



Minnesota Department of Transportation  
Office of Freight and Commercial Vehicle Operations  
Rail Administration



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## Railroad–Highway Grade Crossing Safety Improvement Program Project Development Process

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### Background

Federal funds have been apportioned to the State of Minnesota each year since 1974 to fund the Railroad-Highway Grade Crossing Safety Improvement Program.

The Minnesota Department of Transportation (MnDOT), Office of Freight and Commercial Vehicle Operations (OFCVO), Rail Administration Section (Rail Admin) has worked in cooperation with the state's counties, cities, townships and railroads to improve the railroad-highway transportation infrastructure in order to support economic growth and to connect Minnesota to global opportunities. Active warning devices have been installed at over 1,500 of the approximately 4,200 public railroad-highway grade crossings in the state. Most of these projects have been constructed using federal funds with matching state, local or railroad funds.

MnDOT's efforts to improve safety at railroad-highway grade crossings, to date, have been successful. Grade crossing crashes in Minnesota have been reduced from an average of 400 vehicle/train collisions and 50 deaths annually in 1972 to 26 vehicle/train collisions and 4 vehicle related deaths in 2012.

The following types of projects are eligible for funding under this program:

1. Various types of signals and signal upgrades
2. Crossing closures and consolidations
3. Improving sight conditions by removal of visual obstructions
4. Improving roadway geometrics and/or grades

Grade crossing surface improvements are not eligible for funding under this program.

### Project Identification

In an effort to improve safety at the most hazardous railroad crossings, the Rail Administration Section has focused most of its attention on programming upgrades to warning devices at high hazard crossing locations. However, some locally requested projects and signal replacements will be programmed as well. Crossings to be reviewed are selected by high hazard, local request and signal age.

#### 1. High Hazard Locations

Rail Admin uses the USDOT Accident Prediction (AP) Formula to identify high hazard locations. This formula predicts the frequency of railroad – highway accidents based on crossing characteristics and accident history. The formula uses the following variables:

- Existing warning device (passively signed, flashing lights only, or gates)
- Highway and train traffic volumes
- Number of main line tracks/train switching operations
- Maximum train speed
- Highway characteristics (number of lanes, surface type)
- Accident history (past five years)

## **2. Local Concerns**

Rail Admin staff also proactively evaluates railroad-highway grade crossing safety concerns identified by local road authorities, railroads, local planning organizations and MnDOT District staff. These crossings often have a low accident prediction rates, but may have geometric characteristics, such as restricted sight lines, humped or skewed track that place additional demand on driver decision making that warrant further safety reviews. Local concerns are identified in a number of ways:

- Rail Admin solicits potential projects from local road authorities and railroads as part of the annual State Transportation Improvement Program (STIP) development process.
- Local road authority, railroad, local planning organization or MnDOT district staff request review of a specific crossing for possible safety improvements.
- Rail Administration's staff knowledge of safety concerns at grade crossings (e.g. multiple tracks, skewed crossing).

## **3. Signal Age (antiquated equipment)**

The reliability and credibility of grade crossing warning devices is of utmost importance to the traveling public. When a crossing signal malfunctions, the lights will flash in the same manner as if a train were approaching the crossing. The flashing of the lights will continue until the problem is corrected. When older signal systems malfunction, it creates an impression in the public's mind that all railroad-crossing signals are unreliable. Drivers can misinterpret a signal with a long warning time with one that is malfunctioning, and thus drive into the path of a train.

The normal life cycle for railroad-highway grade crossings signals is 20 to 25 years. As these signals reach the end of their design life, they should be replaced. As with other types of machinery and electronic equipment, older signal systems become more difficult to maintain and hence obsolete. For example, railroads oftentimes find it difficult to obtain spare parts for 20-year-old signal systems, and this can have a significant impact on safety.

Circuitry for grade crossing signals often needs to be replaced more frequently than the 20 to 25 years for entire signal systems. Rapid advancements in electronics and circuitry technology can significantly improve safety at railroad-highway grade crossings. The most advanced technology can accurately predict the train's arrival so the active devices flash the same amount of time prior to a train's arrival at a crossing, regardless of the speed of the approaching train, so that the public can expect consistency in their operation.

There are approximately 1,500 signalized railroad-highway grade crossings in the state of Minnesota. Of this total, approximately 250 signal systems are over 30 years old. The remaining 1,250 signal systems will also need to be replaced as they get to the end of their

design life. These figures do not include locations where signal circuitry needs to be modernized.

## **Project Review Process**

The ranking and selection process is conducted annually outside the metro area and every two years in the Twin City metro area. Each year a new high hazard list is generated. The project review process consists of compiling the high hazard location list and adding to it the local requests. An on-site preliminary (also called a diagnostic) review is conducted at each identified crossing with the road authority, railroad and MnDOT Rail Admin staff. The following information should be provided by the railroad/local road authority during the on-site review:

- 1) The most recent traffic count;
- 2) Plans for any future road work; and
- 3) Information and traffic projections for any development.

The on-site review includes evaluation of the following:

- Verify the current data (e.g. traffic count, train count and school bus count)
- Sight restrictions in crossing quadrants
- Roadway and railroad grade crossing geometrics
- Impact of nearby roadways to the crossing (including storage distance restrictions)
- Review of adjacent crossings to determine whether crossings can be closed or consolidated
- Determine whether any of the trackage through the crossing can be retired

The final component of the diagnostic review process is to develop recommendations as to the appropriate warning device for the crossing. Rail Administration staff may make low cost recommendations (e.g. additional signing, vegetation removal) or program safety improvements for active warning devices. (e.g. flashing light signals, cantilevers and/or gates)

## **Funding**

Railroad-highway grade crossing safety is funded under 23 USC Section 130. The current federal participation for railroad-highway grade crossing safety improvement projects is 100 percent of the cost of warning system. Normally it is expected that the local road authority will pay for roadway or sidewalk work that may be required as part of the signal installation. Limited amounts of state funds are available for minor grade crossing safety improvements.

## **More Information**

For more information, contact Paul DeLaRosa, MnDOT's OFCVO, Rail Administration at (651) 366-3650