

Maine Highway Safety Improvement Program (HSIP)

Background

The Highway Safety Improvement Program (HSIP) is a core Federal-aid program funded through the Federal Highway Administration (FHWA) and administered by the Maine Department of Transportation (MaineDOT). The HSIP was created under Section 1401 of Safe Accountable Flexible Efficient Transportation Act (SAFETEA-LU) with the purpose to reduce traffic fatalities and serious injuries on all public roadways, including non-State owned public roads and roads on tribal lands. The [Moving Ahead for Progress in the 21st Century Act \(MAP-21\)](#) is a continuation of the HSIP, which is authorized under United States Code Title 23 Section 148 (23 U.S.C. 148). Map-21 was replaced with the [Fixing America's Surface Transportation Act \(FAST Act\)](#) into law on December 4, 2015. Complete Federal Highway Administration HSIP guidance is available at <http://safety.fhwa.dot.gov/hsip/>.

MaineDOT has developed a HSIP that involves the identification of problem safety areas, an analysis of problems and countermeasures, and the prioritization and scheduling of improvement projects. MaineDOT seeks to align this plan with its Strategic Highway Safety Plan (SHSP). Appropriate use of HSIP funds is for locations or corridors where a known, substantive safety problem exists as indicated by location-specific data on severe crashes, and where it is determined that the specific project action can with confidence produce a measurable and significant reduction in the number and/or consequences of severe crashes. This includes systemic concerns like interstate median crossover crashes, head on collisions on priority high speed corridors and wrong way mitigations for interstate ramps. To achieve the maximum benefit, the focus of the program is on cost effective use of the funds allocated for safety improvements. Eligible projects are ranked in descending order and funded as such until all funds are depleted. The HSIP also needs to be holistic, considering all safety program needs identified in the SHSP described below.

Strategic Highway Safety Plan

Legislated under 23 U.S.C 148, the HSIP requires each State to develop a Strategic Highway Safety Plan. The SHSP is a statewide-coordinated safety plan that provides a comprehensive framework, and specific goals and objectives, for reducing highway fatalities and serious injuries on all public roads. Maine's HSIP is structured and funded to make significant progress in reducing highway fatalities and injuries on all public roadways (federal, state, or local). MaineDOT continues to refine its safety fund structure to be oriented to key focus areas identified in the SHSP available at http://www.maine.gov/mdot/safety/docs/Strategic-Highway-Safety-Plan_2017.pdf

Maine's 2017 focus areas include the following:

- Lane Departure
- Illegal/Unsafe Speed
- Safety Belts
- Young Drivers (16-24 Years Old)
- Impaired Driving
- Distracted Driving
- Mature Drivers (65+ Years Old)
- Motorcycles
- Winter Crashes
- Intersection Crashes
- Large Trucks and Commercial Buses
- Pedestrians/Bicycles
- Large Animals
- Operating After Suspension
- Emergency Medical Services/Incident Management

Program Administration

The Bureau of Planning and Safety Office has been responsible for development of the 2008 and subsequent Work Plans. MaineDOT has developed a team approach to identifying problems and their potential for engineering solutions, and continues to work with the Safety Office to enhance the project selection process. The Safety Office has been supplementing the HSIP program list with programmatic and systemic type projects noted in the 'Background' section above.

Project Funding

To be eligible for use of federal HSIP funds, a minimum 10 percent match of state or local funds to the federal funds is required. For certain safety improvements listed in 23 U.S.C. 120(c), the Federal share may be 100 percent. HSIP funds may pay for preliminary engineering, right-of-way, construction and construction engineering costs. Projects are required to be in the Statewide Transportation Improvement Program (STIP).

Data-Driven and Performance-Based Approach

Maine's HSIP follows a seven-step, data driven performance based process.

