

# **FEDERAL RAILROAD ADMINISTRATION**



## **OFFICE OF RAILROAD SAFETY**

### **VOLUME II – SIGNAL AND TRAIN CONTROL REGULATIONS, TECHNICAL APPLICATIONS, AND DEFECT CODES**

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## **49 CFR Part 233 – Signal Systems Reporting Requirements**

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## § 233.1 Scope.

This part prescribes reporting requirements with respect to methods of train operation, block signal systems, interlockings, traffic control systems, automatic train stop, train control, and cab signal systems, or other similar appliances, methods, and systems.

### Application:

This section identifies the systems, methods, and appliances that are subject to the reporting requirements.

This rule subjects the following to the reporting requirements of this part:

- Automatic block signal systems
- Traffic control systems
- Interlockings
- Automatic train stop
- Train control
- Cab signal systems
- Other similar appliances, methods, and systems

An automatic block signal system is a block signal system wherein the use of each block is governed by an automatic block signal, cab signal, or both.

**Note:** A non-automatic block signal system is a term used to denote any method of maintaining an interval of space between trains as distinguished from an automatic block signal system, a traffic control system, an automatic cab signal system without roadway signals, or time interval system.

A traffic control system is a block signal system under which train movements are authorized by block signals or cab signals whose indications supersede the superiority of trains for both opposing and following movements on the same track.

An interlocking is an arrangement of signals, with or without other signal appliances, which may be controlled automatically, automatically with supervisory control, or remotely by an operator or dispatcher, and where train movements over all routes are governed by signal indication.

An automatic train stop system is a system arranged so that its operation will automatically result in the application of the brakes until the train has been brought to a stop.

An automatic train control system is a system arranged so that its operation will automatically result in the following:

1. A full-service application of the brakes, which will continue either until the train is brought to a stop, or under control of the engineman, or until its speed is reduced to a predetermined rate.

2. When operating under a speed restriction, application of the brakes when the speed of the train exceeds the predetermined rate and which will continue until the speed is reduced to that rate.

Automatic train control systems include those systems referred to as speed control systems. An automatic cab signal system is a system that provides for the automatic operation of the following:

1. Cab signal, a signal located in the engineer's compartment or cab, indicating a condition affecting the movement of a train and used in conjunction with interlocking signals and in conjunction with or in lieu of block signals, and
2. Cab indicator, a device located in the cab which indicates a condition or a change of condition of one or more elements of the system.

### **§ 233.3 Application.**

(a) Except as provided in paragraph (b) of this section, this part applies to railroads that operate on standard gage track which is part of the general railroad system of transportation.

(b) 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 system of railroad transportation.

#### Application:

This section makes this part applicable to each common carrier by rail subject to the Signal Inspection Act, 49 U.S.C. 205.

It applies to each railroad that is part of the general rail system engaged in interstate commerce.

It does not apply to:

- Rapid transit systems
- Privately owned systems that do not transport interstate commerce
- Automatic classification yards
- Highway-rail grade crossing active warning devices

### **§ 233.5 Accidents resulting from signal failure.**

Each carrier shall report within 24 hours to the Federal Railroad Administration by toll free telephone number 800-424-0201, whenever it learns of the occurrence of an accident/incident arising from the failure of an appliance, device, method, or system to function or indicate as required by part 236 of this title that results in a more favorable aspect than intended or other condition hazardous to the movement of a train.

#### Application:

This section requires each carrier to call FRA at 800-424-0201 within 24 hours of each accident/incident resulting from a false proceed signal indication or failure.

A false proceed signal indication or a false proceed failure is the failure of an appliance, device, method, or system to function or indicate as required by the Rules, Standards, and Instructions (RS&I) that results in either a more favorable aspect than intended or a condition that is hazardous to the movement of a train.

#### CLASSIFICATION OF DEFECTS

233.5.A1 Accident/incident resulting from or involving failure of appliance, device, method, or system to function or indicate as intended, not reported to FRA within 24 hours after accident/incident.

#### **§ 233.7 Signal failure reports.**

Each carrier shall report within 15 days each failure of an appliance, device, method, or system to function or indicate as required by part 236 of this title that results in a more favorable aspect than intended or other condition hazardous to the movement of a train. Form FRA F6180-14, "Signal Failure Report," shall be used for this purpose and completed in accordance with instructions printed on the form.

