

Guidance on State Safety Data Systems

Date Issued

March 15, 2016, FHWA Office of Safety

Effective date

April 14, 2016

Purpose

On December 4, 2015, President Obama signed into law the Fixing America's Surface Transportation Act (FAST Act), and the Federal Highway Administration (FHWA) is issuing this updated guidance to reflect FAST Act changes related to State safety data systems under the Highway Safety Improvement Program (HSIP). This guidance clarifies (1) State safety data capabilities required to satisfy the HSIP requirements under 23 U.S.C. 148 and 23 CFR Part 924, and (2) the safety data collection, integration, improvement, and analysis activities eligible for HSIP funding. This guidance supersedes the Guidance Memorandum on *Fundamental Roadway and Traffic Data Elements to Improve the Highway Safety Improvement Program*, dated August 1, 2011, and the *MAP-21 Guidance on State Safety Data Systems*, dated December 27, 2012, from the FHWA Office of Safety.

Background

The HSIP is a core Federal-aid program, the purpose of which is to achieve a significant reduction in fatalities and serious injuries on all public roads, including non-State-owned public roads and roads on tribal land. [23 U.S.C. 148 (b)(2)]. The HSIP focuses on performance and employs a data-driven, strategic approach to improving highway safety on all public roads.

The Moving Ahead for Progress in the 21st Century Act (MAP-21) called for advancing the capabilities of States for safety data collection, integration, and analysis to support program planning and performance management and continued to allow data improvement activities as an eligible HSIP expense. [23 U.S.C. 148 (a)(4)(B)(xiv)]. MAP-21 acknowledged the importance of using multiple data sources to understand highway safety problems and to make effective decisions regarding resource allocation for highway safety. [23 U.S.C. 148 (c)(2)(A)]. To do this, State safety data systems should be sufficient to guide the HSIP and Strategic Highway Safety Plan (SHSP) processes, including analyses and evaluations identified in 23 U.S.C. 148 and 23 CFR Part 924. The FAST Act continued the provisions of MAP-21 and added a provision related to data collection on unpaved roads. [23 U.S.C. 148(k)]



State Safety Data System Capabilities

As part of its State highway safety improvement program, a State shall have in place a safety data system that can be used to perform analyses supporting the strategic and performance-based goals in the SHSP and HSIP. [23 U.S.C. 148 (c)(2)]. This section provides guidance on the capabilities a State's safety data system should have in order to support analyses and evaluations in 23 U.S.C. 148, including: (1) types of roadways, (2) types of data, (3) geolocation of safety data to a common highway basemap, (4) analysis and evaluation capabilities, and (5) the subset of Model Inventory of Roadway Elements (MIRE) to be collected.

Types of Roadways

Consistent with the purpose and scope of the HSIP, a State shall have in place a safety data system to perform safety problem identification and countermeasure analysis. [23 U.S.C. 148 (c)(2)(A)]. The statute also specifies that a State shall advance the capabilities of the State for data collection, analysis, and integration in a manner that includes all public roads, including non-State-owned public roads and roads on tribal land in the State. [23 U.S.C. 148 (c)(2)(D) and (D)(ii)]. Public road means "any road under the jurisdiction of and maintained by a public authority and open to public travel." [23 CFR 460.2(a)].

Types of Data

Safety data means crash, roadway, and traffic data on a public road, and, includes, in the case of a railway-highway grade crossing, the characteristics of highway and train traffic, licensing, and vehicle data. [23 U.S.C. 148 (a)(9)]. Data on rail-highway grade crossing train traffic are available through the Federal Railroad Administration crossing inventory (<http://safetydata.fra.dot.gov/OfficeofSafety/PublicSite/Crossing/Crossing.aspx>).

States are required to use their safety data systems to identify hazardous locations, sections, and elements that are a danger to all road users, including vehicle occupants and non-occupant users of the roadway (e.g., pedestrians and bicyclists), and to identify fatalities and serious injuries on all public roads by location. [23 U.S.C. 148 (c)(2)(B)(i) and (iii)].

