VERMONT
VTrans

Traffic Engineering Instructions (TEI)

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Approved: _____ **Date:** 1 APRIL 2016
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Subject: Use of Radar Speed Feedback signs within Work Zones

Administrative Information:

Effective Date:	TEI 16 - 600 shall be effective from the date of approval.
Superseded TEI:	Not Applicable
Exceptions:	Not Applicable
Disposition of TEI Content:	The content of TEI 16 - 600 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 Vermont Agency of Transportation (VTrans) has adopted a policy to allow municipalities to install and maintain Radar Speed Feedback Signs (RSFS) within the rights-of-way on the State Highway System. The policy incorporates both temporary (speed trailer) and permanent (dynamic speed sign) uses of these signs. The original policy did not cover the use of these types of signs within work zones. This document is intended to provide guidance for the use of Radar Speed Feedback Signs in the work zone.

Implementation:
The content of TEI 16 - 600 is to be implemented beginning immediately for all work zones on the State Highway Systems that meet the guidance set forth in this Traffic Engineering Instruction.

General Information:
With vehicle speeds becoming an increasing issue within our work zones and an important factor affecting the safety and mobility of road users and highway workers, the use of Radar Speed Feedback signs (RSFS) are becoming a significant tool in providing traffic-calming within VTrans work zones. The intent of reducing driver speeds within the work zone is to promote safe efficient traffic flow, as well as enhance the ability of traffic to safely react to highway work and disruptions in traffic flow. It should be noted that VTrans study indicated that Radar Speed Feedback Sign use were as effective as Uniform Traffic Officer (UTO) presence within a work zone in reducing approach speeds.

Purpose & Objective:
Radar Speed Feedback signs dynamically display a vehicle's speed and should always be supplemented with a "YOUR SPEED" plaque and a regulatory speed limit or advisory speed sign. These devices display the approaching vehicle real-time speed, which tends to draw the attention of the approaching driver to the sign, where the driver reacts to their speed as compared to the posted speed limit and choose to slow down or they will slow down due to radar detectors activated by the radar signals. Please note that radar feedback signs are not intended as an automated enforcement tool.

Drivers tend to reduce their speeds when they perceive a need to do so, based on conditions in the work zone or the perception of enforcement activities. Therefore, it is essential that guidance is established to utilize these traffic control devices within our work zones without reducing their overall effectiveness.

Radar Speed Feedback signs should only be used where there is a real need for drivers to reduce their speed. Otherwise drivers will learn to ignore these devices and they will become ineffective.

Deployment Guidance:
Consider RSFS use within a work zone on the State Highway System when any of the following conditions exist:

- Those work zones where Uniform Traffic Officers (UTO) are present.
- All significant construction project(s)
- Full roadway or ramp closure required for roadway maintenance
- Closure of one or more travel lanes on an interstate or multi-lane highway.
- Work activities requiring workers, equipment, and materials to be in close proximity to travel lanes that are unprotected by concrete barrier or at a higher risk of having vehicular intrusions
- Where there is an expectation of queuing, slowed traffic or the potential of rear-end collisions in an open lane (not signal or flagger controlled).
- Night work activity
- Work Area ingress and egress by construction vehicles requires the traveling public to reduce their speeds
- Work Zone crash history has an unusually high occurrence

- Where an excessive number of vehicles exceed the posted speed limit in a work zone.
- Work Zone geometric design hazards including:
  - Narrow or closed shoulders
  - Narrow or long term closures of travel lanes
  - Pavement edge drop-offs
  - Irregular pavement surfaces and/or uneven joints
  - Lane shifts
  - Horizontal curvature at median crossovers to temporary diversions designed to a lower design speed than the prevailing or expected travel speeds

Location –Specific Guidance:
The specific type of deployment (trailer-based, post-mounted sign, etc.) is at the discretion of the Agency and will depend on the problem being addressed, power supply availability, etc.

