

**Traffic Engineering Instructions (TEI)**

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**Approved:** APPROVED  
By Joshua Schultz at 2:34 pm, Dec 18, 2018 **Date:** \_\_\_\_\_  
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Director of Operations and Safety Bureau

**Subject:** VTrans Quality Standards for Temporary Traffic Control Devices

**Administrative Information:**

**Effective Date:** TEI 18 - 605 shall be effective from the date of approval.

**Superseded TEI:** Not applicable.

**Exceptions:** Not applicable.

**Disposition of TEI Content:** The content of TEI 18 - 605 will be incorporated into future revisions to the Vermont Agency of Transportation Standard Drawings, Traffic Design Manual and/or other applicable design guidance documentation.

**Purpose:**

The purpose of this document is to provide a uniform guideline outlining the Quality Standards for Temporary Traffic Control Devices to ensure that these devices installed with work zones on the state highway systems are installed and are functioning properly.

**Implementation:**

The content of TEI 18 - 605 is to be implemented beginning immediately for all work zones on the State Highway System that meet the guidance set forth in this Traffic Engineering Instruction.

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**Acknowledgements**

This quality standard was developed by the Vermont Agency of Transportation and based on the following Department of Transportation quality standards:

Maryland State Highway Administration

Missouri Department of Transportation

Oklahoma Department of Transportation

## Introduction

Temporary traffic control devices are a necessary part of highway work zones. These devices are used to warn motorists of hazards, advise them of the proper path through the work area, delineate areas where they may not operate, and separate them from workers and opposing traffic.

There are many factors that ensure the success of these functions; the performance and condition of each temporary traffic control device are two such factors. Whenever worn, damaged, or improperly installed devices appear in a work zone, the general quality of the work zone deteriorates. This situation may reduce the level of safety provided to the workers, pedestrians, and traveling public due to the road users' loss of confidence in and compliance with the devices.

It is with this concern in mind and also to provide the means for complying with MUTCD that VTrans has established the *Quality Standards for Temporary Traffic Control Devices* handbook. The quality standards contained herein are applicable to all temporary traffic control devices (e.g., impact attenuators, truck mounted attenuators, signs, channelizers, barricades, warning lights, changeable message signs, flashing arrow panels, work zone traffic signals, lighting units, temporary pavement marking, temporary traffic barrier, etc.) deployed on all Vermont public highway systems. The result of its effective application is a benefit to the wellbeing of those who work in or navigate through work zones located on all public highway rights-of-way within Vermont.

## Quality Requirements

Temporary traffic control devices shall be installed and maintained in an acceptable condition. Unless specified otherwise, this requirement does not mandate the use of 'new' devices. However, it does necessitate the use of functional devices. Unacceptable devices shall be replaced or corrected in accordance with the contract documents or, in the absence of a contract, as directed by the engineer.

## Quality Standards

The quality standards set forth in this publication should be used by those responsible for the installation, operation, maintenance, and inspection of temporary traffic control devices as a guide to determine if those devices are acceptable for use on the state highway system.

These standards should be applied at several stages: prior to delivery to the work zone, during initial setup, and routinely while the work activity is occurring. Such scrutiny will ensure the effectiveness of the temporary traffic control devices throughout the life of the work zone.

## General

All temporary traffic control devices (TTCDs) shall be:

- In conformance with the requirements of the current Manual on Uniform Traffic Control Devices (MUTCD) and VTrans Standards Specifications for Construction.
- Installed and maintained at locations and in orientations that maximize safety and minimize disruption to traffic flow.
- Aligned with the road user's line of sight.
- Positioned as to not obstruct other applicable traffic control devices.
- Free of any noticeable dents, holes, deformations, abrasions, tears, marks, stains, residues, fading, or other deficiencies that affect the operational performance including the crashworthiness of the devices.
- Properly covered, turned, stowed, or removed when not in use.
- Visible during both daytime and nighttime operations.

It is important that the contractor or their representative ride through the entire temporary traffic control zone to ensure that all TTCs are installed and functioning properly. A night inspection is necessary if devices are left in place at night to verify that all devices meet nighttime retroreflectivity requirements.

### **Barricades, Channelizing Devices, and Signs**

These devices shall be:

- Reasonably plumb to the pavement.
- Safely and neatly ballasted, as needed.
- Clearly visible and legible/distinguishable to approaching traffic during the day and, if applicable, at night.

