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## Traffic Engineering Instructions (TEI)

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**Approved:** 
**APPROVED**  
*By Ian Degutis at 10:51 am, Jan 31, 2020*
 **Date:** \_\_\_\_\_  
 Ian Degutis, PE PTOE  
 Traffic Operations Engineer

**Subject:** Guidance to Establishing a Temporary Speed Limit Reduction within the Work Zone

**Administrative Information:**

<b>Effective Date:</b>	TEI 20 - 603 shall be effective from the date of approval.
<b>Superseded TEI:</b>	TEI 16 - 603
<b>Exceptions:</b>	Not Applicable
<b>Disposition of TEI Content:</b>	The content of TEI 20 - 603 will be incorporated into future revisions to the Vermont Agency of Transportation Standard Drawings, Agency Design Manuals and/or other applicable design guidance documentation.

**Purpose:**

The purpose of this document is to provide a uniform guideline outlining the proper layouts and procedures for implementing work zone speed limits.

**Implementation:**

The content of TEI 20 - 603 is to be implemented immediately for all projects in which a temporary speed reduction is being considered.

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## Introduction

Safety in maintenance and construction work zones is an area of emphasis for the Vermont Agency of Transportation (VTrans). It is a key component of the Strategic Highway Safety Plan. Therefore, many improvements concerning work zone safety are being implemented. One of these improvements is the increased use of speed limit reductions and enforcement to control vehicle speeds throughout work zones on Vermont highways. Proper and consistent application of these speed reductions should improve the safety of the highway worker, as well as the traveling public.

## Purpose

The purpose of this document is to provide uniform guidance for the proper application of temporary speed limits for work zones on the State Highway System. This guide outlines the proper layouts and procedures for implementing work zone speed limits primarily for use by VTrans personnel.

**This guidance is not intended to be a standard and should not substitute for the exercise of good engineering judgment nor the determination by contractors of the appropriate manner and method of construction on projects under their control. It is the user's obligation to make sure that he/she uses the appropriate practices.**

## Overview

Studies that VTrans has conducted have shown that vehicle speeds can be reduced by the placement of reduced speed limit signs and the presence of active enforcement within a work zone. A temporarily reduced work zone speed limit should not be considered a "cure-all" for work zone safety problems, but only a tool, which can be used as part of the overall project's traffic control plan. Advisory speeds should be considered prior to establishing a regulatory work zone speed limit. Studies have shown a high level of compliance with advisory signs and that there is little difference in traffic performance between regulatory and advisory signage.

Work zones should be designed so that the existing speed limit can be safely maintained wherever possible. Speed limit reductions in work zones should only be used when necessary and should be appropriate for the conditions or restrictive features that are present. They should not be implemented on all projects; nor for longer periods of time than they are warranted. The safest work zone is one that minimizes the worker and motorist crash probability and does not present roadway conditions that violate driver expectations: temporarily reducing the speed limit in the construction zone is only one of the many traffic control techniques that can be used to safely guide the motorists through highway work zones.

## Speed Management and Driver's Perception

Speed limit reductions in work zones are most effective when drivers perceive the need to slow down and when there is regular active law enforcement of the work zone speed limit. When no work zone conditions are present, or there is no apparent need to reduce speed, most motorists only slightly decrease their speed downstream of the work zone speed limit signs as they travel through the work zone. Therefore, leaving reduced work zone speed limits in place when conditions do not warrant leads to high levels of non-compliance, and a disregard for the speed limits.

The safest work zone is one that minimizes the worker and motorist interaction/exposure and does not present roadway conditions that violate driver expectations. This safe environment is created by properly installed and maintained traffic control devices, methods that follow the Manual on Uniform Traffic Control Devices (MUTCD), State Standards, State Specifications and sound engineering principles and practices.

## Selecting and Authorizing Speed Limit Reductions in Work Zones

Speed reduction in work zones may be proposed by the designer during the development of the Work Zone Traffic Control Plan or by the Resident Engineer during Construction. Contractors who develop their own traffic control plans may request a reduced speed limit through the Resident Engineer. The Vermont Traffic Committee has delegated its statutory authority to set speed limits to allow the Secretary of Transportation, who has further delegated the authority

to approve and certify Temporary Speed Limits on Interstate, State or U.S. Highways to the Director of Project Delivery Bureau or the Director of Construction & Maintenance Bureau or the District Transportation Administrator per Rule Number CVR-14-053-003.