1. Identifying Sites with Potential for Safety Improvements: Project locations are generally selected in one of two ways: using the site-specific approach or Systemic/Systematic approach. The site-specific review sites are based upon the [Highway Safety Manual](#) (HSM) Network screening process using the "excess" method or by selecting off the High Crash Location (HCL) list for both intersections and roadway segments.
 - Site Specific - HSM Excess Expected Average Crash Frequency with Empirical Bayes (EB) Adjustment: The observed average crash frequency and the predicted crash frequency from a Safety Performance Function (SPF) are weighted together using the EB method to calculate an expected average crash frequency. The resulting expected average crash frequency is compared to the predicted average crash frequency for the specific SPF. The difference between the EB adjusted average crash frequency and the predicted average crash frequency from a SPF is the excess expected average crash frequency.
 - a. When the excess expected crash frequency value is greater than zero, a site experiences more crashes than expected.

- b. When the excess expected crash frequency value is less than zero, a site experiences fewer crashes than expected.

The advantages of this method are that it accounts for the regression-to-the-mean (RTM) and it identifies a threshold to indicate sites experiencing more crashes than expected for sites with similar characteristics.

The following network SPF's facilities types that are currently calculated:

- Rural 3-Leg Stop
- Rural 4-Leg Stop
- Rural 4-Leg Signal
- Urban 3-Leg Stop
- Urban 4-Leg Stop
- Urban 3-Leg Signal
- Urban 4-Leg Signal

The next phase for network site screening will include urban and rural roadway segments.

Along with excess expected crash frequency with EB adjustment, excess expected crash costs are calculated for the different facilities and ranked. The intersections are screened using a simple ranking method. They are ranked by excess total crashes, excess crash costs and excess expected to predicted ratio. From the ranking lists, evaluation is performed on the top 50 crash costs, top 50 expected to predicted crash costs ratio, top 20 rural crash costs and top 20 rural expected to predicted crash costs ratio. Since system wide ranking lists are dominated by urban locations the specific attention to 20 top rural locations is intended to develop a more balanced urban/rural listing. Along with the HSM excess screening method, HCL for intersections and roadway sections are also analyzed.

- Site Specific - HCLs: Locations must have a significant crash history that includes a fatal or serious injury crashes. Critical crash rates are used to assess significance. MaineDOT maintains a database of all police-reported crashes since 1989. A listing of HCLs is generated each year for the most recent and complete 3-year period for crash reports. HCLs are defined as those locations that:
 - a. Exhibit a crash rate greater than one would expect for similar locations (same Federal Functional Class and Urban/Rural rating), adjusted for traffic volume; and
 - b. Have experienced at least 8 crashes in the 3-year reporting period.
- Systemic or Systematic Approach: A complementary approach to the traditional site analysis is the systemic approach to safety, which takes a broader view and looks at risk across an entire roadway system rather than managing risk at certain locations. Some examples of engineering strategies include but not limited to new paved shoulders, rumble strips, median barrier, horizontal curves treatment, rectangular rapid flashing beacons for crosswalks and systematic sign upgrades. Additional systemic approach information is provided at the following link:
<http://safety.fhwa.dot.gov/systemic/index.htm>.

- **Other Screening Approaches:** Potential projects can also be identified through other sources such as reported complaints, staff concerns, previous studies or plans and Road Safety Audits (RSA)

A balanced safety program includes projects at both site-specific locations as well as a systemic application of a treatment.