A State's crash, roadway, and traffic data must be able to be linked or combined by virtue of having common data elements. [23 U.S.C. 148 (c)(2)(A)(iii)]. These data should also be able to be linked to a State's other core safety databases including licensing, vehicle, citation/ adjudication, and emergency medical services or injury surveillance system. [23 U.S.C. 405 (c)(1)(C) and (c)(3)(C)]. Additionally, commercial motor vehicle data could also be linked based upon involvement in crashes and inspections. A State shall also improve the compatibility and interoperability of safety data with other State transportation-related data systems and with other States and national data systems, e.g., Fatality Analysis Reporting System. [23 U.S.C. 148 (c)(2)(A)(iv)].

Geolocation of Safety Data to a Common Highway Basemap

Crash, roadway, and traffic data should be linkable by geolocation, i.e., a unique location identifier, on a highway basemap, which is defined as "a representation of all public roads that can be used to geolocate attribute data on a roadway." [23 U.S.C. 148 (a)(2)]. States should put in place methodologies to assure that the location of crashes, roadway elements, and

traffic data are consistent with the most current basemap. These linkages will support the analysis and evaluation capabilities described below.

The FHWA Office of Highway Policy Information and Office of Planning, Environment, and Realty issued the Memorandum, *Geospatial Network for All Public Roads* on August 7, 2012. This Memorandum identified a Highway Performance Monitoring System (HPMS) requirement for States to update their Linear Referencing System to include all public roadways within the State by June 15, 2014, in accordance with the HPMS information collection approval from the Office of Management and Budget (2125-0028). To date, the majority of States have complied with this requirement. This Linear Referencing System is a means to geolocate all safety data on a common highway basemap that includes all public roads.

States that already have basemaps inclusive of all public roads should geolocate all crashes on the basemap and give priority to fatal and serious injury crashes. States without basemaps inclusive of all public roads should first complete the mapping of all roads to the basemap and, once completed, at a minimum, geolocate all reportable crashes on the basemap, giving priority to fatal and serious injury crashes.

Analysis and Evaluation Capabilities

Section 148(c)(2) specifies the problem identification and data analysis requirements a State must include as part of its highway safety improvement program. These requirements relate to:

1. Having in place a safety data system with the ability to perform safety problem identification and countermeasures analysis necessary to accomplish the requirements specified in 23 U.S.C. 148(c)(2)(A).
2. Based on that analysis, identifying hazardous locations that constitute a danger to motorists (including motorcyclists), bicyclists, pedestrians, and other highway users; establishing the relative severity of those locations; identifying the number of fatalities and serious injuries by location in the State; identifying HSIP projects on the basis of crash data or other data-supported means; and considering which projects maximize opportunities to advance safety. [23 U.S.C. 148(c)(2)(B)].
3. Adopting strategic and performance-based goals considering the impacts to all road users that: address traffic safety that include behavioral and infrastructure problems; focus resources on areas of greatest need; and are coordinated with other State highway safety programs. [23 U.S.C. 148(c)(2)(C)].
4. Advancing the State's capabilities for safety data collection, analysis, and integration as required under section 148(c)(2)(D).
5. Determining priorities for the correction of hazardous locations, including railway-highway crossings; identifying opportunities for preventing the development of hazardous conditions; and establishing and implementing a schedule for HSIP projects for hazard correction and prevention. [23 U.S.C. 148(c)(2)(E)].
6. Establishing an evaluation process to analyze and assess results achieved by implemented HSIP projects and use that information in setting priorities for future HSIP projects. [23 U.S.C. 148(c)(2)(F)].

For a list of all the requirements, see 23 U.S.C. 148(c)(2).

