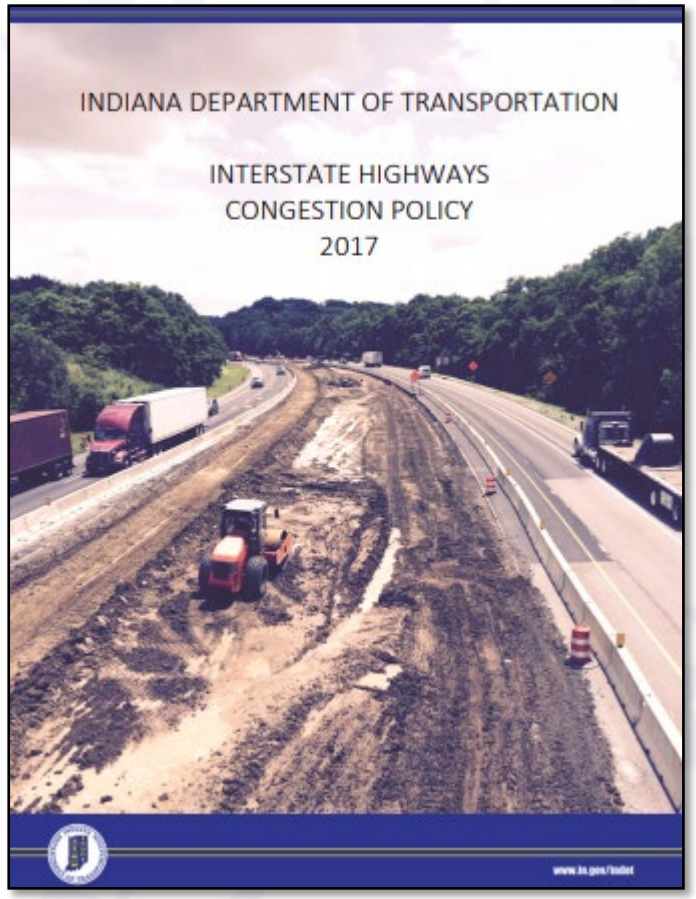
Interstate Highways Congestion Policy (IHCP)

- The intent is to make sure that alternatives have been considered and that the best times have been selected.
- It is **NOT** to prevent work outside of policy criteria from happening.
- Do **NOT** try to change the analysis so that results show queuing within policy limits…that's not the point.
- Ensure if queuing is a concern, it is mitigated and that any required mitigation in the approved exception is added to the contract.



Interstate Highways Congestion Policy (IHCP)

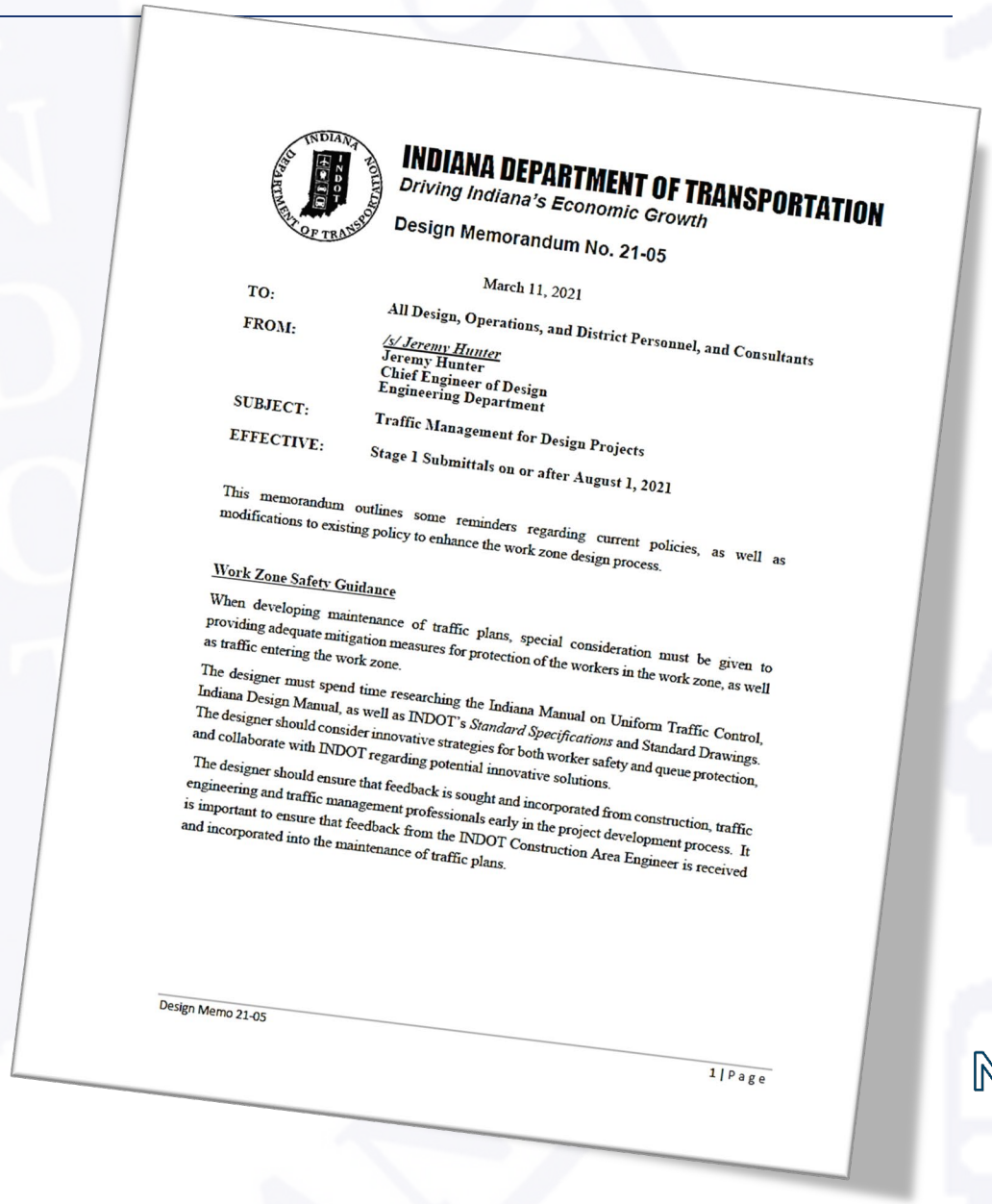
- Address as early as possible in the Design Process
- Consider options to MAINTAIN traffic flow during construction.
- Consider all phases of work
- Consider restrictions needed during phase changes
- Coordinate preliminary IHCP Exception review with District Traffic Engineer



Other Items on DM 21-05

- MOT Cross Sections *
- Lane Tapers *
- Positive Protection Toolbox site
- Moveable Temporary Traffic Barrier
- Truck Mounted Attenuators
- Temporary Worksite Speed Display
- Portable Temporary Traffic Signals

* more on these in a bit…



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Design Memo 21-05

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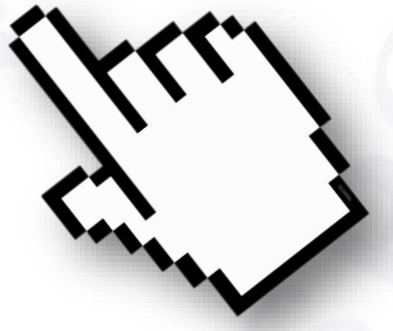
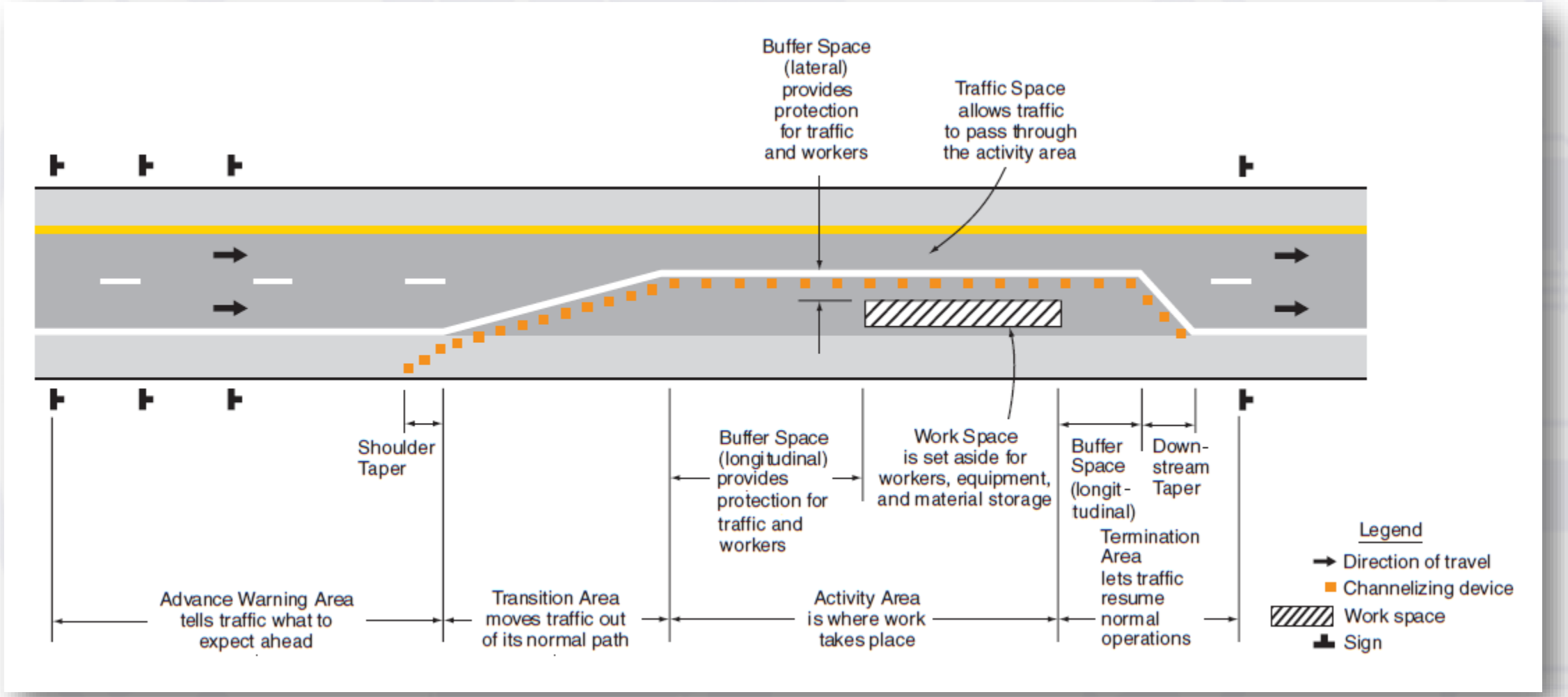
Maintenance of Traffic Practice Pointers



