U.S. Department of Transportation
Federal Railroad Administration

TITLE 49 CFR PART 234
GRADE CROSSING SIGNAL SYSTEM SAFETY

TECHNICAL MANUAL

August 1, 2002

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PART 234 GRADE CROSSING SIGNAL SYSTEM SAFETY

Compliance Policy

The purpose of these regulations is to provide for the safety of users of highway-rail grade crossings, including motor vehicle occupants, non-motorized vehicle users, and pedestrians. *It is the policy of the Federal Railroad Administration to promote voluntary compliance with these minimum safety standards.* Civil penalty sanctions may be employed as necessary to secure compliance, if voluntary compliance is not forthcoming.

In determining whether use of civil penalty sanctions is necessary, the inspector will take into consideration whether the railroad has installed and maintained the installation in a manner likely to provide for its proper functioning in the interval between required inspections and tests. The inspector shall also take into account the harsh environment in which the installation is required to function. Civil penalty sanctions should not be recommended for conditions that the railroad could not have prevented through use of due diligence, provided those conditions occurred subsequent to a previous inspection or test of the system.

Conditions that arise through no fault on the part of the railroad include, for example --

- Gate arm breakage.

- Lamp outage or damage to flashing light units due to mechanical damage.

- Gate arm light not securely fastened to gate arm, due to mechanical damage.

In other cases, normal operation of the system may result in occasional component failure or lack of adjustment that is not predictable or reasonably preventable, for example --

- Lamp outage due to normal burn out of filament, where outages represent failure at an expected rate due to expired service life.

- Switch circuit controller connection loose at time of quarterly inspection.

- Insulation in insulated joint in bad condition at time of quarterly inspection.

- Switch circuit controller not securely fastened in place at time of quarterly inspection.

In summary, certain component failures may occur as a result of vandalism, inadvertent contact with the installation by motor vehicles, or lack of proper maintenance. In individual cases such as those cited above, the inspector should record a defect and the railroad will be expected to promptly remedy the condition as required by Section 234.207.

While certain conditions may seem minor in nature when viewed individually, any failure to correct could result in an activation failure, partial activation, or false activation. Accordingly, should the inspector encounter a pattern involving any such condition, indicating lack of proper inspection or maintenance, civil penalties should be employed as necessary. (See 49 CFR Part 209, Appendix A)

Subpart A - General

§ 234.1 Scope.

This part imposes minimum maintenance, inspection, and testing standards for highway-rail grade crossing warning systems. This part also prescribes standards for the reporting of failures of such systems and prescribes minimum actions railroads must take when such warning systems malfunction. This part does not restrict a railroad from adopting and enforcing additional or more stringent requirements not inconsistent with this part.

§ 234.3 Application.

The following examples address specific types of rail operations and whether this rule applies to that operation:

(1) Rail freight operations - This part applies to all freight railroads which are part of the general railroad system of transportation. FRA's regulations generally exclude railroads whose entire operations are confined to an industrial installation, i.e., "plant railroads" such as those in steel mills that do not go beyond the plant's boundaries. However, even where a railroad operates outside of the general system, other railroads that are part of that system may have occasion to enter the first railroad's property. In that case the plant railroad would have to meet FRA's highway-rail grade crossing warning system standards if a general system railroad operated over the grade crossing. These regulations do not apply to a freight carrying railroad (and the highway-rail grade crossings over which it operates) which is not part of the general railroad system of transportation. Both public and private crossings that general system railroads operate over are covered by this part.

(2) Rail rapid transit - This part does not apply to rail rapid transit operations conducted over track that is used exclusively for that purpose and that is not part of the general railroad system of transportation. (Note: See FRA/FTA Shared Corridor Policy (Federal Register Volume 65, No. 132, July 10, 2000 for further information)).

(3) Rail passenger operations - This part does apply to passenger railroad operations if any of

the following exists on the line of railroad: (a) a public highway-rail grade crossing that is in use; (b) an at grade rail crossing that is in use; (c) a bridge over a public road or waters used for commercial navigation; (d) or its operations are within 30 feet of those of any other railroad. If any of these conditions exist, all highway-rail grade crossings over which the railroad operates, both public and private crossings, are subject to this rule. It is important to note that the fact that a passenger railroad is not connected to the general railroad system does not in itself affect a railroad's duty to comply with this part. An analysis must be made as to the presence of the above mentioned factors.

When a manually operated highway-rail grade crossing active warning system contains components covered by this part, those components shall comply with the applicable rule requirements.

U.S. Department of Transportation

Federal Railroad Administration

Memorandum

Date: November 21, 1996 Reply to Attn of: S-96-06

Subject: Manually Operated Warning Systems

(Original Signed by E. R. English)

From: E. R. English
Director, Office of Safety Assurance and Compliance

To: All Regional Administrators, Deputy Regional Administrators,S&TC Specialists and S&TC Inspectors

The S&TC Technical Resolution Committee meeting held in Portland, Oregon the week of July 22, 1996, acted on a request for the application, interpretation, and enforcement of the requirement of Part 234 as it applies to manually operated warning systems.

The consensus of the committee was that components of manually operated warning systems should be covered by appropriate, corresponding rules. When a warning system is activated the public is not aware of how it is activated. It is essential that they receive the same level of safety from both automatic or manually operated crossings. The following sentence will be added to the Part 234 Grade Crossing Signal System Safety Manual:

> "When a manually operated grade crossing signal system contains components covered by Part 234, those components shall comply with the requirements of that part."

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§ 234.4 Preemptive effect.

Under 49 U.S.C. 20106 (formerly § 205 of the Federal Railroad Safety Act of 1970 (45 U.S.C. 434)), issuance of these regulations preempts any State law, rule, regulation, order, or standard covering the same subject matter, except a provision directed at an essentially local safety hazard that is consistent with this part and that does not impose an undue burden on interstate commerce.

§ 234.5 Definitions.

Activation Failure:

An activation failure is the failure of an active highway-rail grade crossing warning system to indicate the approach of a train at least 20 seconds prior to the train's arrival at the crossing, or to indicate the presence of a train occupying the crossing, unless the crossing is provided with an alternative means of active warning to highway users of approaching trains. (This failure indicates to the motorist that it is safe to proceed across the railroad tracks when, in fact, it is not safe to do so.)

A grade crossing warning system does not indicate the approach of a train within the meaning of this paragraph if:

> (1) more than 50 percent of the flashing lights (not gate arm lights) on any approach lane to the crossing are not functioning as intended, or
>
> (2) in the case of an approach lane for which two or more pairs of flashing lights are provided, there is not at least one flashing light pair operating as intended.

Back lights on the far side of the crossing are not considered in making these determinations.

It shall not be deemed an activation failure if alternative means, as set forth in Section 234.105, are used to provide warning to highway users approaching the crossing where an active warning system is inoperative.

Appropriately Equipped Flagger:

A person other than a train crewmember who is equipped with a vest, shirt, or jacket of a color appropriate for daytime flagging such as orange, yellow, strong yellow green or fluorescent versions of these colors or other generally accepted high visibility colors. For nighttime flagging, similar outside garments shall be retro reflective. Acceptable hand signal devices for daytime flagging include "STOP/SLOW" paddles or red flags. For nighttime flagging, a flashlight, lantern, or other lighted signal shall be used.

Inasmuch as Part VI of the Federal Highway Administrations's (FHWA) Manual on Uniform Traffic Control Devices (MUTCD) addresses standards and guides for flaggers and flagging equipment for highway traffic control, FRA recommends that railroads be aware of the standards and follow them to the greatest extent possible. Copies of the latest MUTCD provisions regarding flagging will be available from FRA, as well as FHWA, as changes are made in this area.

Credible report of system malfunction:

Specific information regarding a malfunction at an identified highway-rail grade crossing, supplied by a railroad employee, law enforcement officer, highway traffic official, or other employee of a public agency acting in an official capacity.

False Activation:

The activation of a highway-rail grade crossing warning system caused by a condition that requires correction or repair of the grade crossing warning system. (This failure indicates to the highway user that it is not safe to cross the railroad tracks when, in fact, it is safe to do so.)

Highway-rail grade crossing:

A location where a public highway, road, street, or private roadway, including associated sidewalks and pathways, crosses one or more railroad tracks at grade.

Partial Activation:

The activation of a highway-rail grade crossing warning system indicating the approach of a train, however, the full intended warning is not provided due to one of the following conditions:

> (1) At non-gated crossings equipped with one pair of lights designed to flash alternately, one of the two lights does not operate properly (and approaching motorists can not clearly see flashing back lights from the warning lights on the other side of the crossing);

(2) at gated crossings, the gate arm is not in a horizontal position; or

(3) at gated crossings, any portion of a gate arm is missing if that portion normally had a gate arm flashing light attached.

Train:

One or more locomotives, with or without cars.

Warning System Malfunction:

An activation failure, a partial activation, or a false activation of a highway-rail grade crossing warning system.

Subpart B - Reports

§ 234.7 Accidents involving grade crossing signal failure.

This section requires each railroad to report each accident/incident (as defined in Section 225.5(b)(1) involving highway-rail grade crossing warning system activation failure, by toll free telephone number 800-424-0201, within 24 hours. This telephone report is not a substitute for other required written reports as appropriate.

Application:

An accident/incident, as defined in Section 225.5(b)(1), is an impact between on-track railroad equipment and an automobile, bus, truck, motorcycle, bicycle, farm vehicle, or pedestrian. When an accident/incident occurs, involving an activation failure of an active highway-rail grade crossing warning system, the telephone report must be made.

It shall not constitute an activation failure if on-track railroad equipment is not designed, equipped, and relied upon to activate such highway-rail grade crossing warning system.

An activation failure is as defined in Section 234.5.

CLASSIFICATION OF DEFECTS

234.7.01 Impact involving a highway-rail grade crossing warning system activation failure not reported to National Response Center by telephone within 24 hours after occurrence.

234.7.02 Telephone report not complete.

§ 234.9 Grade crossing signal system failure reports.

This section requires each railroad to report within 15 days each activation failure of an active highway-rail grade crossing warning system.

Application:

This section requires that each activation failure, including those resulting in an accident/incident (as defined in Section 225.5(b)(1), be reported to FRA within 15 days on Form FRA F6180.83 in accordance with the instructions contained on the form. The completed form shall be submitted to the FRA Regional Administrator of the region in which the railroad is headquartered.

An activation failure is as defined in Section 234.5.

It shall not constitute an activation failure if on-track railroad equipment is not designed, equipped, and relied upon to activate the highway-rail grade crossing warning system.

CLASSIFICATION OF DEFECTS

234.9.01 Report of activation failure not submitted on prescribed form within 15 days.

234.9.02 Report of activation failure incorrect or incomplete.

HIGHWAY-RAIL GRADE CROSSING WARNING SYSTEM ACTIVATION FAILURE REPORT

OMB Approval No.: 2130-0534

Each railroad shall submit a report of each activation failure to FRA within 15 days after the failure occurs. Copies of this form may be obtained from the Federal Railroad Administration, Office of Safety, 400 7th Street, SW, STOP 25, Washington, DC 20590.

