



**APTA RT-RGC-RP-003-03, Rev. 5**

First Published: June 8, 2003

Fifth Revision: March 16, 2026

**Rail Grade Crossing Working Group**

# Rail Transit Grade Crossing Safety Assessment

**Abstract:** This recommended practice provides a structured approach for assessing new and existing highway rail grade crossings.

**Keywords:** assessment, evaluation, identifier, inventory, safety

**Summary:** This recommended practice provides an organized, structured approach for assessing the safety of new and existing rail transit highway rail grade crossings.



## Foreword

The American Public Transportation Association is a standards development organization in North America. The process of developing standards is managed by the APTA Standards Program's Standards Development Oversight Council (SDOC). These activities are carried out through several standards policy and planning committees that have been established to address specific transportation modes, safety and security requirements, interoperability, and other topics.

APTA used a consensus-based process to develop this document and its continued maintenance, which is detailed in the [manual for the APTA Standards Program](#). This document was drafted in accordance with the approval criteria and editorial policy as described. Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

This document was prepared by the Rail Grade Crossing Working Group as directed by the Rail Standards Policy and Planning Committee.

This document represents a common viewpoint of those parties concerned with its provisions, namely transit operating/planning agencies, manufacturers, consultants, engineers and general interest groups. The application of any recommended practices or guidelines contained herein is voluntary. APTA standards are mandatory to the extent incorporated by an applicable statute or regulation. In some cases, federal and/or state regulations govern portions of a transit agency's operations. In cases where there is a conflict or contradiction between an applicable law or regulation and this document, consult with a legal adviser to determine which document takes precedence.

This document supersedes APTA RT-RGC-RP-003-03, Rev. 4, which has been revised. Below is a summary of changes from the previous document version:

- Document changed to the new APTA recommended practice format.
- Added modified rail grade crossings to those that should be assessed.
- Changed references to "rail transit systems" to "rail transit agencies."
- Updated references to current versions.
- Updated Figure 1.
- Removed reference to North America Transit Services Association (NATSA).



## Table of Contents

|   |          |
|---|----------|
| Foreword .....  | ii       |
| Participants.....   | iv       |
| Introduction.....   | iv       |
| Scope and purpose .....   | v        |
| <b>1. Highway rail grade crossing safety assessment process .....</b>                     | <b>1</b> |
| 1.1 Diagnostic review team.....   | 1        |
| 1.2 Site visit and data collection .....  | 1        |
| 1.3 Evaluation/engineering analysis .....   | 1        |
| 1.4 Development of recommendations .....  | 1        |
| 1.5 Implementation of recommendations.....  | 2        |
| 1.6 Grade crossing inventory .....  | 2        |
| 1.7 Follow-up.....  | 3        |
| 1.8 Periodic review .....   | 3        |
| References.....   | 4        |
| Definitions.....  | 4        |
| Abbreviations and acronyms.....   | 4        |
| Document history.....   | 5        |
| <b>Appendix A (informative): Biography .....</b>  | <b>6</b> |
| <b>Appendix B (informative): Factors to consider during assessment of crossings .....</b> | <b>7</b> |
| <b>Appendix C (informative): Emergency Notification System.....</b>                       | <b>8</b> |

## List of Figures and Tables

|                                       |   |
|---------------------------------------|---|
| <b>Figure 1</b> ENS Sign Design ..... | 9 |
|---------------------------------------|---|



## Participants

The American Public Transportation Association greatly appreciates the contributions of the **Rail Grade Crossing Working Group**, which provided the primary effort in the drafting of this document.

At the time this standard was completed, the working group included the following members:

**Seth Daphne Esmeson**, *Sound Transit*, Chair

Alejandro Alvarez-Reyes, *ENSCO Rail*

John Ayers, *Onyx Rail Safety Solutions*

Matthew Baccitich, *TriMet*

Mitch Bennett, *Niagara Frontier*

Mohammed Boukhriess, *Houston Metro*

Kevin Carney, *Chicago Transit Authority*

Ritu Chawla, *Wi-Tronix*

Andrew Clapham, *Network Rail Consulting Ltd.*

Bret Clayborne, *Dallas Area Rapid Transit*

Wende Corcoran, *Operation Lifesaver*

Robert Cotter, *Charlotte Area Transit System*

Shawn Crighton, *Dallas Area Rapid Transit*

Alan Danaher, *WSP*

David Esquibel, *Cordoba Corporation*

Deepika Gangwani, *Toronto Transit Commission*

Brian Gilleran, *Federal Railroad Administration*

Alex Goff, *Junction Rail Consulting*

Carlton Gonsalves, *Frauscher Sensor Technology*

Kisa Holmes, *Regional Transit Authority*

Donna Johnson, *Dallas Area Rapid Transit*

James Joyce, *Dallas Area Rapid Transit*

Srinivas Katreddi, *WSP*

Harold Kirman, *DB E.C.O. North America*

Justin Lee, *TriMet*

Thomas Maher

Michael McArdle, *Vanasse Hangen Brustlin*

William McClellan, *ACI*

Ravinder Minhas, *Calgary Transit*

Brent Ogden, *Kimley-Horn and Associates*

Aderemi Omotayo, *LA Metro*

Michael Puplett, *Toronto Transit Commission*

Fausto Reyes, *ACI*

Bruce Smith, *Rock Region METRO*

Mike Smith, *Regional Transit Authority*

Joseph Tassiello, *NJ Transit*

## Project team

Bryan Sooter, *American Public Transportation Association*

Tytus Suchotinunt, *American Public Transportation Association*

## Introduction

*This introduction is not part of APTA RT-RGC-RP-003-03, “Rail Transit Grade Crossing Safety Assessment.”*

The content of this recommended practice is based on the “Rules and Regulations Governing Signal and Train Control Systems,” published by the Department of Transportation, Federal Railroad Administration, Office of Safety. Specific reference is herein made to the Code of Federal Regulations, Title 49, Part 234 – Subpart E as related to Emergency Notification Systems and the “Highway-Rail Crossing Handbook.”

49 CFR 234 was specifically written to address railroads under the jurisdiction of the FRA. Where necessary, these recommended practices have been modified or extended to address issues unique to rail transit properties not under FRA jurisdiction.

APTA rail transit safety recommended practices represent an industry consensus on safety practices for rail transit agencies to help achieve a high level of safety for passengers, employees and the general public. This recommended practice provides procedures to perform grade crossing safety assessments for highway rail grade crossings on rail transit systems.



APTA recommends the use of this document by:

- individuals or organizations that operate rail transit agencies;
- individuals or organizations that contract with others for the operation of rail transit agencies; and
- individuals or organizations that influence how rail transit agencies are operated (including but not limited to consultants, designers and contractors).

## **Scope and purpose**

This document applies to new-start and existing rail transit, light rail and rapid rail lines on an exclusive right-of-way (ROW). The purpose of this recommended practice is to verify that highway rail grade crossing systems are operating safely and as designed through periodic assessment, thereby increasing safety, lowering risk and reducing the number of highway rail grade crossing collisions, deaths and injuries to road users at highway rail grade crossings.

This recommended practice intends to:

- ensure that special life/safety equipment is operational and reliable;
- help rail transit systems incorporate safety considerations during the inspection and maintenance process; and
- identify inspection criteria and maintenance recommended practices that provide a high level of passenger and personnel safety.

# Rail Transit Grade Crossing Safety Assessment

## 1. Highway rail grade crossing safety assessment process

The rail transit agency should assess each new or modified highway rail grade crossing using a process that includes the activities presented in sections 1.1–1.8 as a minimum.

### 1.1 Diagnostic review team

A diagnostic review team should be interdisciplinary in nature and represent all groups that share responsibility for safety at the grade crossings, such as rail and highway systems, law enforcement agencies, public utilities regulatory bodies, and state and local governments.

The diagnostic team should have experience in the following:

- rail and highway traffic operations
- rail and highway traffic engineering
- railroad and highway signals and their interconnection
- system safety
- administration
- applicable regulatory recommended practices

### 1.2 Site visit and data collection

The diagnostic team should study each crossing by gathering all relevant data and engineering documents. The team should then conduct a group review of the data and a group inspection of the physical crossing location and its surrounding area. The objective is to determine the characteristics and factors at the crossing that affect safety. This information should be kept in a database for reference and updating as conditions change.

### 1.3 Evaluation/engineering analysis

An evaluation of each crossing should be made using a documented methodology that takes into account factors such as those shown in Appendix B. The methodology should identify potential hazards related to people (employees, passengers, pedestrians and members of the general public), trains, equipment, highway vehicles, and other property that may exist at each crossing. Additionally, the grade crossing safety evaluation should be tied to the rail transit agency's overall Agency Safety Plan.