#### Application:

This rule requires that each false proceed failure, including those resulting in an accident/incident, be reported to FRA within 15 days on Form FRA F6180-14, in accordance with the instructions contained on the form. Application of this rule includes that the report of each instance be complete and correct.

A false proceed signal indication or a false proceed failure is the failure of an appliance, device, method, or system to function or indicate as required by the RS&I that results in either a more favorable signal aspect than intended or a condition that is hazardous to the movement of a train.

#### CLASSIFICATION OF DEFECTS

233.7.A1 Report of failure of appliance, device, method, or system to indicate or function as intended not made on prescribed form within 15 days.

233.7.A2 Report of failure of appliance, device, method, or system to indicate or function as intended not complete.

233.7.A3 Report of failure of appliance, device, method, or system to indicate or function as intended not correct.

#### **§ 233.9 Reports.**

Not later than April 1, 1997, and every 5 years thereafter, each carrier shall file with FRA a signal system status report titled "Signal System Five-Year Report" on a form to be provided by FRA in accordance with instructions and definitions provided on the report.

### Application:

This section requires each carrier to file a “Signal System Five-Year Report” every 5 years. The report addresses the status of the filing railroad’s signal systems and methods of train operation. It is due no later than April 1 at regular 5-year intervals beginning with the year 1997. The report is required to be filed on a form to be provided by FRA in accordance with the instructions on the back of the form. Application of this rule requires that the report of each railroad be timely, complete, and correct.

### CLASSIFICATION OF DEFECTS

- 233.9.A1 Five-year signal system status report not filed no later than April 1 of the year in which it is due.
- 233.9.A2 Five-year signal system status report not complete.
- 233.9.A3 Five-year signal system status report not correct.

### **§ 233.11 Civil penalty.**

Any person (an entity of any type covered under 1 U.S.C. 1, including but not limited to the following: a railroad; a manager, supervisor, official, or other employee or agent of a railroad; any owner, manufacturer, lessor, or lessee of railroad equipment, track, or facilities; any independent contractor providing goods or services to a railroad; and any employee of such owner, manufacturer, lessor, lessee, or independent contractor) who violates any requirement of this part or causes the violation of any such requirement is subject to a civil penalty of at least \$650 and not more than \$25,000 per violation, except that: Penalties may be assessed against individuals only for willful violations, and, where a grossly negligent violation or a pattern of repeated violations has created an imminent hazard of death or injury to persons, or has caused death or injury, a penalty not to exceed \$100,000 per violation may be assessed. Each day a violation continues shall constitute a separate offense. See Appendix A to this part for a statement of agency civil penalty policy.

### Application:

This section prescribes a civil penalty for failure to file reports as required by this part.

This rule establishes that a carrier is liable for maximum penalty of \$25,000 for each offense or failure to file reports as required, except in extraordinary cases, where the penalty may be aggravated to \$100,000. Each day a failure or refusal to file continues is a separate offense.

### **§ 233.13 Criminal penalty.**

Whoever knowingly and willfully--

(a) Makes, causes to be made, or participates in the making of a false entry in reports required to be filed by this part; or

(b) Files a false report or other document required to be filed by this part is subject to a \$5,000 fine and 2 years imprisonment as prescribed by 49 U.S.C. 522(a) and section 209(e) of the Federal Railroad Safety Act of 1970, as amended (45 U.S.C. 438(e)).

## Appendix A to Part 233 – Schedule of Civil Penalties1

<u>Section</u>		<u>Violation</u>	<u>Willful</u>
233.5	Accidents resulting from signal failure	\$2,500	\$5,000
233.7	Signal failure reports	\$5,000	\$7,500
233.9	Annual reports	\$1,000	\$2,000

### Application:

This section prescribes a criminal penalty for filing a false report or other document required by this part.

The rule subjects any person who knowingly and willfully makes, causes to be made, or participates in the making of a false entry in an accident report, false proceed report, or 5-year report required by this part to a fine of \$5,000 and/or 2 years' imprisonment.