Subset of Model Inventory of Roadway Elements (MIRE) to be Collected

The FHWA developed the MIRE, a recommended listing of roadway and traffic elements critical to safety management, as a guide to help transportation agencies improve their roadway and traffic data inventories. MIRE was developed to enhance a State's ability to use advanced safety analyses such as presented in the Highway Safety Manual.

MAP-21 required the Secretary to establish a subset of the MIRE that are useful for the inventory of roadway safety and ensure that States adopt and use the subset to improve data collection. [23 U.S.C. 148(f)(2)]. The FHWA established a subset of the MIRE as part of the HSIP Final Rule changes to 23 CFR Part 924, effective April 14, 2016. This subset is referred to as the fundamental data elements (FDEs). The FDEs are categorized by roadway functional classification and surface type and include three tables, one each for non-local paved roads, local paved roads, and unpaved roads. They are further refined into subcategories of data elements for road segments, intersections and interchanges for non-local paved roads.

MIRE FDEs for Non-Local Paved Roads

MIRE FDEs requirements for non-local paved roads are presented in Table 1. [23 CFR 924.9(a)(1)]. These FDEs provide information on roadway segments, intersections, and ramps and are based upon data needed to conduct a sufficient review of a highway network using existing safety analysis methods. It should be noted that additional data would be needed to diagnose conditions at individual sites, to select countermeasures, and to prioritize projects. States should consider all roadway and traffic elements needed to satisfy the full range of safety analyses they perform.

MIRE FDEs for Local Paved Roads

For paved public roads with a functional classification of local, States may collect a reduced set of FDEs, because these public roads routinely have no more than two through lanes and partial or no access control. This reduced set of FDEs is limited to the category of roadway segment elements. States shall collect, at a minimum, the reduced set of FDEs listed in Table 2 on local paved public roads. [23 CFR 924.9(a)(1)]. There is no requirement for collecting intersection data on local roads. Network screening for these low traffic volume roads can be performed using system-wide or corridor level analyses that combine (but do not distinguish) roadway segment, intersection, and ramp crashes. Corridor-level network screening would identify "intersection" hot spots, as well, and then an agency could collect specific roadway data relative to that location as needed.

MIRE FDEs for Unpaved Roads

A limited set of data elements must be collected on unpaved public roads in order to use HSIP funds on these roads. Table 3 provides a listing of the FDEs to be collected on unpaved roads regardless of their functional classification. Three of these elements support the HPMS all-public-roads Linear Referencing System requirement (segment identifier, begin point segment descriptor, and end point segment descriptor) and enable States to locate all crashes on all public roads with their Linear Referencing System. These elements, combined with the remaining two elements (functional class and type of government ownership), support States in fulfilling their SHSP and HSIP requirements.

The FAST Act adds the provision that States may elect not to collect the MIRE FDE on gravel or otherwise unpaved roads as long as they meet two conditions:

- A. The States do not use HSIP funds on any unpaved road for which they do not collect the MIRE FDEs [23 U.S.C. 148(k)(1)(A)]; and
- B. The States demonstrate having consulted with affected Indian tribes before ceasing to collect data on roads included in the National Tribal Transportation Facility Inventory [23 U.S.C. 148(k)(1)(B)].

If States make this election, they should notify their FHWA Division Office via a letter to the Division Administrator. Making this election does not change States' responsibilities for any other statutory data collection requirements.

Collecting and Using the MIRE FDEs

States shall incorporate specific quantifiable and measurable anticipated improvements for collection of MIRE FDEs into their State Traffic Records Strategic Plan update by July 1, 2017. [23 CFR 924.11(b)]. States shall have access to the FDEs on all public roads by September 30, 2026. [23 CFR 924.11(b)].

In planning for improvements needed to fulfill the MIRE FDE requirement, States should develop strategies that consider:

- The current status of MIRE FDE collection efforts, including FDEs currently maintained (or not maintained) in the roadway inventory as well as the public roads for which the FDEs are collected;
- Appropriate data collection methodology;
- Coordination with other agencies (within State, local, and tribal jurisdictions);
- Prioritization criteria for collecting MIRE FDE on all public roads; and
- The schedule and estimated costs for data collection efforts.

