Highway Safety Improvement Program Guidelines

Traffic Safety Division

July 2023

2023 HSIP Program Highlights

2023 HSIP Program Timeline

December 15, 2023	District Project Proposals Due for FYs 24-27
	District Confirms Existing Projects (scope, estimate, date)

District Communications – Category 8

The Traffic Safety Division (TRF) will coordinate approximately quarterly with districts to verify that all Category 8 traffic projects including Systemic Widening (SSW) and HSIP are current in TxDOTCONNECT and TRF's systems, verifying project information such as letting date, project limits, scope, cost estimate, construction start and end dates, and final construction cost. Any changes to projects MUST be reviewed by the Traffic Engineering (TE) section of TRF for approval based on program requirements and funding. No changes may be made in TxDOTCONNECT until approved by TRF.

District HSIP Project Proposals

Associated with the TxDOT Unified Transportation Plan (UTP) update, District total programming levels for FY 24 through FY 27 will be provided on TRF's HSIP SharePoint Site. Districts should look to fill in the funding gaps for FY 24 – FY 26 and submit new projects for FY 27.

By December 15, 2023, each district should submit an FY 2024 – FY 2027 HSIP project list including all projects already approved for HSIP funding as well as those being submitted for HSIP funding review. Each new project submission must include a complete packet of items required for review as detailed under Project Proposals. It is important that districts fully program each FY. The newest programming levels have already incorporated 15% above the projected programming amount for each FY to allow for flexibility.

Changes to Project Submission Process

For the 2023 Project Call, projects will be entered in TxDOTCONNECT.

Contacts

Contact TRF-TE-Safety@txdot.gov for additional questions.

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Overview

Introduction

Texas has approximately 322,153 miles of highway and streets of which the Texas Department of Transportation (TxDOT) maintains approximately 80,905 miles according to TxDOT's 2021 Roadway Inventory Annual Report published by TxDOT's Transportation Planning and Programming (TPP) Division.

The Texas Demographic Center projects population in Texas is expected to increase from 30,029,572 in 2022 to 47,342,417 in 2050. The citizens and visitors, and businesses, depend on the state to provide facilities that safely and efficiently transport people and goods throughout Texas. This is emphasized in TxDOT's Goals and Objectives, "Promote Safety: Champion a culture of safety. Reduce crashes and fatalities by continuously improving guidelines and innovations along with increased targeted awareness and education."

Texas Highway Safety Improvement Program

The Department considers the needs of the citizens as TxDOT plans, designs, constructs, operates, and maintains transportation facilities. However, due to many factors, a road segment or intersection may experience crashes.

In compliance with Title 23 USC, the Texas Highway Safety Improvement Program (HSIP) is a federally mandated program managed by TxDOT. The HSIP, directed by Texas' Strategic Highway Safety Plan (SHSP), works to achieve the main objective of significantly reducing traffic fatalities and serious injuries on all public roads by providing a standardized approach for identifying and reviewing specific traffic safety concerns throughout the state. Texas' SHSP identifies the emphasis areas and strategies that the HSIP will focus on to meet the state's objectives of reducing fatal and serious injury crashes in Texas.

The program requires a data-driven, strategic, results-focused approach to improving highway safety on all public roads, consistent with the SHSP. The HSIP implements the priorities identified in the SHSP and the goal is to achieve a significant reduction in fatalities and serious injuries on Texas roadways, including both on-system and off-system roads. The vision of zero deaths on Texas roadways is based on the belief that everyone, no matter how they travel, should be able to arrive at their destinations safely. The plan lists eight emphasis areas which have the greatest potential for reducing fatalities and injuries. The emphasis areas are roadway and lane departures, speed related, intersection safety, occupant protection, impaired driving, distracted driving, vulnerable road users, and post-crash care. Younger drivers and older drivers are incorporated into the eight emphasis areas to avoid duplication. Projects must address one of the eight emphasis areas and logically flow from the appropriate countermeasure(s) specified in the Texas SHSP. Funds are provided for construction and operational improvements for projects both on and off the state highway system (on- or off-system).

HSIP funded projects are also required to be evaluated for cost effectiveness. Completed projects are subject to cost/benefit analysis using three to five years of before and after crash data, average annual daily traffic for the years before and after the improvement, and actual construction costs.

To maximize the cost benefit of a safety improvement project, the process of planning, implementing, and evaluating HSIP projects requires partnering with all stakeholders at both the state and local level.

HSIP Project Selection

All Texas public roadways are eligible for participation under HSIP provided the proposed safety highway improvement project addresses emphasis areas identified in the most current Texas SHSP. There are also some items of work that may address a serious crash type, but are not eligible for HSIP funding. Some examples include bridge replacements and general maintenance projects of roadways, signs, signals, pavement markings, etc.

Consider the following when selecting HSIP projects

- Is the strategy, activity, or project consistent with the priorities of Texas' SHSP?
- Does the project address a serious crash risk such as a hot spot, systemic risk factor, road segment, or crash type that has been identified through a data driven process?
- Is the project likely to contribute to a significant reduction in fatalities and serious injuries?
- Is this project consistent with the District Annual Safety Plan?

Emphasis Areas from the SHSP

Roadway & Lane Departure

Speed Related

Intersection Safety

Occupant Protection

Impaired Driving

Distracted Driving

Vulnerable Road Users: Pedestrian & Pedalcyclist

Post-Crash Care

Younger Drivers

Older Drivers

Program Funding

The HSIP is federally funded. Program funds are eligible to cover 90 percent of project construction costs. State or local participation must cover the remaining 10 percent of project construction costs. Certain safety projects may qualify for increased federal share, Title 23, United States Code (23 U.S.C.), Section 120(c)(1), as designated by TRF. The HSIP is legislated under Section 148 of Title 23, United States Code (23 U.S.C. 148) and regulated under Part 924 of Title 23, Code of Federal Regulations (23 CFR Part 924).

The Texas HSIP provides funding for construction and operational safety improvements for locations both on and off the state highway system. HSIP is administered by the Texas Department of Transportation (TxDOT) Traffic Safety Division (TRF) and is part of the UTP (Category 8). When a potential highway safety project location is identified, it is important to work with your TxDOT District HSIP Coordinator.

HSIP funds are only eligible to cover construction dollars, i.e. only the funding line in the Construction grid of the Funding Tab in TxDOTCONNECT. Examples of commonly excluded costs include:

- Environmental permits
- Right of Way (ROW)
- Additional contingencies
- Design/engineering costs
- Additional work not covered by the scope of approved safety countermeasures

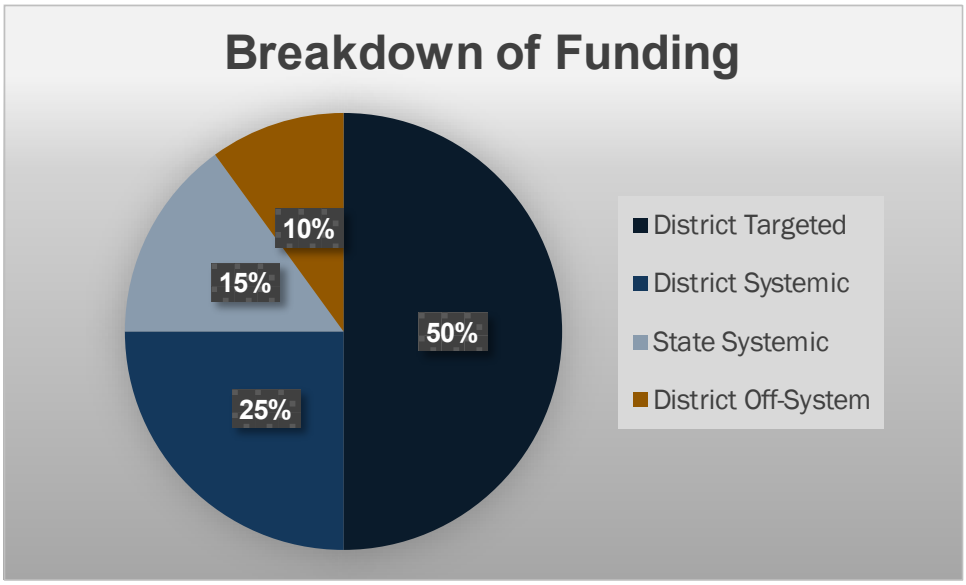
Programming Summary

Each year, TRF will provide districts with 4 years of projected funding levels. Districts should aim to fully program each FY. **The current programming levels have already incorporated 15% over the base programming levels.** This will allow flexibility in the event a project does not meet the requirements, awarded projects let at a lower cost than estimated, projects cancel, or additional funding becomes available. Controlling contracts under $20,000 may not qualify for HSIP funds.

Each District will be provided a proposed HSIP programming level which they should plan to spend each FY towards safety countermeasures supporting a reduction in fatal and serious injury crashes by an average of at least 3.25% each year.* The programmed funds are based upon the previous three years of KA crashes that occurred in each District.

Going forward, the program's UTP allocation will be programmed according to the following guidelines:

Table 1: Breakdown of Funding Programming



50% District Targeted

District Targeted component is the traditional approach used in safety analysis in which "hotspot" locations are identified based on crash history and appropriate countermeasures are implemented to reduce crashes. Targeted projects typically identify specific locations and targeted funding would provide for these "hotspot" on-system locations using KA on-system crash data.

25% District Systemic

Systemic or "system-based" projects take a broader view and evaluate risks across the district's roadway system. A systemic approach does not solely look at crash-data, particularly in low volume and/or rural roadways where crash densities are lower or inconsistent. Systemic funding provides each District a set amount toward district-wide systemic improvement projects using proven safety countermeasures to reduce risk of fatal and serious injury crashes.

15% Statewide Systemic

Each FY TRF will advance statewide systemic projects such as median barriers. Projects will be submitted from the districts for consideration and selected based on existing conditions, need, and available funding.

10% District Off-System

Off-system funds will be programmed by district in the same manner as the On-System Targeted but using KA off-system crash data.

If you are a new off-system partner, please reach out to your district contact regarding options for additional assistance with Design, ROW, and other construction-related costs.

Increased Federal Share (G Match)

TRF is continuing our efforts to encourage local participation in the HSIP program. To that end and in accordance with 23 USC §120(c)(1): Federal share payable, Increased Federal Share for Certain Safety Projects, TRF and FHWA have evaluated the HSIP countermeasures for eligibility for 100% federal funding for construction dollars. All projects must conform to the guidelines for HSIP projects, e.g. meeting minimum SII. Safety Engineering will consider off-system projects a priority for this increased share.

Examples of potentially eligible projects include:

- traffic control signalization,
- traffic circles (also known as "roundabouts"),
- pavement marking, or,
- installation of traffic signs, traffic lights, guardrails, impact attenuators, or concrete barrier end-treatments.

This section is included as a guideline to assist local governments in selecting safety projects that may qualify. G match project selections will be communicated when the district's program is approved.

Systemic Approach

A systemic approach involves widely implementing improvements based on high-risk roadway features correlated with specific severe crash types. This approach provides a more comprehensive method for safety planning and implementation. It is an approach that broadens traffic safety efforts by considering risk and crash history when identifying where to make low-cost safety improvements. A systemic approach helps to identify sites for potential safety improvements that typically would not be identified using a traditional site analysis approach. Districts can also refer to the FHWA's Systemic Safety Project Selection Tool as a resource, or TxDOT staff may visit the TRF SharePoint to review the FHWA Systemic Safety Webinar files.

A systemic approach to safety:

- Identifies a "problem" based on systemwide data, such as a rural lane departure crashes, urban pedestrian crashes, or rural unsignalized intersection crashes. These crashes are often spread across the network with few or no locations experiencing a "cluster" of crashes during a given period of 3-5 years, but which still present a safety risk to the travelling public.
- Looks for characteristics (e.g. geometry, volume, or location) frequently present in severe crashes. These characteristics are referred to as risk factors.
- Focuses on promptly deploying one or more low-cost countermeasure to address the underlying circumstance contributing to crashes on most roads sharing a set of risk factors. By addressing crash types experiencing low densities (crashes per intersection or mile) but high aggregate numbers, program funds can be dedicated toward low-cost solutions deployed across the system, affecting many locations.
- Identifies and prioritizes locations across the roadway network for implementation. Systemic projects should be widely implemented across the system. Projects should be along a roadway corridor/segment or at multiple locations throughout a region.

Additional information about many of the below safety measures can be found in the following resources:

FHWA Proven Safety Countermeasures
Solutions for Saving Lives on Texas Roads
Every Day Counts (EDC)

Approved systemic safety countermeasures are limited to the list below under the appropriate emphasis area. Systemic projects that address a unique location will not be approved. For example, intersection or curve projects should cover multiple intersections/curves located on the corridor or within a geographical region:

- Intersections: Implement systemic signing and marking improvements at stop-controlled intersections

  Includes any combination of doubled up signs, oversize advance signs, street name plaques, enhanced pavement markings, stop ahead warning signs, retroreflective sheeting on signposts, stop bar, sight distance improvements, and two-direction large arrow sign at T Intersections

- Intersections: Low-cost urban intersection improvements

  Includes additional low-cost items such as signal heads, protected left-turn signal phases, pavement markings, signing improvements, and signal-ahead warning signs.

- Intersections: Dedicated right and left turn lanes

  Particularly helpful at two-way stop-controlled intersections on high-speed mainline roadways.
  Includes adding right and left turn lanes at intersections along an entire corridor where none existed and lengthening existing turn lanes to provide appropriate deceleration and storage on high-speed roadways (>50mph).
  Include all intersection standard signing and pavement markings.

- Intersections: Signal head backplates with reflective borders
- Intersections: Leading Pedestrian Intervals (LPI)

  Eligible LPI projects will let to contract with the installation of APS.

- Intersections: Close Median Openings (Crossovers)
- Intersections: Rural Intersection Improvements

  Includes systemic signing and marking improvements at stop-controlled intersections (see above)
  Safety lighting.
  Rumble Strips on stop-controlled approaches.
  Installation of roadside flashers or embedded LEDs for Stop signs on controlled approaches and "Intersection Ahead" warning signs along uncontrolled approaches. Where Overhead Flashing Beacons (OFBs) previously funded by the HSIP are removed due to the installation of roadside flashers or embedded LEDs, the OFBs must have met the 10-year service life.

- Intersections: Two-Way Left-Turn Lanes (TWLTLs / Continuous Turn Lanes)
- Roadway Lane Departure: Median Barrier

  Installation of concrete or cable median barrier where no barrier of any kind currently exists;
  Placed in the median separating opposing mainlines of traffic;
  The existing median width must be less than or equal to 70ft; and,
  Cable median barriers are for use only on medians greater than 25ft in width; concrete median barriers can be used on all median widths.
  Locations of projects will be prioritized in as follows:

  By roadway type (Interstate, non-Interstate freeways, other principal arterials, all others)
  0-45' median widths in urban and rural areas
  Greater than 45ft median widths in rural areas
  Greater than 45ft median widths in urban areas

- Roadway Lane Departure: Roadway widening

  Rural two-lane, two-way undivided highways with a paved surface width less than or equal to 24ft;
  Widen to 28ft or more, add rumble strips

- Roadway Lane Departure: Continuous safety lighting along a corridor where no lighting is present
- Roadway Lane Departure: Enhanced Delineation on Curves

  Systemically treat curves within a geographical area or roadway type, not single locations
  Includes pavement markings, raised retroreflective pavement markers, post mounted delineation, larger chevrons/curve warnings signs/advisory speed plaques, or LED chevrons.
- Pedestrian: Safety lighting at urban intersections where pedestrian facilities are present and no lighting is present.
- Pedestrian: Installation of attachments to existing concrete barrier systems to deter prohibited pedestrian crossings on divided highways.
- Pedestrian: Uncontrolled crossing locations

  Use the Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations when submitting systemic projects for uncontrolled pedestrian crossing locations. To submit eligible systemic countermeasures specific to pedestrian crossings at uncontrolled locations, follow the guidelines provided in Step 4. Table 1 on page 16 of the linked document must be submitted with project proposals; identify (highlight or circle) the appropriate selection box based on each roadway's configuration, AADT, and Speed Limit for each roadway being submitted. In summary, the eligible improvements from Table 1 include:

  Crosswalk pavement markings
  Lighting at the crosswalk
  Raised crosswalks
  Signing – parking restrictions, advance crosswalk warning signs, in street pedestrian crossing signs, and yield here to pedestrians
  Curb extensions
  Rectangular Rapid-Flashing Beacon (RRFB)*
  Pedestrian Hybrid Beacon (PHB)*

  **Selections for PHBs and RRFBs must still meet the TxDOT guidelines dated September 18, 2018, and be reviewed by TRF.*
- Pedestrian: Median and crossing islands in urban and suburban areas

  Install medians or crossing islands where none existed previously on curb sections of urban and suburban multilane roadways where there is a significant mix of pedestrian and vehicle traffic and intermediate or high travel speeds.
  Includes mid-block areas, approaches to multi-lane intersections and areas near transit stops or pedestrian focused corridors.