For enforcement and legal claims, it is necessary to accurately document the application of all regulatory speed limits in work zones. A speed certificate, signed by one of the above-listed delegates, needs to be on file with the Traffic Operations section, and the installation and removal of signs needs to be documented thoroughly. This documentation should accurately describe sign locations, the direction of travel, dates/times the signs were installed and removed, and the speed limit being posted. The sign locations should be referenced to physical features of the roadway, such as the distance from an intersection or reference (milepost) marker. It is suggested that a consistent method of documentation be adopted, so these records may be used to establish the existence of the speed limit.

### **Methods of Reducing Speeds (Refer to the attached flowchart.)**

Design approaches that reduce work duration, decrease the number of work stages, and maintain traffic in long-term work zone configurations can eliminate the need for a regulatory speed limit reduction. Where work zone design applications cannot mitigate the condition, an *Advisory Speed*, *Continuous Speed Limit* or an *Intermittent Regulatory Speed Limit* may be considered. The accompanying flow chart should assist in determining the need for a work zone speed reduction for your construction project. Below are explanations for each of the types of speed reductions that can be used.

#### **A) Advisory Speed signs in the Work Zone**

*Advisory Speeds* are not enforceable by law but are intended to give the motorist warning where the driver encounters work zone conditions (such as rough road, bumps, or a temporary alignment) for which a reduced speed is recommended. A sign warning of the actual condition with an appropriate advisory speed is installed, reduce their speed to safely navigate the work zone. The *Advisory Speed* plaque is intended to only supplement warning signs and is not intended to be used as a standalone device. When used, warning signs with speed advisory plaques identify the speed motorists are recommended to use to safely negotiate a hazardous highway condition. Motorists will typically reduce their speed if they clearly perceive a hazard.



**ADVISORY SPEEDS SHOULD BE THE FIRST CONSIDERATION WHEN ESTABLISHING SPEED LIMITS IN ANY WORK ZONE.**

Use of warning signs with speed advisories should be determined as part of the traffic control plan within the approach sign package to the activity area of the work zone. Once installed, the work zone site should be test driven by a qualified representative of the Contractor or VTrans' employee or their qualified representative to confirm that the *Advisory Speed* is set at a reasonable value for the condition being warned. An *Advisory Speed* plaque (W13-1P) is further detailed in Part 6 of the current MUTCD. For consistency, *Advisory Speeds* work well on bump signing often used for bituminous mill and overlay projects. Although *Advisory Speeds* are usually used to alert motorists to hazards to themselves, there is one special *Advisory Speed* in which this is not the case. The *Advisory Speed (Worker)* is used to alert motorists to workers ahead and is used in conjunction with the "Worker Ahead" W21-1 warning sign. The *Advisory Speed (Worker)* is meant to be used only at spot locations. Additional signs may be used in very long work zones where multiple workstations exist to remind approaching motorists that they are approaching workers within the highway right-of-way.

Because *Advisory Speeds* are not considered enforceable speed limits, a speed certificate is not required to establish an *Advisory Speed*. However, a motorist exceeding an advisory speed could still be cited under the basic speed rule (i.e., driving too fast for the prevailing conditions). There are six methods for establishing advisory speeds for horizontal curves. These advisory speeds should be determined based on free-flowing traffic conditions. Because changes in conditions, such as roadway geometrics, surface characteristics, or sight distance, might affect the advisory speed, each work zone location should be evaluated specifically or when site

conditions change. Refer to the tables in Part 2 of the current MUTCD for the recommended or required advisory speed limit sign needs based on the difference between the existing speed limit and the determined advisory speed from one of the preferred methods.

### B) Continuous Regulatory Speed Limit Reduction in the Work Zone

*Continuous Regulatory Speed Limit Reduction in Work Zones* are regulatory speed zones established in long term construction and/or maintenance projects where there are continuous hazards to the motorist. *Continuous Regulatory Speed Limit Reduction in Work Zones* should be used when the roadway construction environment will continuously dictate a reduced speed, and when it is imperative for the motorist to reduce speed in order to safely navigate hazards that cannot be mitigated by design elements (For example placing traffic on temporary alignments that cannot be designed for the existing speed limit, motorist sight distance concerns, or other long-term work zone safety issues to motorists). Since the signs will be posted 24 hours a day, the primary reasons to establish the limit should also be present 24 hours a day. There are several conditions noted below that may warrant *Continuous Regulatory Speed Limits* in the work zone. These hazards still require warning signs, but it is intended that the regulatory speed limit will reduce drivers' speed such that most hazards can be safely negotiated. Severe hazards at spot locations may still require an additional speed advisory to slow the motorist even more. Because *Regulator Speed Limit Reductions* are considered enforceable speed limits, a speed certificate is required to establish a *Continuous Regulatory Speed Limit Reduction*.