The result of this planning effort should be specific, measurable, achievable, realistic and time-bound strategies for the collection, maintenance, and management of MIRE FDE.

States should follow National Highway Traffic Safety Administration guidance on State Traffic Records Strategic Plans. [23 CFR 1200.22(c)].

Safety Data Activities Eligible for HSIP Funding

States rely on the collection and analysis of safety data to conduct problem identification, countermeasure identification, and project prioritization, which are the foundation of the HSIP process. States also use safety data to evaluate the effectiveness of their program of implemented safety projects. In general, HSIP funds may be used to conduct these functions. [23 U.S.C. 148 (a)(4)(B)(xiv)].

Eligible Safety Data Collection, Analysis, and Improvement Activities

The term "highway safety improvement project" is broadly defined in 23 U.S.C. 148(a)(4) as "strategies, activities, and projects on a public road that are consistent with a State strategic highway safety plan and...correct or improve a hazardous

road location or feature...or address a highway safety problem." Collection, analysis and improvement of safety data is specifically identified as an eligible project within the definition of a highway safety improvement program under 23 U.S.C. 148(a)(4)(B)(xiv). The term "data improvement activities" means "a project or activity to further the capacity of a State to make more informed and effective safety infrastructure investment decisions." [23 U.S.C. 148 (f)(1)(A)]. Safety data collection, analysis, and improvement activities are woven throughout section 148, and examples of such eligible activities include:

1. Collecting, maintaining, and sharing safety data, including MIRE, on all public roads and related systems associated with analytical usage of the data that directly supports HSIP implementation efforts. [23 U.S.C. 148(f)(1)(B)].
2. Creating, updating or enhancing a highway basemap of all public roads. [23 U.S.C. 148(f)(1)(B)].
3. Improving the State's ability to identify the number of fatalities and serious injuries on all public roadways in the State with a breakdown by functional classification and ownership in the State. [23 U.S.C. 148(c)(2)(D)(v)].
4. Improving data timeliness, accuracy, completeness, uniformity, integration, and accessibility. [23 U.S.C. 148(c)(2)(A)(i)].
5. Evaluating the effectiveness of safety data system improvement efforts. [23 U.S.C. 148(c)(2)(a)(ii)].
6. Evaluating the effectiveness of highway safety improvement projects. [23 U.S.C. 148(c)(2)(F)(i)].
7. Improving the ability to link State safety data systems with other data systems within the State. [23 U.S.C. 148(c)(2)(A)(iii)].
8. Improving the compatibility and interoperability of safety data with other State transportation-related data systems and the compatibility and interoperability of State safety data systems with data systems of other States and national data systems. [23 U.S.C. 148(c)(2)(A)(iv)].
9. Improving the ability to collect data on non-motorized (e.g., pedestrian and bicyclist) crashes. [23 U.S.C. 148(c)(2)(A)(vi)].
10. Creating, updating, or enhancing a highway basemap of all public roads in a State. [23 U.S.C. 148(f)(1)(B)(i)].
11. Storing and maintaining safety data in an electronic manner. [23 U.S.C. 148(f)(1)(B)(iii)].
12. Developing analytical processes for safety data elements. [23 U.S.C. 148(f)(1)(B)(iv)].
13. Acquiring and implementing roadway safety analysis tools. [23 U.S.C. 148(f)(1)(B)(v)].

Complementary Processes

A State's efforts to advance its capabilities for safety data collection, analysis, and integration shall be conducted in a manner that complements the National Highway Traffic Safety Administration's Highway Safety Program (HSP) under 23 U.S.C. 402, and the Federal Motor Carrier Safety Administration's Commercial Vehicle Safety Plan (CVSP) under 49 U.S.C. 31102. [23 U.S.C. 148 (c)(2)(D)(i)]. The State's Traffic Records Coordinating Committee (TRCC) would be an appropriate body through which the safety data programs for the HSIP, the HSP and the CVSP may be reviewed, considered and developed into complementary data programs. These programs' projects should be identified and included in the State's Traffic Records Strategic Plan.