Project submissions for the use of systemic funds not following the above criteria will not be approved during the regular program review. However, if your district has data to support an additional systemic countermeasure not listed, the district may submit that data to TRF, before submitting the complete program for statewide review, to request approval.

Crash counts and SII calculations are not required for the above systemic safety countermeasure project proposals, because they are proven effective including on roadways not experiencing clusters of crashes.

Deadline for Letting

Due to the nature of HSIP projects (safety), projects must be let to contract in a timely manner. Ensure the estimated let date entered into TxDOTCONNECT is achievable. Once a project is approved for letting in a fiscal year, every effort must be made to meet this date. TRF reviews and approves all letting date changes. Any project requesting an accelerated letting date will be considered.

However, projects requesting a delay in letting will not be allowed letting past the following three years from the time it was approved for funding. In either case, when a letting date changes outside of the approved FY, the district will need to show how it impacts HSIP funds in the requested FY. Federal safety funds not obligated by the federal lapse date are forfeited by the state.

Changes in Scope

A request for a change in scope must be submitted as soon as the change is known and prior to PS&E submittal. Submit an email request to TRF-TE-Safety@txdot.gov for approval concerning changes in scope. Provide a detailed explanation for the change requested, including required documentation that would have been submitted at project submission. TRF will review the request and notify the District if the request has been approved.

Note: Requests for changes in scope that results in redefining the project location or deviating from the emphasis area or countermeasures specified in the original project proposal may result in the request being denied.

Requests for Additional Funds

Off-system projects are not eligible to receive additional safety funds. The local government is responsible for all costs after the federal funding has reached its maximum authorized amount.

Overruns

No later than the time of PS&E submittal, notify TRF-TE-Safety@txdot.gov when the engineer's final estimate exceeds the project's authorized funds by including the Cat 8 Overrun Justification Form, available to TxDOT staff on the HSIP Sharepoint. TRF will review the request and notify the District if the request has been approved.

If the whole contract is Category 8 funded, and the engineer's final estimate for the whole contract is under the total authorized amount for the contract, an overrun justification is not required, but if the engineer's final estimate for the whole contract exceeds the total authorized amount for the contract, then an overrun justification form will need to be filled out and submitted. It will need to include justification for each CSJ with an overrun on the form.

If the contract includes projects other than HSIP Category 8 projects, and one or more of the HSIP projects has an overrun, an overrun justification form will need to be filled out and submitted for that project(s).

Change Orders

Submit an email request to TRF-TE-Safety@txdot.gov and include a copy of the Change Order Report from Site Manager along with all supporting documentation. TRF will review the request and notify the District if the request has been approved.

Development Authority (8DA)

TxDOT's Administration established a safety development authority category in the Unified Transportation Plan. The development authority category (Category 8DA) allows districts to design the PS&E, purchase ROW if necessary, relocate utilities and obtain environmental clearance for planned safety projects. Category 8DA does not fund the construction of these safety projects. The District needs to continue to pursue construction funding from other categories including STP, Category 8 HSIP, Energy Sector, etc.

Requests for 8DA funding should be those projects which are expected to meet HSIP criteria once ready to let but take significantly longer for planning; in general, larger projects like interchanges are unlikely to be eligible. Category 8DA funding lines are reviewed and approved by TRF; however, 8DA approval does not guarantee Category 8 construction funds nor does the project have to be funded with Category 8 funds.

Confidentiality of Data

Federal statutes 23 U.S.C. 148(h)(4) and 23 U.S.C. 407 make data and reports confidential if they are compiled for the purpose of evaluating safety of federal-aid highways. Data used in the HSIP should not be released. Any written request must be routed through the TxDOT Office of General Council (OGC).

TRF Responsibilities

Table 2: TRF Responsibilities

Step	Action
1.	Analyze the proposed highway safety improvement projects for eligibility, data accuracy, and overall conformance with program requirements.
2.	Analyze each targeted/hot spot project's Safety Improvement Index (SII) and review systemic projects for eligibility.
3.	Place projects in the HSIP according to priority and program federal funding. Forward the districts the list of highway safety projects selected for funding through HSIP.
4.	Oversee overruns of project authorized funds at the divisional PS&E review stage in accordance with the current TxDOT policy. >> See Commission Minute Order 109864, November 18, 2004, or subsequent revisions.

Reporting

TRF submits a statewide HSIP report for the prior federal fiscal year to the FHWA by August 31 of each year. The report addresses intersections and segments as required under 23 U.S.C. Section 148(g). The report includes sections on progress in implementing HSIP projects; program effectiveness; project evaluation; a narrative addressing methodology, and effectiveness; and an explanation of how HSIP projects link to Texas' Strategic Highway Safety Plan.

TRF will analyze the crash reduction data from completed projects and use the results to adjust the factors for the following year's HSIP.

Design

Introduction

The design guidelines presented in this section are intended to aid in planning Highway Safety Improvement Program (HSIP) projects. Work types are assigned based on the information provided by the district during the project proposal process. Only work types programmed for the safety project will be considered "the scope." The design guidelines reference portions of the Roadway Design Manual (RDM) and establish items of work not eligible for HSIP funding. These guidelines offer sufficient flexibility while retaining safety as the essential element of all HSIP projects.

Design Guidelines

Freeway, Non-Freeway "New Location or Reconstruction," or Texas Highway Freight Network (THFN) Projects

All roadway elements affected by the scope of the approved HSIP safety improvement must comply with the "New Location and Reconstruction (4R) Design Criteria" found in the RDM (Chapter 3). Enhancements to features outside the scope of the HSIP project are at the district's option and are to be funded using district funds under a separate Control-Section Job (CSJ).

Non-Freeway "Rehabilitation or Restoration" Projects

All roadway elements affected by the scope of the approved HSIP safety improvement must comply with the "Non-Freeway Rehabilitation (3R) Design Criteria" found in the RDM (Chapter 4). Enhancements to features outside the scope of the HSIP project are at the district's option and are to be funded using district funds under a separate CSJ.

"Safety Treat Fixed Objects" Projects

Projects whose primary scope of work is "Safety Treat Fixed Objects" must comply with the "Clear Zone" (formerly "Horizontal Clearance") criteria found in the "Non-Freeway Rehabilitation (3R) Design Criteria" of the RDM (Chapter 4). The designer should provide clearance greater than that required whenever reasonably practicable.

Other Projects

All projects not included in the above categories must retain the existing roadway conditions (lane widths, shoulder widths, etc.) as a minimum.

Design Considerations

At the beginning of the HSIP project proposal process, highway designers should analyze crash data to identify the specific safety problems that might be corrected and follow the suggested design process in the RDM (Chapter 4, Section 3).

Design Exceptions or Waivers

When the HSIP design guidelines cannot be met, the current design exception or design waiver process established in the RDM (Chapter 1, Section 2) must be followed.

HSIP Project Submission Guidelines

As a condition of obligating Federal Highway Safety Improvement Program (HSIP) funds, a state is required to submit an annual report to the Federal Highway Administration (FHWA) that describes the progress on safety improvement projects and their contribution to reducing roadway fatalities, injuries, and crashes. To comply with these requirements and to maintain the integrity of the program-selection process, the following must be adhered to and considered prior to project proposal submission:

HSIP projects are not eligible for local letting. All HSIP projects must be let by TxDOT's competitive bid process. At this time, TRF is evaluating the progress of a Local Let pilot program initiated with the 2022 program call and will update as more information becomes available. Until then, no additional projects will be added to the local letting pilot.

Off-system project proposals are required to be submitted through the local district office.

HSIP Participant Responsibilities

Table 3: HSIP Project Submittal Guidelines

Step	Action
1.	Use the most current version of the SHSP to learn about the program safety emphasis areas. Conduct safety studies and identify potential project locations that qualify for improvements in the identified program emphasis areas using the three most current years of crash data. Evaluate each identified location to determine if the project is feasible and verify that appropriate countermeasures addressing the location's safety needs are not already completed or scheduled.
2.	Coordinate with stakeholders to gather additional location information and to identify any potential locations that may have been excluded due to incomplete or inaccurate crash and roadway data.
3.	Perform a field evaluation to determine **existing** conditions at the proposed project site. This will avoid the submission of work that has already been constructed and provide the information necessary for a complete and accurate estimate. **Consult with the district's planning office prior to submitting project proposals** to determine if the proposed improvement or another is already scheduled for construction under this program or any other.
4.	For projects determined to be feasible, determine the appropriate countermeasure or group of countermeasures, and develop a detailed cost estimate for the entire construction cost of the project. Leveraging of project estimate is not allowed. NOTE: Districts are discouraged from adding district funds to the requested amount in order to "leverage" the cost of the project. All items must be included in the submitted estimate.
5.	Work is assigned based on the information provided. Only work programmed will be considered "in scope," and is the only work that can be done as part of the safety project. Work considered incidental to the primary work type will not have a separate work code assigned, but the work will be allowed (for example, widening a roadway to install a left-turn lane or extend drainage structures, re-striping to accompany an overlay, etc.). If additional non-incidental work is required or desired, it will be considered "out of scope" and will be funded by the district under a separate CSJ.

6.	Project selection is based on the crash history, traffic volumes, and roadway geometrics at the specified location. Accurately identify project parameters for the project to be programmed correctly. When defining project parameters, consideration should be given to including distance for project approaches and tapers, as necessary. HSIP projects are not eligible for non-site-specific contracts.
7.	Complete and submit HSIP projects containing requested data to TxDOT's Traffic Safety Division, Traffic Engineering/Safety Engineering team, through the District's HSIP point of contact, along with the necessary backup data (typical sections, layouts, maps, photographs of existing site conditions, etc.) in response to the program call. To submit projects for consideration, set projects up in TxDOTCONNECT.
8.	Notify TRF of potential overrun of an HSIP project's authorized funds prior to Plans, Specifications and Estimates (PS&E) submittal.
9.	Submits PS&E for HSIP projects to TRF in accordance with standard PS&E submission schedule.

Project Documentation

The project proposals will be submitted electronically through TxDOTCONNECT, with supporting documentation to be submitted through Box.com.

A Submittal Form is required for each project submitted. All related fields are expected to be filled out completely and accurately. The form is to be submitted along with the rest of the supporting documentation for each project.

- The Location Map in TxDOTCONNECT will not replace the in-person field evaluation (Table 3 item 3).
- SII Report – An email will be sent when the SII reports for districts to use with the project submissions have been updated in CRIS. All crash data used in the SII calculation will be queried using Beginning and Ending Distance From Origins (DFO's). The majority of the required SII reports are located in the MicroStrategy component of CRIS at the following location:

  CRIS -TX DOT> Shared Reports > HSIP Call > On-System SII Submission Reports

  Detailed instructions on how to run the SII reports for on-system projects are provided within this document. Off-system projects will use the Excel SII calculator, and instructions for pulling crashes through CRIS are available in the HSIP SharePoint. Districts must include SII reports for BOTH on- and off-system projects.

- Estimate – The estimate must be for the entire cost of constructing the project and must include **all** items, priced using the **district** average bid prices published by TxDOT. A detailed set of instructions on how funding should be entered into TxDOTCONNECT can be found on SharePoint to ensure letting estimate, inflation and funding lines correlate. If a detailed estimate is not provided, the project may not be considered for funding and may be eliminated from the call. Each bid item must include:

  Complete Descriptive Codes
  Quantities
  District Average Unit Prices
  Total price for each item

  Check for commonly forgotten items, such as curb ramps, mailboxes, mow strips, etc. Contingency or "lump sum" amounts are discouraged when submitting the estimate. Provide the estimate in as much detail as possible to reduce the possibility of future overruns & change orders.

- For projects covering multiple locations, such as signal interconnects or systemic projects, quantities must be broken down by intersection or roadway segment. For example, improving a corridor might show 3 backplates at 1st street, 2 at 2nd street, etc. This is to facilitate completion of the annual report to the FHWA.
- Existing and Proposed Typical Sections – Existing and proposed typical sections are required for any projects that involve widening the roadway or adding lanes.
- Intersection Layouts – Intersection layouts are required for any intersection improvement project, including signing & pavement markings, channelization, pedestrian improvements, or RCUTs.
- Warrants – Traffic signal warrants are required for any project using WC 107 – Install Traffic Signal.

Submittal Instructions

Districts will enter all of the projects to be submitted for approval into TxDOTCONNECT. For each project, prepare the additional documentation required; all supporting documentation will be uploaded to the Safety Engineering team in the folder for your District in Box.com.

After all the projects have been entered into TxDOTCONNECT, including the off-system, districts will submit the entire program for Statewide review. TRF will review submissions, enter comments into TxDOTCONNECT, and return the program as necessary. Once all changes have been reviewed and approved, TRF will approve the program in TxDOTCONNECT which will start the process of approving funding lines and enabling work to begin.

In the event of technical difficulties with TXC, Districts will coordinate with TRF-TE-Safety to manually approve submissions.

Calculating and Using the SII

Introduction

Each eligible proposed highway safety project is subjected to a benefit-cost analysis. The formula used for this purpose is the Safety Improvement Index (SII).

SII Formula

In its most basic form, the SII is the ratio of the annual savings in preventable crash costs that have occurred at a location to the cost of constructing the proposed improvement. The SII incorporates adjustments to provide additional benefit for:

- locations experiencing increasing traffic over the project life
- improvements that will reduce maintenance costs
- projects expected to have long service lives over which construction costs can be amortized.

The SII formula is as follows:

$\boldsymbol{S = \frac{R(CfF + CiI)}{Y} - M}$	$\boldsymbol{Q = \left(\frac{Aa - Ab}{Ab} \div L\right) S}$
$\boldsymbol{B = \frac{S + \frac{1}{2}Q}{1.06} + \sum_{i=2}^{L} \left[\frac{\left(S + \frac{1}{2}Q\right) + (i-1)Q}{(1.06)^i}\right]}$	
$\boldsymbol{SII = \frac{B}{C}}$	

where:

S = annual savings in preventable crash costs (equal to crash cost savings per year less annual maintenance costs), as determined by the above formula

R = crash reduction factor (see following subsection for explanation)

F = number of preventable fatal and incapacitating injury crashes (see following subheading for explanation)

Cf = cost of a fatal or incapacitating injury crash (see following subheading for explanation)

I = number of preventable non-incapacitating injury crashes (see following subheading for explanation)

Ci = cost of a non-incapacitating injury crash (see following subheading for explanation)

Y = number of years of crash data

M = change in annual maintenance costs for the proposed project relative to the existing situation

Q = annual change in crash cost savings, as determined by the above formula

Aa = projected average annual Average Daily Traffic (ADT) at the end of the project service life

Ab = average annual ADT during the year before the project is implemented

L = project service life (see following subheading for explanation)

B = present worth of project benefits over its service life, as determined by the above formula

C = initial cost of the project.

Obtaining SII Data

Before calculating the SII, the "Proposed Corrective Action" must be translated into "work codes." The HSIP Work Codes Table (contained in Appendix B of this manual) provides the work codes that correspond to various descriptions of work. The table also provides associated definitions, reduction factors, service lives, applicable maintenance cost, and preventable crash codes (see following explanation).

The data necessary to calculate each project's SII can be obtained from the sources shown in the following table.

Table 4: Sources for SII Data

Data Item	How It Is Obtained
R — Crash Reduction Factor NOTE: The reduction factor represents the percentage reduction in crash costs or severity of the applicable crash types that can be expected as a result of the improvement.	From the Highway Safety Improvement Program (HSIP) Work Codes Table (Appendix B). NOTE: If the scope of work includes more than one work code, TRF program administrators derive a composite reduction factor.
F — Number of fatal and incapacitating injury crashes *I* — Number of non-incapacitating injury crashes	The HSIP Work Codes Table shows "Preventable Crash" codes. Preventable crashes are those with defined characteristics that may be affected by the proposed improvement as described by the work code. The codes correspond to numeric codes assigned in the Crash Records Information System (CRIS) to the indicated variable. Information is collected from the peace officer's crash report and converted into a coded format. The Preventable Crash Decoding Table (Appendix C) can be used to interpret the codes and determine the number of each type of crash, using three years of preventable crash data. The program call specifies the years used.
Cf — Cost of a fatal or incapacitating injury crash *Ci* — Cost of a non-incapacitating injury crash	The average cost of each type of crash is based on the comprehensive cost figures provided by the National Safety Council. The program call provides the cost figures used each year.
L — Project service life	From the HSIP Work Codes Table found in Appendix B of this manual. NOTE: If the project is represented by more than one work code, TRF program administrators base the project service life on the primary work.

SII Results

All targeted projects, both on and off system, must have an SII report submitted as part of the supporting documentation. Off-system projects will use CRIS and the excel calculator; on-system projects must use the Microstrategy reports, whenever available.

NOTE: The SII does not establish the need or lack of a need for a project. The SII formula is a mathematical representation of the ratio of the historical costs of preventable crashes to costs of construction; it provides no evaluation of the appropriateness of the type of construction.

A project with an SII greater than or equal to 1.0 is considered cost effective. Projects with an SII of less than 1.0 will not be considered for funding through the HSIP program. The SII was designed as a comparison device for project prioritization and should **not** be used as a measure for independent projects.