Parts of a Work Zone



Source: MUTCD

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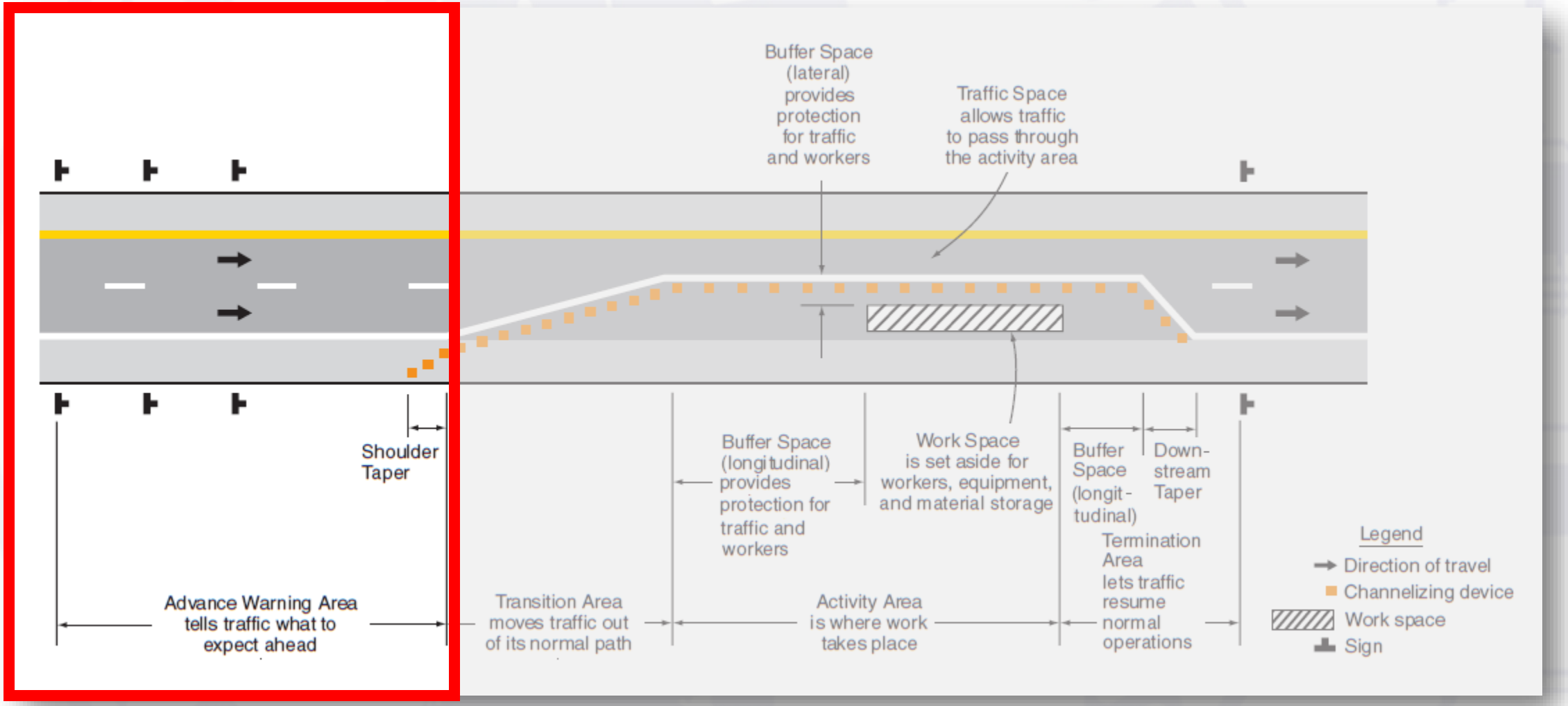
Parts of a Work Zone: Advance Warning Area



Source: MUTCD

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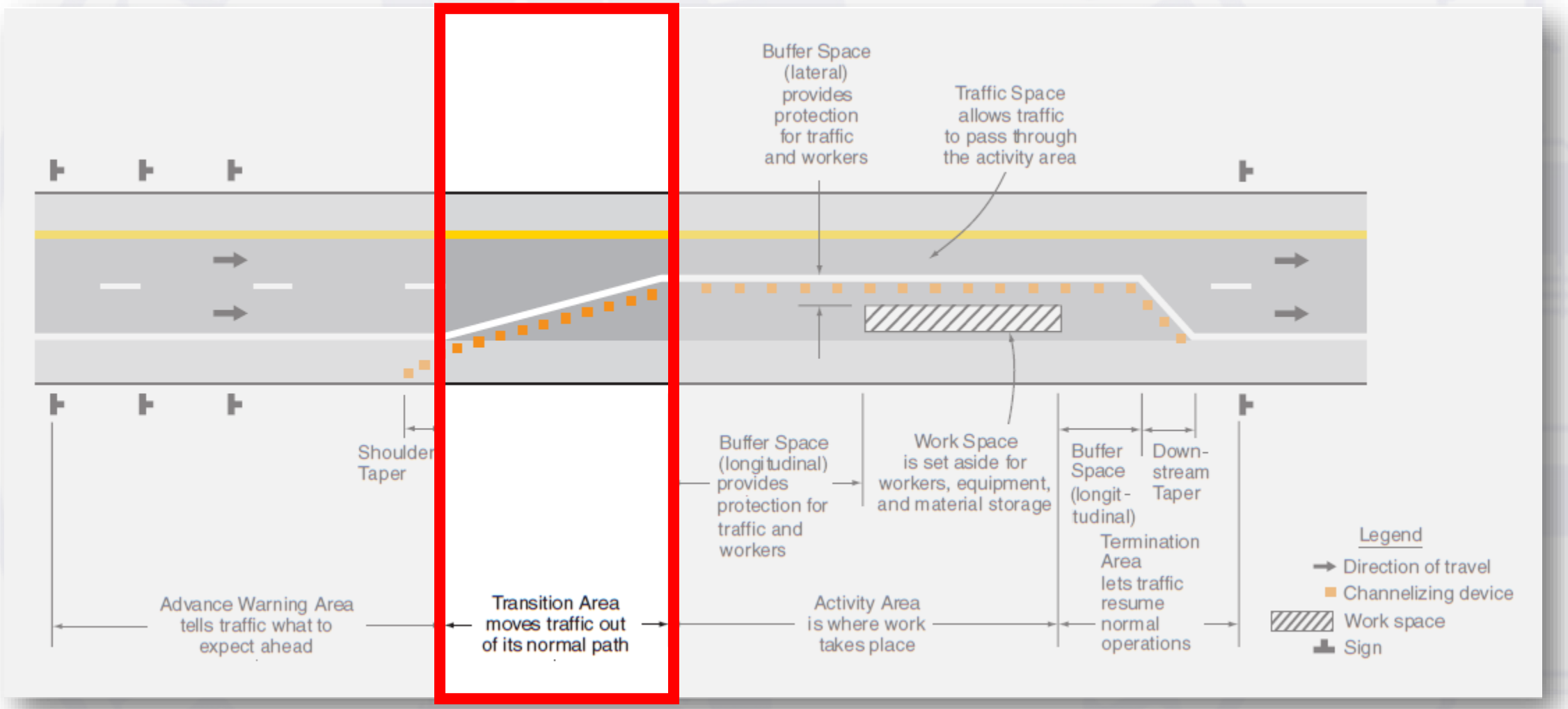
Parts of a Work Zone: Transition Area



Source: MUTCD

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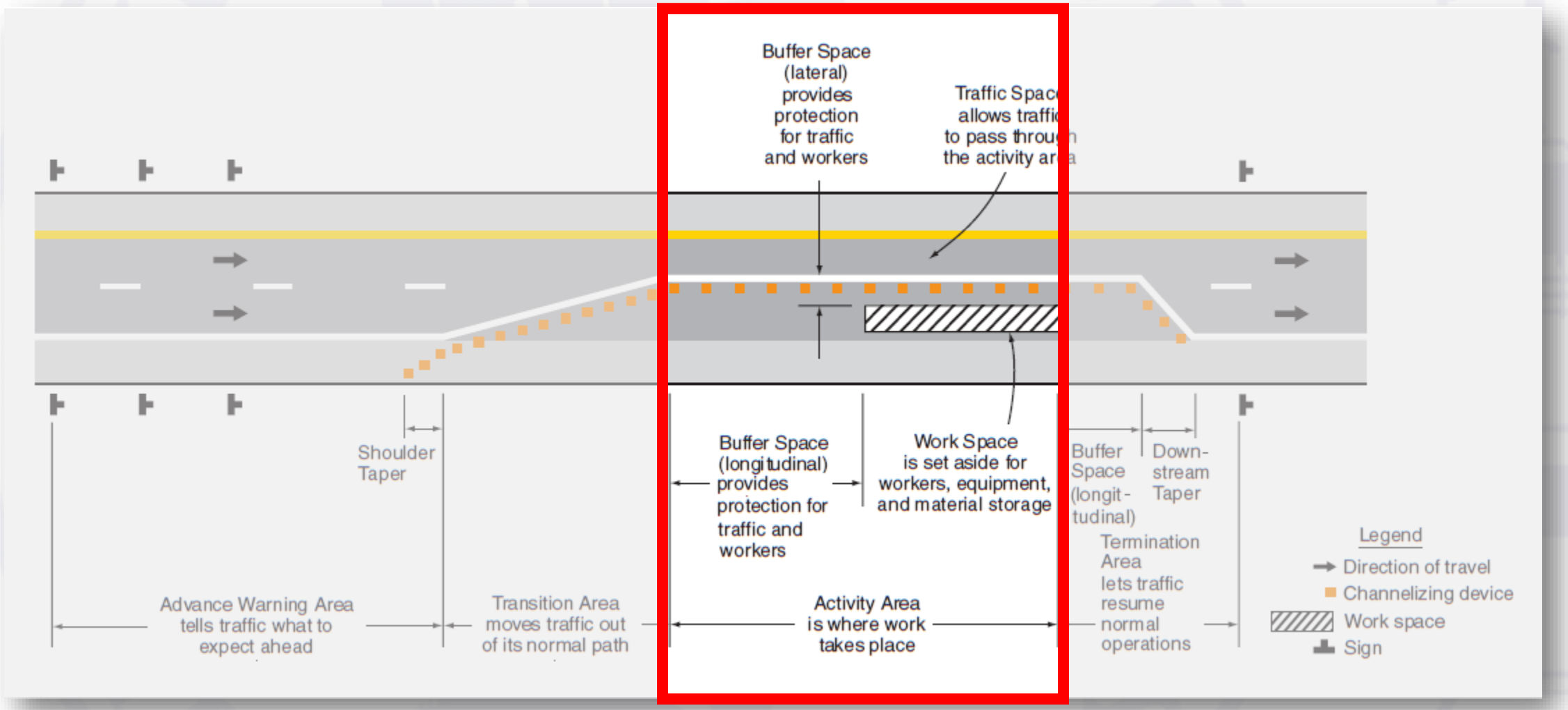
Parts of a Work Zone: Activity Area