Construction conditions that would warrant the inclusion of these types of *Continuous Regulatory Speed Limit Reductions* within a work zone that extends 1 mile or greater include, but are not limited to:

- Diversions
- Lane drops
- Shoulder edge drop-offs
- Narrow lanes
- No shoulder
- Equipment, workers or non-shielded objects in the clear zone
- Major change in alignment
- Temporary guardrail or barrier
- Construction entrances
- Sight distance restrictions
- Poor surface conditions

It should be noted that some of the work zone conditions used to justify reducing the speed limits in work zones (i.e. construction entrances, turning traffic, crash history, etc.) are not adequately perceived by motorists and require additional enforcement to be effective, since motorists are less likely to reduce their speeds voluntarily.

### C) Intermittent Regulatory Speed Limit Reduction in the Work Zone

*Intermittent Regulatory Speed Limit Reductions in the Work Zone* are work zone speed limits intended for use where the hazard requiring a reduced speed limit does not exist continually. Often work areas and workers are adjacent to traveled lane(s) open to vehicular traffic, but the hazard only exists during working hours. This usually occurs in lane closures on multi-lane streets or highways. Work zone speed limits are not to be used on mobile or moving operations, diversions or detours. *Intermittent Regulatory Speed Limit* should not be used when Flagger are used to provide control on a lane closure on two-lane two-way streets or highways. These speed limit signs shall only be posted in the traffic control zone during continuous worker activity while performing construction or maintenance operations. It is critical that the speed limit is only posted when workers are present. Otherwise, misuse of this speed reduction will significantly reduce its effectiveness.



Because *Intermittent Regulatory Speed Limit Reductions* are considered enforceable speed limits, a speed certificate is required to establish an *Intermittent Regulatory Speed Limit Reduction*.



Speed reductions must be applied only where the motorist can perceive the need to reduce their speeds. During periods of no activity or when the traffic controls are removed from the roadway, the speed limit signs shall be covered or removed. This means installing signs at the beginning of a work shift and removing signs at the end of the shift. The speed limit is only in effect when the signs are installed and visible to traffic. The use of *Intermittent Regulatory speed limit* should be determined in advance of their deployment. Generally, posting the work zone speed 10 miles per hour below the existing posted limit is a good beginning point. The work zone site should be reviewed by the contractor or resident engineer to confirm that the reduced speed limit is set at a reasonable value for the activity being performed.

Dynamic Speed Display signs are another way of posting an *Intermittent Regulatory Speed Limit Reduction*. The speed limit is in effect only when the flashing beacons are activated; when turned off the speed limit is not in effect. When the speed limit beacons are not activated, the Radar Speed Feedback sign display should also be turned off. Please refer to the VTrans Engineering Instruction TEI 16-600 Use of Radar Speed Feedback signs within Work Zones for additional information regarding these devices for both post and trailer mounted installations. The *Intermittent Reduced Speed Limit Reduction* **is not intended to be operated continuously 24-hours, 7-days a week continuously posted**. If the conditions warrant a *Continuous Regulatory Speed Limit Reduction*, then the appropriate sign layout for that type of speed reduction should be used and not the *Intermittent Regulatory Speed Limit Reduction*.



*Intermittent Regulatory Speed Limit Reduction* should be used when it is imperative to reduce high speed entry into a work area where the work zone activity necessitates a slower speed entry to provide the workers with an environment with no encroachments into their work space or a way for motorists to safely navigate the temporary traffic controls in place.

Construction conditions that may warrant the inclusion of an *Intermittent Regulatory Speed Limit Reduction* within the work zone include, but are not limited to:

- Bridge painting
- Concrete patching where all lane restrictions (i.e. shifts, merges) are lifted when workers are not present
- Resurfacing
- Guardrail installation
- Panel Sign installation
- Other operations where workers, work vehicles, or materials occupy a travel lane or shoulder only while work is being performed.

*Intermittent Regulatory Speed Limits* shall only be implemented for the specific portion of the work zone where conditions warrant, or restrictive features are present.

