

Eight Systemic Safety Countermeasures - Implementation Criteria

This document summarizes the expectations and implementation criteria for each of the eight systemic safety countermeasures that are part of VDOT's Systemic Safety Implementation Plan approved by the CTB in September of 2019. These eight systemic safety countermeasures include the following:

1. High-Visibility Signal Backplates (HVSB)
2. Flashing Yellow Arrow (FYA)
3. Pedestrian Crossings
4. Centerline Rumble Strip*
5. Edgeline Rumble Strip/Stripes*
6. Curve Delineation
7. Unsignalized Intersection
8. Safety Wedge

*Centerline and Edgeline Rumble Strips are included in one category below.

The information herein was assembled with the help of representatives from all nine VDOT districts. Several notes are general and listed under general comments, below, followed by detailed expectations for each of the eight systemic countermeasures.

General Comments

- **Budgets**
 - Districts should not spend more than allocated for each systemic project. If a District has more funds than needed to complete the systemic projects, they should advise Tracy Turpin or Deepak Koirala in the Traffic Engineering HSIP Project Delivery team. All surplus safety funds shall be return to the statewide balance entry account for redistributing by the Central Office Safety team to fund other systemic safety initiatives at the discretion of the Commissioner and CTB.
- **Project Delivery:**
 - Each District should determine the best delivery method to meet the schedule and budget that was approved by CTB to complete all VDOT-maintained locations.
 - If state forces are to be used, a finding of public interest must be completed since these are Federal funds
 - When initiating these task/activities in the pool and selecting the right template in Project Web Application (PWA), the district shall follow VDOT's Project [Task and Scheduling Guide](#). The Department will utilize

the Dashboard to monitor all tasks/activities as they relate to these initiatives.

- District Traffic Engineering shall provide documentation to the Central Office HSIP Program Delivery team for any locations where there are limitations or issues that prevent the installation of these systemic countermeasures. This documentation should be included in the district's monthly reports on the SharePoint Site.

- **Project Tracking Criteria:**

- Central Office will provide a SharePoint Site that will reside on Inside VDOT at the following;
<https://insidevdot.cov.virginia.gov/div/te/5UULT/W9HQV/SitePages/Home.aspx> the District Traffic Engineer's Office will be responsible for entering project data for each of the systemic projects on the SharePoint
- Typical installation location data needed for intersection improvements will include (but may not be limited to) the following: UPC#, District, Jurisdiction (County), RNS Intersection Node ID, Regional Signal ID, GPS Coordinates (Latitude/Longitude), Admin By, and Major or Minor approach information (Route Number).
- Typical installation location data needed for road segment improvements will include (but may not be limited to) the following: UPC#, District, Jurisdiction (County), Start and End State Milepost Installation Locations, RNS Node ID, Admin By, and Route Number.

- **Public Outreach and General Information:**

- The following document was created by the Communications and Traffic Engineering Divisions to provide general information to the public on each of the systemic countermeasures that are being deployed as part of this effort:

https://drive.google.com/file/d/1UVP-CKFzQ2j82lsA5yDR_oE4HdVI9Sq6/view?usp=sharing

High-Visibility Signal Backplates (HVSBS)



- **Expectation and Implementation Criteria:**

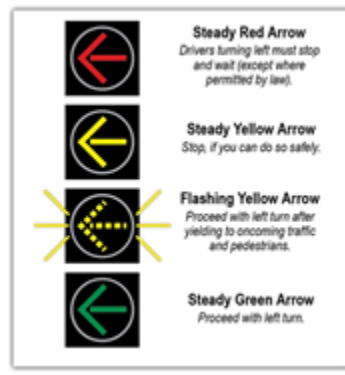
District shall install High Visibility Signal Backplates (HVSBS) on all VDOT-maintained traffic signals. Locations that need pole upgrades are not eligible for this round of HVSBS installations.

- Pole upgrades include signal structure replacement or major signal structure modifications

- **Cost and Funding:**

- An estimate of \$1,000 per HVSBS and 10 HVSBS per intersection was used for the purposes of establishing District budgets. Approximately, \$10,000 per intersection.
- The estimated cost per intersection for a HVSBS survey to determine what type of backplate is needed is approximately \$750 per intersection, based on the experience of Richmond District.
- The budget for HVSBS projects in each District is all inclusive of preliminary engineering, materials, labor, traffic control, CEI, etc to complete the work.

Flashing Yellow Arrow (FYA)



- **Expectation and Implementation Criteria:**

Complete the retrofit and installation of all flashing yellow arrows (FYA) for left turns at VDOT-maintained traffic signals. Locations that need pole upgrades are not eligible for this round of FYA installations.