An activation failure means the failure of an active highway-rail grade crossing warning system to indicate the approach of a train at least 20 seconds prior to the train's arrival at the crossing, or to indicate the presence of a train occupying the crossing, unless the crossing is provided with an alternative means of active warning to highway users of approaching trains. (This failure indicates to the motorist that it is safe to proceed across the railroad tracks when, in fact, it is not safe to do so.)

A train means one or more locomotives, with or without cars.

Mail to:	Name of Railroad	RR Code
Federal Railroad Administration Regional Administrator	Region/Division (Optional)	
	Reporting Employee (Signature/Title)	Date Signed
	DOT/AAR Crossing Number	

CLASSIFICATION

Current Active Warning Devices (Check all that apply)

1☐Gates 2☐Cantilevered Flashing Lights 3☐Flashing Lights 4☐Wig Wags 5☐Hwy. Traffic Signals 6☐Bell

7☐Other (Describe)

LOCATION

Street/Road	County/Parish	City	State	RR Mile Post

CORRECTIVE ACTION

Failure Reported/Discovered		Repairs Completed	
Date (mm/dd/yy)	Time ☐AM ☐PM	Date (mm/dd/yy)	Time ☐AM ☐PM

Cause of Failure Code ☐☐

01 Sand, Rust, or Other Deposit On Rail
02 Failure of Relay
03 Crosses, Grounds, Foreign Current, or Open Circuits
04 Apparatus Broken, Defective, or Out of Adjustment
05 Lightning / Power Surge
06 Vandalism
07 Errors in Connections or Adjustments
08 Design Error
09 Directional Lockout of Stick Circuit or Interlocking Relay
10 Commercial Power Failure
11 Railroad Power Failure (Primary Battery or RR Power Lines)
12 Failure of Electronic Device
13 Interference
14 Other, Miscellaneous (Please explain in comments section.)

Comments if Applicable:

FRA F 6180.83 (04/98)

August 1, 2002

Subpart C - Response to Reports of Warning System Malfunction.

§ 234.101 Employee notification rules.

This section requires that each railroad issue rules requiring that its employees report malfunctions of highway-rail grade crossing warning systems to a designated railroad employee or employees, and that such reports shall be made by the quickest means of communications available.

Application:

The intent of this section is that each railroad issue to its employees rules that require its employees to report by the quickest means available, any activation failure, partial activation or false activation of a highway-rail grade crossing warning system. The railroad must designate a person or persons to whom all such reports must be made. The railroad may do so by inserting the information in their timetable, special instructions, general orders, etc.

CLASSIFICATION OF DEFECTS

234.101.01 Rules not issued requiring railroad employees to report any malfunction of highway-rail grade crossing warning system to designated persons by quickest means available.

§ 234.103 Timely response to report of malfunction.

This section requires that once a credible report of a malfunction of a highway-rail grade crossing warning system has been received, the railroad having maintenance responsibility for the warning system shall promptly investigate the report. Further, if such malfunction is found to be caused by a faulty component, such component shall be adjusted, repaired, or replaced without undue delay, as required by Section 234.207.

A credible report of a highway-rail grade crossing warning system malfunction is defined in Section 234.5 as a report from a railroad employee, law enforcement officer, highway traffic official, or other employee of a public agency acting in an official capacity.

This section also requires that the railroad provide alternative means of warning highway traffic and railroad employees in accordance with Sections 234.105, 234.106 or 234.107, until such malfunction has been investigated and repair or correction of the warning system is completed, or the system is discontinued or dismantled.

This section specifies that nothing in these regulations forces a railroad to continually repair a warning system that, under state law, may be retired. However, a railroad must still comply with this Subpart during retirement proceedings. This section requires that until repair, correction, discontinuance, or dismantling of the system is completed, the railroad must comply with this part.

Application:

Each railroad must take prompt action to investigate any credible report of a malfunctioning highway-rail grade crossing warning system, and each malfunction shall be corrected without undue delay. This section does not require a railroad to continue to repair and maintain a highway-rail grade crossing warning system that might otherwise be discontinued under state laws. The railroad may elect to discontinue and disassemble the warning system, but until the warning system is physically removed, the railroad shall provide alternative means of warning the highway users and railroad employees.

CLASSIFICATION OF DEFECTS

234.103.01 Credible report of highway-rail grade crossing warning system malfunction not promptly investigated.

234.103.02 Action not taken to provide alternative means of warning highway users and railroad employees until repairs or correction of warning system is completed.

§ 234.105 Activation failure.

This section requires that a railroad having maintenance responsibility for a warning system take prompt action to provide alternative means of warning highway users and railroad employees at a specific crossing where a credible report of a system malfunction involving an activation failure has been received. This section further requires specific actions to be followed to provide that alternative warning.

Application:

When a railroad receives a credible report of a system malfunction involving an activation failure, it is required to take prompt action to notify train crews, and other railroads operating over such crossing, prior to the next train operation over the crossing. Further, the railroad is also required to notify the law enforcement agency having jurisdiction over such crossing, or the railroad police who are capable of responding to control vehicular traffic at the crossing. Finally, the railroad must take action to assure that its employees or a law enforcement agency provide the required alternative means of warning for highway users at the crossing.

A credible report of a highway-rail grade crossing warning system malfunction is defined in Section 234.5 as a report from a railroad employee, law enforcement officer, highway traffic official, or other employee of a public agency acting in an official capacity.

At crossings where it has been determined that the warning system is not functioning as intended, Section 234.207's requirement for adjustment, repair, or replacement without undue delay applies.

When the alternative warning consists of at least one uniformed law enforcement officer, one uniformed railroad police officer, or an appropriately equipped flagger for each direction of highway traffic at the crossing, trains may proceed over the crossing at normal speed. If an appropriately equipped flagger provides the alternative means of warning but there is less than one flagger for each direction of highway traffic available at the crossing, trains must not exceed 15 mph until the locomotive has passed over the crossing. If there is no appropriately equipped flagger, uniformed law enforcement officer, or uniformed railroad police officer to provide alternative warning, each train must stop and a member of the train crew must dismount the locomotive and flag highway traffic to a stop before the train occupies the crossing.

This section also requires that the locomotive audible warning device be activated in accordance with railroad rules when approaching a crossing where an activation failure has occurred. The reference to railroad rules has to do with the manner in which the horn is sounded. This section preempts any State or local "whistle bans" with respect to use of the horn under the circumstances addressed in the section.

CLASSIFICATION OF DEFECTS

234.105.01 Train crew or other railroads operating over crossing not notified of activation failure prior to arrival of train at crossing.

234.105.02 Law enforcement agency having jurisdiction or railroad police not promptly notified of activation failure.

234.105.03 Alternate means of actively warning highway users not provided at crossing where credible report indicates activation failure has occurred.

234.105.04 Train passed over crossing at normal speed without alternate means of warning being provided by the required number of appropriately equipped flaggers, uniformed law enforcement officer, or uniformed railroad police officer.

234.105.05 Train passed over crossing at a speed of more than 15 mph with alternate means of warning not being provided by at least one appropriately equipped flagger for each direction of highway traffic.

234.105.06 Flagger not equipped with required vest, shirt, or jacket.

234.105.07 Flagger not equipped with required flagging equipment.

234.105.08 Train failed to stop at crossing when the required alternate means of warning was not provided.

234.105.09 After train stopped, crewmember failed to get off train and flag highway traffic to a stop when the required alternate means of warning was not provided.

234.105.10 Locomotive audible warning device not sounded in accordance with the railroad's rules as train approached crossing where activation failure has been identified by a credible report.

§ 234.106 Partial activation.

This section requires that a railroad having maintenance responsibility for a warning system take prompt action to provide alternative means of warning highway users and railroad employees at a specific crossing where a credible report of a system malfunction involving a partial activation has been received. This section further requires that specific actions be followed to provide that alternative warning.

Application:

When a railroad receives a credible report of a system malfunction involving a partial activation, it is required to take prompt action to notify train crews and other railroads operating over such crossing prior to the next train operation over the crossing. Further, the railroad is also required to notify the law enforcement agency having jurisdiction over such crossing, or the railroad police who are capable of responding to control vehicular traffic at the crossing. Finally, the railroad must take action to assure that its employees or a law enforcement agency provide the required alternative means of warning for highway users at the crossing.

A credible report of a highway-rail grade crossing warning system malfunction is defined in Section 234.5 as a report from a railroad employee, law enforcement officer, highway traffic official, or other employee of a public agency acting in an official capacity.

When the alternative warning that is provided consists of at least one uniformed law enforcement officer, or one uniformed railroad police officer, or an appropriately equipped flagger for each direction of highway traffic at the crossing, trains may proceed over the crossing at normal speed. If there is not an appropriately equipped flagger for each direction of highway traffic or at least one

uniformed law enforcement officer or uniformed railroad police officer at the crossing, each train may proceed with caution through the crossing at a speed not exceeding 15 mph. A train may proceed at normal speed after its locomotive has passed over the crossing. Where a shoving movement is involved, a crewmember must be on the ground to flag the train through the crossing.

In lieu of complying with the alternative warning requirements listed above, a railroad may temporarily take the warning system out of service if the railroad complies with all requirements of Section 234.105, “Activation failure”.

At crossings where it has been determined that the warning system is not functioning as intended, Section 234.207's requirement for adjustment, repair, or replacement without undue delay applies.

This section also requires that the locomotive audible warning device be activated in accordance with railroad rules when approaching a crossing where a partial activation has been reported. The reference to railroad rules has to do with the manner in which the horn is sounded. This section preempts any State or local "whistle bans" with respect to use of the horn under the circumstances addressed in the section.

CLASSIFICATION OF DEFECTS

234.106.01 Train crew or other railroads operating over crossing not notified of partial activation prior to arrival of train at crossing.

234.106.02 Law enforcement agency having jurisdiction or railroad police not promptly notified of partial activation.

234.106.03 Alternate means of actively warning highway users not provided at crossing where credible report indicates partial activation has occurred.

234.106.04 Train passed over crossing at a speed exceeding 15 mph without alternate means of warning being provided by the required number of appropriately equipped flaggers, uniformed law enforcement officers, or uniformed railroad police officers.

234.106.05 Crewmember not on the ground at the crossing to flag train through the crossing in a shoving movement.

234.106.06 Flagger not equipped with required vest, shirt, or jacket.

234.106.07 Flagger not equipped with required flagging equipment.

234.106.08 Warning system taken out of service without complying with the requirements of Section 234.105.

234.106.09 Locomotive audible warning device not sounded in accordance with the railroad's rules as train approached crossing where partial activation has been identified by a credible report.