## **49 CFR Part 234 – Grade Crossing Signal System Safety and State Action Plans**

### **Compliance Policy**

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- § 234.1 Scope.
- § 234.3 Application.
- § 234.5 Definitions.
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#### **Subpart B – Reports and Plans**

- § 234.7 Accidents involving grade crossing signal failure.
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#### **Subpart C – Response to Reports of Warning System Malfunction**

- § 234.101 Employee notification rules.
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#### **Subpart D – Maintenance, Inspection, and Testing**

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- § 234.201 Location of plans.
- § 234.203 Control circuits.
- § 234.205 Operating characteristics of warning system apparatus.
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- § 234.211 Security of warning system apparatus.
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- § 234.217 Flashing light units.
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- § 234.221 Lamp voltage.
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- § 234.225 Activation of warning system.
- § 234.227 Train detection apparatus.
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- § 234.231 Fouling wires.
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- § 234.239 Tagging of wires and interference of wires or tags with signal apparatus.
- § 234.241 Protection of insulated wire; splice in underground wire.
- § 234.243 Wire on pole line and aerial cable.
- § 234.245 Signs.

### ***Inspections and Tests***

- § 234.247 Purpose of inspections and tests; removal from service of relay or device failing to meet test requirements.
- § 234.249 Ground tests.
- § 234.251 Standby power.
- § 234.253 Flashing light units and lamp voltage.
- § 234.255 Gate arm and gate mechanism.
- § 234.257 Warning system operation.
- § 234.259 Warning time.
- § 234.261 Highway traffic signal pre-emption.
- § 234.263 Relays.
- § 234.265 Timing relays and timing devices.
- § 234.267 Insulation resistance tests, wires in trunking and cables.
- § 234.269 Cut-out circuits.
- § 234.271 Insulated rail joints, bond wires, and track connections.
- § 234.273 Results of inspections and tests.

### ***Requirements for Processor-Based Systems***

- § 234.275 Processor-based systems.

## **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 FRA's policy to promote voluntary compliance with these minimum safety standards.* If voluntary compliance is not forthcoming, civil penalty sanctions may be employed as necessary to secure compliance.

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 harshness of the 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 neither predictable nor reasonably preventable, for example:

- Lamp outage due to normal burnout 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 49 CFR § 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, when an inspector encounters a pattern involving any such conditions, 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 also requires particular identified States to develop State highway-rail grade crossing action plans. This part does not restrict a railroad from adopting and enforcing additional or more stringent requirements not inconsistent with this part.

### **§ 234.3 Application.**

With the exception of § 234.11, this part applies to all railroads except:

- (a) A railroad that exclusively operates freight trains only on track which is not part of the general railroad system of transportation;
- (b) Rapid transit operations within an urban area that are not connected to the general railroad system of transportation; and
- (c) A railroad that operates passenger trains only on track inside an installation that is insular; i.e., its operations are limited to a separate enclave in such a way that there is no reasonable expectation that the safety of the public-except a business guest, a licensee of the railroad or an affiliated entity, or a trespasser-would be affected by the operation. An operation will not be considered insular if one or more of the following exists on its line:
  - (1) A public highway-rail crossing that is in use;
  - (2) An at-grade rail crossing that is in use;
  - (3) A bridge over a public road or waters used for commercial navigation; or
  - (4) A common corridor with a railroad, i.e., its operations are within 30 feet of those of any railroad.

#### **Application:**

The following examples address specific types of rail operations and whether § 234.3 applies to that operation:

1. **Rail freight operations.** This part applies to all freight railroads that are part of the general railroad system of transportation. FRA's regulations generally exclude railroads whose entire operations are confined to an industrial installation, e.g., "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) that is not part of the general railroad system of transportation. Both public and private crossings over which general system railroads operate 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/Federal Transit Administration 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; or (d) 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. (*See Technical Bulletin S-96-09.*)

## **§ 234.5 Definitions.**

As used in this part:

**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 grade crossing signal system does not indicate the approach of a train within the meaning of this paragraph if—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 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.

**Appropriately equipped flagger** means 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 Administration's Manual on Uniform Traffic Control Devices 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 FMCSA, as changes are made in this area.

***Credible report of system malfunction*** means specific information regarding a malfunction at an identified highway-rail 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*** means 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 motorist that it is not safe to cross the railroad tracks when, in fact, it is safe to do so.)

***Highway-rail grade crossing*** means 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*** means 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*** means one or more locomotives, with or without cars.

***Warning system malfunction*** means an activation failure, a partial activation, or a false activation of a highway-rail grade crossing warning system.

#### Application:

**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.
2. In the case of an approach lane where 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 § 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, 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 Administration’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 and 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.

