

3. Recommended Practice for Rail Transit System Highway Rail Grade Crossing Safety Assessment

This version contains editorial changes approved at RGC meeting 2/6/2008.

Revisions Approved December 8, 2005

Approved October 9, 2002

APTA Rail Transit Standards Rail Grade Crossings Committee

Revision Approved March 19, 2005

Approved January 10, 2003

APTA Rail Transit Standards Task Force

Authorized June 8, 2003

APTA Rail Transit Standards Policy Committee

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

Keywords: assessment, evaluation, identifier, inventory, safety

Introduction

(This introduction is not a part of APTA RT-RGC-RP-003-03, *Recommended Practice for Rail Transit System Highway Rail Grade Crossing Safety Assessment*.)

APTA rail transit safety standards and recommended practices represent an industry consensus on practices for rail transit systems to help achieve a high level of safety for passengers, employees, and the general public. This document was created by and for those parties concerned with its provisions; namely, rail transit systems (operating agencies), manufacturers, consultants, engineers, and general interest groups. This recommended practice provides guidelines for assessing the safety of rail transit highway rail grade crossings.

APTA recommends this practice for:

- Individuals or organizations that inspect, maintain, and/or operate rail transit systems
- Individuals or organizations that contract with others for the inspection, maintenance, and/or operation of rail transit systems
- Individuals or organizations that influence how rail transit systems are inspected, maintained, and/or operated (including but not limited to consultants, designers, and contractors)

The application of any practices or guidelines contained herein is voluntary. In some cases, federal and/or state regulations govern portions of how a rail transit system operates. In such cases, the government regulations override any conflicting practices this document recommends.

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Recommended Practice for Rail Transit System Highway Rail Grade Crossing Safety Assessment

1. Overview

This recommended practice provides organized, structured approach for assessing the safety of new and existing rail transit system (RTS) highway rail grade crossings.

1.1 Scope

This practice applies to new start and existing rail transit, light rail, and rapid rail lines on an exclusive right of way.

1.2 Purpose

The purpose of this recommended practice is to verify 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 persons who interact with rail transit operations (motorists, employees, passengers, pedestrians, and members of the general public)

2. References

23 CFR 655.601, Subpart F, Manual on Uniform Traffic Control Devices (MUTCD), 2003
Edition published by Federal Highway Administration (FHWA) (<http://mutcd.fhwa.dot.gov/>)

AREMA Recommended Practices for Highway Rail Grade Crossings.

FRA Highway Rail Crossing Inventory, Instructions and Procedures Manual, December 1996.
<http://www.fra.dot.gov>, Federal Railroad Administration (FRA).

FRA/FTA Joint Policy on Shared Corridors.

U.S.C. Title 49, Section 20152- Swift Rail Development Act 1994.

3. Definitions and acronyms

3.1 Definitions

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

3.1.2 rail transit system (RTS): The organization or portion of an organization that operates rail transit service and related activities. *Syn:* **operating agency, operating authority, transit agency, transit authority, transit system.**

3.2 Acronyms

APTA American Public Transportation Association

AREMA American Railway Engineering and Maintenance-of-Way Association

ENS emergency notification system

FRA Federal Railroad Administration (of the DOT)

FTA Federal Transit Administration (of the DOT)

MUTCD Manual on Uniform Traffic Control Devices

RTS rail transit system

USDOT United States Department of Transportation

4. 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 4.1-4.8 as a minimum.

4.1 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:

- rail and highway traffic operations
- rail and highway traffic engineering
- railroad and highway signals and their interconnection
- system safety
- administration

4.2 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.

4.3 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 persons (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.

4.4 Development of recommendations

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

- a) Closure or consolidation of existing crossings
- b) Grade separation of existing crossings
- c) Design recommendations

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

- 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 sub grade 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 standards and recommended practices, *MUTCD*¹, the *FRA/FTA Joint Policy on Shared Corridors*, and the *AREMA Recommended Practices for Highway Rail Grade Crossings*.

4.5 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 4.4 the following areas should be made part of the highway rail grade crossing system safety program plan.

- a) Operating and maintenance procedures
- b) Training programs
- c) Safety education programs
- d) Law enforcement programs

4.6 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.