Source: MUTCD

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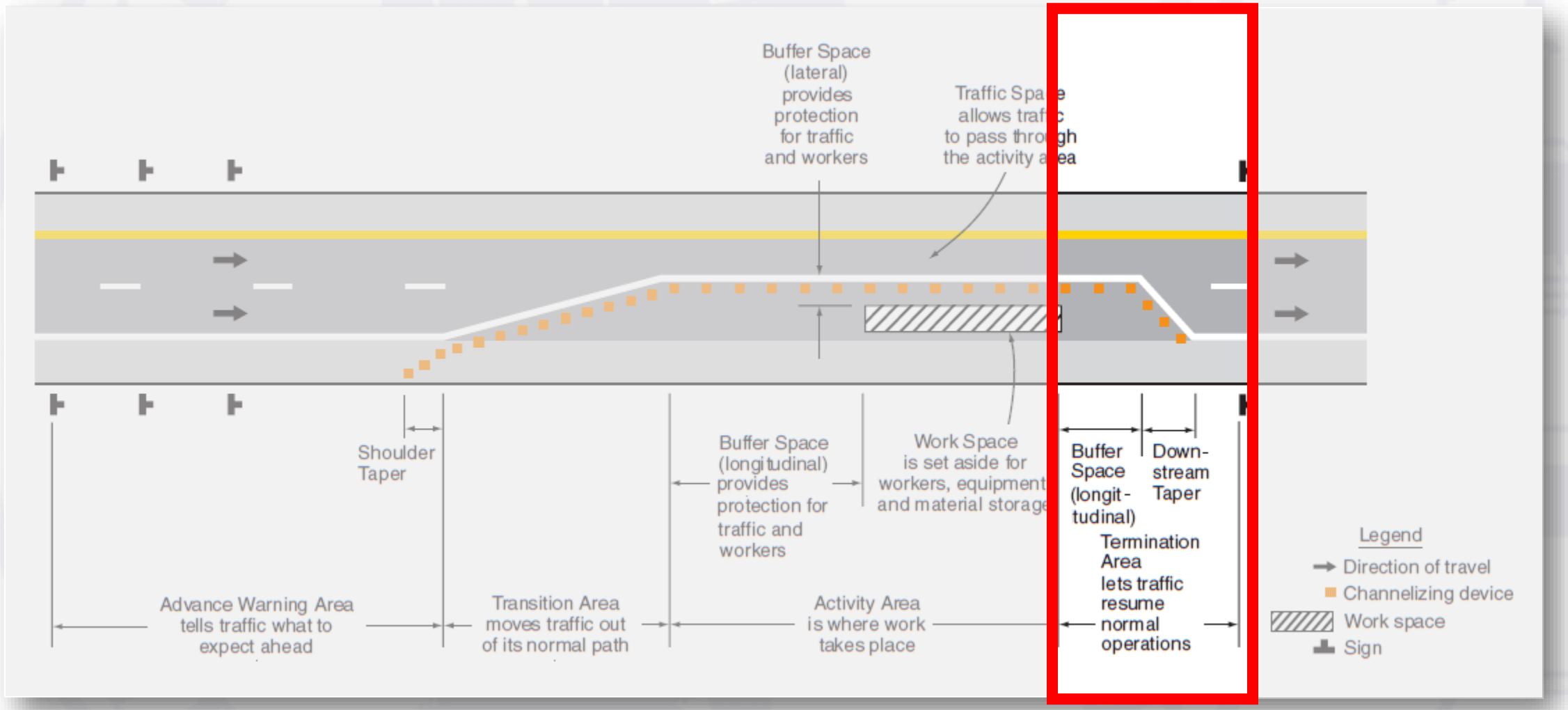
Parts of a Work Zone: Termination Area



Source: MUTCD

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Reduced Speed Limits in Work Zones

Construction Zone Design Speed & Speed Limits

- IDM 503-3.04(01) Construction Zone Design Speed
- Construction Zone Design Speed: the speed for which MOT geometric elements are designed.
- **Construction Zone Design Speed should desirably be the same as the Design Speed and match or exceed the established posted speed limit. If CZDS is reduced, desirably it should not be by more than 10 MPH. (IMUTCD 6C.01)**
- Posted speed limit during construction should take into account the selected Construction Zone Design Speed for the work zone.
- Work zone speed limit (via Official Action) or Worksite speed limit (via CM 14-06) **should not exceed** the Construction Zone Design Speed.
- **Consult District Traffic office** to determine Construction Zone Design Speed and speed limit during construction.

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Common Issues with Speed Limits in Work Zones

- Temporary Worksite Speed Limit (TWSL) requirements:
  - If reduced, Speed Limit MUST be reduced by at least 10 MPH [IC 9-21-5-11(b)]
  - Speed Limit reductions greater than 15 MPH MUST be done in 2 increments
  - All TWSL Sign Assemblies (TWSLSA) must have the “WORKSITE” plaque
  - TWSLSA’s required on both left and right sides if multiple lanes
  - Provide TWSLSA’s at a maximum spacing of 2 mile intervals (ISP prefers 1 mi)
  - Reestablish the existing (established) speed limit by placing sign(s) 500 ft downstream of “END CONSTRUCTION” sign
  - Reestablish the truck speed limit (65 MPH) for rural interstates

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Common Issues with Speed Limits in Work Zones

- Continuous TWSL requirements:
  - No warning lights or flashing strobes on continuous type TWSLSA
  - Cover or remove any existing (established) speed limit signs within TWSL
- Intermittent TWSL requirements:
  - Must have Flashing Strobes and “WHEN FLASHING” plaque
  - Place TWSLSAs by existing (established) speed limit signs or cover them
- Combination Continuous + Intermittent TWSL requirements:
  - Must separately stage the first 2 TWSLSA’s to accomplish the 2 steps: continuous first, then intermittent
  - After first 2, downstream continuous and intermittent TWSLSA’s may be placed together

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References on Reduced Speed Limits in Work Zones

- IDM 503-7.01(02) Regulatory Signing
- Construction Memo CM 14-06
- Standard Drawings E 801-TCDV-10, -11, -12
- Standard Specifications 801.15(c)
- IC 9-21-5 (Title 9 – Motor Vehicles;
  Article 21 – Traffic Regulation;
  Chapter 5 – Speed Limits)

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Buffer Space

Always Provide an SSD-Based Long. Buffer Space*

* Unless there is a justifiable reason for not doing so

- Often not provided in MOT plans or of insufficient length
- IMUTCD 6C.06 and Table 6C-2

Table 6C-2 Stopping Sight Distance as a Function of Speed	
Speed (mph)	Distance (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820

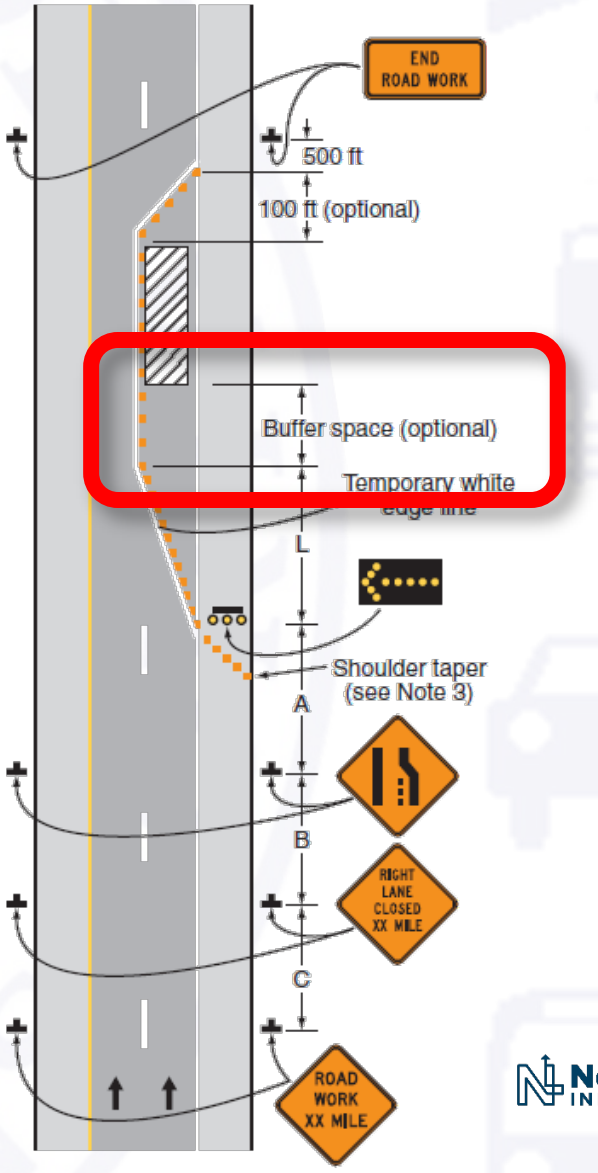

Figure 6H-33. (TA-33)

Transitions

Work Zone Entrance Transition Areas

- Use the upstream Existing (Established) Speed Limit → Results in longer tapers
- Provide at least the minimum required sign spacing & SSD-Based Buffer Spaces
  - If needed, use reduced speed limit for remainder of work zone

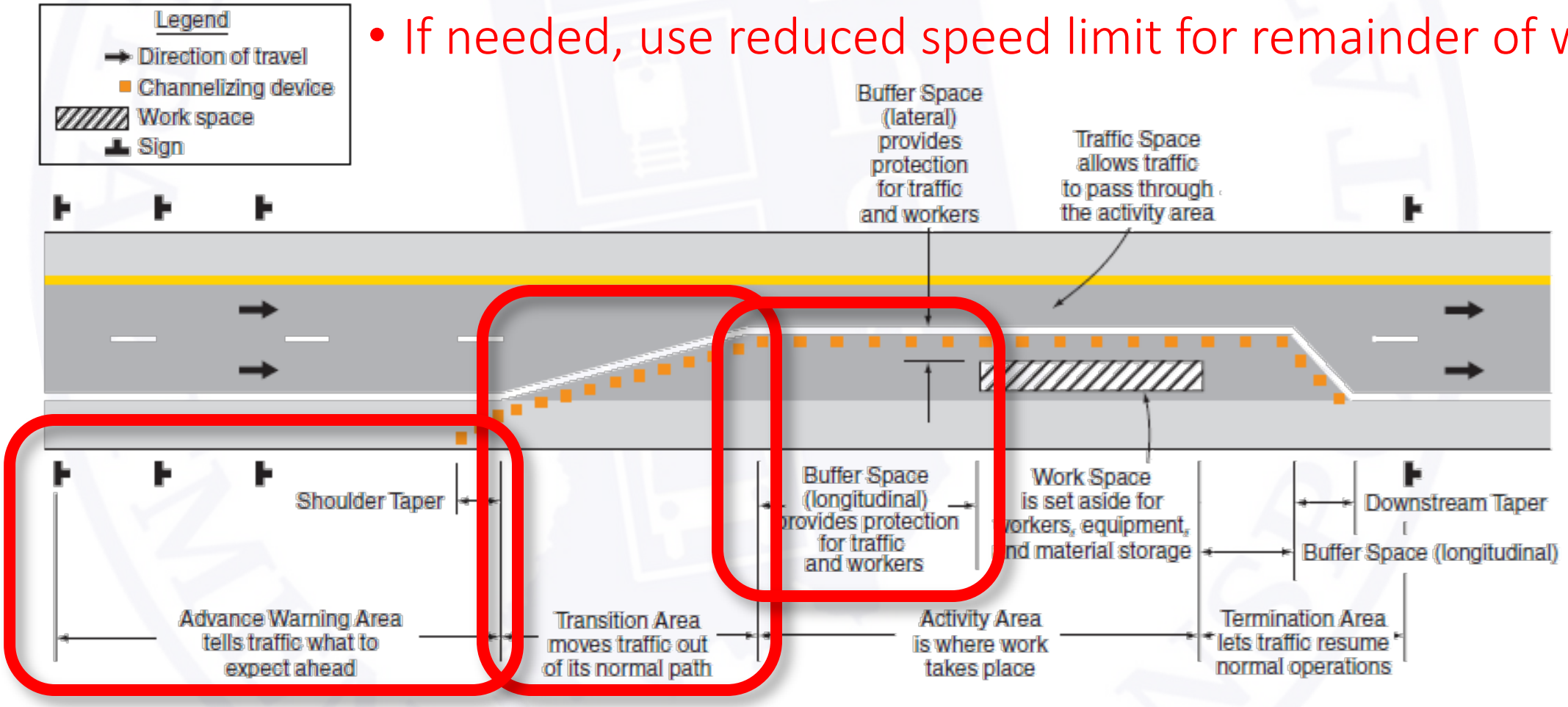

Figure 6C-1. Component Parts of a Temporary Traffic Control Zone

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Use Longer Tapers Into the Work Zone