### **Warning Lights**

These devices shall be:

- Visible for a distance of 3,000 feet on a clear night for Type A (low-intensity, flashing) and Type C (low-intensity, steady-burn) and for a distance of 1,000 feet on a sunny day without the sun directly on or behind the devices for Type B (high-intensity, flashing) warning lights.
- Illuminated at appropriate times.
- Securely affixed to the host.

### **Flashing Arrow Panels**

These devices shall be/have:

- Functioning in the appropriate mode.
- No more than one lamp, of those to be energized, out in stem; and no lamps out in the arrow head(s) when in the arrow (single- or double-headed) and no lamps out when in the caution (four corners) modes.
- Appropriately dimmed at night

### **Changeable Message Signs**

These devices shall be:

- Displaying the prescribed message at an appropriate cycle.
- Clearly legible to approaching traffic with minimal display abnormalities.
- Appropriately dimmed at night.

### **Temporary Pavement Markings**

These markings shall be:

- In place at applicable times.
- Reasonably aligned longitudinally.
- Clearly visible to approaching traffic during the day and night.
- Completely removed or masked when no longer applicable.

## Sign Coverings

These items shall be:

- Sized to match the sign to be covered
- Positioned to cover all the sign face without scratching the covered sheeting face.
- Installed without direct application of adhesive tape to the sign face.
- Designed to prevent the covered sign face information from appearing through the cover during daytime and nighttime use.
- Constructed with non-metallic handles and spacers to keep the sign face from being damaged by the cover.
- Adequately secured to the host sign assembly.

*The following are examples of acceptable sign covering practices.*



**Work Zone Signs**

**ACCEPTABLE**

The sign is in new or like new condition. There are several abrasions on the surface, but very little loss of lettering. There has been no touch-up of the lettering.



**MARGINAL**

Of the many surface abrasions throughout the sign face, many are within the individual letters of the message. The sign surface is free of any residue. Although some color fading is evident, the background color and reflectivity are still apparent at night.



**UNACCEPTABLE**

Signs with asphalt splatter and/or cement slurry or any combination thereof, and/or 50% or more of the of the sign text is missing and/or abrasions covered throughout the face of these signs are unacceptable. There is noticeable color fading.



**Barricade Panels or Vertical Panels**

**ACCEPTABLE**

Panels are in new or like new condition. There are several abrasions on the surface but very little loss of reflective sheeting. The orange is vivid and the stripes provide contrast that is clearly visible with low light.



**MARGINAL**

There are numerous surface abrasions through the panel surface. Some color fading is evident. However, it is free of larger areas of residue or missing reflective material. The orange is vivid and the stripes provide contrast even in low light.



**UNACCEPTABLE**

The surface is marred over a high percentage of the panel area. There is noticeable loss of reflectivity and obvious color fading. Panels with asphalt splatter and/or cement slurry, or any combination of missing and covered reflective material.



**Barrels (Drums)**

**ACCEPTABLE**

The barrel is in new or like new condition. The sheeting has only minor tears and scratches. The device maintains intended shape and retroreflectivity.



**MARGINAL**

The sheeting has numerous tears and scratches. However, it is free of large areas of residue or missing reflective material. The barrel maintains its original shape and responds to washing.



**UNACCEPTABLE**

The large areas of missing reflective material on the fractured upper area make this barrel unacceptable. Barrels with asphalt splatter and/or cement slurry, or any combination of missing and covered reflective material. Substantial deformation of a barrel will cause the barrel to be considered as "unacceptable" even if other parameters are still "acceptable".



**Cones**

**ACCEPTABLE**

The cone is in new or like new condition. Surfaces are free of punctures and abrasions. The surface is free of asphalt splatter, cement slurry or other material and will readily respond to washing.



**MARGINAL**

The surface has some asphalt splattering or cement slurry and may not be readily cleaned due to abrasion and discoloration. The reflective bands are free of large areas of residue or missing material.



**UNACCEPTABLE**

Punctures and large areas of straining asphalt splatter and cement slurry make these an unlikely candidate for improvement. Deformation, dents and loss of material altering the intended shape. Also, the lack of or missing reflectorized bands or resetting mechanism is inoperable.



**Tubular Markers**

**ACCEPTABLE**

The tubular marker is in new or like new condition. Sheeting has minor tears and scratches. The initial shape is maintained and the reflective bands show little to no loss of retroreflectivity.