### 1.4 Development of recommendations

Recommendations to eliminate or control hazards should be identified and documented. The following should be primary considerations:

- closure or consolidation of existing crossings
- grade separation of existing crossings
- design recommendations

**APTA RT-RGC-RP-003-03, Rev. 5**  
**Rail Transit Grade Crossing Safety Assessment**

Examples of specific design-related recommendations for retained crossings include the following:

- improved sight distance (e.g., removal of obstructions in the sight triangle)
- raised median or divider
- signage
- pavement markings
- roadway surface
- highway realignment
- improved cross-section (i.e., humped crossings)
- illumination of the crossing (street lighting, etc.)
- crossing surfaces
- rehabilitation of the highway structure or track structure, including installation of drainage and subgrade filter fabric if required
- installation of active traffic control and warning devices:
  - flashing warning lights
  - bells and other audible devices
  - gates (highway and pedestrian)
  - data recorders
  - health monitoring
  - interconnection with highway traffic signal systems

All recommendations should comply with appropriate federal, state and local regulations; relevant APTA rail standards and recommended practices; MUTCD, the FRA/FTA Joint Policy on Shared Corridors; and the AREMA Recommended Practices for Highway Rail Grade Crossings.

**NOTE:** See the References section at the end of this document for the above references.

## **1.5 Implementation of recommendations**

The design and construction of the system should address all recommendations so that they are implemented. Recommendations should be included in the project safety certification process of the Agency Safety Plan.

In addition to the recommendations developed in Section 1.4, the following areas should be made part of the highway rail grade crossing Agency Safety Plan:

- operating and maintenance procedures
- training programs
- safety education programs
- law enforcement programs

## **1.6 Grade crossing inventory**

Each rail transit agency should maintain a highway rail grade crossing inventory that includes all public, private and pedestrian highway rail grade crossings, both at grade and grade separated (underpasses and overpasses). Each crossing should be assigned an appropriate unique identifier.

It is recommended that any rail transit agency desiring to establish a crossing inventory should obtain and use USDOT crossing inventory numbers. See the FRA Crossing Inventory Program web page for details on how to obtain valid crossing inventory numbers. For information on completing and submitting new or updated inventory forms, see the FRA publication “Federal Railroad Administration Guide for Preparing U.S. DOT Crossing Inventory Forms,” available for download from the FRA website. Information on the regulation “Highway-Rail and Pathway Crossing Inventory Reporting” is found in Subpart F of 49 CFR 234.

At crossings, this unique identifier, along with an Emergency Notification System (ENS) sign with telephone number, as described in Subpart E of 49 CFR 234, should be posted on all approaches to the crossing on a signal mast, signpost or pole. The ENS sign must be posted so that it is conspicuous to the motorist by day or night. While 49 CFR 234 does not regulate rail transit agencies in general, the information on ENS will be of use to those properties desiring to establish such a system. Information on the FRA's ENS regulation is contained in Appendix C.

## **1.7 Follow-up**

There should be a procedure in place to ensure that the grade crossing recommendations have been implemented in accordance with Section 1.4. As soon as practicable after the start of revenue operation, each highway rail grade crossing should be reviewed to determine whether the initial assumptions are still valid. The database discussed in Section 1.2 and the inventory discussed in Section 1.6 should be updated if appropriate.

## **1.8 Periodic review**

### **1.8.1 System-wide review**

System-wide review of new and existing highway rail grade crossings should be done on a regular basis in accordance with the rail transit agency's Agency Safety Plan. This review should identify factors at crossings that may have changed or are emerging that may create the potential for new hazards not previously addressed. The inventory and the factors in Section 1.4 may be used in the Agency Safety Plan if the rail transit agency deems it appropriate.

### **1.8.2 Site-specific review**

Additionally, site-specific review should be done as deemed necessary by the rail transit agency or when any of the following occur:

- changes in the safety factors considered in the grade crossing evaluation (Section 1.4).
- system expansion
- an accident (collision)
- a near-miss (near-hit)

### **1.8.3 Database and USDOT inventory update**

The database and inventory should be updated with frequencies specified in accordance with current federal and state standards.

### **1.8.4 Diagnostic team/engineering study**

During a system-wide or site-specific review, conditions may warrant a full diagnostic team/engineering study.