### Posting a Reduced Work Zone Speed Limit

The regulatory speed limit reduction signs in a work zone should be placed on stationary posts installed on both sides of the road open to through traffic when erecting the work zone sign package. Signs should not be erected in the closed lane since construction equipment and channelizers may obstruct visibility of the signs. Erect the first sign where motorists are required to reduce their speed and erect confirming speed limit signs as specified in the following chart:

**TYPICAL SPACING FOR REGULATORY  
SPEED LIMIT REDUCTION SIGNS  
IN THE WORK ZONE**

Work Zone Speed Limit	Confirming Speed Limit Sign Spacing
20 – 25 MPH	¼ mile
30 – 35 MPH	½ mile
40 – 45 MPH	¾ mile
50 MPH and greater	1 mile

**Other Considerations**

Although the temporary traffic control measures presented in this guidance are a fundamental and important source of information, other sources for communicating information to the driver should be considered. These additional means include enhanced smart work zones, portable changeable message signs, transverse rumble strips, speed feedback trailers, warning devices, and increased enforcement through management measures such as dedicated enforcement patrols.

Speed limit signs alone do not always reduce vehicle speeds in the work zone. Enforcement for a speed limit reduction must be taken seriously. There should be a commitment to the project contractually to procure and implement enforcement within the project. The need for extra enforcement should be identified early in the project development process.

**Certificate for Construction and Maintenance Work Zone – Form**

For programmed projects under design and construction, the Director of the Project Delivery Bureau, the Director of the Construction & Materials Bureau and the District Transportation Administrator have the authority to approve temporary speed certificates.

The Manual on Uniform Traffic Control Devices recommends 10 mph reduction in speed for work zones where conditions or restrictive features exist. A reduction of more than 10 MPH in the speed limit should be used only when required by restrictive features in the work zone. The speed should be stepped down in advance of the location requiring the lowest speed. Note that the individual requesting the temporary speed limit is responsible for the circulation of the document for the required approval signatures and the distribution of the completed document (per e-mail). The applicant will then send the Operations and Safety Bureau a copy of the signed original document during the distribution process. (An e-signed document is acceptable). A hard copy is then stored in the official temporary speed limit paper files for the Agency.

<https://vermontgov.sharepoint.com/sites/VTRANS/VTransIntranetHome/Highway/Ops/TSMO/Shared%20Documents/Forms/AllItems.aspx>

Certificate for Construction and Maintenance Work Zone

STATE OF VERMONT

CERTIFIED STATEMENT DESIGNATING A TEMPORARY  
SPEED LIMIT ON THE INTERSTATE, STATE OR U.S. HIGHWAY SYSTEM

*In accordance with Title 23, Vermont Statutes Annotated, Section 1006a, a temporary speed limit is hereby designated for the section of highway described below.*

Project or Town Name: \_\_\_\_\_

Project Number (if Applicable) \_\_\_\_\_

Route No. \_\_\_\_\_

Current Posted Speed Limit \_\_\_\_\_

Proposed Temporary Speed Limit \_\_\_\_\_

Approximate Mile Points **SEE ATTACHED LIST**

Anticipated Dates From \_\_\_\_\_ Thru \_\_\_\_\_

Requested by \_\_\_\_\_ Date \_\_\_\_\_

*The official signs designating the foregoing speed limit will be erected and removed as directed by the Agency of Transportation. The temporary speed limit will be in effect when the related signs are posted. Removal or covering of the signs by the Agency shall return the speed limit to its previous status. The anticipated from/thru dates indicated may be extended thirty days without a new certificate.*

