



Guideline For Inspecting and Testing Preemption of Interconnected Traffic Control Signals and Railway Crossing Warning Systems

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Table of Contents

1. Introduction

2. Guidance

a) Railway and Road Authority Sample Checklist's

b) Site Information and Joint Inspection Record Form

c) Recommended Warning Label's

3. Railway Safety Act and You

4. Railway "Inspection and Test Sample Checklist"

5. Road Authority "Inspection and Test Sample Checklist"

6. "Site Information and Joint Inspection Record Form"

7. Definitions

8. Technical Organizations Addresses and WWW Locations

9. Transport Canada Addresses and WWW Locations

10. Appendix "A" Recommended Warning Labels

1. Introduction

This guide was developed in consultation with Canadian stakeholders including members of the railway industry, Transport Canada, municipalities, road authorities, related professional associations, and federal and provincial government agencies concerned with public safety at road/railway grade crossings.

In the past, actions were taken that adversely impacted public safety with interconnected traffic signals and road/railway grade crossing warning systems. As a result, the ITE and AREMA got together and jointly addressed the problems encountered. There is now a new FHWA produced MUTCD chapter 8 that has addresses design. AREMA standards have now been modified to reflect these requirements.

This guideline is intended for railway and road authority employees or contractors assigned to the inspection, maintenance, repair, and the testing of road/railway grade crossings and traffic control signals that are interconnected for the purpose of preemption of traffic control signals, or the activation of Prepare To Stop at Railway Crossing sign(s) (WB-6) beacon lights.

The procedures and forms recommended in this guide are provided solely as a guide and should not be quoted or considered as legal authority.

This guide is not intended to replace existing safety procedures or forms in use by the railway or road authority that may be more stringent; and should not considered to be a design document.

Use of this guide is intended to promote a regular joint railway/road authority inspection or test program for interconnected traffic control locations as well as improve communication between the responsible authorities.

Transport Canada welcomes further comments and input into future revisions of this guidance document as part of the ongoing improvement process with this publication.

2. Guidance

When interconnected, the railway grade crossing warning system and the traffic control signals operate in a very precise fashion and should be regarded as one system for purpose of “railway activated” preemption. For this reason, the sample checklists and site information and joint inspection record form are available on our web site. The form may be personalized for your record keeping and should be kept available at each interconnected system location for use as needed.

a) Railway and Road Authority Sample Checklist

The Sample Checklists provide a systematic method of verifying interconnected systems stated design features. This is for the use of railway and road authority employees and contractors assigned to inspect, maintain or test railway grade crossing warning systems interconnected with roadway traffic control signals. Additional checks may be deemed necessary by your responsible engineering managers to ensure proper functioning of interconnected systems.

Note: Any changes to railway or road traffic conditions discovered during the performing of these checks or other regularly scheduled inspections must be reported. The relevance of these observed changes may trigger an engineering safety evaluation of the site. Examples of changes are: changes to railway operation or speed; changes to vehicle traffic or speed; spotting vehicles queuing onto crossing clearance area; and vehicles having difficulty stopping safely when a train approaches and activates the warning system.

b) Site Information and Joint Inspection Record Form

The sample record form provides a location for recording site-specific information including contact persons, crossing and intersection coordinates, railway control circuit features, and design timing parameters. No maintenance employee is authorized to make changes to the system settings without completion of an engineering joint safety site study. The bottom section of the form allows documentation of joint inspection due date and should be completed by the employees assigned to conduct the joint inspection and tests.

c) Recommended Warning Labels

You may want to consider the use of weather resistant, self-adhesive, florescent labels to help identify these unique interconnected systems. This information could be critical during a system failure or when a manual override of the traffic control system by local enforcement agencies or rail and road supervisory and maintenance personnel is needed. If used, the labels affixed at each signal control housing should be clearly visible.

In cases where the railway crossing operation test feature also preempts the traffic signal, another label may be considered useful to affix near this test feature. This will remind or inform the railway employee performing the test they will cause activation of the preemption action at the traffic signals when testing.

3. Railway Safety Act and You

The *Railway Safety Act (RSA)* has requirements with respect to all engineering work relating to railway works.

Section 11 of the *RSA* states:

“All the engineering work relating to railway works, including design, construction, evaluation or alteration, shall be done in accordance with sound engineering principles. A professional engineer shall take responsibility for the engineering work.”

Employees responsible for the maintenance of these systems should not make any modifications without prior authorization. A professional engineer shall take responsibility for any modification. Any changes on one system may have serious consequence on the other, and the impact on both systems must be carefully assessed. For any questions on what “*take responsibility*” means, please refer to the Transport Canada Guideline to Engineering Work referenced below.