§ 234.107 False activation.

This section requires that a railroad having maintenance responsibility for a warning system take prompt action to provide alternative means of warning highway users and railroad employees at a specific crossing where a credible report of a system malfunction involving a false activation has been received. This section further requires that specific actions be followed to provide that alternative warning.

Application:

When a railroad receives a credible report of a system malfunction involving a false activation, it is required to take prompt action to notify train crews and other railroads operating over such crossing prior to the next train operation over the crossing. Further, the railroad is also required to notify the law enforcement agency having jurisdiction over such crossing, or the railroad police who are capable of responding to control vehicular traffic at the crossing. Finally, the railroad must take action to assure that its employees or a law enforcement agency provide the required alternative means of warning for highway users at the crossing.

A credible report of a highway-rail grade crossing warning system malfunction is defined in Section 234.5 as a report from a railroad employee, law enforcement officer, highway traffic official, or other employee of a public agency acting in an official capacity.

When the alternative warning that is provided consists of at least one uniformed law enforcement officer, or one uniformed railroad police officer, or an appropriately equipped flagger for each direction of highway traffic at the crossing, trains may proceed over the crossing at normal speed. If there is not an appropriately equipped flagger for each direction of highway traffic or at least one uniformed law enforcement officer or uniformed railroad police officer at the crossing, each train may proceed with caution through the crossing at a speed not exceeding 15 mph. A train may proceed at normal speed after its locomotive has passed over the crossing. Where a shoving movement is involved, a crewmember must be on the ground to flag the train through the crossing.

In lieu of complying with the alternative warning requirements listed above, a railroad may temporarily take the warning system out of service if the railroad complies with all requirements of Section 234.105, “Activation failure”.

At crossings where it has been determined that the warning system is not functioning as intended, Section 234.207's requirement for adjustment, repair, or replacement without undue delay applies.

This section also requires that the locomotive audible warning device be activated in accordance with railroad rules when approaching a crossing where a false activation has been reported. The reference to railroad rules has to do with the manner in which the horn is sounded. This section preempts any State or local "whistle bans" with respect to use of the horn under the circumstances addressed in the section.

CLASSIFICATION OF DEFECTS

234.107.01 Train crew or other railroads operating over crossing not notified of false activation prior to arrival of train at crossing.

234.107.02 Law enforcement agency having jurisdiction or railroad police not promptly notified of false activation.

234.107.03 Alternate means of actively warning highway users not provided at crossing where credible report indicates false activation has occurred.

234.107.04 Train passed over crossing at a speed exceeding 15 mph without alternate means of warning being provided by the required number of appropriately equipped flaggers, uniformed law enforcement officers, or uniformed railroad police officers.

234.107.05 Crewmember not on the ground at the crossing to flag train through the crossing in a shoving movement.

234.107.06 Flagger not equipped with required vest, shirt, or jacket.

234.107.07 Flagger not equipped with required flagging equipment.

234.107.08 Warning system taken out of service without complying with the requirements of Section 234.105.

234.107.09 Locomotive audible warning device not sounded in accordance with the railroad's rules as train approached crossing where false activation has been identified by a credible report.

Memorandum

U.S. Department
of Transportation

Federal Railroad
Administration

Date: December 23, 1996 Reply to Attn of: S-96-08

Subject: Application of 49 CFR Sections 234.105, 234.106 and 234.107

(Original signed by E. R. English)

From: E.R. English
Director, Office of Safety Assurance and Compliance

To: All Regional Administrators, Deputy Regional Administrators, S&TC Specialists and S&TC Inspectors

The S&TC Technical Resolution Committee meeting in Portland, Oregon the week of July 22, 1996, acted on a request for clarification of the application of 49 CFR Sections 234.105, 234.106 and 234.107. The question before the committee was to determine how long a railroad should be permitted to provide an alternative means of warning highway users in lieu of correcting a condition which required the alternative means of warning.

The committee concluded that the alternative means of warning options provided in Sections 234.105, 106 and 107 are intended to be interim measures to provide warning to highway users until the subject warning system is promptly repaired or a railroad has initiated a formal process to close the crossing.

The following language will be added to Sections 234.105, 234.106 and 234.107 in Part 234 Grade Crossing Signal System Safety Manual:

> "At crossings where it has been determined that the warning system is not functioning as intended, Section 234.207's requirement for adjustment, repair or replacement without undue delay applies."

Note that Section 234.207's requirement for adjustment, repair or replacement without undue delay

applies in all situations where it has been determined that the warning system in not functioning as intended.

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§ 234.109 Recordkeeping.

This section requires the railroad to keep a record of each credible report of a warning system malfunction. This section specifies the information that is to be recorded, and that each record shall remain on file and available for inspection by the FRA for a period of at least one year from the date of the last railroad activity in connection with such report.

Application:

Each railroad is required to keep a record of each credible report of a highway-rail grade crossing warning system malfunction. Such record may be kept on a form provided by the railroad or electronically. Each record shall contain the following information: (1) Location of crossing (by highway name and DOT/AAR crossing inventory number); (2) Time and date that the railroad received the report; (3) Action taken by railroad to comply with Section 234.105, 234.106, or 234.107; and (4) Time and date of action taken to make final repair or correction. If the system is dismantled and removed instead of repaired, the date of removal should be recorded.

Each record of a credible report of a warning system malfunction shall be kept and made available for inspection by the FRA for one year from the last date of action taken on each report. Thus, if the warning system is repaired and put back in service, the record shall be kept for one year from the date of the last repair to reactivate the system. If the system is dismantled and removed, the record shall be kept for one year from the date of the removal. The records required by this section may be kept at division offices or at a central location somewhere on the railroad.

CLASSIFICATION OF DEFECTS

234.109.01 Record not kept of credible report of malfunctioning highway-rail grade crossing warning system.

234.109.02 Record of credible report of malfunctioning highway-rail grade crossing warning system incomplete.

234.109.03 Record of credible report of malfunctioning highway-rail grade crossing warning system incorrect.

234.109.04 Record of credible report of malfunctioning highway-rail grade crossing warning system not kept for at least one year after the last recorded activity in response to the report.

Subpart D--Maintenance, Inspection, and Testing

§ 234.201 Location of plans.

Plans are necessary for the proper installation, inspection, maintenance, testing, and repair of highway-rail grade crossing warning systems. Such plans are required to be legible and correct.

Application:

Plans shall be kept at each highway-rail grade crossing warning system location.

Such plans shall include but are not limited to: Layout of track; warning devices installed; control circuitry; approach lengths; approach circuits; and standby power type and capacity.

Plans are required to be legible and correct. Plans that are torn, faded or consisting of more than one change in colored pencil are not considered to be legible and/or correct. Manufacturer's manuals are not required by this section.

CLASSIFICATION OF DEFECTS

234.201.01 Plans not kept at crossing location.

234.201.02 Plans not legible.

234.201.03 Plans not correct.

§ 234.203 Control circuits.

This section requires that all control circuits that affect the safe operation of a highway-rail grade crossing warning system shall operate on the fail-safe principle.

Application:

Includes all train detection track circuits and control circuits through which a highway-rail grade crossing warning system is activated. Fail-safe principle requires that such circuits shall operate so that the failure of any part or component shall cause the warning system to activate.

A crossing warning system activated by means other than train detection track circuit may not comply with this section.

CLASSIFICATION OF DEFECTS

234.203.01 Control circuit that affects the safe operation of a highway-rail grade crossing warning system does not operate on the fail-safe principle.

§ 234.205 Operating Characteristics of Warning System Apparatus.

This section requires the operating characteristics of electro-magnetic, electronic, or electrical apparatus of each highway-rail grade crossing warning system be maintained in accordance with the limits within which it is designed to operate.

Application:

Sections 234.247 through 234.271 of this part address those devices so important to the safety of highway-rail grade crossing warning systems that periodic tests and/or inspections are required to determine that their operating characteristics remain acceptable.

Applies to all electromagnetic, electronic, or electrical devices used in, or associated with, highway-rail grade crossing warning systems.

Each railroad should have specifications setting forth the pick-up values, release values, working values, and condemning limits of these values for all electromagnetic, electronic, or electrical devices in use in highway-rail grade crossing warning systems on their property.

Some examples of deficient operating characteristics are:

(a) pick-up value too high.
(b) pick-up value too low.
(c) release value too high.
(d) release value too low.

Manufacturer specifications, or railroad standards compatible with manufacturer specifications, shall be used to determine the values.

Some examples of devices covered by this rule but not requiring specific periodic tests are:

(a) electronic train detection devices.
(b) hold clear devices in gate mechanisms.

CLASSIFICATION OF DEFECTS

234.205.01 Pick-up value of electromagnetic device not in accordance with the limits within which it is designed to operate.

234.205.02 Drop-away value of electromagnetic device not in accordance with the limits within which it is designed to operate.

234.205.03 Working values of electromagnetic, electronic, or electrical device not in accordance with the limits within which the apparatus is designed to operate.

234.205.04 Operating characteristics of other electromagnetic, electronic, or electrical device not within prescribed limits.

§ 234.207 Adjustment, repair, or replacement of component.

This section requires a railroad to determine the cause of an active highway-rail grade crossing warning system failure, malfunction, or defective condition affecting the proper operation and/or ability of the system to warn highway users of an approaching train; and perform necessary adjustment, repair, or replacement without undue delay. Until such corrective action is completed, the railroad shall take, when necessary, the appropriate actions as described in Sections 234.105, 234.106 or 234.107.

Application:

An active highway-rail grade crossing warning system failure, malfunction, or defective condition means any essential component of such a system failing to perform its intended function.
A railroad is required to take action to determine the cause of each failure, malfunction, or defective condition and complete necessary adjustment, repair, or replacement without undue delay.

Because of the great variety of factors involved with failure, malfunction, or defective conditions of warning systems, including the location of the crossing, frequency of train movements, type of

corrective action needed, availability of personnel, and other competing emergency situations; it is not practical to establish specific time limits for remedial actions. FRA continues to believe that the requirements of this section, taken together with the alternative protective measures required under Sections 234.105, 234.106, and 234.107, will provide the needed measure of safety. Therefore; "without undue delay" shall mean in as timely a manner as possible.

However, because temporary measures involve heightened risk to persons manually controlling motor vehicle traffic; and other risks (e.g., miscommunication between flaggers at multiple-track crossings), it is important that grade crossing warning systems be restored to proper functioning. The urgency associated with this need is a product of rail traffic, motor vehicle traffic, the configuration of the crossing, and other factors. FRA will expect railroads to restore warning systems to proper functioning without delay that is undue in relation to these safety considerations and, in general, as soon as possible.

CLASSIFICATION OF DEFECTS

234.207.01 No action taken to determine the cause of active warning system failure, malfunction, or defective condition affecting the proper operation and/or ability of the system to warn highway users of an approaching train.