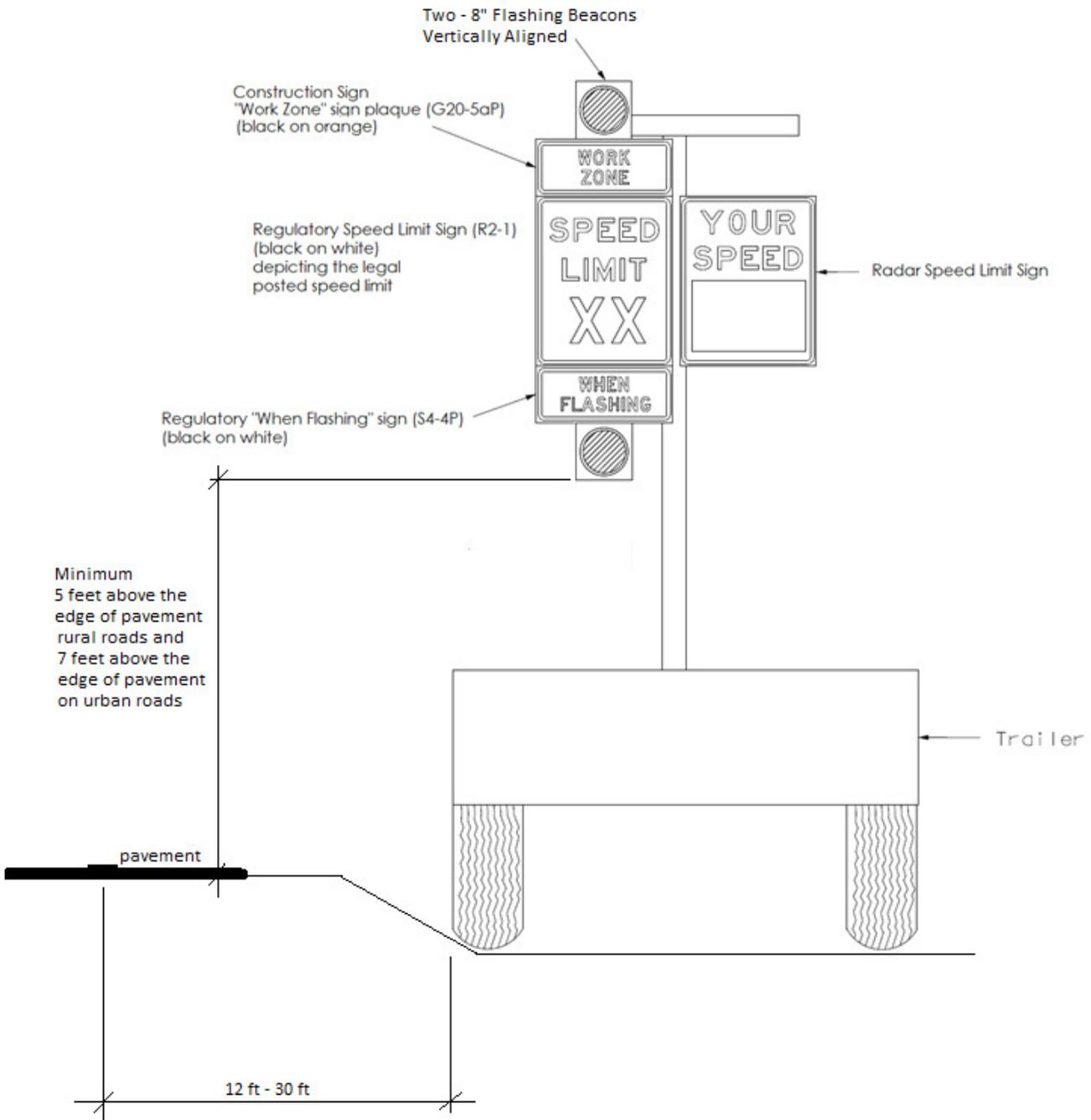
Approved by \_\_\_\_\_ Date \_\_\_\_\_

Title Director of Project Delivery Bureau or  
Director of Construction & Materials Bureau or  
District Transportation Administrator

Original to: Ian Degutis, Traffic Operations Engineer

- Copy to: \*\*, Field Force Commander, Dept. of Public Safety  
\*\*, Dept. of Public Safety  
\*\*, Dept. of Public Safety  
\*\*, DMV Commercial Enforcement Unit  
\*\*, Construction Section  
\*\*, Regional Construction Engineer  
\*\*, District Transportation Administrator # \_\_\_\_\_  
\*\*, (Requestor, Title)