## **§ 234.6 Penalties.**

(a) *Civil penalty.* Any person (an entity of any type covered under 1 U.S.C. 1, including but not limited to the following: a railroad; a manager, supervisor, official, or other employee or agent of a railroad; any owner, manufacturer, lessor, or lessee of railroad equipment, track, or facilities; any independent contractor providing goods or services to a railroad; and any employee of such owner, manufacturer, lessor, lessee, or independent contractor) who violates any requirement of this part or causes the violation of any such requirement is subject to a civil penalty of at least \$650, but not more than \$25,000 per violation, except that: penalties may be

assessed against individuals only for willful violations, and where a grossly negligent violation or a pattern of repeated violations has created an imminent hazard of death or injury to persons, or has caused death or injury, a penalty not to exceed \$100,000 per violation may be assessed. Each day a violation continues shall constitute a separate offense. Appendix A to this part contains a schedule of civil penalty amounts used in connection with this rule. The railroad is not responsible for compliance with respect to any condition inconsistent with the technical standards set forth in this part where such variance arises as a result of actions beyond the control of the railroad and the railroad could not have prevented the variance through the exercise of due diligence. The foregoing sentence does not excuse any instance of noncompliance resulting from the actions of the railroad's employees, agents, or contractors.

(b) *Criminal penalty.* Whoever knowingly and willfully makes, causes to be made, or participates in the making of a false entry in reports required to be filed by this part, or files a false report or other document required to be filed by this part, except for any document filed pursuant to § 234.11, is subject to a \$5,000 fine and 2 years imprisonment as prescribed by 49 U.S.C. 522(a) and 21311(a).

## **Subpart B – Reports**

### **§ 234.7 Accidents involving grade crossing signal failure.**

(a) Each railroad shall report to FRA every impact between on-track railroad equipment and an automobile, bus, truck, motorcycle, bicycle, farm vehicle, or pedestrian at a highway-rail grade crossing involving an activation failure. Notification shall be provided to the National Response Center within 24 hours of occurrence at (800) 424-0201. Complete reports shall thereafter be filed with FRA pursuant to § 234.9 of this part (activation failure report) and 49 CFR 225.11 (accident/incident report).

(b) Each telephone report must state the:

- (1) Name of the railroad;
- (2) Name, title, and telephone number of the individual making the report;
- (3) Time, date, and location of accident;
- (4) U.S. DOT-AAR Grade Crossing Identification Number;
- (5) Circumstances of the accident, including operating details of the grade crossing warning device;
- (6) Number of persons killed or injured, if any;
- (7) Maximum authorized train speed; and
- (8) Posted highway speed limit, if known.

#### **Application:**

This section requires each railroad to report each accident/incident, as defined in § 225.5(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 required written reports.

An accident/incident, as defined in § 225.5(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 § 234.5.

#### CLASSIFICATION OF DEFECTS

234.7.A1      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.B1      Telephone report not complete.

234.7.B2      Telephone report not correct.

#### **§ 234.9 Grade crossing signal system failure reports.**

Each railroad shall report to FRA within 15 days each activation failure of a highway-rail grade crossing warning system. FRA Form No. 6180-83, “Highway-Rail Grade Crossing Warning System Failure Report,” shall be used for this purpose and completed in accordance with instructions printed on the form.

#### Application:

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

This section requires that each activation failure, including those resulting in an accident/incident, as defined in § 225.5(1), be reported to FRA within 15 days on Form FRA F6180.83 in accordance with the instructions contained on the form. Application of this rule includes that the report of each instance be complete and correct. 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 § 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.A1      Report of activation failure not submitted on prescribed form within 15 days.

234.9.A2      Report of activation failure not complete.

234.9.A3      Report of activation failure not correct.

#### **§ 234.11 State highway-rail grade crossing action plans.**

(a) *Purpose.* The purpose of this section is to reduce collisions at highway-rail grade crossings in the ten States that have had the most highway-rail grade crossing collisions, on

average, during the calendar years 2006, 2007, and 2008. This section does not restrict any other State, or other entity, from adopting a highway-rail grade crossing action plan. This section also does not restrict any of the States required to develop action plans under this section from adopting a highway-rail grade crossing action plan with additional or more stringent requirements not inconsistent with this section.