234.207.02 Component causing active warning system failure, malfunction, or defective condition affecting the proper operation and/or ability of the system to warn highway users of an approaching train, not adjusted without undue delay.

234.207.03 Component causing active warning system failure, malfunction, or defective condition affecting the proper operation and/or ability of the system to warn highway users of an approaching train, not repaired without undue delay.

234.207.04 Component causing active warning system failure, malfunction, or defective condition affecting the proper operation and/or ability of the system to warn highway users of an approaching train, not replaced without undue delay.

234.207.05 Train operation not in compliance with the applicable section 234.105, 234.106, or 234.107 until corrective action is completed.

§ 234.209 Interference with normal functioning of system.

This section requires the railroad to provide for the safety of highway users and/or train traffic before interfering, in testing or otherwise, with the normal functioning of any highway-rail grade crossing warning system.

Application:

The intent of this section is to ensure that railroads maintain the integrity of crossing warning systems by prohibiting procedures or practices which defeat or nullify the normal function of such systems.

Interference is any condition that circumvents, hinders, impedes, or diminishes whatsoever the intended warning of a system, and may be accomplished by testing, installing, repairing, replacing, operating, or manipulating a warning system component used in detecting the presence of or displaying warning of a train, or in indicating the operation of the warning system. There is no difference between accidental or intentional interference with respect to the enforcement of this section.

Tests of crossing warning systems must not be conducted until it has been ascertained provisions have been made for the safety of highway users and no train movements will be affected.

Interference includes but is not limited to:

(1) Trains, locomotives, or other railroad equipment left standing within the warning system's approach circuit, other than normal switching operations, where the system is not designed to accommodate those activities.

(2) Not providing alternative methods of maintaining safety for highway users and/or train movements while testing or performing work on the warning system or on track and other railroad systems or structures which may affect the integrity of the warning system.

(3) Physically restricting gate arm operation (e.g. tying up, or blocking up gate arms).

It shall not be considered interference if a train is standing within a warning system's approach circuit waiting for a signal indication or other authority for movement. It shall not be considered interference, when in the course of normal testing, a shunt placed on the rail causes adjacent crossing warning systems to be activated.

Using manual over-rides to activate or deactivate a crossing warning system is not considered interference, as long as proper warning is provided to highway users.

Activation of a warning system during a normal movement through a crossing by on-track vehicles is not considered interference with the warning system. Intermittent activations during a normal movement through a crossing by on-track vehicles is not considered interference with the warning system, provided that the railroad's operating rules or other instructions provide for warning of highway users at the crossing. In general, measures taken for the safety of highway users and train

traffic should be consistent with those specified in Sections 234.105, 234.106, and 234.107 of this part.

CLASSIFICATION OF DEFECTS

234.209.01 Interference with normal functioning of warning system without taking measures to provide for the safety of highway users and train traffic.

§ 234.211 Security of warning system apparatus.

This section requires that all outdoor housings of highway-rail grade crossing warning system apparatus be kept locked, sealed, or secured against unauthorized entry.

Application:

This requirement includes warning system cases, light unit housings, gate mechanism housings, junction or terminal boxes, battery boxes, bell or audible warning devices, etc. Wrench locking or nut-locking with bell is acceptable.

CLASSIFICATION OF DEFECTS

234.211.01 Warning system instrument case not secured against unauthorized entry.

234.211.02 Other component housing not secured against unauthorized entry.

§ 234.213 Grounds.

This section requires that circuits which affect the proper functioning of a highway-rail grade crossing warning system are to be kept free of grounds equal to or in excess of 75 percent of the release value of any relay or electromagnetic device in the circuit. Track circuits, common return wires of grounded common return single break circuits, and alternating current power distribution circuits grounded in the interest of safety are excluded.

Application:

Crossing control circuits designed to be ground free are required to be kept free of any ground having a current value equal to or in excess of 75 percent of the release value of any relay or electromagnetic device in the circuit. Electronic devices designed to be ground free shall be kept free of grounds

having a value that affects the proper operation of the device. The railroad must take prompt action to correct a ground.

There is no difference between an accidental ground and an intentional ground.

Extreme care shall be exercised when testing for grounds. Testing shall not be conducted while trains are approaching or passing, and the meter shall be watched at all times. If the meter indicates that a relay becomes energized, the meter shall be immediately disconnected. An unobserved meter shall never be left connected between a control circuit and ground.

Ground tests shall be performed at every instrument case or house inspected. The preliminary test shall be with a voltmeter connected from line or track arrestor ground to a track circuit which will prove the meter is operating and the integrity of the ground circuit.

AC power shall be interrupted during tests in order to check AC lighting circuits having DC standby.

Note: Technical Bulletin S-99-03 found in Section 234.249 is applicable to this section.

CLASSIFICATION OF DEFECTS

234.213.01 Circuit grounded sufficiently to permit flow of current equal to or in excess of 75 percent of the release value of relay or other electromagnetic device in circuit.

§ 234.215 Standby power system.

This section requires railroads to provide a standby power source to operate the warning system for a reasonable length of time during a period of primary power interruption. The designated capacity shall be specified on the plans, as required by Section 234.201.

Application:

The intent of this section is that a railroad is required to install and properly maintain a standby power source in order to operate the system for a sufficient length of time during a primary power interruption.

The designated capacity specified on the plans shall include the number and ampere hour rating of batteries.

Determining the capacity of the standby power source will be at the discretion of each individual railroad. It is recommended that factors should be considered such as: the power demands of each

particular location (taking into account urban or rural), the likelihood of discovery of the primary power outage (i.e. electronic notification devices, power-off indicators, employee discovery, etc.), the availability and proximity of maintenance employees, and the number of trains that are operated over the crossing.

THE FOLLOWING ARE SCENARIOS OF SEVERAL APPLICATIONS OF THIS SECTION:

(1) A primary power interruption unknown to and beyond the control of the railroad (e.g., blown fuses and opened circuit breakers at commercial power) and;

(a) During which the standby power source operated as designed, discovery of the power interruption was made and primary power was restored, or the standby power source became depleted but alternative warning was provided as required in Section 234.105; no violation is warranted.

(b) If discovery of the power interruption does not occur before the properly maintained standby power source becomes depleted and an activation failure does occur, no violation is warranted.

(c) If discovery of the power interruption occurs after depletion of standby power, and alternative warning or other power source is not promptly provided, a violation of Section 234.105 will normally be warranted.

(d) If the standby power source fails to operate to its designed capacity, a violation has occurred and consideration should be given to assessment of a civil penalty.

(2) A primary power interruption within control of the railroad (e.g., one caused by a defective condition of railroad power line wires, improper grounding, or power left manually interrupted) has occurred and;

(a) If discovery of the power interruption occurs and alternative warning is provided, other power source is provided, or power is restored, a violation is not warranted.

(b) It results in the standby power source becoming depleted and an activation failure occurs, a violation of this section is warranted.

CLASSIFICATION OF DEFECTS

234.215.01 Standby power source not provided.

234.215.02 Standby power source not of sufficient capacity to operate highway-rail grade crossing warning system during an interruption of the primary source of power.

234.215.03 Standby power source not maintained to provide sufficient capacity to operate highway-rail grade crossing warning system during an interruption of the primary source of power.

§ 234.217 Flashing light unit.

This section requires that each flashing light unit be properly positioned and aligned, and be visible to a highway user approaching the crossing. Each flashing light unit shall be maintained to prevent dust and moisture from entering the interior of the unit. Roundels and reflectors shall be clean and in good condition. All light units shall flash alternately and the number of flashes per minute shall not be less than 35 nor more than 65.

Application:

The intent of this section, in part, is that at a minimum, flashing lights are expected to be visible to approaching highway users. Federal and State inspectors should normally defer to the judgement of the signal maintainer if that individual is acting consistent with established railroad policy or practice.

CLASSIFICATION OF DEFECTS

234.217.01 Flashing light not visible to approaching highway user.

234.217.02 Flashing light unit not maintained to prevent dust or moisture from entering the unit.

234.217.03 Roundels or reflectors not maintained in good condition.

234.217.04 Flash rate less than 35 times per minute.

234.217.05 Flash rate more than 65 times per minute.

234.217.06 Flashing lights do not flash alternately.

§ 234.219 Gate arm lights and light cables.

This section requires that each gate arm light be maintained in such condition to be properly visible to approaching highway users. It also requires that lights and light wire be secured to the gate arm.

Application:

This section applies to gate arm lights and light wires installed at active warning systems. Each gate arm light shall be visible to approaching highway users and pedestrians, if applicable. This section also requires that lights and light wires be securely fastened to each gate arm. The intent of this section is that lights and light wires shall be maintained in accordance with design specifications.

CLASSIFICATION OF DEFECTS

234.219.01 Gate arm light burned out or missing.

234.219.02 Gate arm light unit defective, not visible, or missing.

234.219.03 Light unit not securely fastened to gate arm.

234.219.04 Gate arm light unit not maintained per design specifications.

234.219.05 Light wires not securely fastened to gate arm.

§ 234.221 Lamp Voltage.

This section requires that the voltage at each lamp shall be maintained at not less than 85 percent of the prescribed lamp rating.

Application:

See Section 234.253 for testing procedures for flashing light units. Gate arm lights are not subject to periodic testing requirements, however, if there is a question regarding gate arm light visibility (§234.219) a Federal or State inspector may request that voltage be verified by an appropriate test. When there is a need for gate arm lamp voltage to be verified, the voltage should normally be tested at the gate mechanism or suitable junction box. When the test is conducted with primary power removed, the lights should operate for not less than two minutes and not more than five minutes before lamp voltage readings are taken.

CLASSIFICATION OF DEFECTS

234.221.01 Lamp voltage on primary power less than 85 percent of prescribed lamp rating.

234.221.02 Lamp voltage on standby power less than 85 percent of prescribed lamp rating.

Memorandum

U.S. Department
of Transportation

**Federal Railroad
Administration**

Date: January 10, 1997 Reply to Attn of: S-96-07

Subject: Revision of Interpretation and Application of 49 CFR Section 234.221

(Original Signed by E. R. English)

From: E. R. English
Director, Office of Safety Assurance and Compliance

To: All Regional Administrators, Deputy Regional Administrators, S&TC Specialists and S&TC Inspectors

The S&TC Technical Resolution Committee meeting in Portland, Oregon the week of July 22, 1996, acted on a request for clarification of the application of 49 CFR Section 234.221. The question before the committee was to determine the application, interpretation, and enforcement of the requirement of the rule to maintain each lamp at 85 percent of the prescribed lamp rating when the primary power is removed.

After a review of current industry testing procedures and recommended practices it was the consensus of the committee that the rule applies when the warning system is operating with either the primary or standby power source applied.