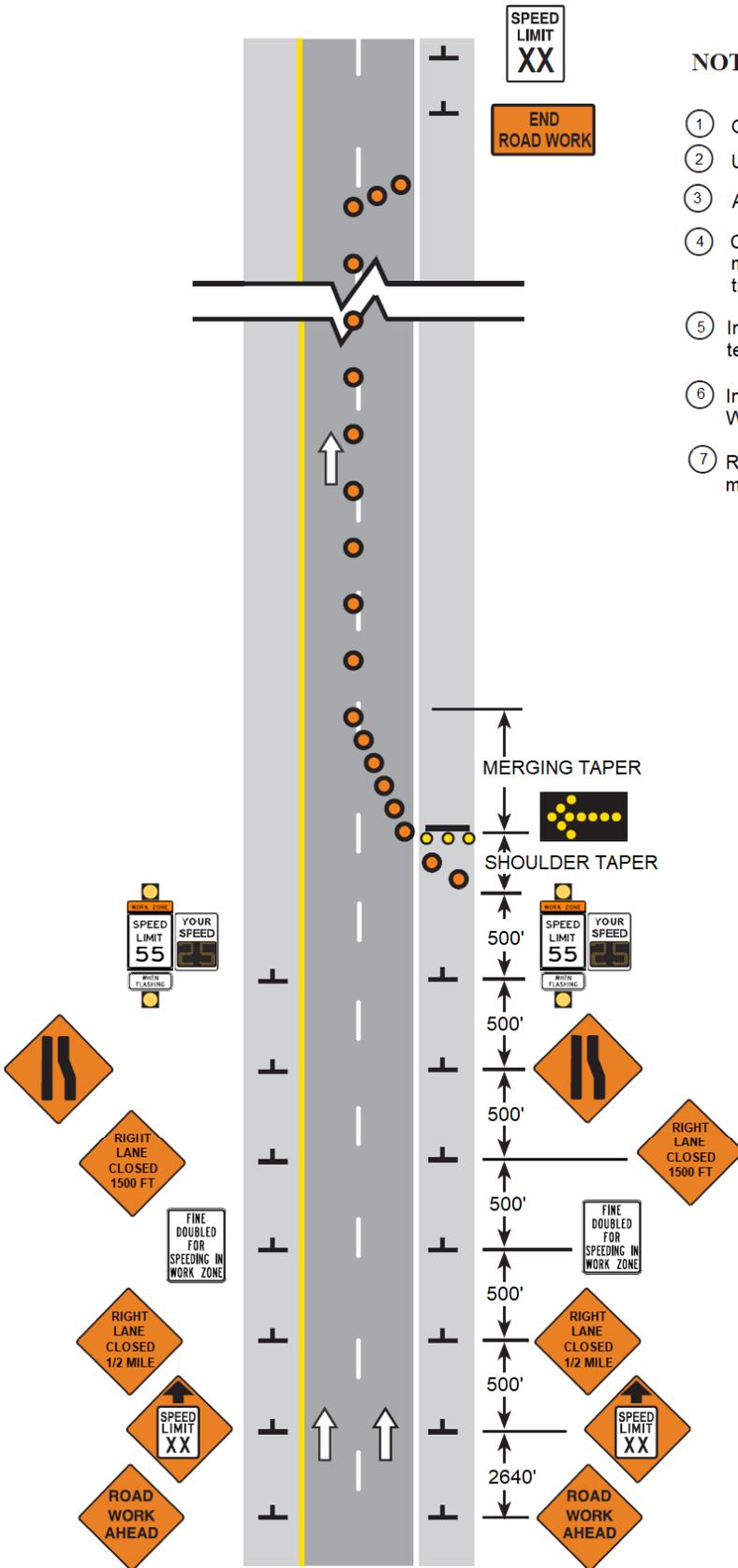




Automated Trailer Mounted Speed Limit Sign  
 note: not to scale

**NOTES:**

- ① Obtain a signed and approved Temporary Speed Certificate.
- ② Use appropriate traffic control layout for site specific conditions.
- ③ All conflicting speed limit signs shall be removed or covered.
- ④ Confirmation speed limit signs to be installed every one to two miles to remind motorist of the maximum speed they should be traveling within the work zone.
- ⑤ Install an END ROAD WORK sign 500 feet downstream of the termination area or as determined by engineering judgement.
- ⑥ Install a resumed speed limit sign 500 feet after the END ROAD WORK sign for motorist to resume to normal traveling speeds.
- ⑦ Refer to State Standard Drawings T-1, T-11, T-12, and T-31 for more information.