Table 1 – MIRE Fundamental Data Elements for Non-Local (based on functional classification) Paved Roads

MIRE Name (MIRE Number)^	
Roadway Segment	Intersection
Segment Identifier (12)	Unique Junction Identifier (120)
Route Number (8)*	Location Identifier for Road 1 Crossing Point (122)
Route/street Name (9)*	Location Identifier for Road 2 Crossing Point (123)
Federal Aid/ Route Type (21)*	Intersection/Junction Geometry (126)
Rural/Urban Designation (20)*	Intersection/Junction Traffic Control (131)
Surface Type (23)*	AADT (79) [for Each Intersecting Road]
Begin Point Segment Descriptor (10)*	AADT Year (80) [for Each Intersecting Road]
End Point Segment Descriptor (11)*	Unique Approach Identifier (139)
Segment Length (13)*	
Direction of Inventory (18)	Interchange/Ramp
Functional Class (19)*	Unique Interchange Identifier (178)
Median Type (54)	Location Identifier for Roadway at Beginning Ramp Terminal (197)
Access Control (22)*	Location Identifier for Roadway at Ending Ramp Terminal (201)
One/Two-Way Operations (91)*	Ramp Length (187)
Number of Through Lanes (31)*	Roadway Type at Beginning Ramp Terminal (195)
Average Annual Daily Traffic (79)*	Roadway Type at Ending Ramp Terminal (199)
AADT Year (80)*	Interchange Type (182)
Type of Governmental Ownership (4)*	Ramp AADT (191)*
	Year of Ramp AADT (192)*
	Functional Class (19)*
	Type of Governmental Ownership (4)*

^Model Inventory of Roadway Elements—MIRE, Version 1.0, Report No. FHWA-SA-10-018, October 2010, http://safety.fhwa.dot.gov/tools/data_tools/mirereport/mirereport.pdf.

*Highway Performance Monitoring System full extent elements are required on all Federal-aid highways and ramps located within grade-separated interchanges, i.e., National Highway System (NHS) and all functional systems excluding local roads and rural minor collectors.

Table 2– MIRE Fundamental Data Elements for Local (based on functional classification) Paved Roads

MIRE Name (MIRE Number)^
Roadway Segment
Segment Identifier (12)
Functional Class (19)*
Surface Type (23)*
Type of Governmental Ownership (4)*
Number of Through Lanes (31)*
Average Annual Daily Traffic (79)*
Begin Point Segment Descriptor (10)*
End Point Segment Descriptor (11)*
Rural/Urban Designation (20)*

^Model Inventory of Roadway Elements—MIRE, Version 1.0, Report No. FHWA-SA-10-018, October 2010, http://safety.fhwa.dot.gov/tools/data_tools/mirereport/mirereport.pdf.

*Highway Performance Monitoring System full extent elements are required on all Federal-aid highways and ramps located within grade-separated interchanges, i.e., National Highway System (NHS) and all functional systems excluding local roads and rural minor collectors.

Table 3 – MIRE Fundamental Data Elements for Unpaved Roads

MIRE Name (MIRE Number)^
Roadway Segment
Segment Identifier (12)
Functional Class (19)*
Type of Governmental Ownership (4)*
Begin Point Segment Descriptor (10)*
End Point Segment Descriptor (11)*

^Model Inventory of Roadway Elements—MIRE, Version 1.0, Report No. FHWA-SA-10-018, October 2010, http://safety.fhwa.dot.gov/tools/data_tools/mirereport/mirereport.pdf.

*Highway Performance Monitoring System full extent elements are required on all Federal-aid highways and ramps located within grade-separated interchanges, i.e., National Highway System (NHS) and all functional systems excluding local roads and rural minor collectors.