Measure Name: Flashing-lights signal

Definition: Signal with two flashing red lights that flash alternately when a train is approaching a grade crossing.

Tags:

Type of Incident:

- ☐ Non-Motorized Users Only
- ☐ Motor Vehicles Only
- ☒ Both

Intervention Strategy:

- ☐ Data: application and planning
- ☐ Education: outreach and messaging
- ☐ Enforcement: policy development and rulemaking
- ☒ Engineering: technological and physical deterrents

Type of Problem:

- ☐ Non-Motorized Users Violating Warning Devices
- ☒ Motor Vehicles Violating Warning Devices
- ☒ Vehicle ROW Incursion
- ☐ Vehicle Congestion
- ☐ Blocked Crossing
- ☐ Vehicle Hang-up

Measure Category:

- ☐ Risk Assessment
- ☐ Policy and Enforcement
- ☐ Collaboration, Training, and Education
- ☐ Public Communication
- ☐ Physical Barriers
- ☐ Detection and Lighting
- ☒ Infrastructure Modification
- ☐ Post-Incident Management
- ☒ Warning Devices

Description

A flashing-lights signal is a warning device consisting of two red signal indications arranged horizontally that flash alternately when rail traffic is approaching or present at a highway-rail grade crossing [1]. The signal lens is red and directs light at drivers approaching the grade crossing [2]. The signal flashes when a train is detected to be approaching the crossing and is intended to warn both motorized and non-motorized users of a train approaching a grade crossing, thus minimizing right-of-way incursions and accidents. Studies have demonstrated that crossings with flashing-lights signals (without automatic gates) reduce the number of accidents by 69% compared to a crossing with only passive systems [3].

While flashing-lights signals traditionally use low-wattage incandescent bulbs, current practice uses LED bulbs. LED units offer higher visibility at distances and angles, wider beam patterns, faster on/off transitions, longer bulb life, and lower power consumption allowing for solar-powered applications [2].

While flashing-light signals are typically installed on the side of the highway, they may also be installed on overhead structures of cantilevered supports to increase emphasis or improve visibility, especially for multi-lane approaches or highways with profile restrictions. Additional sets of flashing-lights signals can also be installed on the supporting post and/or cantilever arm if the overhead signal is still not sufficiently visible [2]. The MUTCD mandates that flashing-light signal assemblies on the side of the highway must include a standard crossbuck sign [1]. Where more than one track exists, a corresponding plaque should be installed to indicate the number of tracks [1].

Additional search terms: *active crossing, light warning*

Advantages

- Flashing lights reduce right-of-way incursions by warning motorists and non-motorists of approaching train. [2]
- Studies indicate accident reduction of 69% compared to passive crossings. [3]
- Lights operate at low voltage and can even sustain operations during loss of power. [1]

Drawbacks

- Installation of new signals may be expensive.
- Introduces additional operational and maintenance costs compared to a passive crossing.

Notable Practices

- Lamps should consist of low-wattage bulb or LED to ensure operation on stand-by battery power if commercial power fails. [2]
- Bells or other audible warning devices can be included in the assembly and operated in conjunction with the flashing-lights signal to provide additional warning to pedestrians, bicyclists, etc. [2]

- When installed at a crossing with automatic crossing gates, the flashing-lights signal should flash, and the gate arm should descend in a minimal amount of time to discourage unsafe behavior. [4]
- Each red signal unit in the flashing-light signal shall flash alternately. The number of flashes per minute for each lamp shall be 35 minimum and 65 maximum. Each lamp shall be illuminated for approximately the same length of time. The total time of illumination of each pair of lamps shall be the entire operating time. [1]
- Bulbs of a flashing-light signal should be properly aimed. Units on the right-hand side of the highway should be aligned to cover a distance far from the crossing, while lights mounted on the left side (back of a signal) should be aimed to cover the near approach to a crossing. New LED technology is more tolerant to aiming precision than traditional incandescent bulbs, but these principles should still be followed. [2]
- A "STOP HERE WHEN FLASHING" sign is often installed in conjunction with the flashing-lights signal to inform drivers of the location at which to stop. [1]
- When installed at a crossing with both traffic control signals and flashing-light signals, the devices should be coordinated to avoid any display of conflicting signal indications. [1]
- Flashing-light signals should use storage batteries either as a primary or stand-by source of electric energy. Signals should include a provision for charging batteries. [1]
- The mounting height of the flashing-light units, measured from the center of the flashing-light unit housing to the elevation of the crown of the roadway, should be between 8 feet and 9 feet. [1]

References

[1] Federal Highway Administration. (2023). Manual on Uniform Traffic Control Devices.

> Excerpt: The purpose of the MUTCD is to establish uniform national criteria for the use of traffic control devices that meet the needs and expectancy of road users on all streets, highways, pedestrian and bicycle facilities, and site roadways open to public travel.

[2] U.S. Department of Transportation. (2019). Highway-Rail Crossing Handbook – Third Edition, p. 55-61.

> Abstract: The purpose of the *Highway-Rail Crossing Handbook, 3rd Edition* is an information resource developed to provide a unified reference document on prevalent and best practices as well as adopted standards relative to highway-rail grade crossings. The handbook provides general information on highway-rail crossings; characteristics of the crossing environment and users; and physical and operational changes that can be made at crossings to enhance the safety and operation of both highway and rail traffic over such intersections. The guidelines identified and potential alternative improvements presented in this handbook reflect current best practices nationwide.

[3] Eck, R. W., Halkias, J. A. (1985). Further investigation of the effectiveness of warning devices at rail-highway grade crossings. *Transportation Research Record, 1010*, 94-101.

> Excerpt: The main objective of the study was to analyze the national inventory of the U.S. Department of Transportation-Association of American Railroads and the accident files of the Federal Railroad Administration to develop measures of effectiveness for the following rail-highway grade-crossing

upgrade stratifications: (a) passive systems to flashing lights on single track, (b) passive systems to gates on single and multiple track, and (c) flashing lights to gates on single and multiple track.

[4] Southern California Regional Rail Authority. (2021). SCRRA Highway-Rail Grade Crossing Manual.

Excerpt: This Manual was developed in 2009 and issued as a Recommended Design Practices and Standards Manual.

Additional Resources

Related Measures

- Automatic gates

Images

Figure 1. Example of a flashing lights signal in Cambridge, MA
Image Credit: Volpe Center

Figure 2. Example of a flashing lights signal in Cambridge, MA
Image Credit: Volpe Center