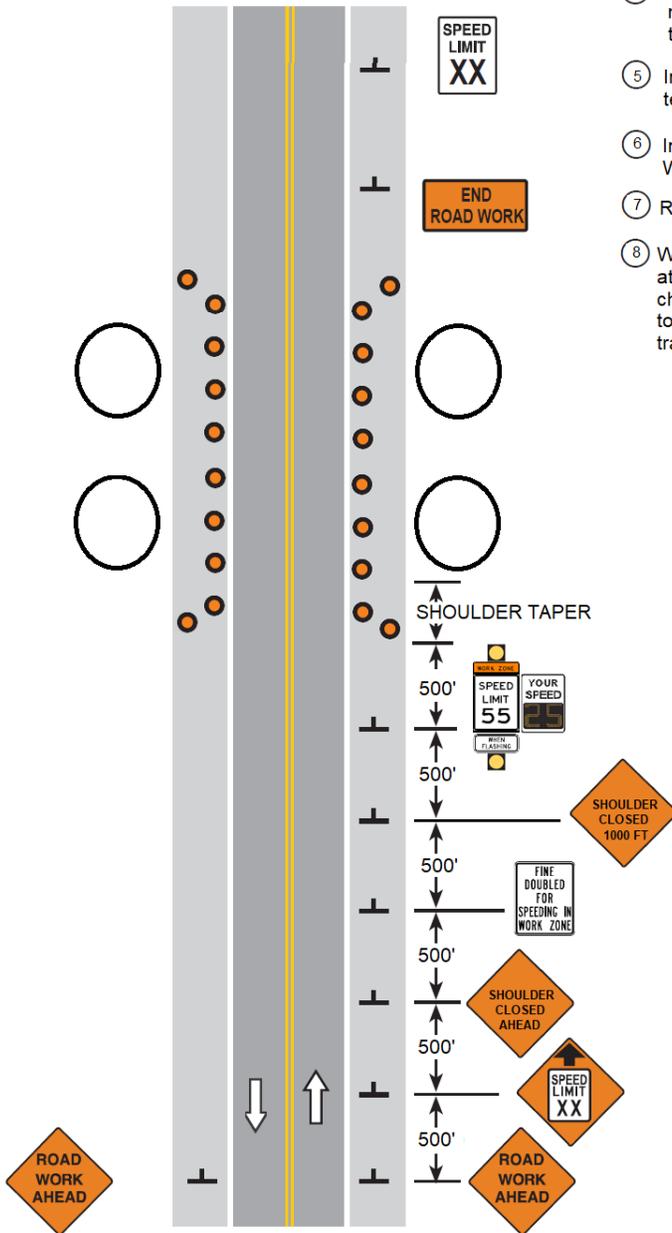
● - Retroreflective channelizing device.

VTrans Speed Reduction in the Work Zone Guidance	Intermittent Speed Limit Reduction Sign Layout Construction Signing for Divided Highway	Layout 1
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**NOTES:**

For clarity signs are shown only in one direction of travel. Both directions of travel will require signs.

- ① Obtain a signed and approved Temporary Speed Certificate.
- ② Use appropriate traffic control layout for site specific conditions.
- ③ All conflicting speed limit signs shall be removed or covered.
- ④ Confirmation speed limit signs to be installed every one to two miles to remind motorists of the maximum speed they should be traveling within the work zone.
- ⑤ Install an END ROAD WORK sign 500 feet downstream of the termination area or as determined by engineering judgement.
- ⑥ Install a resumed speed limit sign 500 feet after the END ROAD WORK sign for motorists to resume to normal traveling speeds.
- ⑦ Refer to State Standard Drawings T-1 and T-31 for more information.
- ⑧ When paved shoulders having a width of 8 feet or more are closed, at least one advance warning sign shall be used. In addition, channelizing devices shall be used to close the shoulder in advance to delineate the beginning of the work space and direct vehicular traffic to remain within the traveled way.