- Pole upgrades include signal structure replacement or major signal structure modifications
- Eligible FYA installations include retrofits of existing green balls or protected-permissive phasing only. Protected-only phasing conversions to FYA are not eligible for funding as part of this project.

- **Cost and Funding:**

- An estimated cost of \$4,000 per signal head and 4 signal heads per intersection was used for the purposes of establishing District budgets.
- The budget for the FYA projects in each District is all inclusive of preliminary engineering, materials, labor, and traffic control to complete the work

- **Additional Installation Criteria:**

- The preferred FYA type is a traditional four-section head
 - In retrofit situations with a structural or height restriction, three-section, bimodal FYA are allowable. For specific guidance on bimodal arrows, contact Matthew Bonacci in the Central Office traffic signal team at Matthew.Bonacci@VDOT.Virginia.gov or (804) 786-6176.
- Older controllers and cabinets may need to be upgraded in order to install FYA for that intersection. In that case, Districts shall first install FYA at all locations that do not need controller and cabinet upgrades first, and if there's any funding left over, Districts may upgrade the old controllers, cabinets, and then install FYA

with the leftover funding. The top priority is to replace all locations that do not require cabinets or controllers upgrades first.

- This work should also include the installation of FYA signing if the signal structural analysis allows. Installing R10-V1 (Left Turn Yield of Flashing) is a should statement in the Virginia Supplement to the MUTCD. Districts should be adding in signage anyways when implementing FYA. Also, the proposed revision to the VA Supplement to the MUTCD will introduce new design of R10-V1. Districts should use this design to implement FYA as Revision 2 to the VA Supplement to the MUTCD will be out soon.



R10-V1 

Pedestrian Crossings



- **Expectation and Implementation Criteria:**

The criteria and countermeasures included for pedestrian crossings are as follows:

- The [PSAP priority corridor and crash cluster map](#) should be used to identify and review the signalized intersections where pedestrian crossing countermeasures should be installed as part of this effort.
- The typical improvements that should be considered for installation include: new or retrofit marked crosswalks, pedestrian signal heads with pedestrian countdown signals, Accessible Pedestrian Signals (APS) and Accessible Pedestrian Signal Detector (APD), and ADA-compliant curb ramps (only if none currently exist). This work shall be conducted at VDOT traffic signals located on the pedestrian priority corridors and crash clusters that are identified in VDOT's Pedestrian Safety Action Plan (PSAP). The intent of this project is not to bring existing ramps up to ADA compliance. FHWA has provided concurrence that the systemic improvements will likely not trigger the need to upgrade the curb ramps, but the District should do their due diligence and ensure the information is correct/updated in the curb ramp inventory. Any work generated from this analysis than the District Traffic Engineering shall coordinate with others in the district to get it scheduled.
- Sidewalk connections, curb and gutter improvements, widening, and etc. are not included in the scope of this HSIP funding. These items can be funded by the District and delivered concurrently with other funding sources.

- Roadway Lighting
 - Street lighting should only be included if it can be accomplished within the budget and if it is needed to address an identifiable safety need.
 - Refer to [IIM-TE-390 for lighting guidance](#).
- Cost and Funding:
 - A cost estimate of \$50,000 per intersection was used for determining District budgets. The estimate is based upon previous-historical similar projects/bid review, consultant review and district recommendations.
 - The budget for pedestrian improvements is all inclusive and includes marked crosswalks, pedestrian signal heads with pedestrian countdown signals, APS and APD, and ADA-compliant curb ramps (only if none currently exist - Check with FHWA - **IIM-TE-388**)
- Pedestrian Crossing Installation:
 - When installing pedestrian crossings at signals as part of this project, a crossing on all legs of the intersection is the preferred treatment. However, in situations where physical or operational constraints make it difficult to install crossings on all legs of the intersection, at least one crossing of the mainline is required. Typical constraints that may result in not installing crosswalks across all legs of the intersection include
 - Physical constraints (need for roadway reconfiguration)
 - High volume turning movements on certain legs of intersection
 - Signal operational efficiency

Centerline and Edgeline Rumble Strip



- **Expectation and Implementation Criteria:**

- Complete installation of edgeline rumble strips or stripes on primary system roads at all prioritized locations that can be installed without shoulder widening
- Complete installation of centerline rumble strips on all prioritized two-lane, undivided primary roads in accordance with current rumble strip policy.

The HSIP team developed a comprehensive inventory that includes completed as well as ongoing and planned rumble strip projects. In addition, a methodology to develop prioritization levels for candidate locations across the Commonwealth has been developed. The inventory is provided as a geodatabase in various formats (i.e. Google Earth, ArcGIS, ArcGIS Online). The ArcGIS Online format can be found at:

<http://www.arcgis.com/home/item.html?id=886c47dc07c643cd9b4a690c44f90240>

For more information and summary by district, refer to the memo on the rumble strip inventory and prioritized candidate implementation locations.