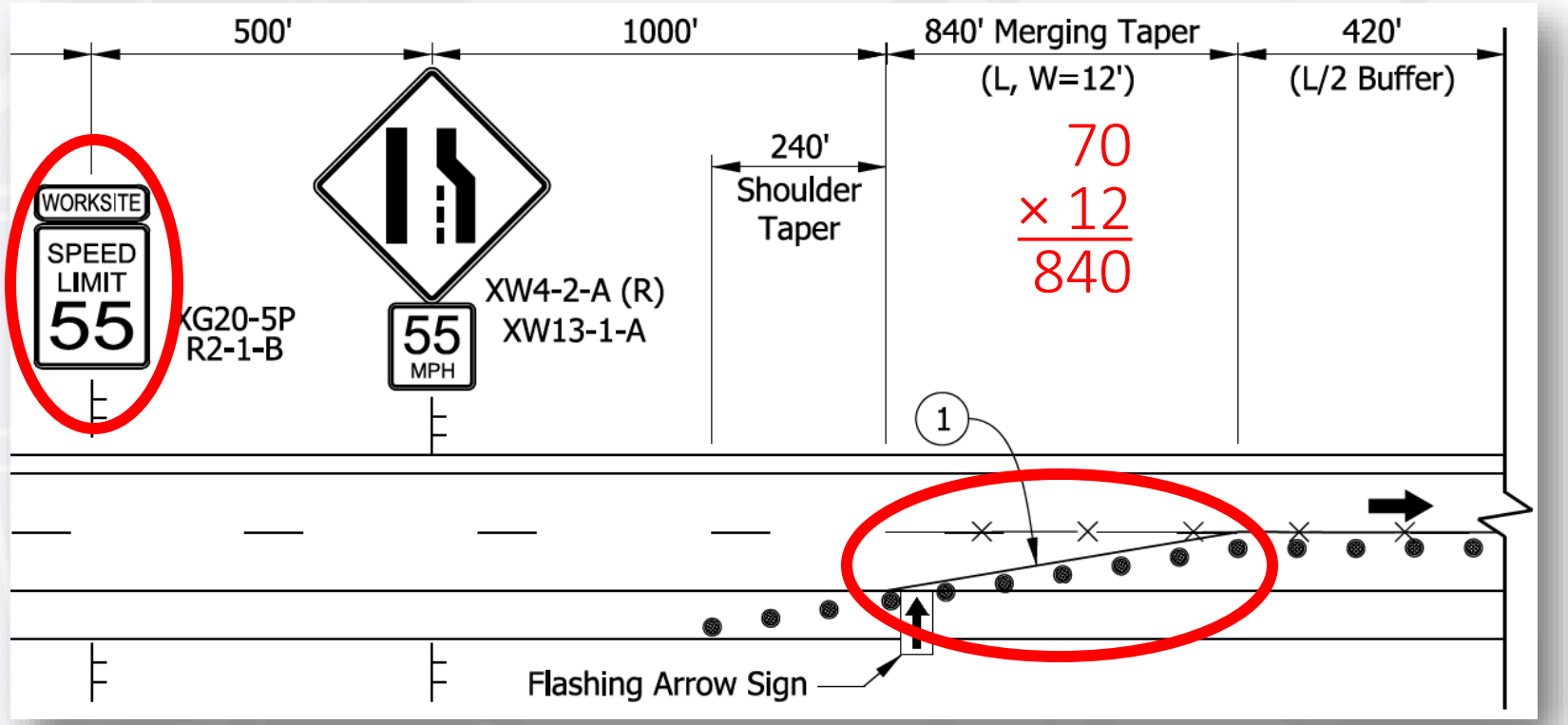
Taper Lengths:

- $L_{MERGE} = S \times W$
- $L_{SHIFT} = \frac{1}{2} S \times W$

where,

S = speed, in MPH

W = width of the shift or the lane being closed, in feet



- Select the upstream Speed Limit (or higher speed) to size taper.
- Use the reduced worksite speed limit, if needed, for elements within the work zone.

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Separate Merge and Lane Shift Tapers

- Provide a tangent length between successive tapers:

  → 2L tangent for a merge taper followed by a merge taper. (IMUTCD TA-37)

  → ½L tangent for a merge taper followed by a lane shift. (IMUTCD TA-32)

- Do not combine:


A merge and lane shift taper.


Even worse: merge + shift + lane width reduction!


Even worse: merge + shift + lane width reduction ending at end of TTB flare


Even worse: merge + shift + lane width reduction ending at end of TTB flare + entrance ramp + horizontal curve + vertical curve

- Remember: multi-lane lane shifts require temporary lane markings, regardless how short the duration

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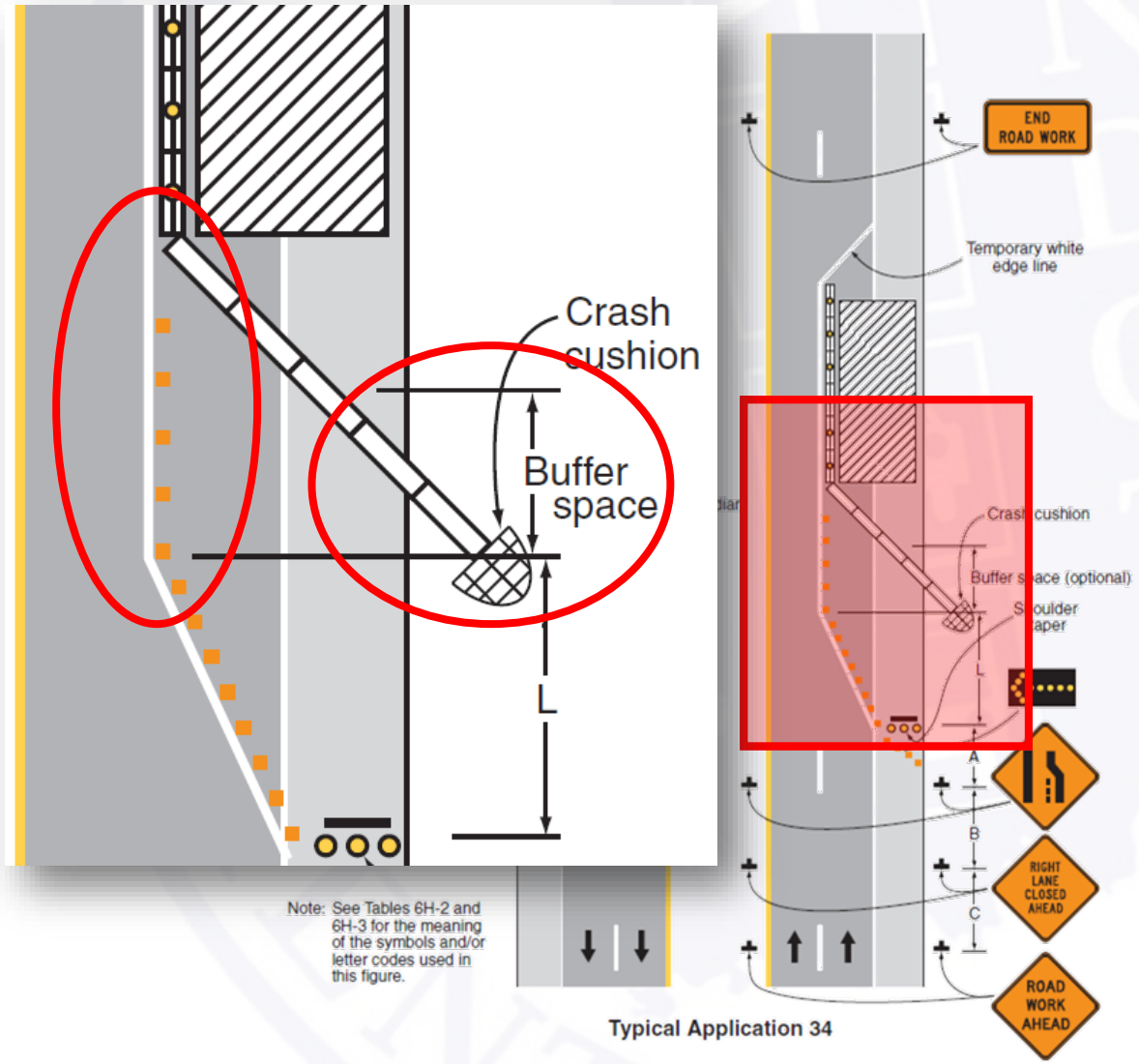
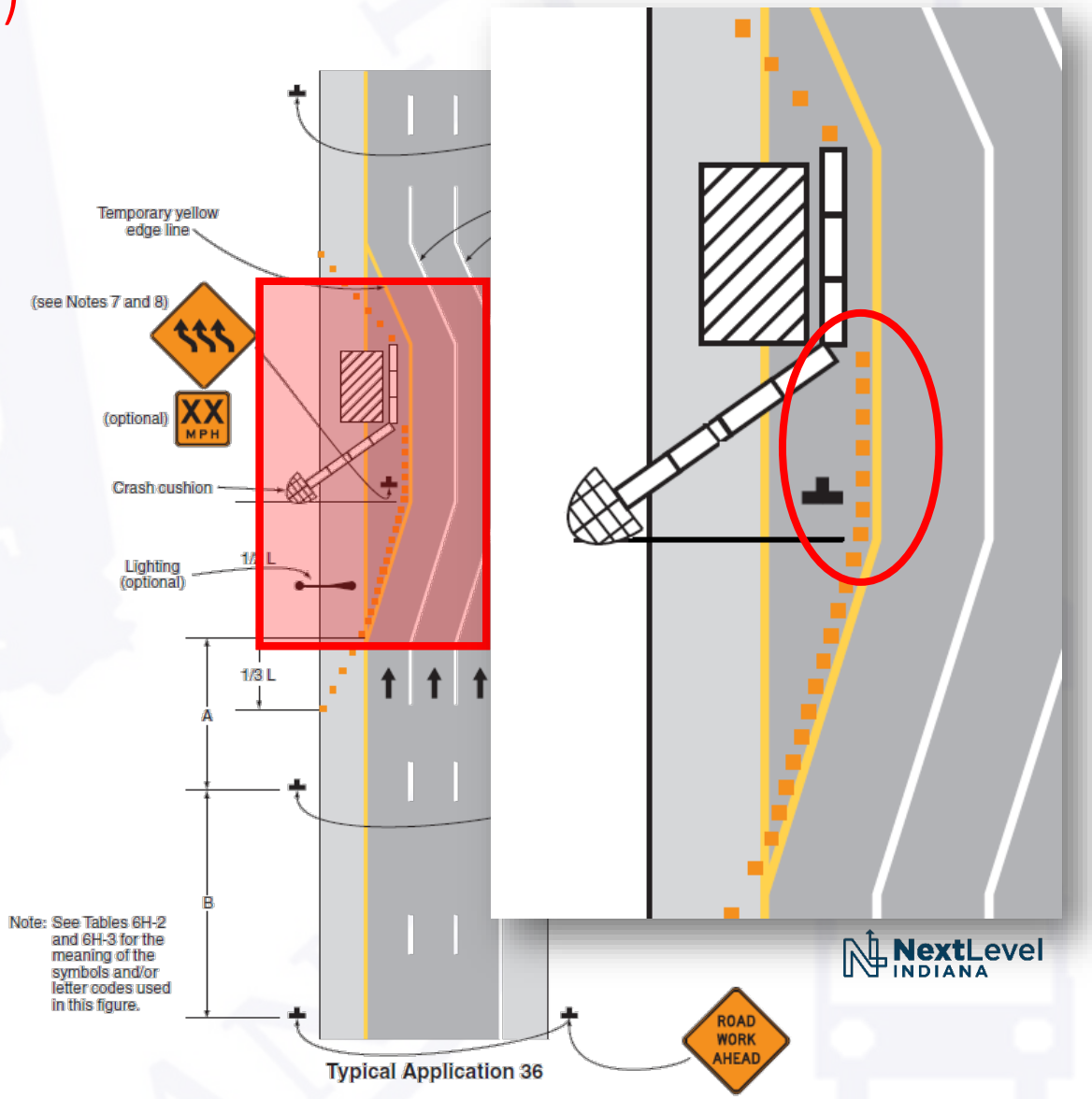
Delineation at Temporary Traffic Barrier Flares