SII Calculator Available

An Excel-based program for approximating a project's SII is on TxDOT's Highway Safety Engineering website. Submissions using this calculator to establish a qualifying SII must also include Crash IDs on the form in order to assist with verification.

SII Report Instructions using Microstrategy (On-System only)

To generate an On-System SII Submission Report:

1. Log in to the Crash Records Information System (CRIS) at https://cris.txdot.gov
2. Click on the MicroStrategy link on the right side of the CRIS landing page
3. Click on the "CRIS - TX DOT" project link
4. In the "Shared Reports" folder, select the "HSIP Call" folder
5. In the "HSIP Call" folder, select the "On-System SII Submission Reports" folder
6. Select the appropriate report for the proposed counter measure (Work Code):

   Safety Project SII Calculator for Signing and Signal Projects (100 Series) by Hwy/DFO
   Safety Project SII Calculator for Roadside Obstacles and Barrier Projects (200 Series) by Hwy/DFO
   Safety Project SII Calculator for Resurfacing and Roadway Lighting Projects (300 Series) by Hwy/DFO
   Safety Project SII Calculator for Pavement Marking Projects (400 Series) by Hwy/DFO
   Safety Project SII Calculator for Roadway Work Projects (500 Series) by Hwy/DFO
   Safety Project SII Calculator for Combination Work Code Projects by Hwy/DFO*

*If a proposed combination does not exist, e-mail the new combination request to TRF-TE-Safety@txdot.gov for evaluation by TRF. If approved, a crash reduction factor and service life will be calculated. The deadline to get a new combination calculated is 8 weeks prior to the project submission deadline. After the deadline, the SII of any work code combinations not in the report will have to be calculated by hand and may not be done in time for the project to be included in the current call.

* Work codes with a reduction factor of "TBD" require additional information and cannot be found in MicroStrategy. To obtain an SII for these work codes send project information and work codes to TRF-TE-Safety@txdot.gov.

7. Complete the required prompted fields:

   Project Parameters – Enter the physical description of the project limits
   Year Group – Select Years
   Work Code – Select the appropriate work code. For projects with multiple proposed work codes, use the "Safety Project SII Calculator for Combination Work Code Projects by Hwy/DFO" report and select from the available combination work codes.
   Part of Roadway (optional) – Leave blank.
   Project Cost – Enter the Total Construction Cost (Bid Items + ROW + Mobilization and Barricades + Safety Contingency + Inflation).
   Annual Maintenance Cost – Enter the maintenance cost as defined in the Work Codes Table of this document, including per luminaire, etc.
   First Highway – Select the Highway from the drop-down list or search box.
   Beginning DFO – Enter the Beginning DFO for the project parameters. The DFO's must be obtained using the LRS Readout tool in the Map application of CRIS. Detailed instructions on using the Map application can be found on the TRF website at
   http://crossroads/org/trf/TRFCDA/MAP_User_Guide_v2.pdf
   Ending DFO – Enter the Ending DFO for the project parameters. See above instructions for obtaining DFO's. The Ending DFO must be greater than the Beginning DFO.
   Second Highway – Select the Highway from the drop-down list or search box if the project is an intersection project with another on-system roadway, or the project spans multiple segments on the same highway. Up to four intersection legs or segments with Beginning and Ending DFO's may be entered.

8. Click on the "Export" button at the bottom left of the screen.
9. Click on the "Add to History List" option.
10. Click on the report once the processing is complete.
11. Save the report as a PDF file.

SII Report Instructions using CRIS & Excel

At this time, it is possible to generate SII reports for Off System projects using the CRIS query builder. Districts are expected to use the CRIS tool to locate relevant preventable crash IDs and use the Excel-based SII calculator to calculate SIIs for off system projects. Additional instructions for calculating off-system crashes using CRIS Query are available on TRF's TE Sharepoint.

Crash Data

Overview

The Crash Records Information System (CRIS) is the official state database for traffic crashes occurring in Texas. CRIS contains spatial and reporting components designed to be used by TxDOT personnel to obtain and analyse crash data. Each district has personnel licensed to have access to CRIS. TxDOT district offices are encouraged to work closely with TxDOT Area Offices and local municipalities to identify locations with the highest need for safety improvements. Crash data for the past 3 years will be used for an HSIP Program Call and any crashes occurring in years other than these years will not be used in the SII calculation.

The crash reports that are provided for each district contain fatal (K) and severe injury (A) crashes only. Non-incapacitating (B) crashes are still used in the Safety Improvement Index (SII) calculation, but for screening purposes, only K and A crashes are provided in the crash reports. The following crash reports will be provided to each district:

- On-System KA Crashes by Control-Section
- On-System KA Crashes on Curves
- On-System KA Crashes on Rural 4-Lane Undivided Highways without Paved Shoulders
- On-System KA Crashes Work Code 541 Preventable Rural 2-Lane Highways < 24ft. and ≥ 400 ADT
- Pedestrian Involved KA Crashes

The Texas A&M Transportation Institute has provided individual District CAVS data to enhance the process of selecting safety projects to submit for HSIP funding consideration. Crash data and crash attributes for all K, A, and B crashes will be compiled into a spreadsheet, analysed for each crash to determine whether that crash could be prevented by the type of work and then mapped. The maps can be filtered to only show crashes that apply to a particular type of work. Additionally, Crash Tree Diagrams and Comprehensive Dashboards may be used to assist districts during their project selection.

Crash Cost

As of this publication, the cost per crash will be $4,000,000 for K or A crashes and $330,000 for B crashes. Only preventable KAB crashes addressed by the project countermeasures are used to calculate each proposal's SII. Please refer to the current program call (if applicable) to verify the current crash costs.

Appendix A – Definitions

Terminology	Definition
A Crash	Crash resulting in one or more Suspected serious injuries as the most serious outcome.
B Crash	Crash resulting in one or more Non-incapacitating injuries as the most serious outcome.
C Crash	Crash resulting in one or more Possible injuries as the most serious outcome.
CAVS Data	Computer Aided ViSualization data set compiled for use by TxDOT in order to identify hot spots as well as possible locations for specific countermeasures across a District.
Change Orders	Work that is added or deleted during construction from the original scope of a contract that alters the original contract amount.
Countermeasure	A roadway-based strategy intended to reduce risk at a site
Crash	A set of events that results in injury, or property damage due to the collision of at least one motorized vehicle and may involve collision with another motorized vehicle, bicyclist, a pedestrian or an object
Crash frequency	The basic measure of crashes in the HSM, number of crashes occurring at a particular site, facility, or network per year (expressed for a location/ site or per mile depending on the context)
CRIS	Crash Records Information System
FHWA	Federal Highway Administration
District	A geographical area managed by a district engineer, in which TxDOT conducts its primary work activities
Emphasis Area	A collection of safety concerns identified in the state SHSP, sharing common characteristics such as users affected, types of transportation involved, or other data points.
Highway Safety Improvement Project	Is a project on a public road that implements countermeasures consistent with the Texas SHSP, and improves road conditions or roadway features.
Highway Safety Improvement Program (HSIP)	The collection of projects on public roads which implement countermeasures consistent with the SHSP and which is funded by a specific category of federal dollars.
K Crash	Crash resulting in one or more Fatalities as the most serious outcome.
O Crash	Crash resulting in Property Damage Only as the most serious outcome.
Off-system Roadways	Roadway not designated on the State Highway System and not maintained by TxDOT (i.e. city street, county road).
On-system Roadways	Roadway designated on the State Highway System and maintained by TxDOT.
Overruns	The difference between the engineer's final estimate and the original amount programmed for a specific HSIP project.
Preventable Crash	Crashes with defined characteristics that may be affected by the proposed improvement as described by the work code.
Road User	Means a motorist, passenger, public transportation operator or user, truck driver, bicyclist, motorcyclist, or pedestrian, including a person with disabilities.
SII	Safety Improvement Index
Safety Study	An analysis of roadway, traffic, and crash-related data to determine the probable cause of an identified crash pattern at an intersection or highway section. The safety study also provides alternative countermeasures meant to mitigate predominate crash pattern(s).
Strategic Highway Safety Plan (SHSP)	Federally mandated document compiled at the State level addressing areas of greatest concern to the state and which identifies strategies and countermeasures to address those emphasis areas.

Systemic Safety Improvement	An improvement that is widely implemented based on high-risk roadway features that are correlated with particular crash types, rather than crash frequency.
Traffic Engineering Section (TE)	A section in the Traffic Safety Division (TRF) whose primary responsibility relates to traffic engineering.
Traffic Safety Division (TRF)	The division within the Texas Department of Transportation, headquartered in Austin, whose primary responsibility relates to traffic operations.
TxDOTCONNECT (TXC)	Project & Portfolio management tool developed for use at TxDOT

Appendix B - HSIP Work Codes Table

The work codes are grouped into five categories, as shown in the following table.

Code	Item
100	Signing and Signals
200	Roadside Obstacles and Barriers
300	Resurfacing and Roadway Lighting
400	Pavement Markings
500	Roadway Work

Work codes are listed by number within each group. Preventable Crash Decoding is in Appendix C of this document.

100 - Signing and Signals

101 Install Warning/Guide Signs	
Definition:	Provide advance signing for unusual or unexpected roadway features where no signing existed previously.
Reduction Factor (%):	20%
Service Life (Years):	6
Maintenance Cost:	0
Preventable Crash:	(Vehicle Movements/Manner of Collision = 20-22 or 30) OR (Roadway Related = 2, 3 or 4)
Required Documents:	Photo or detailed description of hazard
107 Install Traffic Signal	
Definition:	Provide a traffic signal where none existed previously. This does not include the installation of flashing beacons.
Reduction Factor (%):	35%
Service Life (Years):	10
Maintenance Cost:	$3,400 (Isolated) $3,900 (Interconnected) $5,400 (Diamond Interchange)
Preventable Crash:	[(Intersection Related = 1 or 2) AND (Vehicle Movements/Manner of Collision = 10-39)] OR (First Harmful Event = 1 or 5)
Required Documents:	Overhead Intersection Layout, Traffic Signal Warrants
108 Improve Traffic Signals	
Definition:	Improve existing intersection signals to current design standards.
Reduction Factor (%):	24%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	(Intersection Related = 1 or 2) AND [(Vehicle Movements/Manner of Collision = 10-39) OR (First Harmful Event = 1 or 5)]
Required Documents:	Overhead Intersection Layout
110 Install Pedestrian Signal	
Definition:	Provide a pedestrian signal at an existing signalized location where no pedestrian phase exists, but pedestrian crosswalks are existing, or in conjunction with Refer to W.C. 403 for installation of pedestrian crosswalks.
Reduction Factor (%):	34%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	First Harmful Event = 1
Required Documents:	Overhead Intersection Layout
111 Interconnect Signals	
Definition:	Provide a communication link between two or more adjacent signals in a corridor. Specify all signalized intersections to be included in the interconnection.
Reduction Factor (%):	10%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	All
Required Documents:	List and drawing of signals to be connected

113 Install Delineators	
Definition:	Install post-mounted delineators to provide guidance.
Reduction Factor (%):	12%
Service Life (Years):	7
Maintenance Cost:	0
Preventable Crash:	(Roadway Related = 2 , 3 or 4) AND (Light Condition = 3, 4 or 6)
Required Documents:	None
114 Install School Zones	
Definition:	Place school zones to include flashers, signing and/or pavement markings where none existed previously. Refer to W.C. 403 for pedestrian crosswalk markings.
Reduction Factor (%):	20%
Service Life (Years):	5
Maintenance Cost:	0
Preventable Crash:	All
Required Documents:	None
118 Replace Flashing Beacon with a Traffic Signal	
Definition:	Replace an existing flashing beacon at an intersection with a traffic signal.
Reduction Factor (%):	25%
Service Life (Years):	10
Maintenance Cost:	1300
Preventable Crash:	(Intersection Related = 1 or 2) AND [(Vehicle Movements/Manner of Collision = 10-39) OR (First Harmful Event = 1 or 5)]
Required Documents:	Overhead Intersection Layout
119 Install Overhead Signs	
Definition:	Install overhead advance regulatory, warning or guide signing for unusual or unexpected roadway features where no signing existed previously.
Reduction Factor (%):	20%
Service Life (Years):	6
Maintenance Cost:	0
Preventable Crash:	Vehicle Movements/Manner of Collision = 20-29
Required Documents:	None
122 Install Advanced Warning Signals (Intersection - Existing Warning Signs)	
Definition:	Provide flasher units in advance of an intersection where none previously existed but where advance warning signs already exist.
Reduction Factor (%):	10%
Service Life (Years):	10
Maintenance Cost:	$1,300 per approach
Preventable Crash:	Intersection Related = 1 or 2
Required Documents:	None

123	Install Advanced Warning Signals (Curve- Existing Warning Signs)
Definition:	Provide flasher units in advance of a curve where none previously existed. Advance warning signs already exist.
Reduction Factor (%):	10%
Service Life (Years):	10
Maintenance Cost:	$1,300 per approach
Preventable Crash:	(Roadway Related = 2, 3 or 4) OR (Vehicle Movements/Manner of Collision= 20-24 or 30)
Required Documents:	None
124	Install Advanced Warning Signals and Signs (Intersection)
Definition:	Provide flasher units and signs in advance of an intersection where none previously existed.
Reduction Factor (%):	27%
Service Life (Years):	10
Maintenance Cost:	$1,300 per approach
Preventable Crash:	Intersection Related = 1 or 2
Required Documents:	None
125	Install Advanced Warning Signals and Signs (Curve)
Definition:	Provide flasher units and signs in advance of a curve where none previously existed.
Reduction Factor (%):	15%
Service Life (Years):	10
Maintenance Cost:	$1,300 per approach
Preventable Crash:	(Roadway Related = 2, 3 or 4) OR (Vehicle Movements/Manner of Collision = 20-24 or 30)
Required Documents:	None
128	Install Advanced Warning Signs (Intersection)
Definition:	Provide signs in advance of an intersection where none previously existed.
Reduction Factor (%):	5%
Service Life (Years):	6
Maintenance Cost:	0
Preventable Crash:	Intersection Related = 1 or 2
Required Documents:	None
130	Install Advanced Warning Signs (Curve)
Definition:	Provide signs in advance of a curve where none previously existed.
Reduction Factor (%):	5%
Service Life (Years):	6
Maintenance Cost:	0
Preventable Crash:	(Roadway Related = 2, 3 or 4) OR (Vehicle Movements/Manner of Collision = 20-24 or 30)
Required Documents:	None
131	Improve Pedestrian Signals
Definition:	Bring existing pedestrian signal units into conformance with current standards.
Reduction Factor (%):	10%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	First Harmful Event = 1
Required Documents:	None

132 Install Advance Warning Signals and Signs	
Definition:	Provide flasher units and signs in advance of hazard where none previously existed.
Reduction Factor (%):	10%
Service Life (Years):	10
Maintenance Cost:	$1,300 per approach
Preventable Crash:	To be determined
Required Documents:	None
133 Improve School Zone	
Definition:	Improve an existing school zone by upgrading signing, pavement markings or signals.
Reduction Factor (%):	5%
Service Life (Years):	5
Maintenance Cost:	0
Preventable Crash:	All
Required Documents:	None
136 Install LED Flashing Chevrons (Curve)	
Definition:	Install LED flashing chevrons on curve to provide guidance.
Reduction Factor (%):	35%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	(Roadway Related = 2, 3, or 4) OR (Vehicle Movements/Manner of Collision = 20 - 24, or 30)
Required Documents:	None
137 Install Chevrons (Curve)	
Definition:	Install chevrons on curve to provide guidance.
Reduction Factor (%):	25%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	(Roadway Related = 2, 3, or 4) OR (Vehicle Movements/Manner of Collision = 20 - 24, or 30)
Required Documents:	None
138 Install Flashing Yellow Arrow	
Definition:	Improve existing intersection signals by adding a flashing yellow arrow indication and install the LEFT TURN YIELD ON FLASHING YELLOW ARROW (R10-17T) sign. Refer to W.C. 108 for improvement of traffic signal.
Reduction Factor (%):	41%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	(Intersection Related = 1 or 2) AND (Vehicle Movements/Manner of Collision = 29, 34, 36)
Required Documents:	None

139 Install Surface Mounted Delineators on Centerline	
Definition:	Install surface mounted delineators on centerline.
Reduction Factor (%):	12%
Service Life (Years):	7
Maintenance Cost:	0
Preventable Crash:	(Vehicle Movements/Manner of Collision = 21 or 30) OR (Roadway Related = 2 or 3)
Required Documents:	None
140 Wrong Way Driver Warning Signs	
Definition:	Provide warning signs to warn wrong way drivers at freeway entrances. Systemic only.
Reduction Factor (%):	35%
Service Life (Years):	6
Maintenance Cost:	0
Preventable Crash:	Contributing factor = 71
Required Documents:	None
141 Wrong Way Driver Warning Markings	
Definition:	Provide markings (lane direction arrows) to warn wrong way drivers at freeway entrances. Systemic only.
Reduction Factor (%):	40%
Service Life (Years):	4
Maintenance Cost:	0
Preventable Crash:	Contributing factor = 71
Required Documents:	None
142 Wrong Way Driver Advanced Technologies	
Definition:	Provide advanced technologies to detect and warn wrong way drivers at freeway entrances. Systemic only.
Reduction Factor (%):	TBD
Service Life (Years):	8
Maintenance Cost:	25000
Preventable Crash:	Contributing factor = 71
Required Documents:	None
143 Pedestrian Hybrid Beacon	
Definition:	Provide pedestrian hybrid beacon at established crosswalk or in conjunction with installation of new crosswalk (403). Requires TRF-P&S approval.
Reduction Factor (%):	15%
Service Life (Years):	10
Maintenance Cost:	2100
Preventable Crash:	First Harmful Event = 1
Required Documents:	None