Rail transit systems may use USDOT crossing inventory numbers if desired. (See the *FRA Highway Rail Crossing Inventory, Instructions, and Procedures Manual* for information on obtaining these numbers and completing the required inventory form.)

At crossings, this unique identifier, along with an emergency notification system (ENS) telephone number, should be posted on all approaches to the crossing on a signal mast, signpost, or pole, or stenciled on nearby equipment. Information on the ENS is contained in Annex C.

¹

For references in italics, see Section 2.

4.7 Follow-up

There should be a procedure in place to ensure that the grade crossing recommendations have been implemented in accordance with Section 4.4. 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 4.2 and the inventory discussed in Section 4.6 should be updated if appropriate.

4.8 Periodic review

4.8.1 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 4.4 may be used in the system safety program plan if the RTS deems it appropriate.

4.8.2 Site specific review

Additionally, site specific review should be done as deemed necessary by management or when any of the following occurs:

- a) Changes in the safety factors considered in the grade crossing evaluation (Section 4.4).
- b) System expansion
- c) Accidents (collisions)
- d) Near miss (near hit)

4.8.3 Database and US DOT inventory update

The database and inventory should be updated as appropriate.

4.8.4 Diagnostic team/engineering study

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

Annex A

(Informative)

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- [B10] <http://www.arena.org>, American Railway Engineering and Maintenance of Way Association (AREMA). Provides information on Manual of Recommended Practices for railroad engineering.
- [B11] <http://www.trb.org>, Transportation Research Board. Provides information and resources on various transportation issues.
- [B12] <http://ite.org>, Institute of Transportation Engineers. Provides information and resources on various transportation issues.

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.
 - Number of motor vehicles daily and during peak periods, including specialty vehicles such as heavy trucks
 - School buses
 - HAZMAT (hazardous material transport carriers)
 - Emergency response vehicles
- i) Speed of motor vehicles over tracks
- j) Queuing potential across tracks
- k) Accident information/history
- l) Multiple adjacent or parallel grade crossings in close proximity
- m) Nearby vehicle and pedestrian traffic generators such as:
 - Businesses
 - Schools
 - Heavy industry

- Churches
 - Parks and playgrounds
- n) Geometry of the highway rail grade crossing, both horizontal and vertical
- Storage space between highway traffic devices and highway – rail crossing devices
 - Turning lanes
- o) Impact on adjacent highway/street operations
- p) Rail operating characteristics e.g. braking distances
- q) Rail operating rules e.g. horn blowing and near side station stops
- r) Signal interconnection with highway traffic devices including preemption and priority
- s) Visibility of warning devices
- t) Switching operations in the area that may trigger nuisance operation of the grade crossing

Annex C

(Informative)

Emergency notification system signs (ENS)

Toll-free emergency notification system (ENS) signs should be posted on both sides of every at-grade highway rail intersection to provide the public a means to immediately contact the rail transit system's 24-hour center for reporting problems, malfunctions, or emergencies at a crossing. These signs allow motorists who become stalled on or obstruct the transit tracks to immediately provide information and pinpoint the location to the transit dispatch center, or other centralized emergency response communication center, to warn or stop trains approaching the location. It also provides a means to send emergency responders or maintenance crews to make repairs.

While consideration needs to be given to using 911 as the emergency notification for emergency responders, use of these ENS signs provides a means to immediately notify the dispatch center so that trains in the area can be stopped. It also provides a method to immediately receive information about crossing warning device malfunctions, broken gates and other problems which affect crossing safety.

Such a system also provides a means for rail transit systems to document the problems being reported and analyze the data so that crossing safety can be improved. It also provides for the generation of useable reports regarding highway rail signal malfunctions, problems and the prevention of highway vehicle-train collisions for safety analysis.

Such a system is consistent with national legislation *U.S.C. Title 49, Section 20152- Swift Rail Development Act 1994* and for improving highway rail crossing safety and reducing the number of highway rail crossing collisions and casualties by a means to quickly inform railroads and transit agencies of emergencies or other safety problems at highway rail intersections.

Signage:

The signs should comply with the *23 CFR 655.601 MUTCD*.