- IMUTCD, TA-34 (MERGE) and TA-36 (SHIFT)





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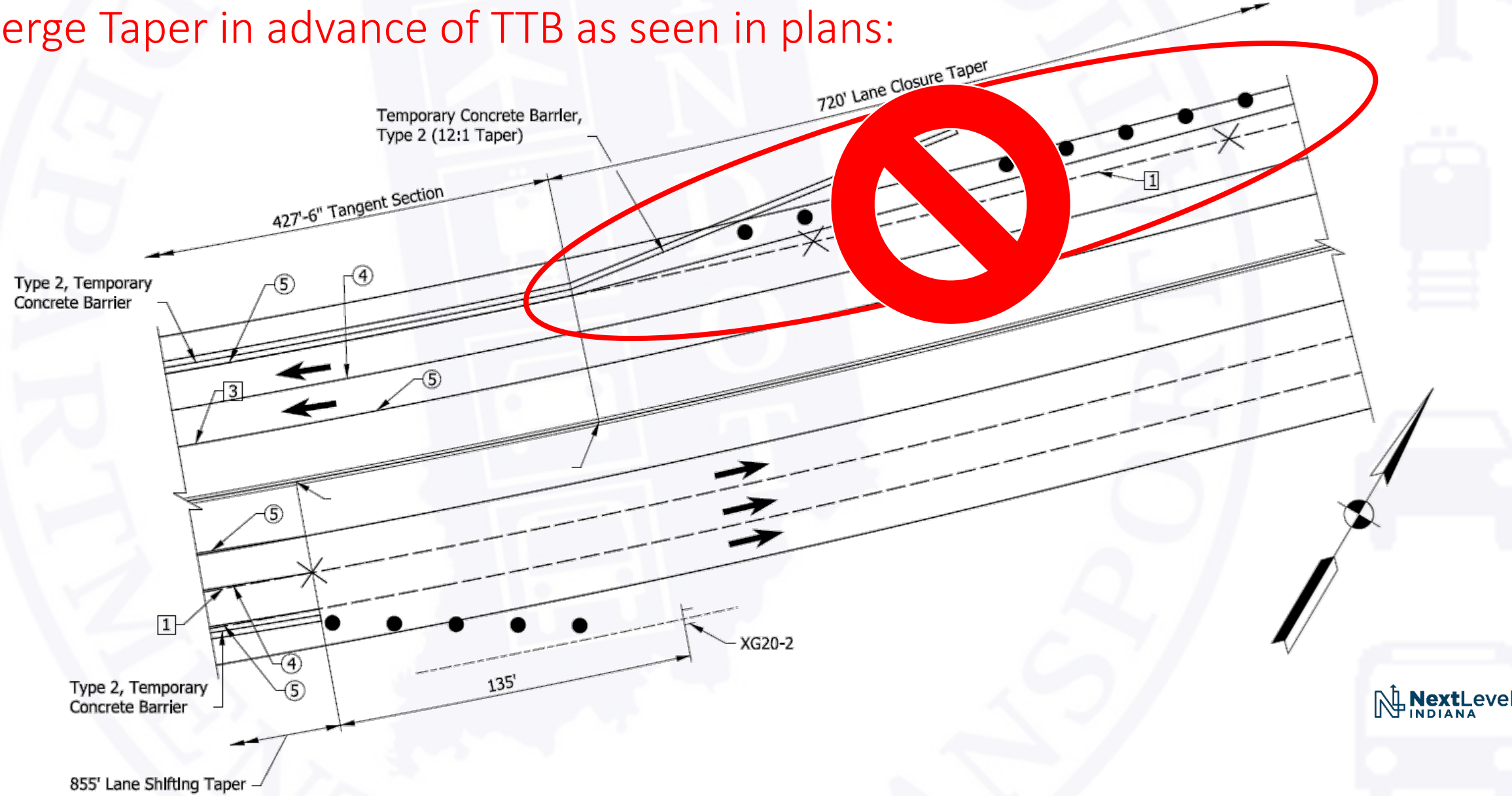
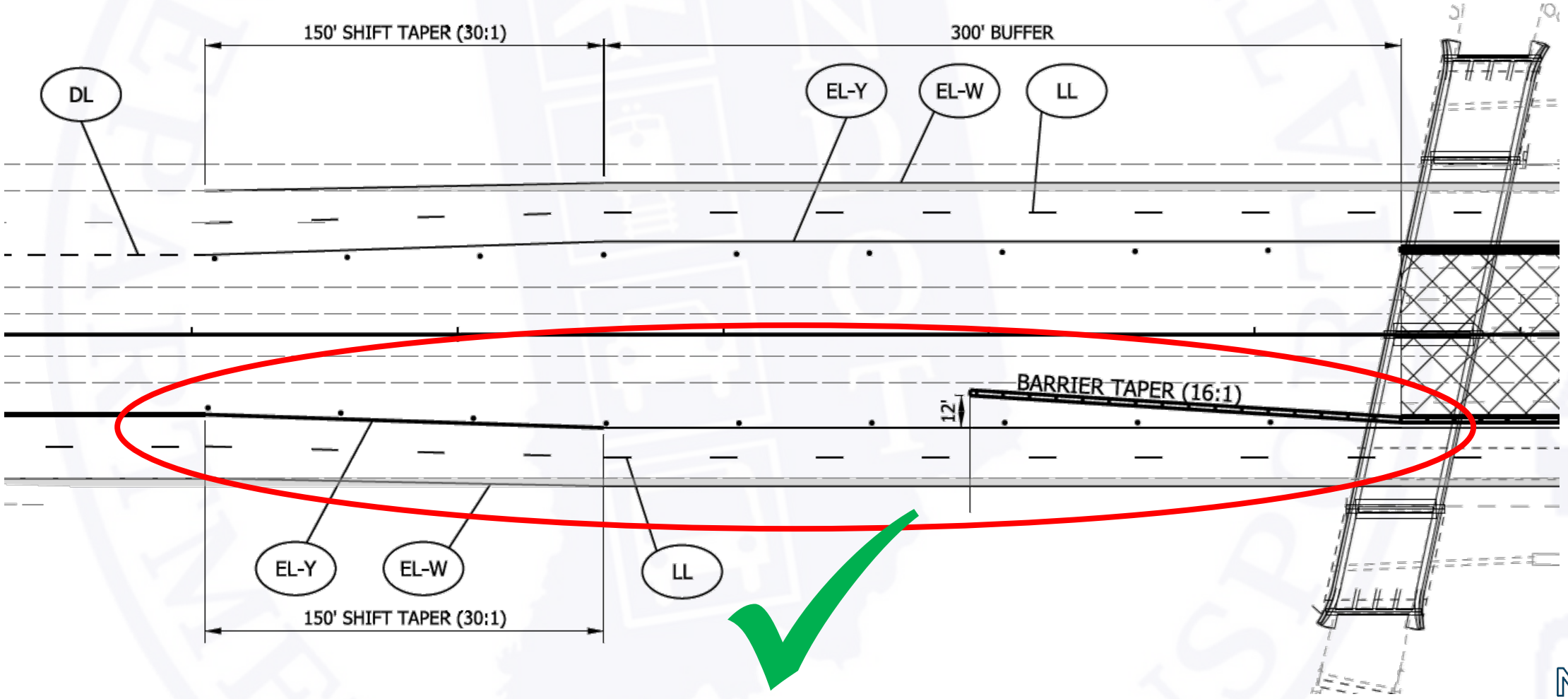
Delineation at Temporary Traffic Barrier Flares

- Merge Taper in advance of TTB as seen in plans:



Delineation at Temporary Traffic Barrier Flares

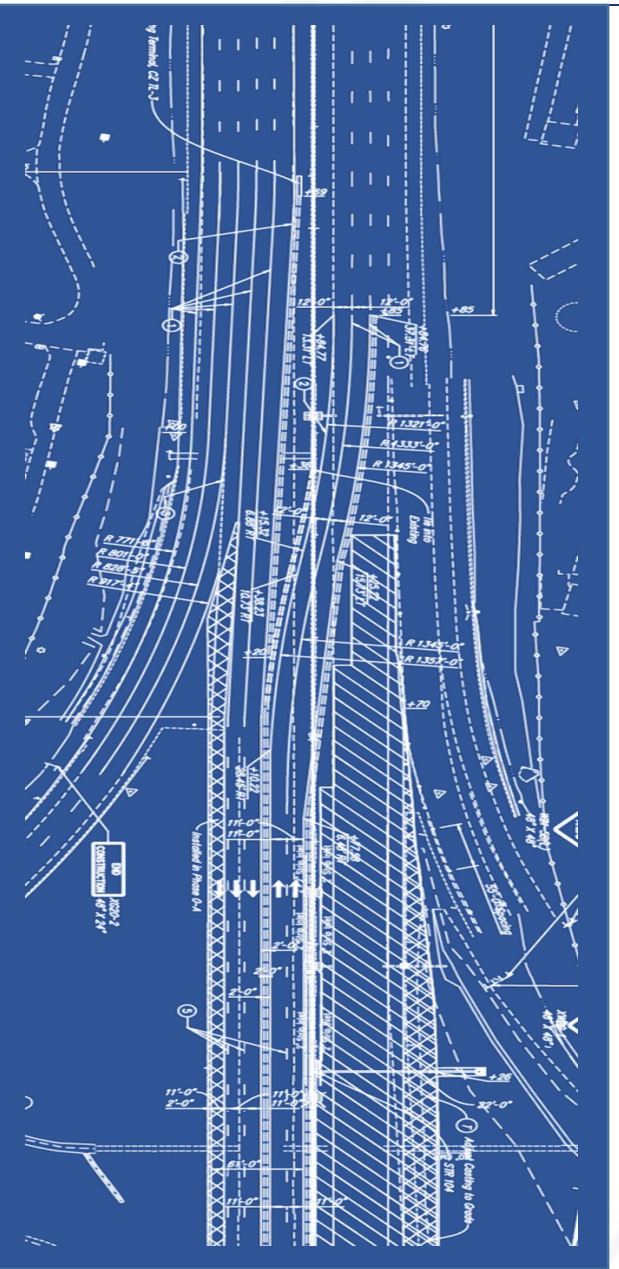
- Lane Shift Taper in advance of TTB as seen in plans:



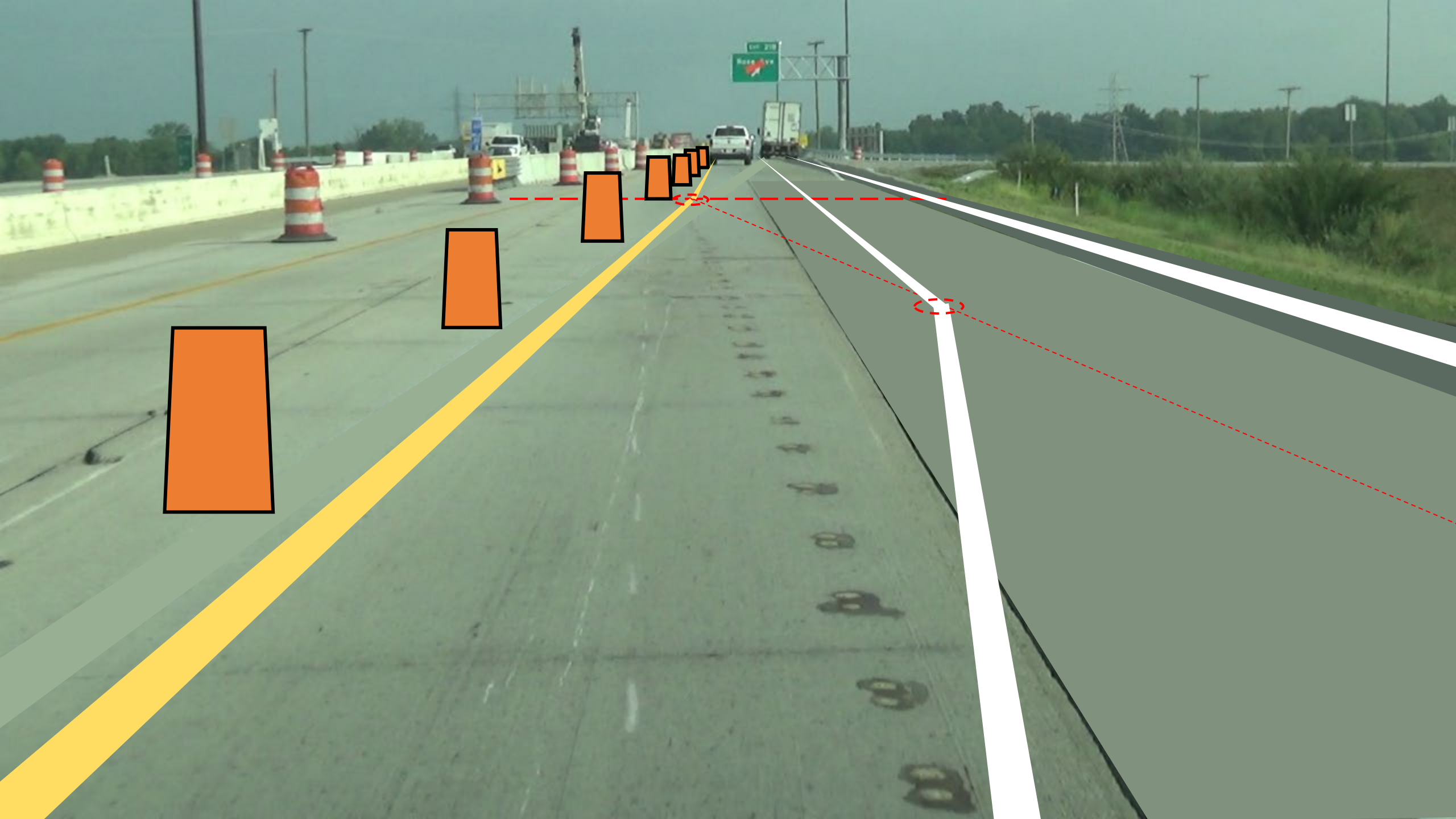
Delineation at Temporary Traffic Barrier Flares

- Lane Shift Taper in advance of TTB as seen in the field:

Plan Development Requirements

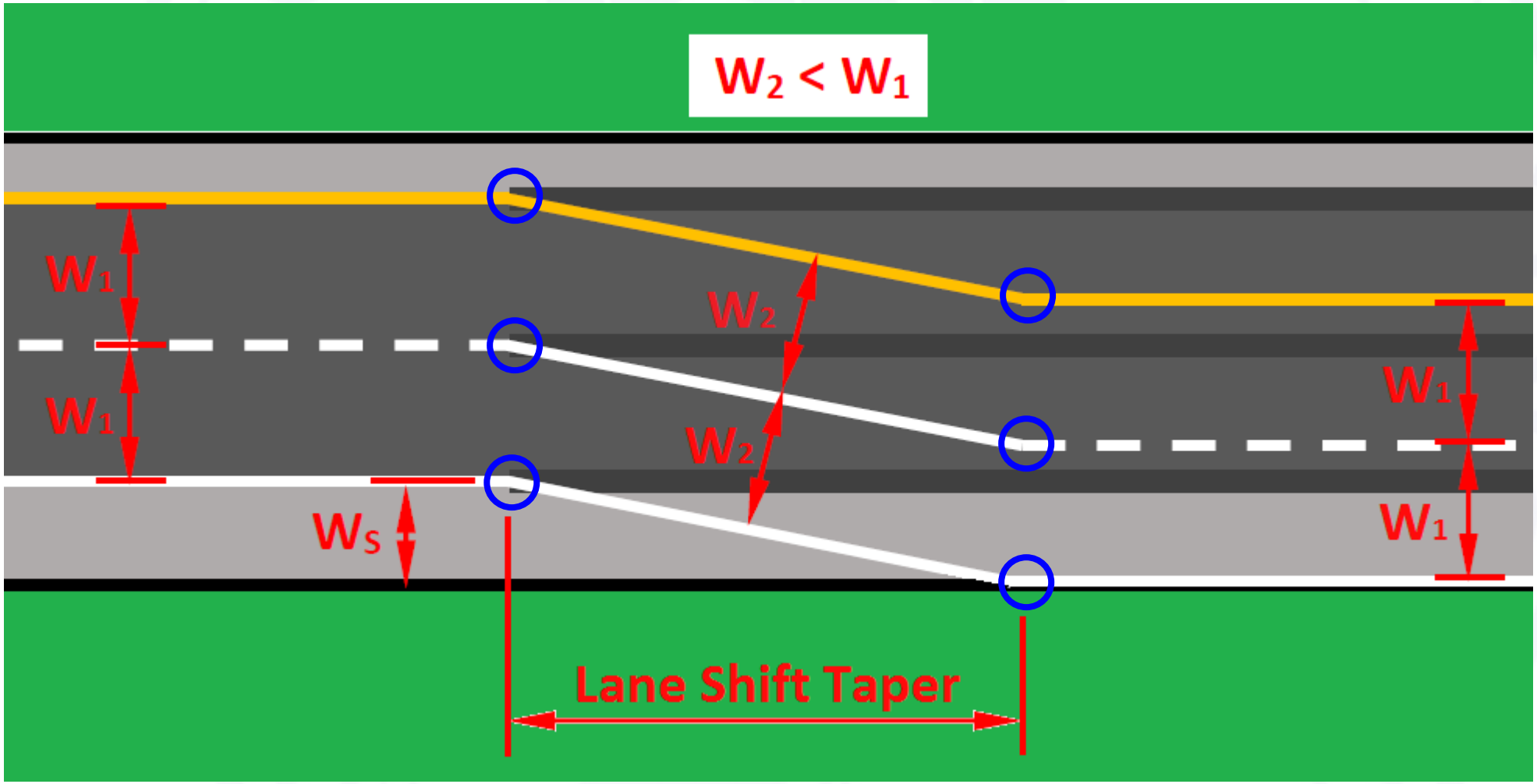


- MOT Plans should include a typical layout and details for critical points
  (e.g., intersections, ramps, or large driveways)
- Layouts should consider the **size** of Temporary Traffic Control (TTC) devices
- Recognize, discuss, and design for the complexities of MOT at critical points
  → Focus of discussion with Area Engineer and District Traffic Engineer during field checks