144 Install RRFB	
Definition:	Install pedestrian activated rectangular rapid flashing beacon (RRFB) at existing or in conjunction with installation of new crosswalk (403). Requires TRF-P&S approval. Systemic only.
Reduction Factor (%):	N/A
Service Life (Years):	10
Maintenance Cost:	$1,300 per roadside assembly
Preventable Crash:	First Harmful Event = 1
Required Documents:	
145 Flashing or LED-embedded Stop Signs	
Definition:	Install LED stop signs or top-mounted flashers on existing stop signs at intersections where only standard stop signs are present.
Reduction Factor (%):	10%
Service Life (Years):	10
Maintenance Cost:	$1,300 per roadside assembly
Preventable Crash:	[(Intersection Related = 1 or 2) AND (Vehicle Movements/Manner of Collision = 10-19)]
Required Documents:	
150 Dynamic Speed Feedback Signs	
Definition:	Install permanent dynamic message speed display signs related to a regulatory speed limit or advisory speed for unexpected roadway features (curves, school zones, etc.).
Reduction Factor (%):	7%
Service Life (Years):	10 Estimated based on signage life
Maintenance Cost:	0
Preventable Crash:	
Required Documents:	

200 - Roadside Obstacles and Barriers

201 Install Median Barrier	
Definition:	Construct a concrete or cable safety system median barrier where none existed previously.
Reduction Factor (%):	75%
Service Life (Years):	20
Maintenance Cost:	0
Preventable Crash:	Vehicle Movements/Manner of Collision = 30
Required Documents:	None
203 Install Raised Median	
Definition:	Install a roadway divider using barrier curb
Reduction Factor (%):	25%
Service Life (Years):	20
Maintenance Cost:	0
Preventable Crash:	(Part of Roadway No. 1 Involved = 1) AND (Vehicle Movements/Manner of Collision = 10, 14, 20-22, 24, 26, 28-30, 34, 36, or 38)
Required Documents:	
204 Flatten Side Slope	
Definition:	Provide an embankment side slope of 6:1 or flatter.
Reduction Factor (%):	5%
Service Life (Years):	20
Maintenance Cost:	0
Preventable Crash:	Roadway Related = 3
Required Documents:	None
209 Safety Treat Fixed Objects	
Definition:	Remove, relocate, or safety treat all fixed objects including the installation of guardrail for safety treatment of a fixed object or drainage structures within the project limits, to include both point and continuous objects.
Reduction Factor (%):	50%
Service Life (Years):	20
Maintenance Cost:	0
Preventable Crash:	(Roadway Related = 2, 3 or 4) OR (Object Struck = 20-26, 29-36, 40-42, 56-58, 60, 62, or 63)
Required Documents:	None
217 Install Impact Attenuation System	
Definition:	Provide any of a variety of impact attenuators where none existed previously.
Reduction Factor (%):	60%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	(Object Struck = 20, 30, 40, or 42)
Required Documents:	None

218 Widen Bridge	
Definition:	Provide additional width across an existing structure, either by rehabilitation or replacement. Specify existing bridge width, existing approach roadway width and roadway type (2 lane, 4 lane undivided, etc.)
Reduction Factor (%):	55%
Service Life (Years):	20
Maintenance Cost:	0
Preventable Crash:	(Bridge Detail is not blank) OR (Vehicle Movements/Manner of Collision = 20, 21, or 30) OR (Roadway Related = 2, 3 or 4)
Required Documents:	Existing & Proposed Typical Sections
225 Pedestrian Crossing Deterrent	
Definition:	Install attachments to existing concrete barrier systems to deter prohibited pedestrian crossings on divided highways. Systemic only.
Reduction Factor (%):	N/A
Service Life (Years):	0
Maintenance Cost:	TBD
Preventable Crash:	First Harmful Event = 1
Required Documents:	

300 - Resurfacing and Roadway Lighting

303 Resurfacing	
Definition:	Provide a new roadway surface to increase pavement skid numbers on all the lanes.
Reduction Factor (%):	30%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	Surface Condition = 2, 5, 6, or 9 (Skid Value must be less than 20)
Required Documents:	Skid Numbers
304 Safety Lighting	
Definition:	Provide roadway lighting, either partial or continuous, where either none existed previously or major improvements are being made. Refer to W.C. 305 for intersection lighting.
Reduction Factor (%):	49%
Service Life (Years):	15
Maintenance Cost:	$100 per Luminaire
Preventable Crash:	Light Condition = 3, 4 or 6
Required Documents:	None
305 Safety Lighting at Intersection	
Definition:	Install lighting at an intersection where either none existed previously or major improvements are proposed. Refer to W.C. 304 for general lighting.
Reduction Factor (%):	13%
Service Life (Years):	15
Maintenance Cost:	$100 per Luminaire
Preventable Crash:	Light Condition = 3, 4 or 6 AND Intersection Related = 1 or 2
Required Documents:	Overhead Intersection Layout

400 - Pavement Markings

401 Install Pavement Markings	
Definition:	Place complete pavement markings, excluding crosswalks, in accordance with the TMUTCD where either no markings or nonstandard markings exist. This work code includes items such as turn arrows, stop bars, lane markings, etc. Refer to W.C. 402 for edge ma
Reduction Factor (%):	20%
Service Life (Years):	4 (Product used must meet 4 year service life.)
Maintenance Cost:	0
Preventable Crash:	(Roadway Related = 1) OR (Vehicle Movements/Manner of Collision = 21 or 30)
Required Documents:	Skid Reports
402 Install Edge Marking	
Definition:	Place edge lines where none existed previously.
Reduction Factor (%):	25%
Service Life (Years):	4 (Product used must meet 4 year service life.)
Maintenance Cost:	0
Preventable Crash:	Roadway Related = 2, 3 or 4
Required Documents:	None
403 Install Pedestrian Crosswalk	
Definition:	Place pedestrian crosswalk markings where none existed previously. Refer to W.C. 114 for school zones, and W.C. 110 for pedestrian signal.
Reduction Factor (%):	10%
Service Life (Years):	4 (Product used must meet 4 year service life.)
Maintenance Cost:	0
Preventable Crash:	First Harmful Event = 1
Required Documents:	None
404 Install Centerline Striping	
Definition:	Provide centerline striping where either no markings or nonstandard markings existed previously. Refer to W.C. 401 for complete pavement markings.
Reduction Factor (%):	65%
Service Life (Years):	4 (Product used must meet 4 year service life.)
Maintenance Cost:	0
Preventable Crash:	Vehicle Movements/Manner of Collision = 30
Required Documents:	None
407 Install Sidewalks	
Definition:	Install sidewalks where none existed previously.
Reduction Factor (%):	65%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	First Harmful Event = 1 or 5
Required Documents:	None

500 - Roadway Work

502 Widen Lane(s)	
Definition:	Provide additional width to the lane(s). Refer to W.C. 517 if adding a through lane.
Reduction Factor (%):	30%
Service Life (Years):	20
Maintenance Cost:	0
Preventable Crash:	(Roadway Related = 2, 3 or 4) OR (Vehicle Movements/Manner of Collision = 13, 21, 23, 30 or 33)
Required Documents:	Typical Section
503 Widen Paved Shoulder (to 5 ft. or less)	
Definition:	Extend the existing paved shoulder to achieve desirable shoulder width. Refer to W.C. 504 or 537 for constructing a paved shoulder.
Reduction Factor (%):	25%
Service Life (Years):	20
Maintenance Cost:	0
Preventable Crash:	(Roadway Related = 2, 3 or 4) OR (First Harmful Event = 4)
Required Documents:	Typical Section
504 Construct Paved Shoulders (1-4 ft.)	
Definition:	Provide paved shoulders of 1- to 4-foot width where no shoulders existed previously. Refer to W.C. 503 or 536 for widening paved shoulders.
Reduction Factor (%):	25%
Service Life (Years):	20
Maintenance Cost:	0
Preventable Crash:	(Roadway Related = 2, 3 or 4) OR (Vehicle Movements/Manner of Collision = 20, 23-24 or 30) OR (First Harmful Event = 4)
Required Documents:	Typical Section
505 Improve Vertical Alignment	
Definition:	Reconstruct the roadway to improve sight distance.
Reduction Factor (%):	50%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	(Roadway Related = 2, 3 or 4) OR (Vehicle Movements/Manner of Collision = 13-14, 20-24, 30, 32 or 34)
Required Documents:	None
506 Improve Horizontal Alignment	
Definition:	Flatten existing curves. Refer to W.C. 507 for providing superelevation, and W.C. 508 for intersection realignment.
Reduction Factor (%):	55%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	(Roadway Related = 2, 3 or 4) OR (Vehicle Movements/Manner of Collision = 20-24 or 30)
Required Documents:	None

507 Increase Superelevation	
Definition:	Provide increased superelevation on an existing curve.
Reduction Factor (%):	65%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	(Roadway Related = 2, 3 or 4) OR (Vehicle Movements/Manner of Collision = 30)
Required Documents:	None
508 Realign Intersection	
Definition:	Improve an existing intersection by partial or complete relocation of the roadway(s). Refer to W.C. 509 for channelization, and W.C. 506 for improving horizontal alignments.
Reduction Factor (%):	TBD
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	Will be determined from supplied diagram
Required Documents:	Proposed Overhead Intersection View
509 Channelization	
Definition:	Install islands and/or pavement markings to control or prohibit vehicular movements. A sketch of the proposed channelization should be provided. Refer to W.C. 508 for intersection realignment.
Reduction Factor (%):	TBD
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	Will be determined from supplied diagram
Required Documents:	Proposed Overhead View
510 Construct Turn Arounds	
Definition:	Provide turnarounds at an intersection where none existed previously.
Reduction Factor (%):	40%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	(Intersection Related = 1 or 2) AND (Vehicle Movements/Manner of Collision = 12, 14, 18, 20, 22, 24, 26, 28, 29, or 34)
Required Documents:	Overhead Intersection View
514 Grade Separation	
Definition:	Construct vertical separation of intersecting roadways.
Reduction Factor (%):	80%
Service Life (Years):	30
Maintenance Cost:	0
Preventable Crash:	Intersection Related = 1 or 2
Required Documents:	Overhead Intersection View
515 Construct Interchange	
Definition:	Construct vertical separation of intersecting roadways to include interconnecting ramps.
Reduction Factor (%):	65%
Service Life (Years):	30
Maintenance Cost:	0
Preventable Crash:	Intersection Related = 1 or 2
Required Documents:	Overhead View

516 Close Crossover	
Definition:	Permanently close an existing crossover.
Reduction Factor (%):	50%
Service Life (Years):	20
Maintenance Cost:	0
Preventable Crash:	(Part of Roadway Involved = 1) AND (Vehicle Movements/Manner of Collision = 10, 14, 20-22, 24, 26, 28-30, 34 or 38)
Required Documents:	
517 Add Through Lane	
Definition:	Provide an additional travel lane.
Reduction Factor (%):	28%
Service Life (Years):	20
Maintenance Cost:	0
Preventable Crash:	Vehicle Movements/Manner of Collision = 20-24, 26-27, 29-30
Required Documents:	Typical Section
518 Install Continuous Turn Lane	
Definition:	Provide a continuous two-way left turn lane where none existed previously.
Reduction Factor (%):	50%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	Vehicle Movements/Manner of Collision = 20-22, 24, 26, 28-30, 34 or 38
Required Documents:	Typical Section
519 Add Left Turn Lane	
Definition:	Provide an exclusive left turn lane where none existed previously. The affected intersection approaches must be specified.
Reduction Factor (%):	25%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	Vehicle Movements/Manner of Collision = 20-22, 24, 26, 28-30, 34 or 38 AND Intersection Related != 4
Required Documents:	Typical Section; overhead proposed layout
520 Lengthen Left Turn Lane	
Definition:	Provide additional length to an existing exclusive left turn lane. Affected intersection approaches must be specified.
Reduction Factor (%):	40%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	Vehicle Movements/Manner of Collision = 20-22 AND Intersection Related != 4
Required Documents:	None
521 Add Right Turn Lane	
Definition:	Provide an exclusive right turn lane where none existed previously. Affected intersection approaches must be specified.
Reduction Factor (%):	25%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	Vehicle Movements/Manner of Collision = 20-23, 25-27, 33 or 36 AND Intersection Related != 4
Required Documents:	Typical Section

522 Lengthen Right Turn Lane	
Definition:	Provide additional length to an existing exclusive right turn lane. Affected intersection approaches must be specified.
Reduction Factor (%):	40%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	Vehicle Movements/Manner of Collision = 20-22 AND Intersection Related != 4
Required Documents:	None
523 Construct Pedestrian Over/Under Pass	
Definition:	Construct a pedestrian crossover where none existed previously.
Reduction Factor (%):	95%
Service Life (Years):	20
Maintenance Cost:	0
Preventable Crash:	First Harmful Event = 1
Required Documents:	None
524 Increase Turning Radius	
Definition:	Provide an increased turning radius at an existing intersection.
Reduction Factor (%):	10%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	[(Vehicle Body Style = 87 or 91) AND (First Harmful Event = 7)] OR (Vehicle Movements/Manner of Collision = 13, 20-21, 30 or 33)
Required Documents:	Overhead Intersection View
525 Convert to One Way Frontage Roads	
Definition:	Convert two-way frontage roads to one-way operation.
Reduction Factor (%):	68%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	Part of Roadway Involved = 2
Required Documents:	None
527 Positive Offset Left-turn Lanes	
Definition:	Add positive offset to existing left-turn lane(s) at an intersection.
Reduction Factor (%):	36%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	Vehicle Movements/Manner of Collision = 20-22, 24, 26, 28-30, 34 or 38 AND Intersection Related = (1 or 2)
Required Documents:	Proposed Intersection Layout
532 Milled Edgeline Rumble Strips	
Definition:	Install continuous milled depressions (rumble stripes or rumble strips) along the edgeline. Stand-alone rumble strip project proposals will not be accepted.
Reduction Factor (%):	15%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	(Roadway Related = 2, 3 or 4) OR (Vehicle Movements/Manner of Collision = 30)
Required Documents:	None

533 Profile Edgeline Markings	
Definition:	Install profile edgeline markings. Stand-alone rumble strip project proposals will not be accepted.
Reduction Factor (%):	7%
Service Life (Years):	5
Maintenance Cost:	0
Preventable Crash:	(Roadway Related = 2, 3 or 4) OR (Vehicle Movements/Manner of Collision = 30) OR (Surface Condition = 2, 5, 6 or 9)
Required Documents:	None
534 Raised Edgeline Rumble Strips	
Definition:	Install non-reflective raised traffic buttons (yellow or white) along the edgeline. Stand-alone rumble strip project proposals will not be accepted.
Reduction Factor (%):	17%
Service Life (Years):	2
Maintenance Cost:	0
Preventable Crash:	(Roadway Related = 2, 3 or 4) OR (Vehicle Movements/Manner of Collision = 30) OR (Surface Condition = 2, 5, 6 or 9)
Required Documents:	None
536 Widen Paved Shoulders (to >5 ft.)	
Definition:	Extend the existing paved shoulder to greater than 5 ft. Refer to W.C. 504 or 537 for constructing a paved shoulder.
Reduction Factor (%):	31%
Service Life (Years):	20
Maintenance Cost:	0
Preventable Crash:	(Roadway Related = 2, 3 or 4) OR (First Harmful Event = 4)
Required Documents:	Typical Section
537 Construct Paved Shoulders (>= 5ft.)	
Definition:	Provide paved shoulders 5 feet or greater where no shoulders existed previously. Refer to W.C. 503 or 536 for widening paved shoulders.
Reduction Factor (%):	40%
Service Life (Years):	20
Maintenance Cost:	0
Preventable Crash:	(Roadway Related = 2, 3 or 4) OR (Vehicle Movements/Manner of Collision = 20, 23-24 or 30) OR (First Harmful Event = 4)
Required Documents:	Typical Section
538 Convert 2 Lane Facility to 4 Lane Divided	
Definition:	Convert an existing 2-lane facility to a 4-lane divided facility.
Reduction Factor (%):	45%
Service Life (Years):	20
Maintenance Cost:	0
Preventable Crash:	(Roadway Related = 2, 3 or 4) OR (Vehicle Movements/Manner of Collision = 10, 13, 14, 20, 21, 22, 24 or 30)
Required Documents:	Typical Section