Subsection 41 (1) of the *RSA*, states:

“Any person, including railway or road authority, and any manager, supervisor, official or other employee, who violates any requirement or provision of this Act is guilty of an offence and is liable upon conviction of a fine not exceeding \$10,000 or imprisonment for a term not exceeding one year, or both.”

If you would like more information regarding Section 11 of the ***RSA***, refer to *Guideline to Engineering Work Relating to Railway Works*, TP13626, available on the Internet at http://www.tc.gc.ca/railway/RSA/RSA_english.htm#INTRODUCTION

4. Railway Sample Checklist

a) Regular Inspection and Test

1. Ensure the design parameters are recorded on the “Site Information and Inspection Record Form”;
2. Activate road/railway grade crossing warning system;
3. Confirm that the preemption signal activates the traffic signals;
4. If applicable, confirm advance preemption or activation of traffic signal (flashing signal, turn restrictions etc.);
5. Ensure all warning labels when used are clearly visible and legible;
6. If due, arrange the upcoming Joint Railway/Road Authority Scheduled Inspection and Test; and
7. Report any railway, road traffic or physical surroundings condition changes (additions resulting in line of site obstructions etc.).

b) Joint (Railway/Road Authority) Inspection and Test

1. Verify Timing Design Parameters listed on the “Site Information and Inspection Record Form”;
2. Confirm interconnection circuit wires are free of grounds or foreign currents and the system fails in the safe mode;
3. Identify if special features are included they function as designed (e.g.: supervisory circuit, power failure monitoring circuit);
4. Activate road/railway grade crossing warning system and confirm preemption activation of traffic signals during all phases of the traffic controller unit operation;
5. Repeat previous step for multiple track locations including any advance preemption circuits; and
6. Record joint inspection and test date as well as the next due date on the Site Information and Inspection Record Form.

5. Road Authority Sample Checklist

a) Regular Inspection and Test

1. Ensure the timing design parameters are recorded on the “Site Information and Inspection Record Form”;
2. Simulate the preemption signal input from road/railway grade crossing warning system while confirming the railway interconnect is connected to the highest priority control unit input;
3. Confirm preemption activation of traffic signals including any associated pre-signals or active signs etc. and that the clear-out phase on the control unit cannot reset or resume it’s normal operation until the gates start to rise or the railway crossing is no longer operating;
4. Confirm the standby battery power “when used”, operates as designed;
5. Ensure all warning labels if used are clearly visible and legible;
6. If required, arrange upcoming Joint Railway/Road Authority Scheduled Inspection and Test; and report any roadway, rail traffic, or physical surroundings condition changes that may affect the road users line of site visibility.

b) Joint (Railway/Road Authority) Inspection and Test

1. Confirm Timing Design Parameters on the “Site Information and Inspection Record Form” are correct;
2. Confirm interconnection circuit wires are free of grounds or foreign currents and the system fails in the safe mode;
3. Confirm the preemption signal from the railway is connected to highest priority preemption input;
4. Identify if special features are included and function as designed (e.g.: interconnect supervisory circuit, power failure monitoring circuit);
5. Activate road/railway grade crossing warning system (railway action) and confirm preemption activation of traffic signals responds during all phases of the traffic controller unit;
6. Confirm preemption restarts after a CU time-out sequence (second or stopped and restarted train scenario) note: when using gates this time out sequence should not be possible unless gate arms have been activated up resetting the CU, “this is sometimes referred to as traffic signal controller re-service”;
7. Confirm pedestrian clear-out time matches the design timing;
8. When applicable, confirm the active “Prepare-to-Stop-at-Railway-Crossing Sign (WB6)” delayed beacon turn-off time; and
9. Record joint inspection and test date as well as the next due date on both Site Information and Inspection Record Forms.

Site Information and Inspection Record Form

For Interconnected Road/Railway Grade Crossing Warning System With Traffic Control Signals

ATTENTION: DO NOT MODIFY the preemption design without written joint approval from the railway and the road authority engineers responsible for safety at this location.

Railway Co. _____ Subdivision _____

Contact person _____ Subdivision mileage _____

Phone no _____ - _____ - _____ Email address _____ @ _____

Railway emergency call number _____ - _____ - _____

Transport Canada Crossing Inventory No. _____

Road Authority _____ Road intersections _____ & _____

Contact person _____ Email address _____ @ _____

City _____ Phone No _____ - _____ - _____

Province _____ R. A. Identifier _____

Road Authority emergency call number _____ - _____ - _____

Road/Railway Grade Crossing Warning System Type and Timing Control Circuit Settings:

Constant warning approach timing: ____ Fixed distance approach timing: ____ Motion sensing: ____

Does test switch feature deactivate preemption of traffic signals: Yes ____ No ____.

Does test switch feature activate preemption of traffic signals: Yes ____ No ____.

Road/Railway Grade Crossing System activation warning time (Minimum 20 sec.) _____ seconds.