**MARGINAL**

The surface has some asphalt splattering or cement slurry and may not be readily cleaned due to abrasion or discoloration. The reflective bands, if required, have numerous tears and scratches, but are free of large areas of residue or missing material.



**UNACCEPTABLE**

Punctures and large areas of staining asphalt splatter or cement slurry make these unlikely candidates for improvement. Large areas of missing or stained reflective material also make the markers unacceptable.



**Portable Changeable Message Sign (PCMS) Boards****ACCEPTABLE**

90% or more of the pixels per character module are operating properly. The text should be legible from a minimum of 650' to 900' as required in the material specifications.

**UNACCEPTABLE**

Less than 90% of the pixels per character module are operating properly or not performing within the criteria of the MUTCD or text is not legible from the specified acceptable distances.

**Unacceptable Field practices are listed below:**

- Use of the PCMS does not meet MUTCD guidelines
- Incorrect or unapproved message
- Non-standard or unapproved PCMS equipment
- Device not protected, if not outside the prescribed clear zone
- Improper placement
- Inadequate sight distance
- PCMS is not angled 3 degrees toward the roadway from the perpendicular edge of the roadway to reduce glare
- Brightness of the PCMS is not set for either daytime or nighttime requirements
- Message Flashes, Scrolls, or Blinks
- Too many messages/sequences/phases (2-phase message maximum)

**Flashing Arrow Panels (Merge Mode)**

**ACCEPTABLE**

No more than one (1) lamp out in stem and none out in arrowhead. Lights dim properly.



**MARGINAL**

Two (2) or fewer lamps in stem out. No lamps out in head. Lights dim properly.



**UNACCEPTABLE**

Any lamp out in the arrowhead, or more than two (2) lamps out in the stem or lights do not dim properly.



**Note:** Any operating lamp that is out of alignment will be considered "not functioning".

**Flashing Arrow Panels (Double Arrow Mode)**

**ACCEPTABLE**

No more than one (1) lamp out in stem and none out in arrowhead. Lights dim properly.



**MARGINAL**

Two (2) or fewer lamps in stem out. Both arrowheads completely functional with no lamps out. Lights dim properly.



**UNACCEPTABLE**

Any lamps in arrowheads out or more than two (2) lamps out in the stem or lights do not dim properly.

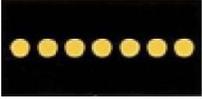


**Note:** Any operating lamp that is out of alignment will be considered "not functioning".

**Flashing Arrow Panels (Caution Mode - Bar, 4-Corners)**

**ACCEPTABLE**

Four (4) or more lamps operating. Lights dim properly.



**MARGINAL**

Minimum of four (4) lamps functioning. Lights dim properly.



**UNACCEPTABLE**

Less than four (4) lamps functioning or lights do not dim properly.



**Note:** Any operating lamp that is out of alignment will be considered "not functioning".

**High Visibility Work Zone Safety Apparel**

During daytime operations, construction personnel working within the state’s right-of-way shall wear a minimum of ISEA/ANSI 107-2004 Class 2 safety apparel. During nighttime operations, high speed highways, and Flagger operations require ISEA/ANSI Class 3 apparel identifying the worker or Flagger as a person providing visibility for full range of motion. This would require the addition of Performance E trousers or gators.

**ACCEPTABLE**

New high-visibility safety apparel is characterized by having vivid color contrast and high reflectivity. Apparel that is used but is in like-new condition is characterized as having excellent color contrast, excellent reflectivity and is not faded or soiled.



**MARGINAL**

Good reflectivity although the vest has some soiling and light fading. Note: The second picture was taken with a flash and simulates nighttime conditions.



**UNACCEPTABLE**

Little or no reflectivity and soiled and faded material. Poor color contrast, low or no reflectivity, significant fading or soiling, and deteriorated reflective strips.



**Temporary Pavement Markings**

**ACCEPTABLE**

All pavement marking tape and paint required is in place and meets the requirements of the MUTCD and the VTras Standard Specifications for Construction.



**MARGINAL**

Less than ten percent (10%) of message or symbol is missing, and two or fewer consecutive skip lines are missing, and less than 50 FT of continuous solid line is missing or nonreflective.



**UNACCEPTABLE**

When any of the following conditions exist: 1) Less than ninety percent of all pavement marking tape or paint is present, 2) Three or more consecutive skip lines are missing. 3) More than 50 FT of continuous solid line are missing or nonreflective.