## References

- American Railway Engineering and Maintenance-of-Way Association, *Communications & Signals Manual*, Section 3, Highway-Rail Grade Crossing Warning Systems, 2020.  
<https://publications.arena.org/PDF/CS/2024/TOC/03%20Index.pdf>
- Federal Highway Administration, “Manual on Uniform Traffic Control Devices for Streets and Highways” (MUTCD), 11th Edition, 2023. <http://mutcd.fhwa.dot.gov/>
- Federal Railroad Administration, “Highway-Rail Crossing Inventory Instructions and Procedures Manual,” December 1996. <https://railroads.dot.gov/elibrary/highway-rail-crossing-inventory-instructions-and-procedures-manual-december-1996>
- Federal Railroad Administration, GradeDec Crossing Evaluation Tool. <https://railroads.dot.gov/research-development/program-areas/highway-rail-grade-crossing/gradedec-crossing-evaluation-tool>
- Federal Railroad Administration, Grade Crossing Toolkit, 2024. <https://gradedcrossingtoolkit.fra.dot.gov/>
- Federal Railroad Administration and Federal Transit Administration, Statement of Agency Policy Concerning Jurisdiction Over the Safety of Railroad Passenger Operations and Waivers Related to Shared Use of the Tracks of the General Railroad System by Light Rail and Conventional Equipment. July 2000.  
<https://www.federalregister.gov/documents/2000/07/10/00-17208/statement-of-agency-policy-concerning-jurisdiction-over-the-safety-of-railroad-passenger-operations>
- U.S.C. Title 49, Section 20152 – Swift Rail Development Act 1994.

## Definitions

**diagnostic review team:** A group of knowledgeable representatives, interdisciplinary in nature, that represents all groups having responsibility for safety at highway rail grade crossings.

**rail transit agency:** The organization or portion of an organization that operates rail transit service and related activities. Also called *operating agency*, *operating authority*, *transit agency*, *transit authority*, *transit system*.

## Abbreviations and acronyms

|              |   |
|--------------|---|
| <b>AREMA</b> | American Railway Engineering and Maintenance-of-Way Association |
| <b>CFR</b>   | Code of Federal Regulations                                     |
| <b>ENS</b>   | Emergency Notification System                                   |
| <b>FRA</b>   | Federal Railroad Administration                                 |
| <b>FTA</b>   | Federal Transit Administration                                  |
| <b>MUTCD</b> | Manual on Uniform Traffic Control Devices                       |
| <b>USDOT</b> | United States Department of Transportation                      |

**APTA RT-RGC-RP-003-03, Rev. 5**  
**Rail Transit Grade Crossing Safety Assessment**

## Document history

| <b>Document Version</b> | <b>Working Group Vote</b> | <b>Public Comment/<br/>Technical Oversight</b> | <b>Rail CEO Approval</b> | <b>Policy &amp; Planning Approval</b> | <b>Publish Date</b> |
|-------------------------|---------------------------|--|--------------------------|---------------------------------------|---------------------|
| First published         | Oct. 9, 2002              | —  | —                        | June 8, 2002                          | June 8, 2002        |
| First revision          | —                         | —  | —                        | Feb. 2, 2008                          | Dec 8, 2005         |
| Second revision         | —                         | —  | —                        | —                                     | —                   |
| Third revision          | —                         | —  | —                        | —                                     | Feb 6, 2017         |
| Fourth revision         | Oct. 6, 2015              | Aug. 1, 2017                                   | Sept. 18, 2017           | Nov. 2, 2017                          | Dec. 6, 2017        |
| Fifth revision          | Sep. 5, 2025              | Dec. 3, 2025                                   | Jan. 31, 2026            | Mar. 13, 2026                         | Mar. 16, 2026       |

## Appendix A (informative): Biography

1. FHWA-SA-18-40, FRA-RRS-18-001, “Highway-Rail Crossing Handbook, Third Edition,” July 2019.
2. <http://www.fra.dot.gov>. FRA publication “Summary of the USDOT Rail-Highway Crossing Resource Allocation Procedure – Revised.”
3. Institute of Transportation Engineers (ITE) Recommended Guidance on Preemption.
4. The AASHTO Green Book, “A Policy on Geometric Design of Highways and Streets,” 7th Edition 2nd Printing 2018.
5. USDOT Highway Railroad Grade Crossing Technical Working Group “Guidance on Traffic Control at Highway Rail Crossings,” 2002.
6. <http://www.apta.com>. American Public Transportation Association. Provides information on public transportation issues.
7. <http://www.oli.org>. Offers information on Operation Lifesaver, its mission, state programs, structure, volunteer opportunities, partners, safety brochures, approved vendors of safety materials, etc.
8. <http://www.fta.dot.gov>. Federal Transit Administration. Provides information on current grade crossing technology demonstration projects as well as information on a variety of highway rail grade crossing issues.
9. <http://www.arema.org>. American Railway Engineering and Maintenance of Way Association (AREMA). Provides Manual of Recommended Practices for railroad engineering.
10. <http://www.trb.org>. Transportation Research Board. Provides information and resources on various transportation issues.
11. <http://ite.org>. Institute of Transportation Engineers. Provides information and resources on various transportation issues.