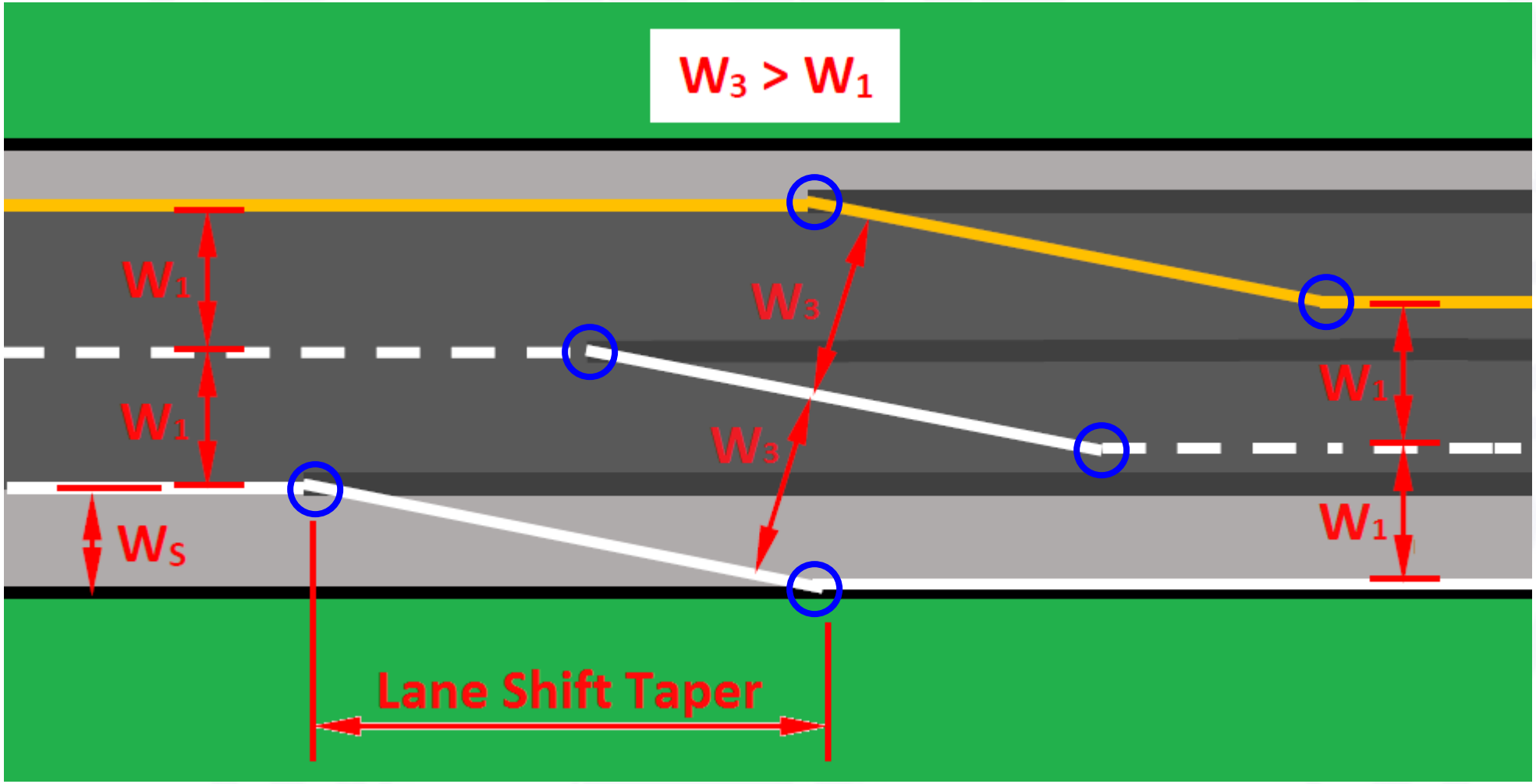
Widen Lanes through Shifts by Staggering the Start

- If all lanes start at same station, lane width decreases through shift!

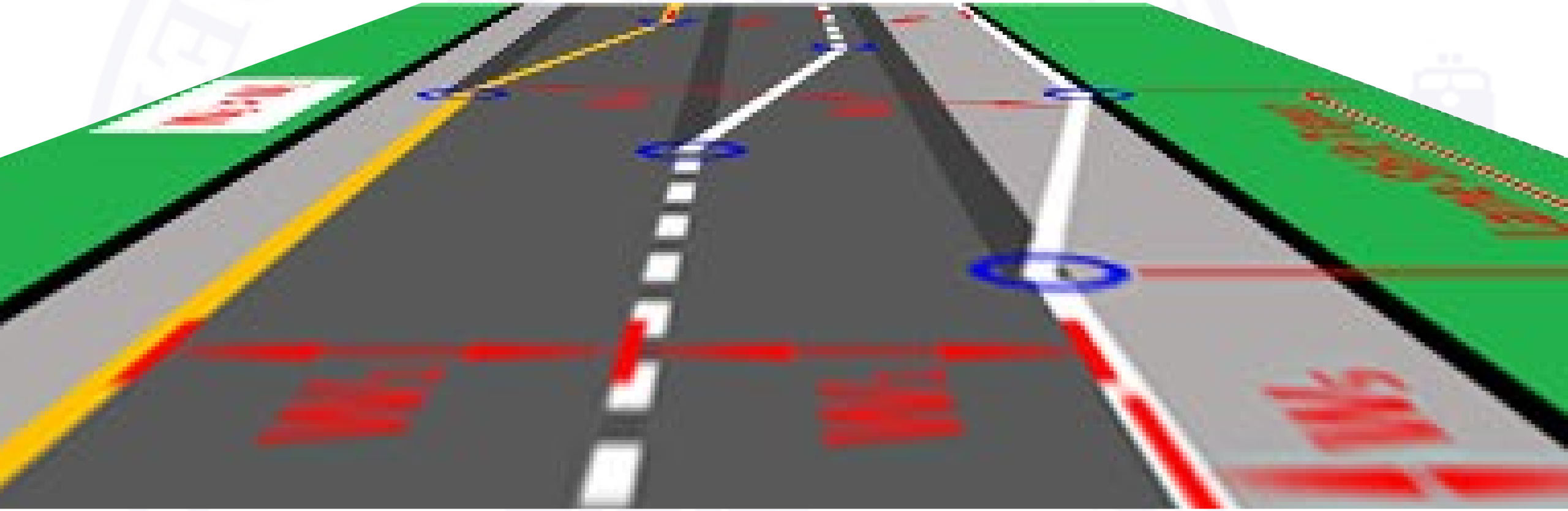


Widen Lanes through Shifts by Staggering the Start

- To ensure wider lanes through shifts, stagger the start of the lane shift lines.



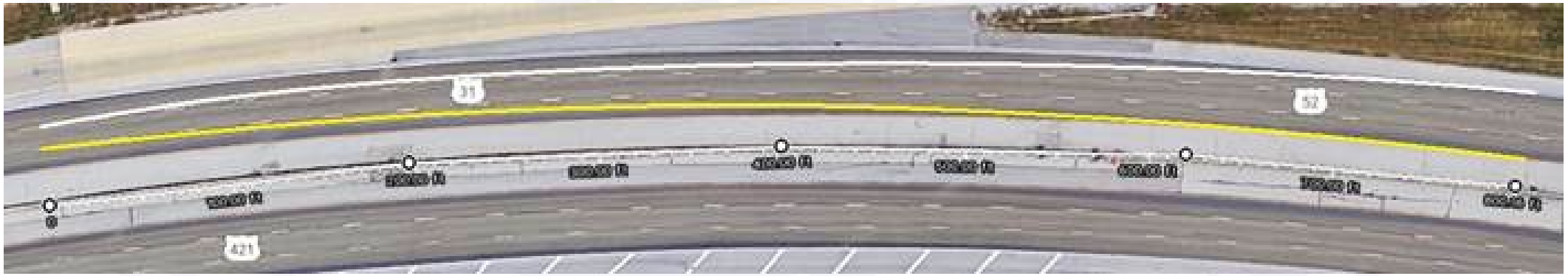
Widen Lanes through Shifts by Staggering the Start



Avoid Merge and Shift Tapers on Horizontal Curves

Clearly, straight line transitions in curves won't work:

Curved linear transitions along a horizontal curve are more difficult to layout correctly also more difficult for a motorist to drive.



White line: right lane closure -OR- Yellow line: left lane closure

Improve Transitions Into and Within the Work Zone

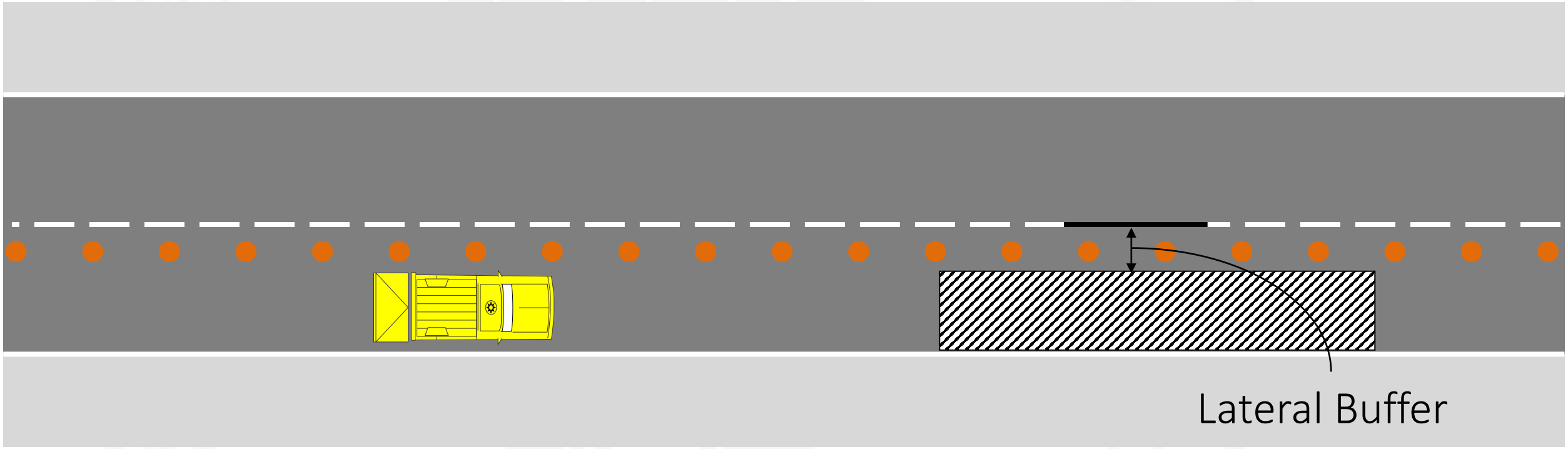
- Use **longer tapers** into the work zone by using the upstream existing Speed Limit.
- Provide the required **sign spacing** for advance signage.
- Provide **longitudinal Buffer Space** based on SSD.
- Provide additional **lane width** through lane shifts by staggering lane lines for multi-lane shifts – NOT LESS!
- Provide additional **lane width** through cross-overs – NOT LESS!
- Provide sufficient **shoulders** (lateral buffer space).
- **Delineate merge and shift tapers** with construction drums and pavement markings – NOT TEMPORARY TRAFFIC BARRIER (TTB)!
- Provide **longitudinal Buffer Space** after merge tapers – ESPECIALLY BEFORE TTB!
- Avoid locating merge and shift tapers on horizontal curves.