(b) *Application.* This section applies to the ten States that have had the most highway-rail grade crossing collisions, on average, during the calendar years 2006, 2007, and 2008.

(c) *Action plans.* (1) The ten identified States shall each develop a State highway-rail grade crossing action plan and submit such a plan to FRA for review and approval not later than August 27, 2011.

(2) A State highway-rail grade crossing action plan shall:

(i) Identify specific solutions for improving safety at crossings, including highway-rail grade crossing closures or grade separations;

(ii) Focus on crossings that have experienced multiple accidents or are at high risk for such accidents; and

(iii) Cover a five-year period.

(d) *Review and approval.* (1) State highway-rail grade crossing action plans required under paragraph (c) of this section shall be submitted for FRA review and approval using at least one of the following methods: Mail to the Associate Administrator for Railroad Safety/Chief Safety Officer, U.S. Department of Transportation, Federal Railroad Administration, 1200 New Jersey Ave. SE., Washington, DC 20590; or e-mail to [rrs.correspondence@fra.dot.gov](mailto:rrs.correspondence@fra.dot.gov).

(2) FRA will review and approve or disapprove a State highway-rail graded crossing action plan submitted pursuant to paragraph (d) of this section within 60 days of receipt.

(3) If the proposed State highway-rail graded crossing action plan is disapproved, FRA will notify the affected State as to the specific areas in which the proposed plan is deficient. A State shall correct all deficiencies within 30 days following receipt of written notice from FRA.

(4) FRA may condition the awarding of any grants under 49 U.S.C. 20158, 20167, or 22501 to an identified State on the development of an FRA approved State highway-rail graded crossing action plan.

#### Application:

This section requires that the ten States that have had the most highway-rail grade crossing collisions, on average—during the calendar years 2006, 2007, and 2008—develop a State highway-rail grade crossing action plan and submit such a plan to FRA for review and approval not later than August 27, 2011. It further identifies what information shall be included and the process regarding FRA’s review and approval of each plan.

This section requires an action plan from the ten identified States by not later than the date indicated but does not require subsequent plans beyond that date.

#### **Subpart C – Response to Reports of Warning System Malfunction.**

##### **§ 234.101 Employee notification rules.**

Each railroad shall issue rules requiring its employees to report to persons designated by that railroad, by the quickest means available, any warning system malfunction.

Application:

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.

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 active 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.A1 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.**

(a) Upon receipt of a credible report of a warning system malfunction, a railroad having maintenance responsibility for the warning system shall promptly investigate the report and determine the nature of the malfunction. The railroad shall take appropriate action as required by § 234.207.

(b) Until repair or correction of the warning system is completed, the railroad shall provide alternative means of warning highway traffic and railroad employees in accordance with §§ 234.105, 234.106, or 234.107 of this part.

(c) Nothing in this subpart requires repair of a warning system, if, acting in accordance with applicable State law, the railroad proceeds to discontinue or dismantle the warning system. However, until repair, correction, discontinuance, or dismantling of the warning system is completed, the railroad shall comply with this subpart to ensure the safety of the traveling public and railroad employees.

Application:

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 § 234.207.

A “credible report of a highway-rail grade crossing warning system malfunction” is defined in § 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. A “warning system malfunction” is defined in § 234.5 as an activation failure, a partial activation, or a false activation of a highway-rail grade crossing warning system.

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

In summary, 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.A1 Credible report of highway-rail grade crossing warning system malfunction not promptly investigated.
- 234.103.B1 Action not taken to provide alternative means of warning highway traffic and railroad employees until repairs or correction of warning system is completed.
- 234.103.C1 Action not taken to provide alternative means of warning highway traffic and railroad employees until dismantling of a discontinued warning system is completed.

#### **§ 234.105 Activation failure.**

Upon receipt of a credible report of warning system malfunction involving an activation failure, a railroad having maintenance responsibility for the warning system shall promptly initiate efforts to warn highway users and railroad employees at the subject crossing by taking the following actions:

(a) Prior to any train's arrival at the crossing, notify the train crew of the report of activation failure and notify any other railroads operating over the crossing;

(b) Notify the law enforcement agency having jurisdiction over the crossing, or railroad police capable of responding and controlling vehicular traffic; and

(c) Provide for alternative means of actively warning highway users of approaching trains, consistent with the following requirements (see appendix B for a summary chart of alternative means of warning):

(1)(i) If an appropriately equipped flagger provides warning for each direction of highway traffic, trains may proceed through the crossing at normal speed.