## Appendix B (informative): Factors to consider during assessment of crossings

The assessment and recommendations for highway rail crossings should take into consideration the following safety factors:

1. maximum speed of rail vehicles
2. number of tracks, mainline or other
3. number and types of rail vehicles daily and during peak periods
4. multiple trains approaching crossing simultaneously
5. types of existing warning and traffic control devices, if any
6. sight distances, motor vehicle to rail
7. number of traffic lanes
8. condition of highway rail grade crossing surface
9. number of motor vehicles daily and during peak periods, including specialty vehicles such as heavy trucks, school buses, HAZMAT vehicles (hazardous material transport carriers) and emergency response vehicles
10. speed of motor vehicles over tracks
11. queuing potential across tracks
12. accident information/history
13. multiple adjacent or parallel grade crossings in close proximity
14. nearby vehicle and pedestrian traffic generators, such as businesses, schools, heavy industry, churches, and parks and playgrounds
15. geometry of the highway rail grade crossing, both horizontal and vertical:
  - storage space between highway traffic devices and highway rail crossing devices
  - turning lanes
16. impact on adjacent highway/street operations
17. rail operating characteristics—e.g., braking distances
18. clear storage distance (distance to parallel roadways)
19. rail operating rules—e.g., horn blowing and near-side station stops
20. signal interconnection with highway traffic devices, including preemption and priority
21. visibility of warning devices
22. switching operations in the area that may trigger nuisance operation of the grade crossing
23. Illumination and visibility of trains at night
24. Any adjacent driveway access required by transit for equipment maintenance

## Appendix C (informative): Emergency Notification System

While transit systems are required to follow their state safety oversight agencies (SSOAs), they are generally not required to comply with this federal regulation. The ENS system does provide many safety and operational benefits, and transit systems may wish to avail themselves of these benefits by establishing such an ENS on their properties. The FRA's regulation will provide beneficial information and guidance to any such transit operator.

Section 205 of the 2008 Rail Safety Improvement Act required FRA to develop—and railroads under FRA jurisdiction to implement—a “telephone number to report grade crossing problems.”

The system as described by 49 CFR 234 Subpart E is intended to receive calls reporting four types of unsafe conditions at highway-rail or pathway grade crossings:

1. A warning system malfunction
2. Disabled vehicles or other obstructions blocking railroad tracks
3. Obstructions to the view of a pedestrian or a vehicle operator for a reasonable distance in either direction of a train's approach
4. Any information relating to other unsafe conditions at the crossing

Upon receiving report of signal malfunction, disabled vehicle or other obstruction, the railroad must:

- Immediately contact trains.
- Contact appropriate law enforcement agency so they can assist as necessary.
- Investigate the report.
- Correct the malfunction or unsafe condition.

Upon receiving a report of sight obstructions or other unsafe conditions, the railroad must:

- Investigate the report in a timely manner.
- Remove the obstruction if possible, or correct the safety condition if lawful and feasible.

An essential element of this system is the posting of a special ENS sign as described in Subpart E of 49 CFR Part 234. In general, the sign must satisfy the following conditions:

- It must measure at least 12 × 9 in.
- It must be retroreflective.
- It must have text at least 1 in. in height.
- It must have white text on a blue background with a white border.
- The USDOT Inventory Number only may be black text on white background (see the design shown in [Figure 1](#)).

**FIGURE 1**  
ENS Sign Design



49 CFR §234.309 describes the ENS signs in general terms, and §234.311 covers the requirements for proper placement and maintenance of the ENS signs. Any transit operator wishing to establish its own ENS and place the related signs would be well served to follow the guidance of these two parts, even though transit operators are not generally bound by these regulations.

Additionally, the 11th Edition of the Manual on Uniform Traffic Control Devices (MUTCD), published by the Federal Highway Administration, provides information on the ENS signs. Transit operators may view those guidelines under Part 8 of the MUTCD, Section 8B.27. FHWA provides a free PDF version of the MUTCD online at [mutcd.fhwa.dot.gov/](https://mutcd.fhwa.dot.gov/).