NextLevel INDIANA

Realistic Cross Sections & Addressing Shoulders

Provide Realistic Lateral Buffers

- Often plans show idealized work areas and buffers…

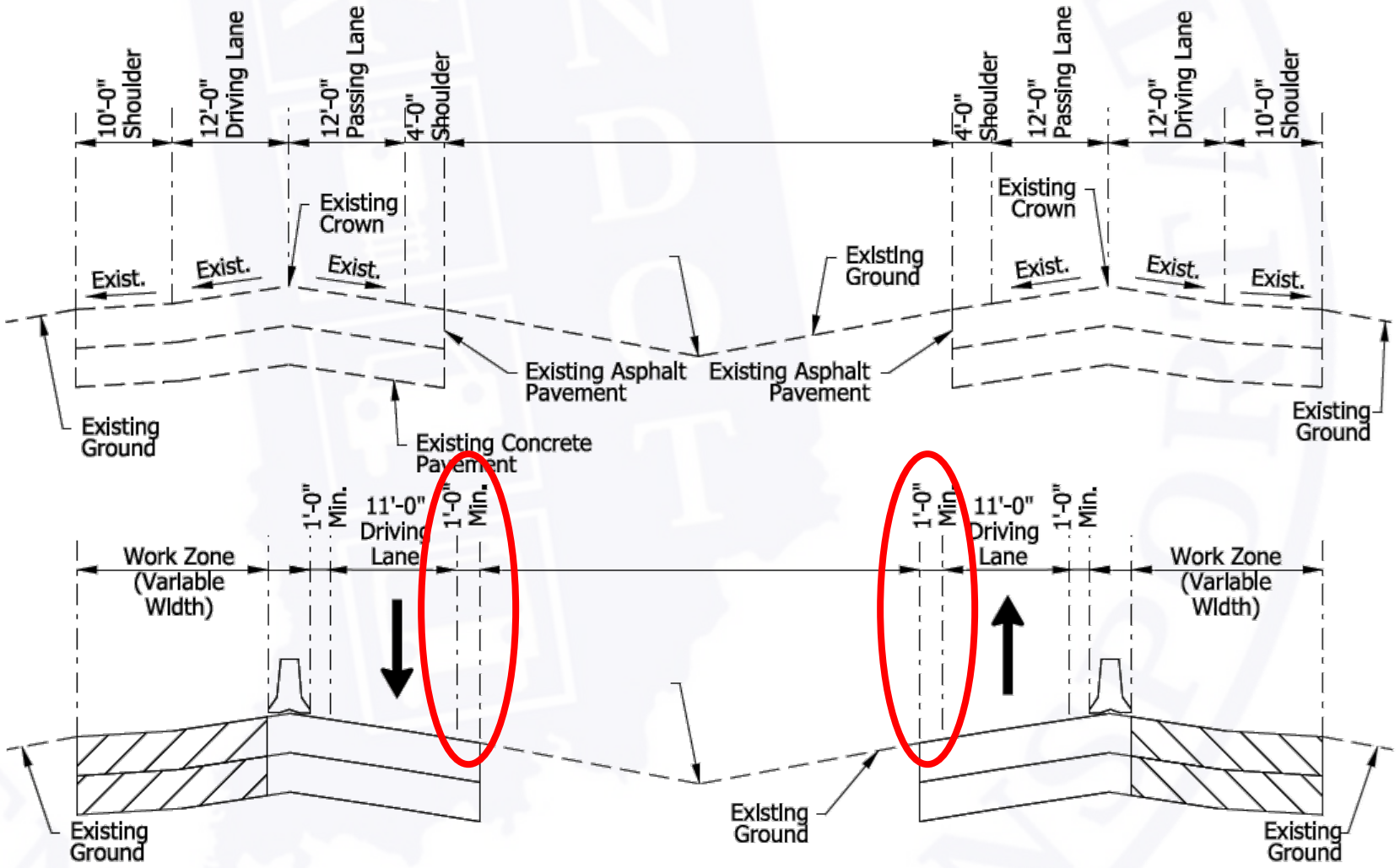


Provide Realistic Lateral Buffers

- But reality often looks quite different…

Realistic Typical MOT Cross Sections

- Typical Sections and MOT Typical Sections for one phase as seen in plans:



Realistic Typical MOT Cross Sections

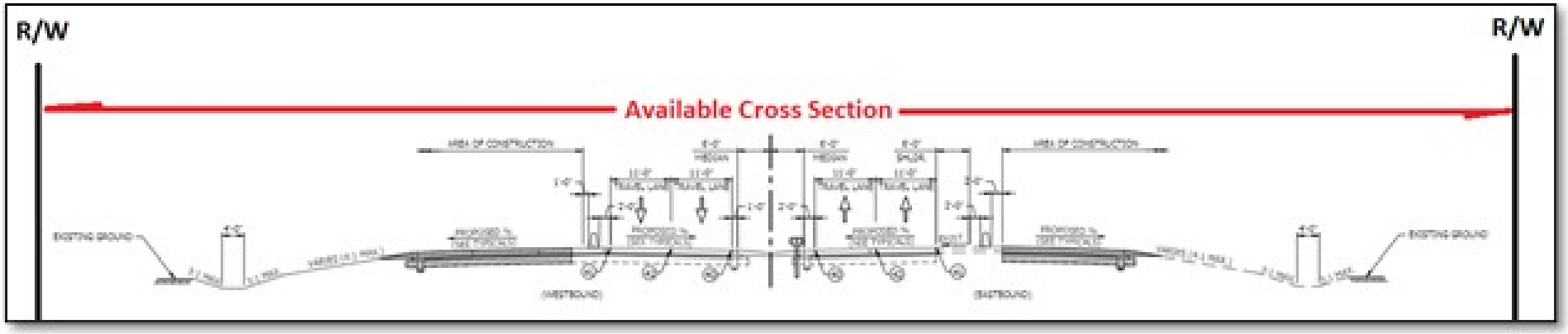
- Actual work zone.
- How was this modeled in terms of IHCP queue analysis?
- Would this require a design exception?

Lane and Shoulder Widths

IDM 503-3.04(02)

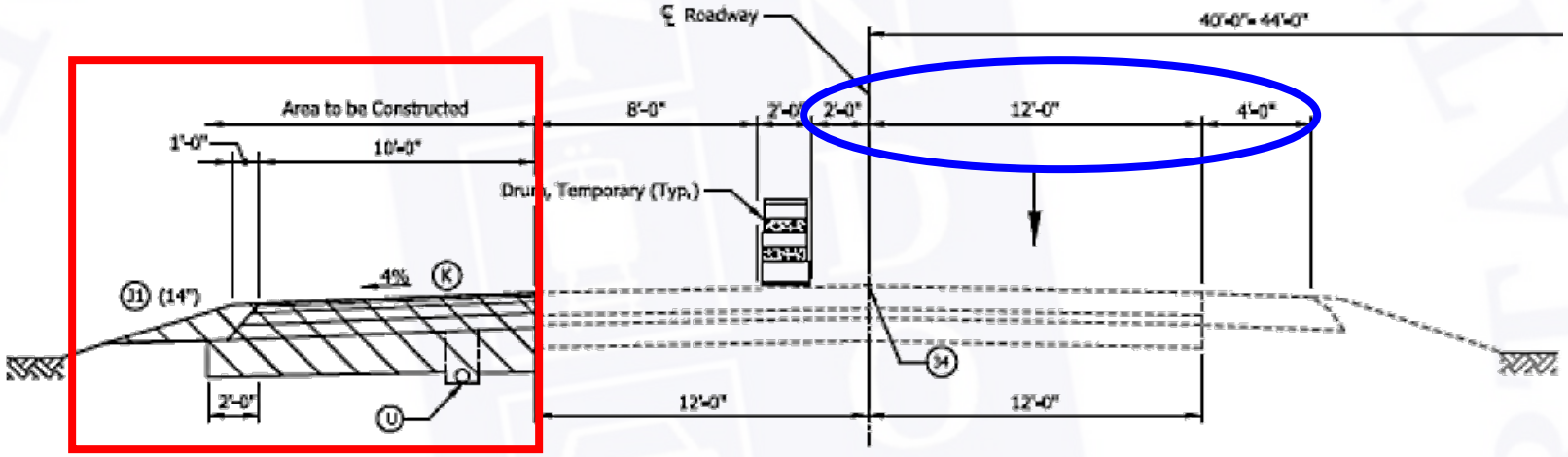
“For a freeway, a minimum 11-ft lane width should be maintained with shoulders or barrier offsets of 2 ft or wider.”

It is only under the condition that the “available cross section” is less than the values indicated in said section, that one may utilize the 1 ft shoulder.



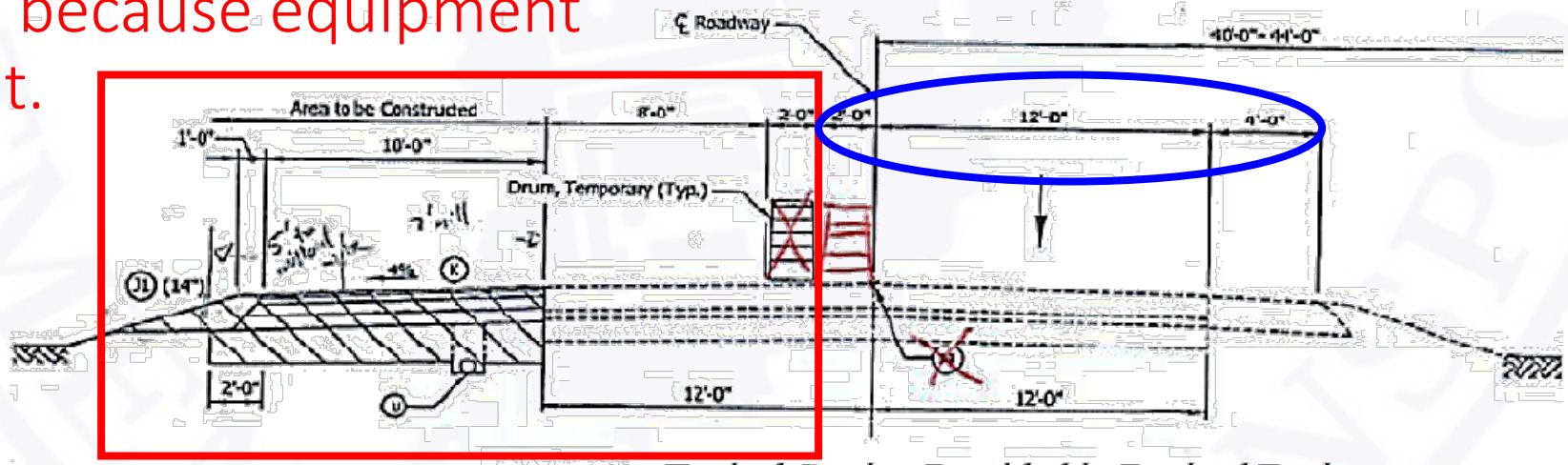
Realistic Typical MOT Cross Sections

- Original plan was to work in 10’ shoulder area, providing 8’ buffer.



PHASE IA Typical Section Provided in Original Design

- Revised because equipment didn’t fit.



PHASE IA Typical Section Provided in Revised Design

NextLevel INDIANA

Realistic Construction Drum Placement

- Actual work zone:

- Construction Drums encroach both work and traffic areas
- Shoulders corrugations were left unaddressed
- Width beyond corrugations is narrow (no widening)
- Potential for generating unanticipated queuing
- Potential for overturned trucks

Take Care of Existing Shoulders

- Address existing shoulder corrugations
- Strengthen existing shoulder used as temporary pavement

  → Don’t rely on signage to keep trucks off existing shoulders
- Provide sufficient shoulder width beyond travel lane

  → Especially in tight situations where there is TTB on left but no barrier on right

NextLevel INDIANA

Address Edge Line Rumble Strips

- Remove Edge Line Rumble Strips When Appropriate
- Consider replacing shoulders with full depth pavement for cases where MOT plans required traffic flow on shoulders.
  - Allow traffic to straddle right Edge Line Rumble Strips while rebuilding left shoulder as 1st Phase.
- Consider wider shoulders to help trucks stay on the road.

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NextLevel INDIANA