2. **Problem Identification:** This step provides an understanding of the crash patterns and examines the geometric and physical characteristics of the location, providing a diagnosis of the location. Whereas, the network screening provides a broad look at the number of crashes, the crash analysis in this step investigates the types of crashes and circumstances around the crash history to identify patterns. These patterns will provide additional details related to the cause of the crashes and help diagnose the safety concern, leading to an improvement that will directly link to the problem at the location. Site visit or a road safety audit (RSA) may be performed at this step. It is not enough to select a location from the HSM excess crash or HCL list; having a good location does not directly translate into a good project. However, proper diagnosis of the problem can help to identify a good project.
3. **Countermeasure Selection:** The selection of an appropriate countermeasure is a key step in the process which addresses the problems identified at the location. For locations selected based on the HSM excess list, HCL list or discovered through emerging safety needs with fatal and/or disabling injury crash experiences, countermeasure(s) must address the type(s) of crash(es) at the particular location. For a systemic approach, countermeasures that are based on high-risk roadway features correlated with specific severe crash types. Countermeasure crash reduction effectiveness is taken from Part D of the HSM and/or the Crash Modification Factors (CMF) Clearinghouse (<http://www.cmfclearinghouse.org/>).
4. **Benefit-Cost Analysis:** It is not enough to simply have a location with a crash history and apply the correct countermeasures; projects must also provide a benefit that exceeds their cost of construction. Consequently, MaineDOT must prioritize projects based on the overall cost of the countermeasure(s), its expected effectiveness, and expected service life (typically 5,10, or 20-year period). The purpose of the prioritization process is to ensure that the maximum safety benefit (i.e., lives saved) will be obtained for the amount of funds invested. The quantitative Benefit-Cost analysis is based on Part C of HSM and the NCHRP 17-38 MaineDOT modified spreadsheets for the different facility types.
5. **Project Safety Review:** The final step in MaineDOT's data-driven HSIP selection process is review by a Project Safety Review Team, comprised of MaineDOT staff including, Bureau of Project Development, Bureau of Maintenance and Operation, Office of Safety and Bureau of Planning. Safety projects will also be reviewed by the Highway Safety Committee. Members of the Project Review Team evaluate the feasibility of the projects in terms of scope/cost/constructability prior to inclusion in the Work Plan. Following that meeting, the Project Safety Review Team either moves the project forward, refines the scope, requests Regional maintenance forces to make adjustments of repairs, or in some cases discontinues the projects.

6. **Implementation:** The implementation component of Maine’s HSIP encompasses the development of projects, identified for implementation and prioritized in the Bureau of Planning. The Highway Program or Multimodal Program within the Bureau of Project Development shepherds the project through implementation. Prior to implementation of HSIP projects, a formal handoff meeting describing the project history and scope will take place between the Bureau of Planning and Project Development. The Project Development process for the HSIP safety projects is the same as for all other Federal-Aid projects as defined in the MaineDOT Highway Design Guide.

7. **Annual Evaluation Report:** The Safety Office conducts the evaluation of the safety improvements after implementation of the countermeasures. Maine’s HSIP includes a process for evaluation of its program and projects. A report covering the HSIP during the previous Calendar Year (January 1 through December 31) is submitted to the Maine FHWA Division Administrator no later than August 31 each year pursuant to 23 CRF 924.15. The document summarizes MaineDOT’s HSIP program structure, including project planning, implementation progress, safety performance achievements, and improvement effectiveness. The key evaluation is whether the HSIP program is performing or exceed safety performance targets. Maine’s most recent HSIP report can be accessed from FHWA at <http://safety.fhwa.dot.gov/hsip/reports>

Project Eligibility

A highway safety improvement project is defined as a project consistent with the SHSP that corrects or improves a hazardous road location or feature or addresses a highway safety problem (see 23 U.S.C 148). Typical safety projects include, but are not limited to, the following:

- Install/upgrade/modify/interconnect traffic signals
- Flashing beacons
- Active intersection warning systems
- Roundabouts
- Construct turning, bypass or other auxiliary lanes
- Modification of roadway alignment
- Eliminate a roadside obstacle
- Install signs, pavement markings and delineators
- High friction surface treatment
- Improve sight distance
- Turning radii improvements
- Install/upgrade guardrail, barriers and crash attenuators
- Access modifications
- Rumble Strips
- Paving shoulders
- Slope flattening
- Pedestrian/bicycle safety improvements
- Breakaway utility poles and sign supports
- Illumination

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