(ii) If at least one uniformed law enforcement officer (including a railroad police officer) provides warning to highway traffic at the crossing, trains may proceed through the crossing at normal speed.

(2) If an appropriately equipped flagger provides warning for highway traffic, but there is not at least one flagger providing warning for each direction of highway traffic, trains may proceed with caution through the crossing at a speed not exceeding 15 miles per hour. Normal speed may be resumed after the locomotive has passed through the crossing.

(3) If there is not an appropriately equipped flagger or uniformed law enforcement officer providing warning to highway traffic at the crossing, each train must stop before entering the crossing and permit a crewmember to dismount to flag highway traffic to a stop. The locomotive may then proceed through the crossing, and the flagging crewmember may reboard the locomotive before the remainder of the train proceeds through the crossing.

(d) A locomotive's audible warning device shall be activated in accordance with railroad rules regarding the approach to a grade crossing.

#### Application:

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 an alternative warning.

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 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 § 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. A warning system malfunction is defined in § 234.5 as an activation failure, a partial activation, or a false activation of a highway-rail grade crossing warning system.

At crossings where it has been determined that the warning system is not functioning as intended, § 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.

**Note:** The appropriately equipped flagger requirements are very narrow in scope, in that only in the event the flagger is being used as alternative warning to allow train movement through the crossing at normal speed do the appropriately equipped provisions apply.

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 this section. (*See Technical Bulletin S-96-08*)

### CLASSIFICATION OF DEFECTS

- 234.105.A1 Train crew or other railroads operating over crossing not notified of activation failure prior to arrival of train at crossing.
- 234.105.B1 Law enforcement agency having jurisdiction or railroad police not promptly notified of activation failure.
- 234.105.C1 Alternative means of actively warning highway users not provided at crossing where credible report indicates activation failure has occurred.
- 234.105.C2 Train passed over crossing at normal speed without alternative means of warning being provided by the required number of appropriately equipped flaggers, a uniformed law enforcement officer, a or uniformed railroad police officer.
- 234.105.C3 Train passed over crossing at a speed of more than 15 mph with alternative means of warning not being provided by at least one appropriately equipped flagger for each direction of highway traffic.
- 234.105.C4 Flagger not equipped with required vest, shirt, or jacket.
- 234.105.C5 Flagger not equipped with required flagging equipment.
- 234.105.C6 Train failed to stop at crossing when the required alternative means of warning was not provided.
- 234.105.C7 After train stopped, crewmember failed to get off train and flag highway traffic to a stop when the required alternative means of warning was not provided.
- 234.105.D1 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.**

Upon receipt of a credible report of a partial activation, a railroad having maintenance responsibility for the warning system shall promptly initiate efforts to warn highway users and

railroad employees at the subject crossing in the same manner as required for false activations (§ 234.107).

Application:

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 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.

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 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 § 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. A warning system malfunction is defined in § 234.5 as an activation failure, a partial activation, or a false activation of a highway-rail grade crossing warning system.

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.

**Note:** The appropriately equipped flagger requirements are very narrow in scope in that only in the event the flagger(s) is being used as alternative warning to allow train movement through the crossing at normal speed do the appropriately equipped provisions apply.

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 § 234.105, “Activation failure.”

At crossings where it has been determined that the warning system is not functioning as intended, § 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. (*See Technical Bulletin S-96-08.*)

#### CLASSIFICATION OF DEFECTS

- 234.106.A1 Train crew or other railroads operating over crossing not notified of partial activation prior to arrival of train at crossing.
- 234.106.B1 Law enforcement agency having jurisdiction or railroad police not promptly notified of partial activation.
- 234.106.C1 Alternative means of actively warning highway users not provided at crossing where credible report indicates partial activation has occurred.
- 234.106.C2 Train passed over crossing at a speed exceeding 15 mph without alternative means of warning being provided by the required number of appropriately equipped flaggers, a uniformed law enforcement officer, or a uniformed railroad police officer.
- 234.106.C3 Crewmember not on the ground at the crossing to flag train through the crossing in a shoving movement.
- 234.106.C4 Flagger not equipped with required vest, shirt, or jacket.
- 234.106.C5 Flagger not equipped with required flagging equipment.
- 234.106.C6 Warning system taken out of service without complying with the requirements of § 234.105.
- 234.106.D1 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.**