The committee recognized that due to some design standards in effect prior to January 1, 1995, there are certain highway-rail grade crossing warning systems that presently do not comply with the requirements of this regulation while operating on standby power. Some railroads may have a significant number of locations that do not comply and immediate correction is not possible. Each railroad headquarted in each respective region should be advised that FRA will work with them in developing a compliance plan for all locations the railroad has determined that do not presently meet

the requirements of this section. If an inspector discovers a non-compliant condition with this part, it should be determined if the railroad has developed a mutually acceptable plan to bring the location into compliance. If a plan has not been developed, normal enforcement procedures should be followed.

The Association of American Railroads and the American Shortline Railroad Association have been advised of the 85 percent requirement for systems operating with either primary power or standby power applied. They have been advised that FRA will work with railroads in implementing a compliance plan where immediate correction is not possible.

To distinguish the results of these tests, the original defect code was revised and a new defect code added to enhance the current data base. This will provide information to determine the number of non-compliant conditions found with primary power applied and standby power applied.

CLASSIFICATION OF DEFECTS

Revised defect:

234.221.01 Lamp voltage on primary power less than 85 percent of prescribed lamp rating.

New defect:

234.221.02 Lamp voltage on standby power less than 85 percent of prescribed lamp rating.

Additional discussion revealed that there were questions concerning the proper time interval when the test is conducted as per Section 234.253, with primary power removed. Section 234.215 (Standby Power System) requires that if alternating current power is used as the primary source of power, a standby power source must be provided. The following sentence will be added to Part 234 Grade Crossing Signal System Safety Manual in Section 234.253:

> "When the test is conducted with primary power removed, the lights should operate for not less than two minutes and not more than five minutes before lamp voltage readings are taken."

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§ 234.223 Gate Arm.

This section requires that each gate arm, when in the horizontal position, extend across each lane of approaching highway traffic and be maintained in a condition sufficient to be clearly viewed by approaching highway users. Each gate arm shall start its downward motion not less than 3 seconds

after flashing lights begin to operate and assume the horizontal position at least 5 seconds before the arrival of any normal train movement through the crossing.

Application:

The required length of each gate arm is determined by the design length as indicated on the circuit plans. In the absence of a design length, the gate arm must extend across at least 90 percent of each lane of approaching highway traffic.

The "5 seconds" provision applies to the design and maintenance of warning systems to ensure the gates are horizontal for the normal operation of through trains. Switching movements that occupy grade crossings, or trains that stop short of grade crossings and then occupy such grade crossings after the warning system has timed out, must operate according to railroad operating rules or special instructions. When there is no conflicting highway traffic, such movements are not required to wait 5 seconds.

Trains operating over "island only" installations must operate in accordance with operating rules which ensure the gates are down and safety is provided for highway users.

As information, the MUTCD recommends that the gate arm will not be less than 3 feet 6 inches nor more than 4 feet 6 inches, measured from the crown of the highway surface, when the gate arm is in the full horizontal position. It further recommends that at a minimum, the gate arm shall be equipped with at least three red lights and when activated the gate arm light nearest the tip shall be illuminated continuously and the other two lights shall flash alternately in unison with the flashing light signals.

CLASSIFICATION OF DEFECTS

234.223.01 Gate arm starts its downward motion less than 3 seconds after flashing lights begin to operate.

234.223.02 Gate arm not in horizontal position at least 5 seconds (when required) prior to arrival of a train at the crossing.

234.223.03 Gate arm does not extend across each lane of approaching highway traffic.

234.223.04 Gate arm broken or missing.

234.223.05 Gate arm not in horizontal position.

234.223.06 Gate arm not maintained in a condition to be clearly viewed by approaching highway users.

August 1, 2002

§ 234.225 Activation of warning system.

This section requires that each highway-rail grade crossing warning system be maintained to activate in accordance with the design of the warning system, but in no event shall it provide less than 20 seconds warning time for the normal operation of through train movements before the crossing is occupied by rail traffic.

Application:

The "20 seconds" provision applies to the design and maintenance of warning systems to provide warning for the normal operation of through trains. Switching movements that occupy grade crossings, or trains that stop short of grade crossings and then occupy such grade crossings after the warning system has timed out, must operate according to railroad operating rules or special instructions. When there is no conflicting highway traffic, such movements are not required to wait 20 seconds.

Trains operating over “island only” installations must operate in accordance with operating rules which ensure the system is operating and safety is provided for highway users.

Rail traffic is considered to be equipment designed to activate the crossing warning system. A highway-rail grade crossing is considered to be occupied when rail traffic enters the highway-rail intersection.

Note: Defect 234.225.02 applies to instances where the system warning time differs significantly from the designed warning time.

CLASSIFICATION OF DEFECTS

234.225.01 Crossing warning system does not provide at least 20 seconds warning time.

234.225.02 Crossing warning time not in accordance with the design of the warning system.

§ 234.227 Train detection apparatus.

This section requires that train detection apparatus be maintained to detect a train, locomotive, or car which occupies any part of a train detection circuit, in accordance with the design of the warning system. It shall not be a violation if the presence of sand, rust, dirt, grease, or other foreign matter prevents effective shunting. When these conditions are known to exist, a railroad shall take appropriate action as required by Section 234.105.

Application:

For purposes of this section a train detection circuit is a dc, ac, or audio frequency track circuit, or a track circuit associated with a motion sensing device or constant warning time device that is used to detect the presence and/or motion of a train, locomotive, or car. For dc, ac, or audio frequency track circuits, the active portion of the train detection circuit includes all the trackage between the ends of the track circuit. For motion sensing device or constant warning time device, the active portion of the train detection circuit includes all the trackage between the crossing and the point where the device is designed to activate the warning system.

When crossing circuit plans show standby/backup train detection equipment installed at the crossing, such equipment shall be operational and function as intended.

CLASSIFICATION OF DEFECTS

234.227.01 Train detection apparatus does not detect a train, locomotive, or car occupying any part of the designed limits of the train detection circuit.

234.227.02 Adequate measures to safeguard highway users and train operation not taken when it is known that a condition of sand, rust, dirt, grease, or other foreign matter exists that has prevented effective shunting of a track circuit when occupied by a train, locomotive, or car.

234.229 Shunting sensitivity.

This section requires that each highway-rail grade crossing train detection circuit shall detect the application of a 0.06 ohm resistance shunt when the shunt is connected across any part of the track rails of the train detection circuit.

Application:

Detection may or may not include activation of the warning system with a 0.06 ohm resistance shunt applied to the approach circuit(s). Detection shall include continuous activation of the warning system with a 0.06 ohm resistance shunt applied to any part of the island circuit(s). This section applies to all train detection circuits that utilize the track rails as part of the detection circuit.

For purposes of this section a train detection circuit is a dc, ac, or audio frequency track circuit, or track circuit associated with a motion sensing device or constant warning time device that is used to detect the presence and/or motion of a train, engine, or car. For dc, ac, or audio frequency track circuits, the active portion of the train detection circuit includes all the track between the ends of the

track circuit. For motion sensing device or constant warning time device, the active portion of the train detection circuit includes all the trackage between the crossing and the point where the device is designed to activate the warning system.

CLASSIFICATION OF DEFECTS

234.229.01 Train detection circuit does not detect the application of a shunt of 0.06 ohms resistance when the shunt is connected across the track rails of the circuit.

§ 234.231 Fouling wires.

This section requires that when a switch turnout located within a highway-rail grade crossing train detection circuit is equipped with fouling wires, those wires shall consist of two discrete conductors, and each conductor shall be of sufficient conductivity and maintained in such condition to ensure proper operation of the train detection circuit as required in Section 234.227.

Application:

This section applies only to installations where parallel fouling circuits are utilized as part of the highway-rail grade crossing warning system.

The installation of a single duplex wire with single plug as fouling wires is prohibited. The single plug constitutes a single conductor. Existing installations having single duplex wires with single plug for fouling wires may be continued in use until such time as they require repair or replacement.

Fouling circuits shall be maintained with the requirement of two fouling wires at the heel of the reverse switch point, toe and heel of the switch frog, and between the outer rails of the main track and turnout.

CLASSIFICATION OF DEFECTS

234.231.01 Fouling wires do not consist of at least two discrete conductors.

234.231.02 Fouling wires not of sufficient conductivity to detect occupancy when train detection circuit is shunted.

234.231.03 Fouling wires not maintained in such condition to detect occupancy when train detection circuit is shunted.

§ 234.233 Rail joints.

This section requires that each non-insulated rail joint located within the limits of a highway-rail grade crossing train detection circuit be bonded by means other than joint bars and that the bonds be maintained in such condition to ensure electrical conductivity.

CLASSIFICATION OF DEFECTS

234.233.01 Non-insulated rail joint located within the limits of highway-rail grade crossing train detection circuit not bonded to ensure electrical conductivity.

§ 234.235 Insulated rail joints.

This section requires that each insulated rail joint used in train detection circuits of a highway-rail grade crossing be maintained to prevent current from flowing between the rails separated by the insulation, in an amount sufficient to cause a failure of any train detection circuit.

CLASSIFICATION OF DEFECTS

234.235.01 Insulated rail joint not maintained in condition to prevent current from flowing between rails separated by the insulation, in an amount sufficient to cause a failure of any train detection circuit.

234.235.02 Insulation in insulated rail joint in bad condition.

§ 234.237 Reverse switch cut-out circuit.

This section requires that when a switch is equipped with a switch circuit controller connected to the point and interconnected with highway-rail grade crossing warning system circuitry, such switch circuit controller shall be maintained so the warning system can be cut out only when the switch point is within one-half inch of the full reverse position.

Application:

Tests shall be made by placing appropriate gauge between the reverse switch point and rail, 6 inches from the end of the point and applying pressure against the gauge until it cannot be removed.

Normally open contacts shall be open at least one sixteenth inch. The one sixteenth inch requirement applies to reverse contacts when the switch is in full normal position, or the normal contacts when the switch is in full reverse position.
This section applies specifically to highway-rail grade crossing reverse switch position cut-out

circuits using switch circuit controllers. The switch circuit controller shall be securely fastened in place with its connections also securely fastened.

CLASSIFICATION OF DEFECTS

234.237.01 Switch circuit controller contacts on hand-operated switch adjusted to cut out warning system when reverse switch point is open more than one-half inch.

234.237.02 Contact opening of switch circuit controller contact less than one-sixteenth inch.

234.237.03 Switch circuit controller not securely fastened in place.

234.237.04 Switch circuit controller connections not securely fastened.

§ 234.239 Tagging of wires and interference of wires or tags with signal apparatus.

This section requires that each wire be tagged or otherwise so marked that it can be identified at each terminal. Tags and other marks of identification shall be made of insulating material and so arranged that tags and wires do not interfere with moving parts of apparatus.

Application:

Applies to each wire at each terminal in all housings including switch circuit controllers and terminal or junction boxes. This requirement does not apply to flashing light units, gate arm light units and other auxiliary light units.