540 Install Passing Lanes on 2 Lane Road	
Definition:	Widen roadway to install passing lanes on a 2-lane roadway where none currently exist.
Reduction Factor (%):	25%
Service Life (Years):	15
Maintenance Cost:	0
Preventable Crash:	(Roadway Related = 1, 2, or 3) AND (Vehicle Movements/Manner of Collision = 20-24 or 30)
Required Documents:	Typical Section
541 Provide Additional Paved Surface Width	
Definition:	Provide additional paved surface width with appropriate subsurface to each side of two lane, two-way roadways with existing paved surface width less than 24' to a maximum width of 28'.
Reduction Factor (%):	30%
Service Life (Years):	20
Maintenance Cost:	0
Preventable Crash:	(Roadway Related = 2, 3, or 4) OR (Vehicle Movements/Manner of Collision = 21 or 30) OR First Harmful Event = 10)
Required Documents:	Typical Section
542 Milled Centerline Rumble Strips	
Definition:	Install milled centerline rumble strips along the centerline. Stand-alone rumble strip project proposals will not be accepted.
Reduction Factor (%):	26%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	(Vehicle Movements/Manner of Collision = 21 or 30) OR (Roadway Related = 2 or 3)
Required Documents:	None
543 Profile Centerline Markings	
Definition:	Install profile centerline markings and preformed thermoplastic strips along the centerline. Stand-alone centerline rumble strip project proposals will not be accepted.
Reduction Factor (%):	7%
Service Life (Years):	5
Maintenance Cost:	0
Preventable Crash:	(Vehicle Movements/Manner of Collision = 21 or 30) OR (Roadway Related = 2 or 3) OR (Surface Condition = 2, 5, 6 or 9)
Required Documents:	None
544 Raised Centerline Rumble Strips	
Definition:	Install non-reflective raised traffic buttons (yellow or black) and preformed thermoplastic strips along the centerline. Stand-alone centerline rumble strip project proposals will not be accepted.
Reduction Factor (%):	17%
Service Life (Years):	4
Maintenance Cost:	0
Preventable Crash:	(Vehicle Movements/Manner of Collision = 21 or 30) OR (Roadway Related = 2 or 3) OR (Surface Condition = 2, 5, 6 or 9)
Required Documents:	None

545 Transverse Rumble Strips	
Definition:	Install transverse or in-lane rumble strips in advance of a high incident and special geometric location.
Reduction Factor (%):	15%
Service Life (Years):	5
Maintenance Cost:	0
Preventable Crash:	Intersection Related = 1 or 2
Required Documents:	None
547 Construct a Roundabout	
Definition:	Convert an existing intersection to a single lane roundabout design
Reduction Factor (%):	62%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	Intersection Related = 1 or 2
Required Documents:	Overhead Intersection View
550 Restricted Crossing U-Turn (RCUT)	
Definition:	Convert intersection to restricted crossing U-turn (RCUT) intersection.
Reduction Factor (%):	42%
Service Life (Years):	10
Maintenance Cost:	0
Preventable Crash:	Intersection Related = 1 or 2
Required Documents:	Overhead intersection layout

Work Codes and Work Code Combinations in MicroStrategy

Work Code (Combo)	Description	Reduction Factor	Service Life
101	Install Warning/Guide Signs	20%	6
107	Install Traffic Signal	35%	10
108	Improve Traffic Signals	24%	10
110	Install Pedestrian Signal	34%	10
111	Interconnect Signals	10%	10
113	Install Delineators	12%	7
114	Install School Zones	20%	5
118	Replace Flashing Beacon with a Traffic Signal	25%	10
119	Install Overhead Signs	20%	6
122	Install Advanced Warning Signals (Intersection - Existing Warning Signs)	10%	10
123	Install Advanced Warning Signals (Curve- Existing Warning Signs)	10%	10
124	Install Advanced Warning Signals and Signs (Intersection)	27%	10
125	Install Advanced Warning Signals and Signs (Curve)	15%	10
128	Install Advanced Warning Signs (Intersection)	5%	6
130	Install Advanced Warning Signs (Curve)	5%	6
131	Improve Pedestrian Signals	10%	10
132	Install Advance Warning Signals and Signs	10%	10
133	Improve School Zone	5%	5
136	Install LED Flashing Chevrons (Curve)	35%	10
137	Install Chevrons (Curve)	25%	10
138	Install Flashing Yellow Arrow	41%	10
139	Install Surface Mounted Delineators on Centerline	12%	7
140	Wrong Way Driver Warning Signs	35%	6
141	Wrong Way Driver Warning Markings	40%	4
142	Wrong Way Driver Advanced Technologies	TBD	8
143	Pedestrian Hybrid Beacon	15%	10
144	Install RRFB	Systemic	10
145	Flashing or LED-embedded Stop Signs	58%	10
150	Dynamic Speed Feedback Signs	7%	10
201	Install Median Barrier	75%	20
203	Install Raised Median	25%	20

204	Flatten Side Slope	5%	20
209	Safety Treat Fixed Objects	50%	20
217	Install Impact Attenuation System	60%	10
218	Widen Bridge	55%	20
225	Pedestrian Crossing Deterrent	Systemic	TBD
303	Resurfacing	30%	10
304	Safety Lighting	49%	15
305	Safety Lighting at Intersection	13%	15
401	Install Pavement Markings	20%	4
402	Install Edge Marking	25%	4
403	Install Pedestrian Crosswalk	10%	4
404	Install Centerline Striping	65%	4
407	Install Sidewalks	65%	10
502	Widen Lane(s)	30%	20
503	Widen Paved Shoulder (to 5 ft. or less)	25%	20
504	Construct Paved Shoulders (1-4 ft.)	25%	20
505	Improve Vertical Alignment	50%	10
506	Improve Horizontal Alignment	55%	10
507	Increase Superelevation	65%	10
508	Realign Intersection	TBD	10
509	Channelization	TBD	10
510	Construct Turn Arounds	40%	10
514	Grade Separation	80%	30
515	Construct Interchange	65%	30
516	Close Crossover	50%	20
517	Add Through Lane	28%	20
518	Install Continuous Turn Lane	50%	10
519	Add Left Turn Lane	25%	10
520	Lengthen Left Turn Lane	40%	10
521	Add Right Turn Lane	25%	10
522	Lengthen Right Turn Lane	40%	10
523	Construct Pedestrian Over/Under Pass	95%	20
524	Increase Turning Radius	10%	10
525	Convert to One Way Frontage Roads	68%	10
527	Positive Offest Left-turn Lanes	36%	10

532	Milled Edgeline Rumble Strips	15%	10
533	Profile Edgeline Markings	7%	5
534	Raised Edgeline Rumble Strips	17%	2
536	Widen Paved Shoulders (to >5 ft.)	31%	20
537	Construct Paved Shoulders (>= 5ft.)	40%	20
538	Convert 2 Lane Facility to 4 Lane Divided	45%	20
540	Install Passing Lanes on 2 Lane Road	25%	15
541	Provide Additional Paved Surface Width	30%	20
542	Milled Centerline Rumble Strips	26%	10
543	Profile Centerline Markings	7%	5
544	Raised Centerline Rumble Strips	17%	4
545	Transverse Rumble Strips	15%	5
547	Construct a Roundabout	62%	10
550	Restricted Crossing U-Turn (RCUT)	27%	10
551	Median U-Turn (MUT)	36%	25
101, 132	Install Warning/Guide Signs, Install Advance Warning Signals and Signs	58%	10
101, 136, 533, 543	Install Warning/Guide Signs, Install LED Flashing Chevrons (Curve), Profile Edgeline Markings, Profile Centerline Markings	27%	10
101, 137, 401	Install Warning/Guide Signs, Install Chevrons (Curve), Install Pavement Markings	32%	10
101, 209	Install Warning/Guide Signs, Safety Treat Fixed Objects	70%	20
101, 303	Install Warning/Guide Signs, Resurfacing	44%	10
101, 303, 404	Install Warning/Guide Signs, Resurfacing, Install Centerline Striping	36%	10
101, 303, 404, 519, 521, 534	Install Warning/Guide Signs, Resurfacing, Install Centerline Striping, Add Left Turn Lane, Add Right Turn Lane, Raised Edgeline Rumble Strips	37%	10
101, 303, 543	Install Warning/Guide Signs, Resurfacing, Profile Centerline Markings	36%	10
101, 401	Install Warning/Guide Signs, Install Pavement Markings	24%	6
107, 111	Install Traffic Signal, Interconnect Signals	22%	10
107, 111, 407	Install Traffic Signal, Interconnect Signals, Install Sidewalks	47%	10
107, 122	Install Traffic Signal, Install Advanced Warning Signals (Intersection - Existing Warning Signs)	38%	10
107, 122, 305, 545	Install Traffic Signal, Install Advanced Warning Signals (Intersection - Existing Warning Signs), Safety Lighting at Intersection, Transverse Rumble Strips	39%	15
107, 124	Install Traffic Signal, Install Advanced Warning Signals and Signs (Intersection)	55%	10

107, 124, 305, 519, 545	Install Traffic Signal, Install Advanced Warning Signals and Signs (Intersection), Safety Lighting at Intersection, Add Left Turn Lane, Transverse Rumble Strips	53%	15
107, 124, 305, 545	Install Traffic Signal, Install Advanced Warning Signals and Signs (Intersection), Safety Lighting at Intersection, Transverse Rumble Strips	39%	15
107, 124, 545	Install Traffic Signal, Install Advanced Warning Signals and Signs (Intersection), Transverse Rumble Strips	46%	10
107, 128	Install Traffic Signal, Install Advanced Warning Signs (Intersection)	36%	10
107, 128, 520	Install Traffic Signal, Install Advanced Warning Signs (Intersection), Lengthen Left Turn Lane	49%	10
107, 203, 304, 407	Install Traffic Signal, Install Raised Median, Safety Lighting, Install Sidewalks	50%	20
107, 203, 305, 401, 509, 518, 519	Install Traffic Signal, Install Raised Median, Safety Lighting at Intersection, Install Pavement Markings, Channelization, Install Continuous Turn Lane, Add Left Turn Lane	TBD	10
107, 203, 305, 509, 519	Install Traffic Signal, Install Raised Median, Safety Lighting at Intersection, Channelization, Add Left Turn Lane	TBD	10
107, 203, 401, 508, 521	Install Traffic Signal, Install Raised Median, Install Pavement Markings, Realign Intersection, Add Right Turn Lane	TBD	20
107, 209, 519	Install Traffic Signal, Safety Treat Fixed Objects, Add Left Turn Lane	72%	20
107, 305	Install Traffic Signal, Safety Lighting at Intersection	42%	15
107, 305, 521	Install Traffic Signal, Safety Lighting at Intersection, Add Right Turn Lane	36%	15
107, 305, 545	Install Traffic Signal, Safety Lighting at Intersection, Transverse Rumble Strips	42%	15
107, 407	Install Traffic Signal, Install Sidewalks	59%	10
107, 516	Install Traffic Signal, Close Crossover	69%	20
107, 519	Install Traffic Signal, Add Left Turn Lane	43%	10
107, 521	Install Traffic Signal, Add Right Turn Lane	43%	10
108, 110, 407	Improve Traffic Signals, Install Pedestrian Signal, Install Sidewalks	42%	10
108, 111	Improve Traffic Signals, Interconnect Signals	28%	10
108, 111, 122	Improve Traffic Signals, Interconnect Signals, Install Advanced Warning Signals (Intersection - Existing Warning Signs)	30%	10
108, 111, 122, 138	Improve Traffic Signals, Interconnect Signals, Install Advanced Warning Signals (Intersection - Existing Warning Signs), Install Flashing Yellow Arrow	31%	10
108, 111, 122, 407	Improve Traffic Signals, Interconnect Signals, Install Advanced Warning Signals (Intersection - Existing Warning Signs), Install Sidewalks	40%	10
108, 111, 128, 401, 403	Improve Traffic Signals, Interconnect Signals, Install Advanced Warning Signs (Intersection), Install Pavement Markings, Install Pedestrian Crosswalk	31%	10
108, 111, 138	Improve Traffic Signals, Interconnect Signals, Install Flashing Yellow Arrow	31%	10

108, 111, 138, 203, 305	Improve Traffic Signals, Interconnect Signals, Install Flashing Yellow Arrow, Install Raised Median, Safety Lighting at Intersection	41%	20
108, 111, 138, 305	Improve Traffic Signals, Interconnect Signals, Install Flashing Yellow Arrow, Safety Lighting at Intersection	37%	15
108, 111, 203	Improve Traffic Signals, Interconnect Signals, Install Raised Median	27%	20
108, 111, 305	Improve Traffic Signals, Interconnect Signals, Safety Lighting at Intersection	35%	15
108, 111, 403	Improve Traffic Signals, Interconnect Signals, Install Pedestrian Crosswalk	30%	10
108, 122, 138	Improve Traffic Signals, Install Advanced Warning Signals (Intersection - Existing Warning Signs), Install Flashing Yellow Arrow	31%	10
108, 124	Improve Traffic Signals, Install Advanced Warning Signals and Signs (Intersection)	51%	10
108, 124, 138, 401, 519	Improve Traffic Signals, Install Advanced Warning Signals and Signs (Intersection), Install Flashing Yellow Arrow, Install Pavement Markings, Add Left Turn Lane	36%	10
108, 124, 305	Improve Traffic Signals, Install Advanced Warning Signals and Signs (Intersection), Safety Lighting at Intersection	31%	15
108, 124, 305, 545	Improve Traffic Signals, Install Advanced Warning Signals and Signs (Intersection), Safety Lighting at Intersection, Transverse Rumble Strips	38%	15
108, 128	Improve Traffic Signals, Install Advanced Warning Signs (Intersection)	26%	10
108, 128, 131, 138, 305, 401, 519	Improve Traffic Signals, Install Advanced Warning Signs (Intersection), Improve Pedestrian Signals, Install Flashing Yellow Arrow, Safety Lighting at Intersection, Install Pavement Markings, Add Left Turn Lane	36%	15
108, 128, 305	Improve Traffic Signals, Install Advanced Warning Signs (Intersection), Safety Lighting at Intersection	34%	15
108, 128, 401, 403	Improve Traffic Signals, Install Advanced Warning Signs (Intersection), Install Pavement Markings, Install Pedestrian Crosswalk	30%	10
108, 128, 403	Improve Traffic Signals, Install Advanced Warning Signs (Intersection), Install Pedestrian Crosswalk	28%	10
108, 131	Improve Traffic Signals, Improve Pedestrian Signals	26%	10
108, 131, 133, 407	Improve Traffic Signals, Improve Pedestrian Signals, Improve School Zone, Install Sidewalks	37%	7
108, 131, 138	Improve Traffic Signals, Improve Pedestrian Signals, Install Flashing Yellow Arrow	33%	10
108, 131, 138, 303, 305, 401, 519	Improve Traffic Signals, Improve Pedestrian Signals, Install Flashing Yellow Arrow, Resurfacing, Safety Lighting at Intersection, Install Pavement Markings, Add Left Turn Lane	36%	15
108, 131, 138, 305, 519	Improve Traffic Signals, Improve Pedestrian Signals, Install Flashing Yellow Arrow, Safety Lighting at Intersection, Add Left Turn Lane	44%	10
108, 131, 138, 519	Improve Traffic Signals, Improve Pedestrian Signals, Install Flashing Yellow Arrow, Add Left Turn Lane	36%	10
108, 131, 203, 521, 517	Improve Traffic Signals, Improve Pedestrian Signals, Install Raised Median, Add Right Turn Lane, Add Through Lane	36%	20

