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 system (RTS) highway rail grade crossings.

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. 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 involving people who interact with rail transit operations (motorists, employees, passengers, pedestrians and members of the general public).

This document represents a common viewpoint of those parties concerned with its provisions, namely operating/planning agencies, manufacturers, consultants, engineers and general interest groups. The application of any standards, recommended practices or guidelines contained herein is voluntary. In some cases, federal and/or state regulations govern portions of a transit system’s operations. In those cases, the government regulations take precedence over this standard. The North American Transportation Services Association (NATSA) and its parent organization APTA recognize that for certain applications, the standards or practices, as implemented by individual agencies, may be either more or less restrictive than those given in this document.

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Introduction

This introduction is not part of APTA RT-RGC-RP-003-03, Rev. 4, “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 – Grade Crossing Signal Safety, Subpart D, as related to Maintenance, Testing and Inspection and Subpart E as related to Emergency Notification Systems.

49 CFR 234 was specifically written to address Class One and other railroads or rail-transit operations that are connected to the general railroad system of transportation and thereby under the jurisdiction of the FRA. Where necessary, these recommended practices have been modified and/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 systems to help achieve a high level of safety for passengers, employees, and the general public. This Recommended Practice provides procedures for inspecting, maintaining, and testing RTS highway rail grade crossings.

APTA recommends the use of this Recommended Practice by:

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

This Recommended Practice intends to meet the following objectives:

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

The application of any standards, recommended practices, or guidelines contained herein is voluntary. In some cases, federal and/or state regulations govern portions of how a RTS operates. In such cases, the government regulations override any conflicting practices this document requires or recommends.
Rail Transit Grade Crossing Safety Assessment

1. **Highway rail grade crossing safety assessment process**

The RTS should assess each new 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**

The RTS should assemble a diagnostic review team that is interdisciplinary in nature and represents all groups that share responsibility for safety at the grade crossings, such as rail and highway systems, law enforcement agencies and local municipalities.

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 proposed 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 proposed/existing physical crossing location and its surrounding area. The objective is to determine the characteristics and factors at the proposed crossing that affect safety. This information should be kept in a database for easy 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 Annex 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 system’s overall system safety program 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

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
• curbs
• roadway surface
• highway realignment
• improved cross-section (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 prior to operation. Recommendations should be included in the project safety certification process of the system safety program plan.

In addition to the recommendations developed in Section 1.4, the following areas should be made part of the highway rail grade crossing system safety program plan:

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

### 1.6 Grade crossing inventory

Each RTS 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 RTS 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 “Guide for Preparing U. S. DOT Crossing Inventory Forms” available for download from the FRA website. Information on the recently published regulation “Highway-Rail and Pathway Crossing Inventory Reporting” found in Subpart F of 49 CFR 234 can be found starting on Page 786 of the Federal Register, Volume 80, No. 3, or on the public website of the FRA at [www.fra.dot.gov](http://www.fra.dot.gov).

At crossings, this unique identifier, along with an emergency notification system (ENS) 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.
49 CFR 234 does not regulate rail transit systems 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 Annex 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 system’s system safety program 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 system safety program plan if the RTS deems it appropriate.

1.8.2 Site-specific review
Additionally, site-specific review should be done as deemed necessary by management 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 as appropriate.

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

AREMA, Recommended Practices for Highway Rail Grade Crossings.

http://mutcd.fhwa.dot.gov/


FRA/FTA, Joint Policy on Shared Corridors.


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 system (RTS): 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

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<th>Abbreviation</th>
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<td>ENS</td>
<td>emergency notification system</td>
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<td>NATSA</td>
<td>North American Transit Services Association</td>
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<td>RTS</td>
<td>rail transit system</td>
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Summary of document changes

- Document formatted to the new APTA Rail Recommended Practice format.
- Sections to reflect APTA Recommended Practices format added to Content Index.
- Section 1.6 last two paragraphs added to reflect the ability of a transit property to incorporate its grade crossings into the USDOT crossing inventory system.
- Annex C was totally rewritten to reflect the recent regulatory change found in 49 CFR 234 Subpart E, 49 CFR §234.309 and 49 CFR §234.311.

Document history

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Annex A (informative): Bibliography

1. AREMA C&S Manual, Section 3-Highway-Rail Grade Crossing Warning System.
4. ITE Recommended Guidance on Preemption.
Annex B (informative): Safety factors to consider during assessment of crossings

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

a) maximum speed of rail vehicles  
b) number of tracks, mainline or other  
c) number and types of rail vehicles daily and during peak periods  
d) multiple trains approaching crossing simultaneously  
e) types of existing warning and traffic control devices if any  
f) sight distances, motor vehicle to rail  
g) number of traffic lanes  
h) condition of highway rail grade crossing surface  
i) 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  
j) speed of motor vehicles over tracks  
k) queuing potential across tracks  
l) accident information/history  
m) multiple adjacent or parallel grade crossings in close proximity  
n) nearby vehicle and pedestrian traffic generators, such as businesses, schools, heavy industry, churches, and parks and playgrounds  
o) geometry of the highway rail grade crossing, both horizontal and vertical:  
  • storage space between highway traffic devices and highway; rail crossing devices  
  • turning lanes  
p) impact on adjacent highway/street operations  
q) rail operating characteristics—e.g., braking distances  
r) rail operating rules—e.g., horn blowing and near-side station stops  
s) signal interconnection with highway traffic devices including preemption and priority  
t) visibility of warning devices  
u) switching operations in the area that may trigger nuisance operation of the grade crossing
Annex C (informative): Systems for telephonic notification of unsafe conditions at highway rail and pathway grade crossings

While transit systems are generally not required to comply with this regulation, the ENS system does provide many safety and operational benefits. 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; or
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 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 DOT Inventory Number only may be black text on white background (see the alternate design shown in Figure 1).
Within 49 CFR 234, § 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.