Wiring shall be tagged or otherwise marked at a terminal. A terminal is any point where the wire terminates from its point of origin to and including the point of final termination. The wire may be tagged or marked in any manner so that it can be identified. All tag and wire identification shall correspond with the circuit plan. If it is necessary to pull the wire to identify it, the railroad is in non-compliance.

The local wiring on a solid state crossing controller rack will not require tags, as long as the wiring is an integral part of the solid state equipment.

CLASSIFICATION OF DEFECTS

234.239.01 Wire not tagged or otherwise marked so that it can be identified at terminal.

234.239.02 Nomenclature of tag or wire identification does not correspond to that of the circuit plan.

234.239.03 Tag interferes with moving parts of apparatus.

234.239.04 Wire interferes with moving parts of apparatus.

234.239.05 Tag or other mark of identification in instrument case or apparatus housing not made of insulating material.

§ 234.241 Protection of insulated wire; splice in underground wire.

This section requires that insulated wire be protected from mechanical injury. The insulation shall not be punctured for test purposes. A splice in underground wire shall have insulation resistance at least equal to that of the wire spliced.

Application:

Insulated wire shall be placed in wire runs, strung on pole line or messenger, buried or otherwise protected in a manner that it cannot be damaged by the operation of apparatus, vehicles, tools, workers, or by the opening or closing of doors. No insulated wire or conductor, whether in housing or outside, shall be punctured for test purposes. Temporary installation of cable or wires on top of the ground must be made permanent as soon as practical.

CLASSIFICATION OF DEFECTS

234.241.01 Insulated wire not protected from mechanical injury.

234.241.02 Insulation of insulated wire punctured for test purposes.

234.241.03 Splice in underground wire does not have insulation resistance value at least equal to that of the wire spliced.

§ 234.243 Wire on pole line and aerial cable.

This section requires that all wires be securely tied in on insulators that are properly fastened to a crossarm or bracket attached to a pole or fixture. Wires are required to be maintained clear of all other wires.

Open-wire transmission lines of 750 volts or more must be placed at least 4 feet above the nearest crossarm carrying highway-rail grade crossing control circuits.

Application:

Applies to all wires that affect the proper operation of highway-rail grade crossing warning systems, including AC power supply carried on pole line.

Particular attention should be given to vertical runs of cable. These are frequently found tied off at the top of the run, at which point the entire weight of the cable is self-supported. The cable is required to be supported throughout by messenger.

CLASSIFICATION OF DEFECTS

234.243.01 Wire carried on pole line not securely tied in on insulator.

234.243.02 Wire not secured because of broken, missing, or burnt pole.

234.243.03 Wire not secured because of broken, missing, or burnt crossarm.

234.243.04 Wire interferes with or is interfered with by another wire.

234.243.05 Cable used aerially not supported on insulators or by messenger.

234.243.06 Open wire transmission lines operating at 750 volts or more, less than 4 feet above nearest crossarm carrying highway-rail grade crossing control circuits.

§ 234.245 Signs.

This section requires that each sign mounted on a highway-rail grade crossing signal post or mast be maintained in good condition and be visible to the highway user.

Application:

This section applies to signs located at highway-rail grade crossings equipped with any type of active warning system.

CLASSIFICATION OF DEFECTS

234.245.01 Sign not clearly visible to highway user.

234.245.02 Sign not in good condition.

234.245.03 Sign missing or not secure.

U.S. Department
of Transportation

Federal Railroad
Administration

Memorandum

Date: November 21, 1996 Reply to Attn of: S-96-09

Subject: Interpretation and Application of 49 CFR Sections 234.245

(Original Signed by E. R. English)

From: E. R. English
Director, Office of Safety Assurance and Compliance

To: All Regional Administrators, Deputy Regional Administrators, S&TC Specialists and S&TC Inspectors

The S&TC Technical Resolution Committee meeting held in Portland, Oregon the week of July 22, 1996, acted on a request for the application, interpretation, and enforcement of the requirement of Section 234.245, Signs.

The consensus of the committee was that Section 234.245 applies to any sign that is attached to the signal pole and is associated with warning highway motorists.

The following defect code will be added to clarify the intent of this section:

234.245.03 Sign missing or not secure.

#

August 1, 2002

§ 234.247 Purpose of inspections and tests; removal from service of relay or device failing to meet test requirements.

This section requires that the inspections and tests set forth in Sections 234.249 through 234.271 are required at highway-rail grade crossings with active warning systems located on in-service railroad tracks and shall be made to determine if the warning system and its component parts are maintained in a condition to perform their intended function.

If a railroad elects not to comply with the requirements of these sections because all tracks over the grade crossing are out of service or the railroad suspends operations during a portion of the year, and the grade crossing warning system is also temporarily taken out of service, a full inspection and all required tests must be successfully completed before railroad operations over the grade crossing resume.

Any electronic device, relay, or other electromagnetic device that fails to meet the requirements of tests required by this part shall be removed from service and shall not be restored to service until its operating characteristics are in accordance with the limits within which such device or relay is designed to operate.

Application:

The purpose of inspections and tests is to determine if operating characteristics of electronic devices, relays, or other electromagnetic devices are within specified values and that apparatus and equipment is being maintained in a condition to assure proper operation of warning systems at highway-rail grade crossings.

A railroad may elect not to comply with the requirements of these sections if tracks over the grade crossing are out of service or the railroad suspends operations during a portion of the year, and the grade crossing warning system is also temporarily taken out of service. A full inspection and all required tests must be successfully completed before railroad operations over the grade crossing resume.

CLASSIFICATION OF DEFECTS

234.247.01 Electronic device, relay, or other electromagnetic device that fails to meet the requirements of specified tests not removed from service.

234.247.02 Electronic device, relay, or other electromagnetic device that fails to meet requirements of specified tests restored to service with operating characteristics not in accordance with limits within which it is designed to operate.

§ 234.249 Ground tests.

This section requires a test for grounds on each energy bus furnishing power to circuits that affect the safety of highway-rail grade crossing warning system operation. The test shall be made when such energy bus is placed in service and at least once each month thereafter.

Application:

Ground tests are not required to be made on track circuit wires, AC distribution circuits grounded in the interest of safety, or common return wires of grounded common single break circuits. At some locations it may be necessary to remove the primary power when testing.

Use of an appropriate external battery source is an acceptable means of testing.

Test shall be made by measuring the voltage potential between each energy bus and a point known to be grounded with the warning system activated. Warning system activation is not necessary when each warning system circuit is tested with an external battery supply. If a voltage potential is detected between energy bus and ground, a current reading shall be taken to determine whether the ground is in excess of that permitted by Section 234.213. In no case shall a reading be taken when a train is closely approaching or passing, nor shall a meter connected between an energy bus and ground be left unattended.

Tests shall be applied to each output circuit of those electronic devices installed to provide one or more individual isolated power supplies from a single common storage battery or power supply.

CLASSIFICATION OF DEFECTS

234.249.01 Ground test not made on each energy bus furnishing power to circuits that affect the safety of warning system operation when such energy bus is placed in service and at least once each month thereafter.

Memorandum

U.S. Department
of Transportation

Federal Railroad
Administration

Date: Reply to Attn. of: S-99-03

Subject: Clarification of Application, Interpretation and Enforcement
of 49 CFR Sections 234.213, 236.2, 234.249 & 236.107

From: George Gavalla
Associate Administrator for Safety

To: All Regional Administrators, Deputy Regional Administrators,
S&TC Specialists and S&TC Inspectors

The S&TC Technical Resolution Committee meeting in Omaha, Nebraska the week of August 16, 1999, acted on a request for clarification of the application, interpretation, and enforcement of 49 CFR Sections 234.213 and 236.2 (Grounds), and Sections 234.249 and 236.107 (Ground Tests). The question before the committee was to determine if an isolated energy source should be considered an energy bus. A secondary issue was the allowable limit of current value of a ground on electronic equipment.

After a review of current industry testing procedures, recommended practices and input from railroad management, labor, and suppliers, it was the consensus of the committee that energy sources from electronic devices that provide one or more individual isolated power supplies, the functioning of which affects the safety of train operations or highway-rail grade crossing warning systems operation, are to be considered an energy bus. On the second issue the committee could not reach a consensus on what the allowable limit of current of a ground should be on electronic equipment.

It is an accepted practice in the railroad industry to use electronic devices to provide one or more individual isolated power supplies from a single common storage battery or power supply. One example of this would be dc to dc converters. These devices produce a energy source that may be used in vital circuitry and, if grounded, create a safety risk to the safe operation of trains, highway-rail grade crossing warning system operation, and the public.

Discussion within the committee and external customers revealed that the intent of testing these sources was to check all circuits functioning outside the structure in conjunction with what is already required. It is not the intent to perform a ground test on isolated energy sources circuited within the

structure. One example of this would be an energy source to a relay within the structure (i.e., MD relay drive to XR relay).

Concerning the second issue; Section 234.213 requires electronic devices designed to be ground free shall be kept free of grounds having a value that affects the proper operation of the device.

Suppliers were unable provide a value of grounded current that would affect the safe and proper operation of the device. The committee recommends further discussions with suppliers to obtain recommended values.

It was a concern to all parties that consistency of the requirements of grounds and ground tests in Parts 234 and 236 be established. Section 234.213 requires electronic devices designed to be ground free shall be kept free of grounds having a value that affects the proper operation of the device. This language does not currently exist in Section 236.2. Section 234.249 allows the use of an external battery source as an acceptable means of testing, while Section 236.107 does not address this. Section 236.107 also states that tests should be applied to each output circuit of those electronic devices installed to provide one or more individual isolated power supplies from a single common storage battery or power supply. This language is not in Section 234.249.

In an effort to standardize the application of the rules of Sections 234.213, 234.249, 236.2 and 236.107, the following changes will be made to the application of the rules:

Add to 236.2: **Electronic devices designed to be ground free shall be kept free of grounds having a value that affects the proper operation of the device.**

Add to 236.107: **Use of an appropriate external battery source is an acceptable means of testing.**

Change in 236.107: The ground test ~~should~~ **shall** be applied to each output circuit of those electronic devices installed to provide one or more individual isolated power supplies from a single common storage battery or power supply.

Add to 234.249: **Tests shall be applied to each output circuit of those electronic devices installed to provide one or more individual isolated power supplies from a single common storage battery or power supply.**

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August 1, 2002

§ 234.251 Standby Power

This section requires that standby power be tested at least once each month.

Application:

Standby power shall be tested at least once each month to determine its capability to operate the warning system in instances of primary power interruption.

CLASSIFICATION OF DEFECTS

234.251.01 Standby power not tested at least once each month.

§ 234.253 Flashing light units and lamp voltage.