108, 131, 304, 403	Improve Traffic Signals, Improve Pedestrian Signals, Safety Lighting, Install Pedestrian Crosswalk	44%	15
108, 131, 305	Improve Traffic Signals, Improve Pedestrian Signals, Safety Lighting at Intersection	31%	15
108, 131, 305, 403	Improve Traffic Signals, Improve Pedestrian Signals, Safety Lighting at Intersection, Install Pedestrian Crosswalk	34%	15
108, 131, 403	Improve Traffic Signals, Improve Pedestrian Signals, Install Pedestrian Crosswalk	28%	10
108, 131, 407	Improve Traffic Signals, Improve Pedestrian Signals, Install Sidewalks	38%	10
108, 131, 517	Improve Traffic Signals, Improve Pedestrian Signals, Add Through Lane	47%	20
108, 131, 519	Improve Traffic Signals, Improve Pedestrian Signals, Add Left Turn Lane	44%	10
108, 132	Improve Traffic Signals, Install Advance Warning Signals and Signs	36%	10
108, 138	Improve Traffic Signals, Install Flashing Yellow Arrow	27%	10
108, 138, 305	Improve Traffic Signals, Install Flashing Yellow Arrow, Safety Lighting at Intersection	35%	15
108, 138, 305, 401, 519, 521	Improve Traffic Signals, Install Flashing Yellow Arrow, Safety Lighting at Intersection, Install Pavement Markings, Add Left Turn Lane, Add Right Turn Lane	36%	15
108, 138, 407	Improve Traffic Signals, Install Flashing Yellow Arrow, Install Sidewalks	43%	10
108, 203	Improve Traffic Signals, Install Raised Median	51%	20
108, 209, 401, 506, 517, 520, 522	Improve Traffic Signals, Safety Treat Fixed Objects, Install Pavement Markings, Improve Horizontal Alignment, Add Through Lane, Lengthen Left Turn Lane, Lengthen Right Turn Lane	32%	20
108, 209, 401, 506, 519, 520, 521, 522	Improve Traffic Signals, Safety Treat Fixed Objects, Install Pavement Markings, Improve Horizontal Alignment, Add Left Turn Lane, Lengthen Left Turn Lane, Add Right Turn Lane, Lengthen Right Turn Lane	82%	20
108, 209, 401, 506, 520, 522	Improve Traffic Signals, Safety Treat Fixed Objects, Install Pavement Markings, Improve Horizontal Alignment, Lengthen Left Turn Lane, Lengthen Right Turn Lane	82%	20
108, 209, 401, 506, 520, 522, 538	Improve Traffic Signals, Safety Treat Fixed Objects, Install Pavement Markings, Improve Horizontal Alignment, Lengthen Left Turn Lane, Lengthen Right Turn Lane, Convert 2 Lane Facility to 4 Lane Divided	50%	20
108, 209, 517	Improve Traffic Signals, Safety Treat Fixed Objects, Add Through Lane	36%	20
108, 209, 519, 521	Improve Traffic Signals, Safety Treat Fixed Objects, Add Left Turn Lane, Add Right Turn Lane	62%	20
108, 209, 520, 522	Improve Traffic Signals, Safety Treat Fixed Objects, Lengthen Left Turn Lane, Lengthen Right Turn Lane	65%	20
108, 305	Improve Traffic Signals, Safety Lighting at Intersection	33%	15
108, 308	Improve Traffic Signals	36%	10

108, 401, 403	Improve Traffic Signals, Install Pavement Markings, Install Pedestrian Crosswalk	30%	10
108, 403	Improve Traffic Signals, Install Pedestrian Crosswalk	26%	10
108, 509	Improve Traffic Signals, Channelization	TBD	10
108, 517, 518	Improve Traffic Signals, Add Through Lane, Install Continuous Turn Lane	52%	20
108, 519	Improve Traffic Signals, Add Left Turn Lane	34%	10
108, 519, 521	Improve Traffic Signals, Add Left Turn Lane, Add Right Turn Lane	42%	10
108, 519, 522, 524	Improve Traffic Signals, Add Left Turn Lane, Lengthen Right Turn Lane, Increase Turning Radius	41%	10
108, 519, 524	Improve Traffic Signals, Add Left Turn Lane, Increase Turning Radius	46%	10
108, 520, 522	Improve Traffic Signals, Lengthen Left Turn Lane, Lengthen Right Turn Lane	45%	10
108, 521	Improve Traffic Signals, Add Right Turn Lane	34%	10
108, 538	Improve Traffic Signals, Convert 2 Lane Facility to 4 Lane Divided	64%	20
110, 403	Install Pedestrian Signal, Install Pedestrian Crosswalk	36%	10
111, 138	Interconnect Signals, Install Flashing Yellow Arrow	13%	10
111, 518	Interconnect Signals, Install Continuous Turn Lane	29%	10
111, 519	Interconnect Signals, Add Left Turn Lane	17%	10
113, 122, 519, 521	Install Delineators, Install Advanced Warning Signals (Intersection - Existing Warning Signs), Add Left Turn Lane, Add Right Turn Lane	44%	10
113, 123, 137, 139, 218, 506	Install Delineators, Install Advanced Warning Signals (Curve- Existing Warning Signs), Install Chevrons (Curve), Install Surface Mounted Delineators on Centerline, Widen Bridge, Improve Horizontal Alignment	36%	20
113, 128	Install Delineators, Install Advanced Warning Signs (Intersection)	35%	7
113, 130, 137	Install Delineators, Install Advanced Warning Signs (Curve), Install Chevrons (Curve)	10%	10
113, 533	Install Delineators, Profile Edgeline Markings	63%	7
119, 514	Install Overhead Signs, Grade Separation	57%	30
122, 305	Install Advanced Warning Signals (Intersection - Existing Warning Signs), Safety Lighting at Intersection	20%	15
122, 519	Install Advanced Warning Signals (Intersection - Existing Warning Signs), Add Left Turn Lane	27%	10
123, 125, 503, 532, 542	Install Advanced Warning Signals (Curve- Existing Warning Signs), Install Advanced Warning Signals and Signs (Curve), Widen Paved Shoulder (to 5 ft. or less), Milled Edgeline Rumble Strips, Milled Centerline Rumble Strips	50%	20
123, 125, 532, 541, 542	Install Advanced Warning Signals (Curve- Existing Warning Signs), Install Advanced Warning Signals and Signs (Curve), Milled Edgeline Rumble Strips, Provide Additional Paved Surface Width, Milled Centerline Rumble Strips	52%	20

123, 136	Install Advanced Warning Signals (Curve- Existing Warning Signs), Install LED Flashing Chevrons (Curve)	38%	10
123, 136, 503	Install Advanced Warning Signals (Curve- Existing Warning Signs), Install LED Flashing Chevrons (Curve), Widen Paved Shoulder (to 5 ft. or less)	38%	20
123, 136, 507, 537	Install Advanced Warning Signals (Curve- Existing Warning Signs), Install LED Flashing Chevrons (Curve), Increase Superelevation, Construct Paved Shoulders (>= 5ft.)	63%	20
123, 136, 507, 543	Install Advanced Warning Signals (Curve- Existing Warning Signs), Install LED Flashing Chevrons (Curve), Increase Superelevation, Profile Centerline Markings	45%	10
123, 136, 532, 542	Install Advanced Warning Signals (Curve- Existing Warning Signs), Install LED Flashing Chevrons (Curve), Milled Edgeline Rumble Strips, Milled Centerline Rumble Strips	41%	10
123, 136, 537	Install Advanced Warning Signals (Curve- Existing Warning Signs), Install LED Flashing Chevrons (Curve), Construct Paved Shoulders (>= 5ft.)	51%	20
123, 137	Install Advanced Warning Signals (Curve- Existing Warning Signs), Install Chevrons (Curve)	29%	10
123, 137, 209, 504, 532, 542	Install Advanced Warning Signals (Curve- Existing Warning Signs), Install Chevrons (Curve), Safety Treat Fixed Objects, Construct Paved Shoulders (1-4 ft.), Milled Edgeline Rumble Strips, Milled Centerline Rumble Strips	38%	20
123, 137, 209, 532, 537, 542	Install Advanced Warning Signals (Curve- Existing Warning Signs), Install Chevrons (Curve), Safety Treat Fixed Objects, Milled Edgeline Rumble Strips, Construct Paved Shoulders (>= 5ft.), Milled Centerline Rumble Strips	50%	20
123, 137, 209, 532, 541, 542	Install Advanced Warning Signals (Curve- Existing Warning Signs), Install Chevrons (Curve), Safety Treat Fixed Objects, Milled Edgeline Rumble Strips, Provide Additional Paved Surface Width, Milled Centerline Rumble Strips	42%	20
123, 137, 533, 543	Install Advanced Warning Signals (Curve- Existing Warning Signs), Install Chevrons (Curve), Profile Edgeline Markings, Profile Centerline Markings	23%	10
123, 209, 504, 532, 542	Install Advanced Warning Signals (Curve- Existing Warning Signs), Safety Treat Fixed Objects, Construct Paved Shoulders (1-4 ft.), Milled Edgeline Rumble Strips, Milled Centerline Rumble Strips	67%	20
123, 209, 532, 537, 542	Install Advanced Warning Signals (Curve- Existing Warning Signs), Safety Treat Fixed Objects, Milled Edgeline Rumble Strips, Construct Paved Shoulders (>= 5ft.), Milled Centerline Rumble Strips	71%	20
123, 209, 532, 541, 542	Install Advanced Warning Signals (Curve- Existing Warning Signs), Safety Treat Fixed Objects, Milled Edgeline Rumble Strips, Provide Additional Paved Surface Width, Milled Centerline Rumble Strips	41%	20
123, 303	Install Advanced Warning Signals (Curve- Existing Warning Signs), Resurfacing	36%	10
123, 401	Install Advanced Warning Signals (Curve- Existing Warning Signs), Install Pavement Markings	15%	10

123, 532, 541, 542	Install Advanced Warning Signals (Curve- Existing Warning Signs), Milled Edgeline Rumble Strips, Provide Additional Paved Surface Width, Milled Centerline Rumble Strips	42%	20
123, 533	Install Advanced Warning Signals (Curve- Existing Warning Signs), Profile Edgeline Markings	62%	10
123, 533, 543	Install Advanced Warning Signals (Curve- Existing Warning Signs), Profile Edgeline Markings, Profile Centerline Markings	65%	10
123, 543	Install Advanced Warning Signals (Curve- Existing Warning Signs), Profile Centerline Markings	38%	10
124, 304	Install Advanced Warning Signals and Signs (Intersection), Safety Lighting	59%	15
124, 305	Install Advanced Warning Signals and Signs (Intersection), Safety Lighting at Intersection	25%	15
124, 401, 545	Install Advanced Warning Signals and Signs (Intersection), Install Pavement Markings, Transverse Rumble Strips	33%	10
124, 514	Install Advanced Warning Signals and Signs (Intersection), Grade Separation	86%	30
124, 545	Install Advanced Warning Signals and Signs (Intersection), Transverse Rumble Strips	49%	10
125, 136	Install Advanced Warning Signals and Signs (Curve), Install LED Flashing Chevrons (Curve)	40%	10
125, 136, 533, 543	Install Advanced Warning Signals and Signs (Curve), Install LED Flashing Chevrons (Curve), Profile Edgeline Markings, Profile Centerline Markings	36%	10
125, 137	Install Advanced Warning Signals and Signs (Curve), Install Chevrons (Curve)	31%	10
125, 137, 209, 541	Install Advanced Warning Signals and Signs (Curve), Install Chevrons (Curve), Safety Treat Fixed Objects, Provide Additional Paved Surface Width	65%	20
125, 137, 402	Install Advanced Warning Signals and Signs (Curve), Install Chevrons (Curve), Install Edge Marking	31%	10
125, 137, 532, 542	Install Advanced Warning Signals and Signs (Curve), Install Chevrons (Curve), Milled Edgeline Rumble Strips, Milled Centerline Rumble Strips	30%	10
128, 305	Install Advanced Warning Signs (Intersection), Safety Lighting at Intersection	9%	15
128, 519	Install Advanced Warning Signs (Intersection), Add Left Turn Lane	45%	10
128, 519, 521	Install Advanced Warning Signs (Intersection), Add Left Turn Lane, Add Right Turn Lane	45%	10
130, 136	Install Advanced Warning Signs (Curve), Install LED Flashing Chevrons (Curve)	52%	10
130, 136, 533	Install Advanced Warning Signs (Curve), Install LED Flashing Chevrons (Curve), Profile Edgeline Markings	64%	10
130, 136, 533, 543	Install Advanced Warning Signs (Curve), Install LED Flashing Chevrons (Curve), Profile Edgeline Markings, Profile Centerline Markings	17%	10
130, 137	Install Advanced Warning Signs (Curve), Install Chevrons (Curve)	27%	10

130, 137, 209, 504, 532, 542	Install Advanced Warning Signs (Curve), Install Chevrons (Curve), Safety Treat Fixed Objects, Construct Paved Shoulders (1-4 ft.), Milled Edgeline Rumble Strips, Milled Centerline Rumble Strips	67%	20
130, 137, 209, 532, 537, 542	Install Advanced Warning Signs (Curve), Install Chevrons (Curve), Safety Treat Fixed Objects, Milled Edgeline Rumble Strips, Construct Paved Shoulders (>= 5ft.), Milled Centerline Rumble Strips	74%	20
130, 137, 209, 532, 541, 542	Install Advanced Warning Signs (Curve), Install Chevrons (Curve), Safety Treat Fixed Objects, Milled Edgeline Rumble Strips, Provide Additional Paved Surface Width, Milled Centerline Rumble Strips	69%	20
130, 137, 304	Install Advanced Warning Signs (Curve), Install Chevrons (Curve), Safety Lighting	31%	15
130, 137, 504, 506, 507, 532, 541, 542	Install Advanced Warning Signs (Curve), Install Chevrons (Curve), Construct Paved Shoulders (1-4 ft.), Improve Horizontal Alignment, Increase Superelevation, Milled Edgeline Rumble Strips, Provide Additional Paved Surface Width, Milled Centerline R	57%	20
130, 137, 532, 542	Install Advanced Warning Signs (Curve), Install Chevrons (Curve), Milled Edgeline Rumble Strips, Milled Centerline Rumble Strips	29%	10
130, 137, 533, 543	Install Advanced Warning Signs (Curve), Install Chevrons (Curve), Profile Edgeline Markings, Profile Centerline Markings	29%	10
130, 137, 534, 544	Install Advanced Warning Signs (Curve), Install Chevrons (Curve), Raised Edgeline Rumble Strips, Raised Centerline Rumble Strips	30%	10
130, 209, 503	Install Advanced Warning Signs (Curve), Safety Treat Fixed Objects, Widen Paved Shoulder (to 5 ft. or less)	36%	20
131, 403	Improve Pedestrian Signals, Install Pedestrian Crosswalk	34%	10
131, 403, 407	Improve Pedestrian Signals, Install Pedestrian Crosswalk, Install Sidewalks	67%	10
131, 407	Improve Pedestrian Signals, Install Sidewalks	66%	10
131, 521	Improve Pedestrian Signals, Add Right Turn Lane	29%	10
132, 133, 203	Install Advance Warning Signals and Signs, Improve School Zone, Install Raised Median	36%	20
133, 403	Improve School Zone, Install Pedestrian Crosswalk	36%	5
133, 403, 407	Improve School Zone, Install Pedestrian Crosswalk, Install Sidewalks	19%	10
133, 407	Improve School Zone, Install Sidewalks	65%	10
136, 209, 303, 502, 504, 533, 543	Install LED Flashing Chevrons (Curve), Safety Treat Fixed Objects, Resurfacing, Widen Lane(s), Construct Paved Shoulders (1-4 ft.), Profile Edgeline Markings, Profile Centerline Markings	49%	20
136, 209, 502, 504, 533, 543	Install LED Flashing Chevrons (Curve), Safety Treat Fixed Objects, Widen Lane(s), Construct Paved Shoulders (1-4 ft.), Profile Edgeline Markings, Profile Centerline Markings	49%	20
136, 209, 504, 533, 543	Install LED Flashing Chevrons (Curve), Safety Treat Fixed Objects, Construct Paved Shoulders (1-4 ft.), Profile Edgeline Markings, Profile Centerline Markings	53%	20
136, 209, 533, 541, 543	Install LED Flashing Chevrons (Curve), Safety Treat Fixed Objects, Profile Edgeline Markings, Provide Additional Paved Surface Width, Profile Centerline Markings	58%	20

136, 402	Install LED Flashing Chevrons (Curve), Install Edge Marking	36%	10
136, 506	Install LED Flashing Chevrons (Curve), Improve Horizontal Alignment	69%	10
136, 533	Install LED Flashing Chevrons (Curve), Profile Edgeline Markings	67%	10
136, 533, 542	Install LED Flashing Chevrons (Curve), Profile Edgeline Markings, Milled Centerline Rumble Strips	41%	10
136, 533, 543	Install LED Flashing Chevrons (Curve), Profile Edgeline Markings, Profile Centerline Markings	70%	10
136, 542	Install LED Flashing Chevrons (Curve), Milled Centerline Rumble Strips	32%	10
137, 209, 217	Install Chevrons (Curve), Safety Treat Fixed Objects, Install Impact Attenuation System	74%	20
137, 209, 532, 537, 542	Install Chevrons (Curve), Safety Treat Fixed Objects, Milled Edgeline Rumble Strips, Construct Paved Shoulders (>= 5ft.), Milled Centerline Rumble Strips	57%	20
137, 209, 532, 541, 542	Install Chevrons (Curve), Safety Treat Fixed Objects, Milled Edgeline Rumble Strips, Provide Additional Paved Surface Width, Milled Centerline Rumble Strips	63%	20
137, 304	Install Chevrons (Curve), Safety Lighting	30%	15
137, 401	Install Chevrons (Curve), Install Pavement Markings	47%	10
137, 503, 507	Install Chevrons (Curve), Widen Paved Shoulder (to 5 ft. or less), Increase Superelevation	45%	20
137, 504	Install Chevrons (Curve), Construct Paved Shoulders (1-4 ft.)	30%	20
137, 507	Install Chevrons (Curve), Increase Superelevation	67%	10
137, 532, 542	Install Chevrons (Curve), Milled Edgeline Rumble Strips, Milled Centerline Rumble Strips	30%	10
137, 533, 543	Install Chevrons (Curve), Profile Edgeline Markings, Profile Centerline Markings	68%	10
137, 541	Install Chevrons (Curve), Provide Additional Paved Surface Width	34%	20
137, 543	Install Chevrons (Curve), Profile Centerline Markings	51%	10
140, 141	Wrong Way Driver Warning Signs, Wrong Way Driver Warning Markings	59%	6
140, 141, 142	Wrong Way Driver Warning Signs, Wrong Way Driver Warning Markings, Wrong Way Driver Advanced Technologies	TBD	8
143, 304	Pedestrian Hybrid Beacon, Safety Lighting	52%	15
143, 403, 407	Pedestrian Hybrid Beacon, Install Pedestrian Crosswalk, Install Sidewalks	24%	10
201, 204	Install Median Barrier, Flatten Side Slope	65%	20
201, 303	Install Median Barrier, Resurfacing	69%	20
201, 303, 532	Install Median Barrier, Resurfacing, Milled Edgeline Rumble Strips	71%	20
201, 304	Install Median Barrier, Safety Lighting	64%	20
201, 516	Install Median Barrier, Close Crossover	64%	20