Advance Preemption Time (APT) if required by the Road Authority is _____ seconds in order to provide the total required Preemption time of _____ seconds to the traffic signal controller.

Traffic Signal Preemption Activation Timing Settings and Control Circuit Type:

Controller unit type (specify): _____

Total Traffic controller preemption activation warning time required prior to train arriving at crossing is _____ seconds. Note: This time is greater than the crossing activation time above if the railway is requested to provide **advance preemption** (railway term) due to their normal approach time being insufficient for road authority timing purposes. Delayed WB-6 beacon turn off time as specified by the Road Authority is _____ seconds. *See Guide definitions for time setting explanations and sample timeline.*

Interconnection circuit: Level: ____ volts, Type (check): AC ____, DC ____ or Vital Serial ____

Next Joint Inspection Due: ____/____/____ (sign below when inspection completed)

MM / DD / YYYY / TT: TT | Railway Contact Name | Road Authority Contact Name

____/____/____/____:____ | _____ | _____

(Print names) _____ | _____

7. Definitions

Common definitions are used in this guide and are adopted by ITE. In the US the Federal Highway Administration (FHWA) produces their MUTCD.

Advance Preemption / Advance Preemption Time (APT):

Notification of an approaching train is forwarded to the highway traffic signal controller by railroad equipment for a period of time prior to activating the railroad active warning devices. This period of time is the difference in the Maximum Preemption Time required for highway traffic signal operation and the Minimum Warning Time needed for railroad operation. (Note: common definitions have been adopted by AREMA and the ITE and are used in the US FHWA version of the MUTCD)

Advance Activation Time of the Prepare to Stop at Railway Crossing Sign (WB-6):

The time specified by the road authority to provide advance notification of an approaching train before the activation of the Road/Railway Grade Crossing. “See advance preemption time.” (TC)

Beacon:

This is a signal face (light) with one or more sections that operates in the flashing mode. (ITE)

Control Unit (CU):

A part of a traffic signal controller assembly that is devoted to the selection and timing of signal phases. (ITE) Note: These come in several versions with different characteristics regarding identifying the railway priority input(s). (ITE)

Delayed Turnoff of Prepare to Stop at Railway Crossing Sign (WB-6):

This is a delay in the turn off of the advance warning sign beacons and is intended to reduce the speed of approaching vehicles thus allowing the crossing area to safely clear out of previously stored traffic after the passage of a train. (TAC)

Engineering Work (section 11 RSA):

All the engineering work relating to railway works, including design, construction, evaluation or alteration, shall be done in accordance with sound engineering principles. A professional engineer shall take responsibility for the engineering work.

An Engineering Work definition is available at the Transport Canada web site http://www.tc.gc.ca/railway/RSA/RSA_english.htm or the Transport Canada information document TP 13626 available at the listed offices.

Interconnected Signals:

These are traffic signals that are connected together by some means for the purpose of establishing a definite timing relationship. (ITE)

Interconnection:

This is the electrical connection between the railroad active warning system and the traffic signal controller for the purpose of preemption. This may be a “Vital Serial” wire or wireless connection utilizing isolated vital serial data circuit(s) or a hard wire interconnection circuit. Vital serial connections are designed using fail-safe design principals. (ITE)

Institute of Transportation Engineers (ITE):

This organization prints the US MUTCD and has a joint committee with AREMA to insure there are common definitions used when these systems are interconnected. This guide incorporates the ITE definitions. Their Web Site is located at: <http://www.ite.org>

Manual of Uniform Traffic Control Devices For Canada (MUTCD-C):

Manual of Uniform Traffic Control Devices for Canada and is managed by the Transportation Association of Canada. Their Web Site is located at <http://www.tac-atc.ca>

Manual of Uniform Traffic Control Devices US (MUTCD):

The MUTCD for the USA is a product of the (FHWA), and covers all aspects of traffic design including crossing protection interconnection in section 8. The manual may be ordered from their web site at <http://www.ite.org> or may be downloaded at <http://mutcd.fhwa.dot.gov/>

Minimum Warning Time (through train movements):

The least amount of time railway active warning devices shall operate prior to the arrival of a train at the railroad-highway grade crossing. (ITE)

Preemption:

The transfer of normal operation of a road traffic control signals to a special control mode. (ITE)

Note: The need for preemption, type of preemption and time interval for any advance preemption shall be determined by the public agencies having jurisdictional authority.

Pre-Signal:

This is a supplementary traffic signal that is part of the traffic control signal system and is controlled by the road intersection CU. It is normally placed in a position that controls road traffic approaching the railway crossing warning system and the intersection. (ITE)

Prepare to Stop at Railway Crossing Sign (WB-6):

The active Prepare to Stop at Railway Crossing Sign indicated to drivers in advance of a railway crossing that there is a high probability of having to stop for the railway crossing signals ahead. The primary function is to reduce dilemma zone incidents. (MUTCD-C)

Railway Safety Act (RSA):

This is an Act of Parliament of Canada, which applies in respect of transport by railways to all persons, railway companies and railways within the legislative authority of Parliament.