This section requires that each flashing light unit be inspected when installed and at least once every 12 months for proper alignment and frequency of flashes in accordance with installation specifications. Lamp voltage is required to be tested when the system is installed and at least once every 12 months thereafter. Each flashing light unit shall be inspected for proper visibility, and for dirt and damage to roundels and reflectors at least once each month. A visual external inspection of flashing light unit is an acceptable means of compliance.

Application:

Part of this section requires lamp voltage to be tested when the system is installed and at least once every 12 months thereafter. Measuring lamp voltage at the base of a mast is an acceptable means for the railroad to perform the test on an annual basis, provided the railroad can determine 85 percent of the rated voltage at the lamp. However, FRA Inspectors or State Inspectors can observe a flashing light unit voltage test at any point in the system to determine compliance with Section 234.221. When there is a need for gate arm lamp voltage to be verified, the voltage measurement will normally be tested at the gate mechanism or suitable junction box.

It is acceptable for railroads to test lamp voltage with primary power applied or with standby power applied if they elect to do so. However, FRA Inspectors or State Inspectors can observe tests of lamp voltage with primary power or standby power applied, for compliance with Section 234.221. This section does not require periodic testing of gate arm lights.

When the test is conducted with primary power removed, the lights should operate for not less than 2 minutes and not more than 5 minutes before lamp voltage readings are taken.

CLASSIFICATION OF DEFECTS

234.253.01 Each flashing light unit not inspected for alignment and frequency of flashes when installed and at least once every 12 months thereafter.

234.253.02 Lamp voltage not tested when system is installed and at least once every 12 months thereafter.

234.253.03 Each flashing light unit not inspected for proper visibility, and for dirt and damage to roundels and reflectors at least once each month.

§ 234.255 Gate arm and gate mechanism.

This section requires that each gate arm and gate mechanism be inspected at least once each month to determine compliance with Section 234.223. Gate arm movement shall be observed for proper operation at least once each month and hold-clear devices shall be tested for proper operation at least once every 12 months.

Application:

Hold-clear devices are not required to be tested for operating values. An observation of the hold-clear device to ensure that it is functioning properly is an acceptable means of testing.

CLASSIFICATION OF DEFECTS

234.255.01 Gate arm and gate mechanism not inspected at least once each month.

234.255.02 Gate arm movement not observed for proper operation at least once each month.

234.255.03 Hold-clear device not tested for proper operation at least once every 12 months.

§ 234.257 Warning system operation.

This section requires that each highway-rail grade crossing warning system be tested for proper operation when the warning system is placed in service and at least once each month thereafter, and whenever modified or disarranged.

When a warning bell or other stationary audible warning device is used, it shall be tested for proper operation when placed in service. Thereafter it must be tested at least once each month and whenever modified or disarranged.

Application:

"Disarranged" includes, but is not limited to, situations in which a relay, circuit board, termination shunt, joint bypass coupler, or other electronic device is replaced with another; two or more conductors in a cable are severed; a cable or conductor in a warning system is replaced with another; or wires are removed at the same time from more than one terminal of a relay, electronic device, terminal board, or other vital component of a warning system. The extent of testing the warning

system for proper operation will be dependent on the degree of modification or disarrangement. The use of a test switch or similar device is permissible while performing a routine test at least once each month.

CLASSIFICATION OF DEFECTS

234.257.01	Highway-rail grade crossing warning system not tested to determine that it functions as intended when placed in service or when modified or disarranged.
234.257.02	Highway-rail grade crossing warning system not tested at least once each month to determine that it functions as intended.
234.257.03	Warning bell or other stationary audible warning device not tested when placed in service or when modified or disarranged.
234.257.04	Warning bell or other stationary audible warning device not tested at least once each month.

U.S. Department of Transportation

Federal Railroad Administration

Memorandum

Date: December 23, 1996 Reply to Attn of: S-96-10

Subject: Interpretation and Application of 49 CFR Section 234.257

(Original signed by E. R. English)

From: E. R. English
Director, Office of Safety Assurance and Compliance

To: All Regional Administrators, Deputy Regional Administrators, S&TC Specialists and S&TC Inspectors

The S&TC Technical Resolution Committee (TRC), meeting in Portland, Oregon, the week of July 22, 1996, acted on a request for clarification of the application of 49 CFR §234.257. The matter before the committee was to determine the application, interpretation, and enforcement of 49 CFR §234.257, as to what constitutes testing for proper operation of the highway-rail grade crossing warning system.

After much discussion surrounding the issue, the committee could not reach a consensus without additional background information to determine the original intent of the rule when it was written. There were two contrasting views as to what constitutes a proper test. One view was that opening a test switch or similar device to determine if the lights flash, the gates operate properly and the bell functions meets the requirement of this section. The other view was that the test must include the application of a shunt or shunts sufficient to activate the system.

The committee eventually determined the issue should be referred to a S&TC technical resolution review committee for further research into the original intent of the rule.

All of the comments and testimony that were submitted during the rulemaking process have been reviewed. The FRA convened a public hearing on March 1, 1994 to gather comments subsequent to the publication of the Notice of Proposed Rulemaking on the grade crossing regulations.

The Brotherhood of Railroad Signalmen, Association of American Railroads, and American Shortline Railroad Association presented joint testimony that they supported Part 234.257 as it was written. They stated the following:

> "We recognize in accordance with the FRA's section-by-section analysis that the extent of the tests required in a particular situation would vary depending upon whether a routine monthly test for proper operation was being performed, which might be limited to simple activation and visual inspection of the warning devices, or whether the test was actually required in connection with the modification and disarrangement of the system."

There were no other comments by any other parties pertaining to this section.

The FRA's intent when drafting this monthly test requirement was for railroads to perform a routine operational test of the warning devices to ensure the equipment, visible to highway users, functions as intended. The intent of how this is to be accomplished was to be left to the discretion of each railroad. Some railroads may elect to use track shunts as a means of performing this test, while others may elect to use test switches or other similar devices.

Mandating that a shunt be routinely used at high traffic volume crossing locations, equipped with train detection circuits that overlap, can be very detrimental to the credibility of the other crossing warning systems that are activated where the test is not actually being performed. At other locations, applying a shunt might be reasonable. This is one reason that the test requirement in Section 234.259 (Warning Time) provided railroads with three options; (1) Observation of a train movement, (2) Calculation and simulation of a train movement (using shunts), and (3) Electronic devices that actually determine warning time.

The requirement of placing a shunt across the rails to perform an operational test may be desirable in some cases, however, it was never the intent of the original rule. Proper operation of the train detection apparatus and its interconnection with activation is confirmed when the system is placed in service and thereafter every 12 months as prescribed in 49 CFR §234.259. It is further confirmed by the requirement in §234.257 that if a modification or disarrangement of the train detection circuit occurs, that modification or disarrangement must be tested.

For the purpose of compliance with 49 CFR §234.257, the use of a test switch or similar device is permissible while performing a routine test at least once each month.

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§ 234.259 Warning time.

This section requires that each highway-rail grade crossing warning system be tested for the prescribed warning time at least once every 12 months and when the warning system is modified because of a change in train speeds.

Application:

Testing can be accomplished by observation of a train movement, if practical, by calculation and track shunt simulation of a train movement, or by use of an electronic device that accurately determines warning time.

If calculation and track shunt simulation of a train movement is not practical for testing constant warning time devices and motion detection devices, observation of a train movement or use of an electronic device that accurately determines warning time can be used.

The calculation method would require that the maximum train speed be converted from miles per hour to feet per second. The resulting feet per second train speed would then be multiplied by a minimum of 20 (representing a minimum of 20 seconds warning time). This product would then represent a point, in feet, a minimum distance from the edge of the grade crossing where train detection by the warning system must occur to assure adequate warning time. A shunt must then be placed at that point to ensure that the system detects the presence of the shunt.

This section applies to all equipment (including standby units, if equipped) used in each highway-rail grade crossing warning system.

CLASSIFICATION OF DEFECTS

234.259.01	Crossing warning system not tested for the prescribed warning time at least once every 12 months.
234.259.02	Crossing warning system not tested for the prescribed warning time when warning system is modified because of a change in train speeds.

§ 234.261 Highway traffic signal pre-emption.

This section requires that highway traffic signal pre-emption interconnections, for which a railroad has maintenance responsibility, be tested at least once each month.

Application:

The pre-emption of a highway traffic signal requires an electrical circuit between the control device of the crossing warning system and the controller assembly of the highway traffic signal. The railroad will only be responsible for the maintenance and testing of its interconnections.

CLASSIFICATION OF DEFECTS

234.261.01 Highway traffic signal pre-emption interconnections, for which a railroad has maintenance responsibility, not tested at least once each month.

§ 234. 263 Relays.

This section requires that each relay which affects the proper functioning of a crossing warning system shall be tested at least once every 4 years thereafter, except:

(1) Alternating current vane type relays, direct current polar type relays, and relays with soft iron magnetic structure shall be tested at least once every 2 years.

(2) Alternating current centrifugal type relays shall be tested at least once every 12 months.

Application:

Applies to in-service relays used in vital circuits of highway-rail grade crossing warning systems. Does not apply to miniature non-vital relays or motor control and gate mechanism relays.

This section is applicable only to relays in service. A relay, after being tested or repaired, is not considered in service until it is installed in a warning system.

Use of an "in-service" relay that has broken glass, high resistance contacts, burnt contacts, burnt ribbons, broken or bent contacts, improperly installed ribbons, or evidence of moisture or other foreign matter inside its housing is not properly maintained and is prohibited.

Tests of operating characteristics include pick-up, release, and working values. They may be recorded in either voltage or current values.

CLASSIFICATION OF DEFECTS

234.263.01 Tests of relay in service not made at least once every 4 years.

234.263.02 Tests of AC vane type relay, DC polar type relay, or relay with soft iron magnetic structure in service, not made at least once every 2 years.

234.263.03 Tests of AC centrifugal type relay in service not made at least once every 12 months.

§ 234.265 Timing relays and timing devices.

This section requires that each timing relay and timing device be tested at least once every 12 months. The timing shall be maintained at not less than 90 percent nor more than 110 percent of the predetermined time interval. The predetermined time interval shall be shown on the plans or marked on the timing relay or timing device.

Application:

Timing relays and timing devices are essential components of time-out circuits which are primarily used for train switching movements at active warning system installations using conventional relay type train detection circuits.

Timing devices which perform internal functions associated with motion detectors, motion sensors, and grade crossing predictors are not subject to the requirements of this section.

CLASSIFICATION OF DEFECTS

234.265.01	Timing relay or timing device not tested at least once every 12 months.
234.265.02	Timing of timing relay or timing device less than 90 percent or more than 110 percent of predetermined time interval.
234.265.03	Predetermined time interval not shown on plans or marked on timing relay or timing device.

§ 234.267 Insulation resistance tests.

This section requires that insulation resistance tests be made when wires or cables are installed and at least once every 10 years thereafter.