- **Edgeline Or Centerline Rumble Strip/Stripes on Primaries ([IIM-LD-212.6](#) and [IIM-TE-368.0](#))**

- Providing consistency across jurisdictional boundaries is expected. When the rumble strip passes across different jurisdiction/district boundaries, the uniformity and consistency of rumble strip design shall be necessary. Adjacent districts should coordinate and agree to a rumble strip installation strategy that provides consistency across District lines.

Curve Delineation



- **Expectation and Implementation Criteria:**
 - Review and install curve delineation devices at all locations on VDOT-maintained roads in each District that meet MUTCD criteria as outlined in Table 2C-5.
 - The budgets for each District were determined using curve quantities that were verified by the Districts. (Originally identified by RWD Countermeasures Implementation Plan and district validated it)
- **Other Installation Criteria:**
 - MUTCD Requirements for Warning Signs and Chevron Signs based on Traffic Volume and Curvature.
 - For freeways, expressways and roadways with more than 1,000 AADT that are functionally classified as arterial or collectors, should be based upon speed difference (Advisory Vs Statutory).
 - Curve warning signs and speed placards to be required for speed differential of 10 mph or more.
 - Chevrons to be required for speed differential of 15 mph or more.
- **Cost and Funding:**
 - Per curve cost estimate used for determination of budget for each District: \$32,500 per location (Length of Curve) i.e. curve start point (point of curve –PC) to Curve End Point (point of tangent –PT).
- **Reference Documents:**
 - [Fredericksburg District Chevron Compliance Procedures](#)
 - [Fredericksburg District Task Order 266 Chevron Final Submittal of 2 22 2017](#)
 - [Fredericksburg District Bid Order 16 107196](#)

Unsignalized Intersection



- **Expectation and Implementation Criteria:**

This package of treatments includes the following:

- Tier 1: Standard traffic control devices, advance warning signs, and pavement markings
- Tier 2: Oversized traffic control devices, advance warning signs, and other countermeasures
- Tier 3: Additional traffic control devices and enhanced pavement markings

Refer to Study VTRC19-R5 for a full listing of countermeasures and installation criteria: http://www.virginiadot.org/vtrc/main/online_reports/pdf/19-r5.pdf

Complete review and countermeasure installation at approximately 1700 unsignalized intersections identified by the following study as having crash outcomes greater than expected.

- District Traffic Engineers have flexibility for the installation of Stop Bars as well as the other devices. The three tiers were created as templates based on best practices for a starting point. The intersection specific study that the district conducts drives the final selection of the countermeasures. The DTEs can also add devices, as they deem appropriate.
 - DTE staff should review the listing and determine the implementation location based upon field review and study.
 - Contractor shall stake all locations prior to installation of signs. DTE staff shall field verify the location as per the best practice.
- **Cost Estimate Used to Establish District Budgets:**
 - \$15,000 per intersection based on the Tier 2 with added contingency.
 - **Locations by District:** [Unsignalized Intersection](#)

Safety Wedge Installation Criteria



- **Expectation and Implementation Criteria:**

Pavement shoulder wedge is required on new construction, mill-and-fill, and straight overlay projects that mill or pave to the edge of pavement. The pavement shoulder wedge shall be installed under following conditions and follow the IIM-TE-391 / IIM-MD-002.01 (

http://www.virginiadot.org/business/resources/IIM/TE-391_Pavement_Shoulder_Wedge.pdf.)

- Open ditch sections no curb and gutter
- Paved shoulder widths 4 feet wide or less
- Speed limits greater than 35 MPH
- Specified final asphalt surface lift thickness at least 1.25 inches

Pavement shoulder wedge shall be stopped in the following conditions.

- Driveways, intersections, interchanges or bridges
- Ditch slope begins within one foot from edge of pavement
- Less than one foot of unpaved shoulder exists
- Guardrail exists and the face of guardrail is within 3 feet from existing edge of pavement.

- **Cost and Funding:**

The standard Special Provision (SP315-000320-01) for pavement shoulder wedge will guide payment for 1) Pavement Shoulder wedge Preparation and 2) Pavement Shoulder wedge construction.

- Cost for the required asphalt will be paid with the contract prices for asphalt based on tonnage
- Shoulder wedge prep work will be paid under bid item 16368 at the contract unit price per linear foot.
- Generally the safety budget for Safety Wedge installation includes only for pavement shoulder wedge preparation, however for this purpose all the funds for shoulder preparation and additional asphalt will be funded by Maintenance resurfacing funds.