201, 521, 532	Install Median Barrier, Add Right Turn Lane, Milled Edgeline Rumble Strips	80%	20
201, 532	Install Median Barrier, Milled Edgeline Rumble Strips	66%	20
201, 533	Install Median Barrier, Profile Edgeline Markings	69%	20
203, 407	Install Raised Median, Install Sidewalks	37%	20
203, 517	Install Raised Median, Add Through Lane	37%	20
203, 533	Install Raised Median, Profile Edgeline Markings	48%	20
203, 533, 542	Install Raised Median, Profile Edgeline Markings, Milled Centerline Rumble Strips	39%	20
203, 533, 543	Install Raised Median, Profile Edgeline Markings, Profile Centerline Markings	31%	20
204, 209	Flatten Side Slope, Safety Treat Fixed Objects	36%	20
209, 218	Safety Treat Fixed Objects, Widen Bridge	64%	20
209, 218, 541	Safety Treat Fixed Objects, Widen Bridge, Provide Additional Paved Surface Width	69%	20
209, 303, 502, 503, 518, 533	Safety Treat Fixed Objects, Resurfacing, Widen Lane(s), Widen Paved Shoulder (to 5 ft. or less), Install Continuous Turn Lane, Profile Edgeline Markings	78%	20
209, 303, 502, 503, 532, 542	Safety Treat Fixed Objects, Resurfacing, Widen Lane(s), Widen Paved Shoulder (to 5 ft. or less), Milled Edgeline Rumble Strips, Milled Centerline Rumble Strips	68%	20
209, 303, 502, 503, 533, 543	Safety Treat Fixed Objects, Resurfacing, Widen Lane(s), Widen Paved Shoulder (to 5 ft. or less), Profile Edgeline Markings, Profile Centerline Markings	66%	20
209, 303, 503	Safety Treat Fixed Objects, Resurfacing, Widen Paved Shoulder (to 5 ft. or less)	63%	20
209, 303, 504	Safety Treat Fixed Objects, Resurfacing, Construct Paved Shoulders (1-4 ft.)	83%	20
209, 303, 532, 540, 542	Safety Treat Fixed Objects, Resurfacing, Milled Edgeline Rumble Strips, Install Passing Lanes on 2 Lane Road, Milled Centerline Rumble Strips	68%	20
209, 304	Safety Treat Fixed Objects, Safety Lighting	72%	20
209, 304, 502, 503	Safety Treat Fixed Objects, Safety Lighting, Widen Lane(s), Widen Paved Shoulder (to 5 ft. or less)	54%	20
209, 304, 518, 536	Safety Treat Fixed Objects, Safety Lighting, Install Continuous Turn Lane, Widen Paved Shoulders (to >5 ft.)	79%	20
209, 304, 536	Safety Treat Fixed Objects, Safety Lighting, Widen Paved Shoulders (to >5 ft.)	70%	20
209, 401	Safety Treat Fixed Objects, Install Pavement Markings	64%	20
209, 502	Safety Treat Fixed Objects, Widen Lane(s)	65%	20
209, 502, 503	Safety Treat Fixed Objects, Widen Lane(s), Widen Paved Shoulder (to 5 ft. or less)	63%	20

209, 502, 503, 518, 533	Safety Treat Fixed Objects, Widen Lane(s), Widen Paved Shoulder (to 5 ft. or less), Install Continuous Turn Lane, Profile Edgeline Markings	51%	20
209, 502, 503, 532, 542	Safety Treat Fixed Objects, Widen Lane(s), Widen Paved Shoulder (to 5 ft. or less), Milled Edgeline Rumble Strips, Milled Centerline Rumble Strips	49%	20
209, 502, 503, 533	Safety Treat Fixed Objects, Widen Lane(s), Widen Paved Shoulder (to 5 ft. or less), Profile Edgeline Markings	49%	20
209, 502, 503, 533, 543	Safety Treat Fixed Objects, Widen Lane(s), Widen Paved Shoulder (to 5 ft. or less), Profile Edgeline Markings, Profile Centerline Markings	49%	20
209, 502, 504	Safety Treat Fixed Objects, Widen Lane(s), Construct Paved Shoulders (1-4 ft.)	63%	20
209, 502, 504, 532, 542	Safety Treat Fixed Objects, Widen Lane(s), Construct Paved Shoulders (1-4 ft.), Milled Edgeline Rumble Strips, Milled Centerline Rumble Strips	49%	20
209, 502, 536	Safety Treat Fixed Objects, Widen Lane(s), Widen Paved Shoulders (to >5 ft.)	66%	20
209, 503	Safety Treat Fixed Objects, Widen Paved Shoulder (to 5 ft. or less)	56%	20
209, 503, 518	Safety Treat Fixed Objects, Widen Paved Shoulder (to 5 ft. or less), Install Continuous Turn Lane	78%	20
209, 503, 518, 532	Safety Treat Fixed Objects, Widen Paved Shoulder (to 5 ft. or less), Install Continuous Turn Lane, Milled Edgeline Rumble Strips	78%	20
209, 503, 518, 532, 542	Safety Treat Fixed Objects, Widen Paved Shoulder (to 5 ft. or less), Install Continuous Turn Lane, Milled Edgeline Rumble Strips, Milled Centerline Rumble Strips	58%	20
209, 503, 532	Safety Treat Fixed Objects, Widen Paved Shoulder (to 5 ft. or less), Milled Edgeline Rumble Strips	62%	20
209, 503, 534, 544	Safety Treat Fixed Objects, Widen Paved Shoulder (to 5 ft. or less), Raised Edgeline Rumble Strips, Raised Centerline Rumble Strips	36%	20
209, 503, 540	Safety Treat Fixed Objects, Widen Paved Shoulder (to 5 ft. or less), Install Passing Lanes on 2 Lane Road	62%	20
209, 504	Safety Treat Fixed Objects, Construct Paved Shoulders (1-4 ft.)	63%	20
209, 504, 532, 542	Safety Treat Fixed Objects, Construct Paved Shoulders (1-4 ft.), Milled Edgeline Rumble Strips, Milled Centerline Rumble Strips	67%	20
209, 504, 533	Safety Treat Fixed Objects, Construct Paved Shoulders (1-4 ft.), Profile Edgeline Markings	36%	20
209, 504, 533, 543	Safety Treat Fixed Objects, Construct Paved Shoulders (1-4 ft.), Profile Edgeline Markings, Profile Centerline Markings	36%	20
209, 504, 542	Safety Treat Fixed Objects, Construct Paved Shoulders (1-4 ft.), Milled Centerline Rumble Strips	66%	20
209, 506	Safety Treat Fixed Objects, Improve Horizontal Alignment	64%	20
209, 516	Safety Treat Fixed Objects, Close Crossover	75%	20
209, 517	Safety Treat Fixed Objects, Add Through Lane	64%	20
209, 518	Safety Treat Fixed Objects, Install Continuous Turn Lane	75%	20

209, 518, 532	Safety Treat Fixed Objects, Install Continuous Turn Lane, Milled Edgeline Rumble Strips	76%	20
209, 518, 532, 542	Safety Treat Fixed Objects, Install Continuous Turn Lane, Milled Edgeline Rumble Strips, Milled Centerline Rumble Strips	77%	20
209, 518, 536	Safety Treat Fixed Objects, Install Continuous Turn Lane, Widen Paved Shoulders (to >5 ft.)	70%	20
209, 519	Safety Treat Fixed Objects, Add Left Turn Lane	56%	20
209, 519, 521	Safety Treat Fixed Objects, Add Left Turn Lane, Add Right Turn Lane	62%	20
209, 532	Safety Treat Fixed Objects, Milled Edgeline Rumble Strips	63%	20
209, 532, 536, 542	Safety Treat Fixed Objects, Milled Edgeline Rumble Strips, Widen Paved Shoulders (to >5 ft.), Milled Centerline Rumble Strips	70%	20
209, 532, 537, 542	Safety Treat Fixed Objects, Milled Edgeline Rumble Strips, Construct Paved Shoulders (>= 5ft.), Milled Centerline Rumble Strips	74%	20
209, 532, 540	Safety Treat Fixed Objects, Milled Edgeline Rumble Strips, Install Passing Lanes on 2 Lane Road	64%	20
209, 532, 540, 542	Safety Treat Fixed Objects, Milled Edgeline Rumble Strips, Install Passing Lanes on 2 Lane Road, Milled Centerline Rumble Strips	35%	15
209, 532, 541	Safety Treat Fixed Objects, Milled Edgeline Rumble Strips, Provide Additional Paved Surface Width	54%	20
209, 532, 541, 542	Safety Treat Fixed Objects, Milled Edgeline Rumble Strips, Provide Additional Paved Surface Width, Milled Centerline Rumble Strips	37%	20
209, 532, 542	Safety Treat Fixed Objects, Milled Edgeline Rumble Strips, Milled Centerline Rumble Strips	57%	20
209, 533, 537, 543	Safety Treat Fixed Objects, Profile Edgeline Markings, Construct Paved Shoulders (>= 5ft.), Profile Centerline Markings	71%	20
209, 533, 541	Safety Treat Fixed Objects, Profile Edgeline Markings, Provide Additional Paved Surface Width	59%	20
209, 533, 541, 543	Safety Treat Fixed Objects, Profile Edgeline Markings, Provide Additional Paved Surface Width, Profile Centerline Markings	71%	20
209, 533, 542	Safety Treat Fixed Objects, Profile Edgeline Markings, Milled Centerline Rumble Strips	68%	20
209, 533, 543	Safety Treat Fixed Objects, Profile Edgeline Markings, Profile Centerline Markings	53%	20
209, 536	Safety Treat Fixed Objects, Widen Paved Shoulders (to >5 ft.)	60%	20
209, 536, 542	Safety Treat Fixed Objects, Widen Paved Shoulders (to >5 ft.), Milled Centerline Rumble Strips	68%	20
209, 537	Safety Treat Fixed Objects, Construct Paved Shoulders (>= 5ft.)	70%	20
209, 540	Safety Treat Fixed Objects, Install Passing Lanes on 2 Lane Road	63%	20
209, 541	Safety Treat Fixed Objects, Provide Additional Paved Surface Width	65%	20
209, 541, 542	Safety Treat Fixed Objects, Provide Additional Paved Surface Width, Milled Centerline Rumble Strips	68%	20
209, 542	Safety Treat Fixed Objects, Milled Centerline Rumble Strips	54%	20
209, 547	Safety Treat Fixed Objects, Construct a Roundabout	74%	20
303, 401	Resurfacing, Install Pavement Markings	50%	10

303, 407, 502, 505, 518	Resurfacing, Install Sidewalks, Widen Lane(s), Improve Vertical Alignment, Install Continuous Turn Lane	68%	20
303, 407, 518	Resurfacing, Install Sidewalks, Install Continuous Turn Lane	56%	10
303, 503, 542	Resurfacing, Widen Paved Shoulder (to 5 ft. or less), Milled Centerline Rumble Strips	47%	20
303, 518, 532, 540	Resurfacing, Install Continuous Turn Lane, Milled Edgeline Rumble Strips, Install Passing Lanes on 2 Lane Road	52%	15
303, 518, 533	Resurfacing, Install Continuous Turn Lane, Profile Edgeline Markings	64%	10
303, 519	Resurfacing, Add Left Turn Lane	36%	10
303, 519, 532, 540	Resurfacing, Add Left Turn Lane, Milled Edgeline Rumble Strips, Install Passing Lanes on 2 Lane Road	49%	15
303, 519, 533	Resurfacing, Add Left Turn Lane, Profile Edgeline Markings	63%	10
303, 532	Resurfacing, Milled Edgeline Rumble Strips	48%	10
303, 532, 540	Resurfacing, Milled Edgeline Rumble Strips, Install Passing Lanes on 2 Lane Road	44%	15
303, 532, 542	Resurfacing, Milled Edgeline Rumble Strips, Milled Centerline Rumble Strips	58%	10
303, 533	Resurfacing, Profile Edgeline Markings	41%	10
303, 533, 536	Resurfacing, Profile Edgeline Markings, Widen Paved Shoulders (to >5 ft.)	41%	20
303, 533, 536, 543	Resurfacing, Profile Edgeline Markings, Widen Paved Shoulders (to >5 ft.), Profile Centerline Markings	41%	20
303, 533, 542	Resurfacing, Profile Edgeline Markings, Milled Centerline Rumble Strips	37%	10
303, 533, 543	Resurfacing, Profile Edgeline Markings, Profile Centerline Markings	22%	10
303, 542	Resurfacing, Milled Centerline Rumble Strips	42%	10
303, 543	Resurfacing, Profile Centerline Markings	37%	10
304, 407	Safety Lighting, Install Sidewalks	46%	15
304, 502, 533, 543	Safety Lighting, Widen Lane(s), Profile Edgeline Markings, Profile Centerline Markings	41%	20
304, 506	Safety Lighting, Improve Horizontal Alignment	75%	15
304, 533, 543	Safety Lighting, Profile Edgeline Markings, Profile Centerline Markings	15%	15
305, 407	Safety Lighting at Intersection, Install Sidewalks	53%	15
305, 508, 519, 521	Safety Lighting at Intersection, Realign Intersection, Add Left Turn Lane, Add Right Turn Lane	TBD	10
305, 514	Safety Lighting at Intersection, Grade Separation	56%	30
305, 515	Safety Lighting at Intersection, Construct Interchange	51%	30
305, 519	Safety Lighting at Intersection, Add Left Turn Lane	33%	15
305, 519, 521	Safety Lighting at Intersection, Add Left Turn Lane, Add Right Turn Lane	42%	15

305, 519, 532, 540, 542	Safety Lighting at Intersection, Add Left Turn Lane, Milled Edgeline Rumble Strips, Install Passing Lanes on 2 Lane Road, Milled Centerline Rumble Strips	39%	15
305, 524	Safety Lighting at Intersection, Increase Turning Radius	37%	15
305, 547	Safety Lighting at Intersection, Construct a Roundabout	72%	15
401, 402, 403	Install Pavement Markings, Install Edge Marking, Install Pedestrian Crosswalk	15%	4
401, 403, 504	Install Pavement Markings, Install Pedestrian Crosswalk, Construct Paved Shoulders (1-4 ft.)	36%	20
401, 532, 536	Install Pavement Markings, Milled Edgeline Rumble Strips, Widen Paved Shoulders (to >5 ft.)	50%	20
402, 543	Install Edge Marking, Profile Centerline Markings	31%	5
403, 407	Install Pedestrian Crosswalk, Install Sidewalks	74%	10
407, 517, 518, 536	Install Sidewalks, Add Through Lane, Install Continuous Turn Lane, Widen Paved Shoulders (to >5 ft.)	75%	20
502, 503	Widen Lane(s), Widen Paved Shoulder (to 5 ft. or less)	36%	20
502, 503, 518	Widen Lane(s), Widen Paved Shoulder (to 5 ft. or less), Install Continuous Turn Lane	63%	20
502, 503, 518, 533	Widen Lane(s), Widen Paved Shoulder (to 5 ft. or less), Install Continuous Turn Lane, Profile Edgeline Markings	66%	20
502, 503, 532, 542	Widen Lane(s), Widen Paved Shoulder (to 5 ft. or less), Milled Edgeline Rumble Strips, Milled Centerline Rumble Strips	36%	20
502, 503, 542	Widen Lane(s), Widen Paved Shoulder (to 5 ft. or less), Milled Centerline Rumble Strips	42%	20
502, 504	Widen Lane(s), Construct Paved Shoulders (1-4 ft.)	36%	20
502, 504, 518	Widen Lane(s), Construct Paved Shoulders (1-4 ft.), Install Continuous Turn Lane	63%	20
502, 504, 542	Widen Lane(s), Construct Paved Shoulders (1-4 ft.), Milled Centerline Rumble Strips	42%	20
502, 518	Widen Lane(s), Install Continuous Turn Lane	58%	20
502, 518, 533, 537, 543	Widen Lane(s), Install Continuous Turn Lane, Profile Edgeline Markings, Construct Paved Shoulders (>= 5ft.), Profile Centerline Markings	71%	20
502, 518, 537	Widen Lane(s), Install Continuous Turn Lane, Construct Paved Shoulders (>= 5ft.)	62%	20
502, 537	Widen Lane(s), Construct Paved Shoulders (>= 5ft.)	49%	20
503, 507	Widen Paved Shoulder (to 5 ft. or less), Increase Superelevation	62%	20
503, 518	Widen Paved Shoulder (to 5 ft. or less), Install Continuous Turn Lane	63%	20
503, 519	Widen Paved Shoulder (to 5 ft. or less), Add Left Turn Lane	58%	20
503, 532	Widen Paved Shoulder (to 5 ft. or less), Milled Edgeline Rumble Strips	48%	20
503, 532, 542	Widen Paved Shoulder (to 5 ft. or less), Milled Edgeline Rumble Strips, Milled Centerline Rumble Strips	49%	20