Application:

Insulation resistance tests shall be made between all conductors and ground and between all other wires or conductors within a cable.

Track wires, line wires, and case wiring are excluded from the requirements of this rule.

Where a conductor is found with insulation resistance of less than 500,000 ohms, prompt action is required for repair or replacement of the defective wire or cable. Until repair or replacement, insulation resistance tests must be made annually. The reason for this provision is to allow lead time for acquisition of cable or scheduling of work forces. However, if material and work forces are available to effect repairs or replacement, corrective action shall be taken immediately.

Where a conductor is found with insulation resistance of less than 200,000 ohms, the conductor shall be either repaired immediately or removed from service.

CLASSIFICATION OF DEFECTS

234.267.01	Tests of insulation resistance not made when installed, within specified period, or at least once every 10 years.
234.267.02	Action not taken to promptly repair or renew conductor having insulation resistance value less than 500,000 ohms.
234.267.03	Circuit permitted to function on a conductor having insulation resistance value less than 200,000 ohms.

§ 234.269 Cut-out circuits.

This section requires that each cut-out circuit be tested at least once every 3 months to determine that the circuit functions as intended.

Application:

For purposes of this section, a cut-out circuit is any circuit which overrides the operation of automatic warning systems. This includes reverse switch cut-out circuits and devices which enable personnel to manually override the operation of automatic warning systems.

This section is not applicable to key switches that manually activate the warning system.

CLASSIFICATION OF DEFECTS

234.269.01	Cut-out circuit not tested at least once every 3 months.

§ 234.271 Insulated rail joints, bond wires, and track connections.

This section requires that each insulated rail joint, bond wire, and track connection be inspected at least once every 3 months.

Application:

Each insulated rail joint shall be inspected at least once every 3 months for compliance with Section 234.235.

Each bond wire shall be inspected at least once every 3 months for compliance with Section 234.233.

Each track connection shall be inspected at least once every 3 months to maintain the integrity of the warning system.

CLASSIFICATION OF DEFECTS

234.271.01	Insulated rail joint, bond wire, or track connection not inspected at least once every 3 months.

§ 234.273 Results of inspections and tests.

This section requires that the results of inspections and tests be recorded on forms provided by the railroad, or by electronic means, subject to approval by the Associate Administrator for Safety. Each record shall show the name of the railroad, DOT/AAR inventory number, place and date, equipment tested, results of tests, repairs, replacements, adjustments made, and condition in which the apparatus was left.

Each record shall be signed or electronically coded by the employee making the test and shall be filed in the office of a supervisory official having jurisdiction.

Each record shall be retained until the next record for that test is filed, but in no case for less than one year from the date of the test.

Application:

Each inspection or test performed in compliance with the requirements as set forth in Sections 234.249 through 234.271 inclusive shall be recorded.

CLASSIFICATION OF DEFECTS

234.273.01	Record of tests and inspections not made.
234.273.02	Tests and inspections not recorded on form or electronically.
234.273.03	Record of tests and inspections not complete.
234.273.04	Record of tests and inspections not filed with a supervisory official having jurisdiction.
234.273.05	Record of test and inspection form does not show name of railroad, DOT/AAR inventory number, place and date, equipment tested, results of tests, repairs, replacements, adjustments made, condition in which apparatus was left, and signature or electronic code by employee making the test.

U.S. Department of Transportation

Federal Railroad Administration

Memorandum

Date: 01-17-2001

Reply to Attn. of: S-99-06

Subject: Clarification of Application, Interpretation and Enforcement of 49 CFR Section 234.273

From: George Gavalla
Associate Administrator for Safety

To: All Regional Administrators, Deputy Regional Administrators, S&TC Specialists and S&TC Inspectors

The S&TC Technical Resolution Committee meeting in Omaha, Nebraska the week of August 16, 1999, acted on a request for clarification of the application, interpretation, and enforcement of 49 CFR Section 234.273, by defining the minimum information required for recording the results of various inspections and tests required by other sections of Part 234. Part of the Committee continued working on this issue via e-mail subsequent to the original meeting to finalize some items that were unresolved.

The Committee considered industry practices, requirements of Part 234 inspection and testing rules, and clarifications which had previously been provided for Section 236.110 in formulating these requirements.

These clarifications are a supplement to what information is required in the rule. They do not relieve any requirements in the rule such as the signature or electronic code for the employee performing the inspection or test. Other items required in the rule, and applicable to each section, include name of the railroad, DOT/AAR inventory number, Place (city/county, state, street/road name), Date (month/day/year), and repairs, replacements, adjustments made. Following are the clarifications of other items which sometime vary by each section due to the equipment being tested.

August 1, 2002

Section	Requirements
234.249	Equipment tested (each energy source tested for either positive or negative ground identified by nomenclature (i.e., B10, B12, B16, XB12, EB12, etc.); Results of tests (results may be recorded by using codes which are defined on the record with the exception of when any current ground is detected during tests, the actual measured value and the corrective action taken shall be recorded); and condition in which the apparatus was left. (Satisfactory condition would indicate the test is complete and no ground is found of a value non-compliant with the requirements of Section 234.213.)
234.251	Equipment tested (each standby power source tested identified by nomenclature i.e. B10, B12, B16, XB12, EB12, etc.); Results of test (results may be recorded by using codes which are defined on the record with the exception of when any standby power source is detected in an insufficient state during tests, the actual measured value and the corrective action taken shall be recorded); and condition in which the apparatus was left. (Satisfactory condition would indicate the test is complete and the standby power is found of sufficient capacity to comply with the requirements of Section 234.215.)
234.253	Equipment inspected or tested (each flashing light unit identified (i.e., all, flasher A, flasher B, unit 2B, etc.); Results of each inspection (subsections (a) and (c) for compliance with Section 234.217), or test (subsection (b) for compliance with Section 234.221). (Results may be recorded by using codes which are defined on the record with the following exceptions: the actual flash rate shall be recorded, when any defective condition is found in lamp voltage the actual measured value shall be recorded, and when any condition is found non-compliant with Section 234.253, it shall be noted and the corrective action taken shall be recorded); and condition in which the apparatus was left. (Satisfactory condition would indicate the flashing light unit(s) has been inspected or lamp voltage tested and no defective condition was found).
234.255	Equipment inspected, observed, or tested (each gate arm/gate mechanism identified i.e. all, gate A, gate B, etc.); Results of each inspection (subsection (a)), each observation (subsection (b)), and each test (subsection (c)), all for compliance with Section 234.223. Results may be recorded by using codes which are defined on the record); and condition in which the apparatus was left. (Satisfactory condition would indicate the gate arm, gate mechanism, and/or hold clear device has been inspected, observed, or tested as applicable and no defective condition was found).

Section	Requirements
234.257	Equipment tested (the type devices identified (i.e., flashing lights, flashing lights and gates, bell(s), etc.); Results of tests (results may be recorded by using codes which are defined on the record); and condition in which the apparatus was left. (Satisfactory condition would indicate the test is complete and the system is found to be operating as intended.)
234.259	Equipment tested (the type train detection devices identified (i.e., DC track circuits, AC track circuits, AFO track circuits, Model 1140 Motion Detector, GCP 3000, HXP-1, etc.); Results of tests (results shall be recorded by identifying the method of testing used and the actual warning time found); and condition in which the apparatus was left. (Satisfactory condition would indicate the test is complete and the warning time(s) is found to be as prescribed.)
234.261	Equipment tested (the nomenclature or other positive identification for each interconnection); Results of tests (results may be recorded by using codes which are defined on the record); and condition in which the apparatus was left. (Satisfactory condition would indicate the test is complete and the interconnection, for which a railroad has maintenance responsibility, is found to be operating as intended.)
234.263	Equipment tested (the nomenclature, manufacturer or model/type, and Serial number, of each relay tested); Results of tests (results shall be recorded by pick-up and release values or working values where pick-up and release are not applicable. If a relay is found non-compliant, the defective condition shall be noted, the measured values shall be recorded, and the corrective action taken recorded); and condition in which the apparatus was left. (Satisfactory condition would indicate the test is complete and the relay is found to be non-defective, and otherwise operating properly and within specifications.)
234.265	Equipment tested (the nomenclature of each timing relay or timing device); Results of tests (the predetermined time and the actual time measured shall be recorded. If a timing relay or timing device is found non-compliant, the defective condition shall be noted and the corrective action taken shall be recorded); and condition in which the apparatus was left. (Satisfactory condition would indicate the test is complete and the relay or timing device is found to be non-defective, and otherwise operating properly and within the requirements.)

Section	Requirements
234.267	Equipment tested (each grouping of wires or cable tested shall be positively identified); Results of tests (results may be recorded by using codes which are defined on the record with the exception that when the insulation resistance of any conductor(s) in use is found to be below 500,000 ohms, such conductor(s) shall be individually identified and the actual value of the insulation resistance of that conductor(s) shall be recorded. The corrective action taken shall then also be recorded.); and condition in which the apparatus was left. (Satisfactory condition would indicate the test is complete and each conductor is found to be in compliance with Section 234.267.)
234.269	Equipment tested (the nomenclature or other positive identification for each cut-out circuit); Results of tests (results may be recorded by using codes which are defined on the record); and condition in which the apparatus was left. (Satisfactory condition would indicate the test is complete and the cut-out circuit is found to be operating as intended.)
234.271	Equipment inspected (either identified as all within the limits of the train detection circuitry or some other effective method if less than all); Results of tests (results may be recorded by using codes which are defined on the record); and condition in which the apparatus was left. (Satisfactory condition would indicate the inspection is complete and no insulated rail joint, bond wire, or track connection is found defective to a point that it is not performing its intended function).

Alternate Methods of Protection
under 49 CFR 234.105(c), 234.106, and 234.107(c)
This is a summary-see body of text for complete requirements

	Flagger For Each Direction of Traffic	Police Officer Present	Flagger Present, But Not One For Each Direction of Traffic	NoFlagger/ No Police
False Activation	**Normal Speed**	**Normal Speed**	**Proceed with caution-maximum speed of 15 mph**	**Proceed with caution-maximum speed of 15 mph**
Partial Activation *	**Normal Speed**	**Normal Speed**	**Proceed with caution-maximum speed of 15 mph**	**Proceed with caution-maximum speed of 15 mph**
Activation Failure**	**Normal Speed**	**Normal Speed**	**Proceed with caution-maximum speed of 15 mph**	**Stop: Crewmember flag traffic and reboard**

* Partial activation--full warning not given.
Non-gated crossing with one pair of lights designed to flash alternatively, one light does not work (and back-lights from other side not visible).
Gated crossing--gate arm not horizontal; or any portion of a gate arm is missing if that portion had held a gate arm flashing light.

**Activation failure includes--if more than 50% of the flashing lights on any approach lane not functioning; or if an approach lane has two or more pairs of flashing lights, there is not at least one pair operating as intended.

August 1, 2002