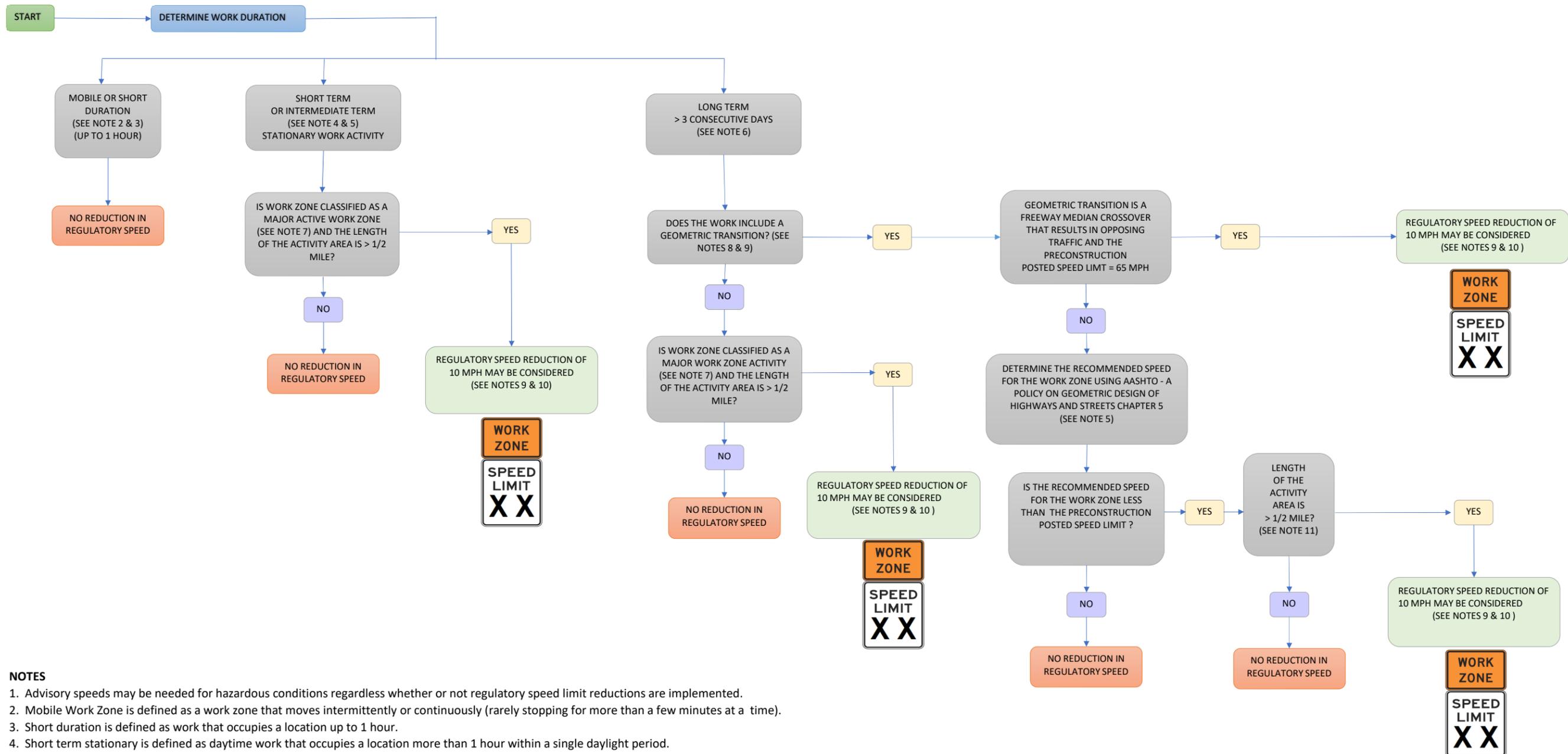


● - Retroreflective channelizing device.

VTrans Speed Reduction in the Work Zone Guidance	Intermittent Speed Limit Reduction Sign Layout Construction Signing for Two-lane Highway	Layout 2
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# WORK ZONE - TEMPORARY SPEED LIMIT REDUCTION FLOW CHART

\* Regulatory speed reductions are not warranted and should not be used where the work zone consist solely of a shoulder closure.



## NOTES

1. Advisory speeds may be needed for hazardous conditions regardless whether or not regulatory speed limit reductions are implemented.
2. Mobile Work Zone is defined as a work zone that moves intermittently or continuously (rarely stopping for more than a few minutes at a time).
3. Short duration is defined as work that occupies a location up to 1 hour.
4. Short term stationary is defined as daytime work that occupies a location more than 1 hour within a single daylight period.
5. Intermediate term is defined as more than 1 daytime period up to 3 consecutive days, or nighttime work lasting more than 1 hour.
6. Long-term is defined as a work zone that occupies a location more than 3 consecutive days.
7. A "Major Work Zone Activity", is defined as a stationary work zone having a duration exceeding 4 hours and unprotected workers on foot are within the roadway, who are not predominantly separated from traffic by positive protection.
8. A geometric transition is defined as a change in the existing horizontal or vertical alignment of the travel lane. A lane shift or lane closure is not considered a geometric transition when appropriate taper lengths are provided.
9. Work zone geometric transitions, sight distance, lane width, and super elevation should meet or exceed applicable state and federal design standards in order to minimize speed differential of vehicles entering the work zone. The basic safety principals governing the design of permanent roadways should also govern the design of temporary traffic control zones. The goal should be to route users through such zones using roadway geometrics and roadside features and temporary traffic control devices as nearly as possible to normal highway situations.
10. The speed limit should not be reduced more than 10 MPH below the preconstruction posted speed limit, unless an engineering study indicates the geometric conditions warrant a greater speed limit reduction. The speed limit reduction should be design in accordance with the 2009 Manual on Uniform Traffic Control Devices and its latest revisions, Section 6C.01 Temporary Traffic Control Plans. The District Transportation Administrator (DTA), Director of Construction & Materials Bureau, Director of Project Delivery Bureau, or their designee will be responsible for approving all work zone temporary speed limits.
11. Regulatory zones less than ½ mile in length are not considered warranted or affective.

This guidance is not intended to be a standard and should not substitute for the exercise of good engineering judgment by engineers nor the determination by contractors of the appropriate manner and method of construction on projects under their control. It is the user's obligation to make sure that he/she uses the appropriate practices.