503, 540	Widen Paved Shoulder (to 5 ft. or less), Install Passing Lanes on 2 Lane Road	34%	20
503, 542	Widen Paved Shoulder (to 5 ft. or less), Milled Centerline Rumble Strips	32%	20
504, 506	Construct Paved Shoulders (1-4 ft.), Improve Horizontal Alignment	46%	20
504, 506, 507	Construct Paved Shoulders (1-4 ft.), Improve Horizontal Alignment, Increase Superelevation	63%	20
504, 507	Construct Paved Shoulders (1-4 ft.), Increase Superelevation	49%	20
504, 518	Construct Paved Shoulders (1-4 ft.), Install Continuous Turn Lane	63%	20
504, 519	Construct Paved Shoulders (1-4 ft.), Add Left Turn Lane	34%	20
504, 533, 543	Construct Paved Shoulders (1-4 ft.), Profile Edgeline Markings, Profile Centerline Markings	28%	20
505, 506, 507	Improve Vertical Alignment, Improve Horizontal Alignment, Increase Superelevation	72%	10
505, 516	Improve Vertical Alignment, Close Crossover	63%	20
506, 507, 519, 520, 537	Improve Horizontal Alignment, Increase Superelevation, Add Left Turn Lane, Lengthen Left Turn Lane, Construct Paved Shoulders (>= 5ft.)	77%	20
506, 507, 519, 537	Improve Horizontal Alignment, Increase Superelevation, Add Left Turn Lane, Construct Paved Shoulders (>= 5ft.)	64%	20
506, 507, 537	Improve Horizontal Alignment, Increase Superelevation, Construct Paved Shoulders (>= 5ft.)	64%	20
506, 508, 519, 537	Improve Horizontal Alignment, Realign Intersection, Add Left Turn Lane, Construct Paved Shoulders (>= 5ft.)	TBD	20
507, 532	Increase Superelevation, Milled Edgeline Rumble Strips	74%	10
507, 532, 537	Increase Superelevation, Milled Edgeline Rumble Strips, Construct Paved Shoulders (>= 5ft.)	52%	20
507, 533	Increase Superelevation, Profile Edgeline Markings	75%	10
507, 536	Increase Superelevation, Widen Paved Shoulders (to >5 ft.)	60%	20
507, 537	Increase Superelevation, Construct Paved Shoulders (>= 5ft.)	50%	20
507, 537, 532, 542	Increase Superelevation, Construct Paved Shoulders (>= 5ft.), Milled Edgeline Rumble Strips, Milled Centerline Rumble Strips	61%	20
508, 509	Realign Intersection, Channelization	TBD	10
508, 520, 522, 524	Realign Intersection, Lengthen Left Turn Lane, Lengthen Right Turn Lane, Increase Turning Radius	TBD	10
514, 516	Grade Separation, Close Crossover	85%	30
516, 519	Close Crossover, Add Left Turn Lane	67%	20
516, 520	Close Crossover, Lengthen Left Turn Lane	70%	20
517, 518	Add Through Lane, Install Continuous Turn Lane	46%	20
517, 518, 533	Add Through Lane, Install Continuous Turn Lane, Profile Edgeline Markings	62%	20
517, 522	Add Through Lane, Lengthen Right Turn Lane	42%	20

518, 532	Install Continuous Turn Lane, Milled Edgeline Rumble Strips	63%	10
518, 532, 540	Install Continuous Turn Lane, Milled Edgeline Rumble Strips, Install Passing Lanes on 2 Lane Road	60%	15
518, 533	Install Continuous Turn Lane, Profile Edgeline Markings	65%	10
518, 533, 543	Install Continuous Turn Lane, Profile Edgeline Markings, Profile Centerline Markings	53%	10
518, 536	Install Continuous Turn Lane, Widen Paved Shoulders (to >5 ft.)	70%	20
518, 537	Install Continuous Turn Lane, Construct Paved Shoulders (>= 5ft.)	70%	20
519, 521	Add Left Turn Lane, Add Right Turn Lane	34%	10
519, 521, 524	Add Left Turn Lane, Add Right Turn Lane, Increase Turning Radius	38%	10
519, 532	Add Left Turn Lane, Milled Edgeline Rumble Strips	50%	10
520, 521, 524	Lengthen Left Turn Lane, Add Right Turn Lane, Increase Turning Radius	43%	10
532, 536	Milled Edgeline Rumble Strips, Widen Paved Shoulders (to >5 ft.)	52%	20
532, 536, 540, 542	Milled Edgeline Rumble Strips, Widen Paved Shoulders (to >5 ft.), Install Passing Lanes on 2 Lane Road, Milled Centerline Rumble Strips	40%	20
532, 537	Milled Edgeline Rumble Strips, Construct Paved Shoulders (>= 5ft.)	48%	20
532, 537, 542	Milled Edgeline Rumble Strips, Construct Paved Shoulders (>= 5ft.), Milled Centerline Rumble Strips	52%	20
532, 540	Milled Edgeline Rumble Strips, Install Passing Lanes on 2 Lane Road	34%	15
532, 540, 542	Milled Edgeline Rumble Strips, Install Passing Lanes on 2 Lane Road, Milled Centerline Rumble Strips	49%	15
532, 541	Milled Edgeline Rumble Strips, Provide Additional Paved Surface Width	39%	20
532, 541, 542	Milled Edgeline Rumble Strips, Provide Additional Paved Surface Width, Milled Centerline Rumble Strips	44%	20
532, 542	Milled Edgeline Rumble Strips, Milled Centerline Rumble Strips	59%	10
533, 536, 542	Profile Edgeline Markings, Widen Paved Shoulders (to >5 ft.), Milled Centerline Rumble Strips	36%	20
533, 536, 543	Profile Edgeline Markings, Widen Paved Shoulders (to >5 ft.), Profile Centerline Markings	37%	20
533, 537	Profile Edgeline Markings, Construct Paved Shoulders (>= 5ft.)	49%	20
533, 537, 543	Profile Edgeline Markings, Construct Paved Shoulders (>= 5ft.), Profile Centerline Markings	42%	20
533, 541	Profile Edgeline Markings, Provide Additional Paved Surface Width	49%	20
533, 541, 543	Profile Edgeline Markings, Provide Additional Paved Surface Width, Profile Centerline Markings	55%	20
533, 542	Profile Edgeline Markings, Milled Centerline Rumble Strips	67%	10
533, 543	Profile Edgeline Markings, Profile Centerline Markings	31%	5
533, 544	Profile Edgeline Markings, Raised Centerline Rumble Strips	67%	5

534, 544	Raised Edgeline Rumble Strips, Raised Centerline Rumble Strips	55%	4
541, 542	Provide Additional Paved Surface Width, Milled Centerline Rumble Strips	36%	20

Appendix C – Preventable Crash Decoding

Introduction

The Preventable Crash Decoding Table in this section can be used to interpret the codes in the Highway Safety Improvement Program (HSIP) Work Codes Table.

Part of Roadway No. 1 Involved:			
1	Main Proper Lane	5	Connector/Flyover
2	Service/Frontage Road	6	Detour
3	Entrance/On Ramp	7	Transitway
4	Exit/Off Ramp	8	Transitway Ramp
Roadway Related:			
1	On roadway	3	Shoulder
2	Off roadway	4	Median
Intersection Related:			
1	Intersection	3	Driveway access
2	Intersection related	4	Non-intersection

First Harmful Event			
Collision of a motor vehicle with:			
1	Pedestrian	5	Pedalcyclist
2	Another motor vehicle in transport	6	Animal
3	RR train	7	Fixed object
4	Parked car	8	Other object
Other than a collision:			
9	Other non-collision	10	Overturn

Vehicle Movements & Manner of Collision			
Two motor vehicles approaching at an angle:			
10	Both going straight	15	Both right turn
11	One straight, one backing	16	One right turn, one left turn
12	One straight, one stopped	17	One right turn, one stopped
13	One straight, one right turn	18	Both left turn
14	One straight, one left turn	19	One left turn, one stopped
Two motor vehicles going same direction:			
20	Both going straight - rear end	25	Both right turn
21	Both going straight - sideswipe	26	One right turn, one left turn
22	One straight, one stopped	27	One right turn, one stopped
23	One straight, one right turn	28	Both left turn
24	One straight, one left turn	29	One left turn, one stopped

Two motor vehicles going opposite directions:			
30	Both going straight	35	One backing, one stopped
31	One straight, one backing	36	One right turn, one left turn
32	One straight, one stopped	37	One right turn, one stopped
33	One straight, one right turn	38	Both left turn
34	One straight, one left turn	39	One left turn, one stopped
Two motor vehicles – other:			
40	One straight, one entering or leaving parking space		
41	One right turn, one entering or leaving parking space		
42	One left turn, one entering or leaving parking space		
43	One entering or leaving parking space, one stopped		
44	Both entering or leaving parking space		
45	Both vehicles backing		
46	All others		
Movement of Vehicle in Other Than Motor-with-Motor Crashes:			
1	Vehicle going straight		
2	Vehicle turning right		
3	Vehicle turning left		
4	Vehicle backing		
5	Other		

Object Struck			
0	No code shown is applicable	40	Vehicle hit end of bridge (abutment or rail end)
1	Vehicle overturned	41	Vehicle hit side of bridge (bridge rail)
2	Vehicle hit hole in road	42	Vehicle hit pier or support at underpass, tunnel or overhead sign bridge
3	Vehicle jackknifed	43	Vehicle hit top of underpass or tunnel
4	Person fell or jumped from vehicle	44	Vehicle hit bridge crossing gate
9	Vehicle hit train on tracks parallel to road - no crossing	45	Vehicle hit attenuation device
10	Vehicle hit train moving forward	49	Vehicle hit by falling/blowing rocks from a truck
11	Vehicle hit train backing	50	Vehicle hit fallen trees or debris on road
12	Vehicle hit train standing still	51	Vehicle hit object from another vehicle in road
13	Vehicle hit train - action unknown	52	Vehicle hit previously wrecked vehicle
20	Vehicle hit highway sign	53	Vehicle hit toll booth
21	Vehicle hit curb	54	Vehicle hit other machinery
22	Vehicle hit culvert - headwall	55	Vehicle hit other object
23	Vehicle hit guardrail	56	Vehicle hit concrete traffic barrier
24	Vehicle hit railroad signal pole or post	57	Vehicle hit delineator or marker post
25	Vehicle hit railroad crossing gates	58	Vehicle hit retaining wall
26	Vehicle hit traffic signal pole or post	59	Vehicle hit HOV lane gate
27	Vehicle hit overhead signal light, wires, sign, etc.	60	Vehicle hit guard post
28	Vehicle hit work zone barricade, cones, signs or material	61	Fire hydrant
29	Vehicle hit luminaire pole	62	Ditch (long narrow excavation dug in earth)
30	Vehicle hit utility pole	63	Embankment (a raised strip of land or berm)
31	Vehicle hit mailbox	64	Not Applicable
32	Vehicle hit tree or shrub	65	Not Reported
33	Vehicle hit fence		
34	Vehicle hit house, building or building fixture		
35	Vehicle hit commercial sign		
36	Vehicle hit other fixed object		
37	Vehicle hit bus stop structure		
38	Vehicle hit work zone machinery or stockpiled materials		
39	Vehicle hit median barrier		

Bridge Detail:			
1	Vehicle retained on bridge or overpass	6	Structure not hit
2	Vehicle went through rail	7	Result Unknown
3	Vehicle went over rail	8	Not Applicable
4	Crash involved underpass	9	Not Reported
5	Vehicle went between parallel structures		

Other Factors:			
0	No code shown is applicable	10	One car parked improper location
1	Lost control or skidded (icy or slick road, etc.)	11	One car forward from parking
2	Passenger interfered with driver	12	One car backward from parking
3	Attention diverted from driving (delayed perception or lack of alertness)	13	One car entering driveway
4	Open door or object projecting from vehicle	14	One car leaving driveway
5	Foot slipped off clutch or brake	54	Not Applicable
6	Gusty winds	55	Not Reported
7	Vehicle passing or attempting to pass on left	56	Road rage
8	Vehicle passing or attempting to pass on right		
9	Vehicle changing lanes		
Vision obstructed by:			
16	Standing or parked vehicle	21	Headlight or sun glare
17	Moving vehicle	22	Hillcrest
18	Embankment or ledge	23	Trees, shrubs, weeds, etc.
19	Commercial sign	24	Other visual obstructions
20	Highway sign		
Vehicle swerved or veered from intended course:			
25	Reason not specified	31	Avoiding vehicle stopped or moving slowly in traffic lane
26	For surface or visibility	32	Avoiding vehicle entering road
27	For officer, watchman, flagman, or traffic control device (unable to stop, etc.)	33	Avoiding vehicle from opposite direction in wrong lane
28	Avoiding pedestrian, pedal cyclist, etc. in road	34	Avoiding previous crash
29	Avoiding animal in road	35	Avoiding vehicle passing, changing lanes
30	Avoiding object in road		

Vehicle slowing, stopping, or stopped on road:			
36	Reason not specified		
37	Because of surface or visibility		
38	For officer, watchman, flagman, or traffic control device		
39	For pedestrian, pedalcyclist, etc. in road		
40	For animal in road		
41	For object in road		
42	For traffic		
43	To avoid vehicle entering road		
44	To avoid vehicle from opposite direction in wrong lane		
45	To avoid previous crash		
46	To make right turn		
47	To make left turn		
School bus related crash:			
48	School bus related crash		
Construction related:			
49	Within posted road construction zone (not related to crash)		
50	Within posted road construction zone (related to crash)		
51	In other construction maintenance area (not related to crash)		
52	In other construction maintenance area (related to crash)		
Beach related:			
53	Crash occurred on a beach		
Light Condition:			
0	Unknown	4	Darkness - lighted
1	Daylight	5	Dusk
2	Dawn	6	Darkness, unknown lighting
3	Darkness - not lighted	8	Other
Surface Condition:			
0	Unknown	6	Ice
1	Dry	7	Muddy
2	Wet	8	Other
3	Standing Water	9	Snow
4	Snow/Icy	10	Sand, Mud, Dirt
5	Slush		
Vehicle Body Style:			
87	Truck - tractor	91	Semitrailer

Appendix D – Change Log

Date of Release	*Changes*
October 2020	Clarified "Highlights" to specify the requirement for complete project packets for all new projects being submitted for funding. Clarified "Highlights" with the current dates for district submissions. Updated section "Systemic Approach" and added eligible systemic countermeasures. Updated language regarding 8DA funding lines. Updated language describing the SII ratio. Updated section "Crash Data - Overview" to reflect that K, A, and B crashes are included in CAVS data. Updated section "Crash Cost" to reflect current numbers, and updated language regarding crashes counted toward the SII. Added "CAVS" to Appendix A – Definitions. Removed WCs 306, 307 and associated Combinations.
September 2021	Updated timeline to reflect new program call dates. Added section "Increased Federal Funding (G Match)." Added approved systemic countermeasures. Revised "Submission Instructions" to reflect upcoming guidance about process changes as a result of TxDOTCONNECT improvements. Revised SII instructions. Removed WC 105 Install Overhead Flashing Beacon, and associated Combinations. Added approved countermeasures to Work Codes tables.
August 2022	Updated timeline to reflect new program call dates Incorporated 15% extra funding into new programming levels Updated emphasis areas Updated "Project Documentation" to include Submittal Form and how funding lines need to be entered into TxDOTCONNECT. Updated "Submission Instructions" to include Box.com submittal location Updated crash costs Added work codes: "150 – Install Dynamic Speed Feedback Signs" & "537 – Install off-set left turn lane" Updated Reduction Factors for WC "144 - RRFB", "145 – Flashing or Embedded Stop Signs", "225 – Pedestrian Crossing Deterrent", "550 – Median U-Turn" Removed combo code "107, 124, 138"
August 2023	Updated timeline to reflect 2023 Program Call dates. Updated citations relating to Confidentiality of Data. Updated Project Submission Guidelines with a discussion of Local Letting as a pilot program. Updated Project Documentation with a note to discourage contingency or "lump sum" line items in estimates. Updated Crash Costs to reflect current expected values. Updated Appendix A with additional definitions and clarifications. Updated Work Code tables to reflect current countermeasures, definitions, and preventable crash types.