Placement:
The placement of radar speed signs will vary according to factors such as:
- The posted speed limit of the roadway
- The roadside environment
- The specific application

Radar Speed Feedback Sign (RSFS) Placement in Work Zones:
While the Manual on Uniform Traffic Control Devices (MUTCD) does not provide specific guidance regarding Radar Speed Feedback signs used in work zones, research used by States across the country has resulted in the following guidance:

- RSFS should be placed upstream (in advance) of the work zone activity area.
- The RSFS unit and any associated solar panels shall be installed so as not to restrict lateral clearance or sight distances of other traffic control devices in the area.
- The mounting height, lateral offset, and orientation of the post-mounted speed display signs shall conform to applicable guidelines from the 2009 MUTCD sections 2A.18, 2A.19, and 2A.20.
  - The exception would be radar speed trailers (or Portable Changeable Message Signs PCMS being used as RSFS), which represent a more substantial roadside obstacle. Trailer deployments should be farther from the edge of the pavement or shoulder. This distance will vary but should be no less than the baseline clearances set forth by the MUTCD as noted above.
- RSFS are to be used in conjunction with speed limit signs or advisory speed plaques associated with a warning sign.
  - Post-mounted RSFS should be mounted below the speed limit sign on the same post, or on a separate post to the right of the speed limit sign.
- To maintain speed reductions throughout the work zone, more than one RSFS should be used in work zones longer than one mile.
  - If sequential RSFS are used, they should be placed on the same side of the roadway and be separated by at least 1,000 ft.
- RSFS should be placed on the right-hand side of the highway and aligned to provide maximum legibility to approaching traffic.
  - RSFS units should be gate-posted (installed across from each other) on interstates or other multi-lane highways.

Specifications:
The general specifications shared between post-mounted signs and trailer-based radar speed signs include:

- Dimensions – shall not exceed 36" in width, 48" in height and 12" in depth.
- Numeric display – shall consist of two 7-segment amber LED numerals.
- The numeric display range shall be 0 to 99 mph.
- Numerals shall be eighteen (18) inches tall for interstates and multilane high speed arterials and fifteen (15) inches tall for conventional roadways
- The numerals displaying the speed shall be amber color on a black background.
- Display shall be capable of showing the speed of an approaching vehicle and showing a "blank-out" display, which has no visible message, when the approaching vehicle speed exceeds 15 MPH over the posted speed.
- When activated, the display format shall not include animation, rapid flashing, or other dynamic elements.
- With respect to using strobe effects, Paragraph 4 of Section 2A.15 of the 2009 MUTCD specifically prohibits the use of flashing displays and strobe light technology on changeable message signs including radar speed feedback signs.
- The display should be visible from ½ mile under both day and night conditions.
- The sign should be legible from a minimum distance of 650 feet.
- Display shall be wind load rated at 100 mph when installed to the manufacturer's specifications.
- Display must be highly resistant to damage from thrown or launched projectiles.
- Display and/or electronics enclosure shall be ventilated NEMA 3R compliant, or better.
- All sign system functions shall be controlled by a dedicated on-board removable solid-state computer.
- The radar sign's operational temperature shall be -30° to 60° Celsius (-22° to 140° Fahrenheit) at a minimum.
- Only brass and stainless steel tamper-proof fasteners shall be employed in sign fabrication.
- The enclosure shall have a label with the manufacturer's name, model number, serial number, date of manufacture and the rated voltage, current, power and volt-amperes, if applicable, permanently attached to the unit.

Maintenance Considerations:
General considerations for maintenance should include:

- Plan and budget for routine maintenance work and parts replacement.
- Plan and budget for occasional heavy maintenance needs.
- Avoid or minimize deployment in areas of excessive tree canopy cover when using solar power.
- Consider visibility of the sign to motorists, particularly in areas of visual clutter (significant signage, tree branches, etc.).
- Consider the potential for vandalism and address accordingly through increased police patrols or other measures.
- Consider the performance capabilities and maintenance needs of battery power, either as a primary or backup power source.