This may be found at. http://www.tc.gc.ca/railway/RSA/RSA_english.htm

Road/Railway Grade Crossing Warning System:

The active system consisting of lights, bell, and/or gates used at road/railway or, may be called “highway-rail grade crossing intersections (AREMA)”, to warn motorists of an approaching train.

Simultaneous Preemption:

Notification of an approaching train is forwarded to the highway traffic signal controller unit or assembly and railroad active warning devices at the same time. (ITE)

Test:

This means to inspect the apparatus, and also to subject it to specified electrical and/or mechanical tests to verify its proper operation. (AREMA)

Traffic Signal Controller Re-service:

This is when the preemption signal is reestablished after an immediate prior activation as in a second train or a stop and restart scenario. (ITE)

Transport Canada (TC):

Transport Canada is the federal government department responsible for most of the transportation policies, programs and goals set by the government of Canada.

Vital Serial:

Vital serial communication connections are designed using fail-safe design principals. A break or unacceptable change in the data stream acts the same as a broken or shorted wire in a conventional wire based interconnected fail-safe designed system. (ITE)

WB-6:

This is the TAC (MUTCD-C *for Canada*) identifier used for active Prepare to Stop at Railway Crossing Signs. The old name used for this was Active Advance Warning Sign and this reference may still be used in some areas of North America. (TAC)

Technical Organizations

American Railway Engineering and Maintenance of Way Association,
8201 Corporate Drive, Suite 1125,
Landover, Maryland, 20785-2230
Phone: 301-459-3200
Fax: 301-459-8077
Web site, <http://www.arema.org>

Institute of Transportation Engineers U. S.,
1099 14th Street, NW, Suite 300 West
Washington, DC 20005-3438 USA
Telephone: +1 202-289-0222
Fax: +1 202-289-7722
Web Site, <http://www.ite.org>
MUTCD (U.S. Version)

Transportation Association of Canada,
2323 St. Laurent Blvd.,
Ottawa, Ontario,
K1G 4J8
Phone: (613) 736-1350
Fax: (613) 736-1395
Web Site, <http://www.tac-atc.ca>
MUTCD-C (Canadian Version)

Federal Highway Administration
U.S. Department of Transportation
400 7th Street, S.W.
Washington D.C. 20590
Information: 202-366-4000
Web site, <http://www.fhwa.dot.gov/>

Transport Canada Addresses

Rail Safety Headquarters

Transport Canada Rail Safety
Place de Ville, Tower C
330 Sparks Street, 10th floor
Ottawa, Ont., K1A 0N5
Tel.: 613 998-2985,
Fax: 613 990-7767
<http://www.tc.gc.ca/railway/>

Rail Safety Regional Offices

ATLANTIC REGION,

Transport Canada Surface,
Heritage Place,
95 Foundry Street, Suite 418,
Moncton, N.B., E1C 5H7,
Tel.: 506 851-7040,
Fax: 506 851-7042

ONTARIO REGION,

Transport Canada Surface Group,
4900 Yonge St. 3rd. Floor,
North York, Ont., M2N 6A5,
Tel.: 416 973-9820,
Fax: 416 973-9907

PACIFIC REGION

Transport Canada Surface,
225 - 625 Agnes Street,
New Westminster, B.C., V3M 5Y4,
Tel.: 604 666-0011,
Fax: 604 666-7747

PRAIRIE AND NORTHERN REGION

Transport Canada Surface,
344 Edmonton Street,
4th Floor, P.O. Box 8550,
Winnipeg, MB. R3C 0P6,
Tel.: 204 983-4214,
Fax: 204 983-8992

QUEBEC REGION,

Transport Canada Surface,
800 René-Lévesque Blvd. West,
6th Floor, Suite 638,
Montreal, QC, H3B 1X9,
Tel.: 514 283-5722,
Fax: 514 283-8234

Appendix "A"

Recommended warning labels (Florescent orange or yellow background with black letters).

WARNING
**THIS LOCATION IS
INTERCONNECTED WITH THE
RAILWAY CROSSING Warning System**

Place this label at Traffic Signal Controller Housing location

WARNING
**THIS LOCATION IS
INTERCONNECTED
WITH THE TRAFFIC CONTROL
SIGNALS**

Place this label at the Railway Crossing Warning System Housing

WARNING
Keep the crossing warning test or flagging operation time short.
Activation of the Road/Railway Grade Crossing Warning System
Will affect the interconnected Traffic Control Signals.
Extended operation may require flagging of road traffic.

Place this label at the railway test location when applicable