Upon receipt of a credible report of a false activation, a railroad having maintenance responsibility for the highway-rail grade crossing warning system shall promptly initiate efforts to warn highway users and railroad employees at the crossing by taking the following actions:

- (a) Prior to a train’s arrival at the crossing, notify the train crew of the report of false activation and notify any other railroads operating over the crossing;
- (b) Notify the law enforcement agency having jurisdiction over the crossing, or railroad police capable of responding and controlling vehicular traffic; and
- (c) Provide for alternative means of actively warning highway users of approaching trains, consistent with the following requirements (see Appendix B for a summary chart of alternative means of warning):

(1)(i) If an appropriately equipped flagger is providing warning for each direction of highway traffic, trains may proceed through the crossing at normal speed.



(ii) If at least one uniformed law enforcement officer (including a railroad police officer) provides warning to highway traffic at the crossing, trains may proceed through the crossing at normal speed.

(2) If there is not an appropriately equipped flagger providing warning for each direction of highway traffic, or if there is not at least one uniformed law enforcement officer providing warning, trains with the locomotive or cab car leading, may proceed with caution through the crossing at a speed not exceeding 15 miles per hour. Normal speed may be resumed after the locomotive has passed through the crossing. In the case of a shoving move, a crewmember shall be on the ground to flag the train through the crossing.

(3) In lieu of complying with paragraphs (c)(1) or (2) of this section, a railroad may temporarily take the warning system out of service if the railroad complies with all requirements of § 234.105, “Activation failure.”

(d) A locomotive’s audible warning device shall be activated in accordance with railroad rules regarding the approach to a grade crossing.

#### Application:

This section requires that a railroad having maintenance responsibility for a warning system take prompt action to provide alternative means of warning for 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.

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 § 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. A warning system malfunction is defined in § 234.5 as an activation failure, a partial activation, or a false activation of a highway-rail grade crossing warning system.

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.

**Note:** The appropriately equipped flagger requirements are very narrow in scope in that only in the event the flagger(s) is being used as alternative warning to allow train movement through the crossing at normal speed do the appropriately equipped provisions apply.

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 § 234.105, “Activation failure.”

At crossings where it has been determined that the warning system is not functioning as intended, § 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. (*See Technical Bulletin S-96-08.*)

#### CLASSIFICATION OF DEFECTS

- 234.107.A1 Train crew or other railroads operating over crossing not notified of false activation prior to arrival of train at crossing.
- 234.107.B1 Law enforcement agency having jurisdiction or railroad police not promptly notified of false activation.
- 234.107.C1 Alternative means of actively warning highway users not provided at crossing where credible report indicates false activation has occurred.
- 234.107.C2 Train passed over crossing at a speed exceeding 15 mph without alternative means of warning being provided by the required number of appropriately equipped flaggers, a uniformed law enforcement officer, or a uniformed railroad police officer.
- 234.107.C3 Crewmember not on the ground at the crossing to flag train through the crossing in a shoving movement.
- 234.107.C4 Flagger not equipped with required vest, shirt, or jacket.
- 234.107.C5 Flagger not equipped with required flagging equipment.
- 234.107.C6 Warning system taken out of service without complying with the requirements of § 234.105.
- 234.107.D1 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.

## **§ 234.109 Recordkeeping.**

(a) Each railroad shall keep records pertaining to compliance with this subpart. Records may be kept on forms provided by the railroad or by electronic means. Each railroad shall keep the following information for each credible report of warning system malfunction:

- (1) Location of crossing (by highway name and DOT/AAR Crossing Inventory Number);
- (2) Time and date of receipt by railroad of report of malfunction;
- (3) Actions taken by railroad prior to repair and reactivation of repaired system; and
- (4) Time and date of repair.

(b) Each railroad shall retain for at least one year (from the latest date of railroad activity in response to a credible report of malfunction) all records referred to in paragraph (a) of this section. Records required to be kept shall be made available to FRA as provided by 49 U.S.C. 20107 (formerly 208 of the Federal Railroad Safety Act of 1970 (45 U.S.C. 437)).

### Application:

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.

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 U.S. Department of Transportation (DOT)/Association of American Railroads (AAR) crossing inventory number).
2. Time and date that the railroad received the report.
3. Action taken by railroad to comply with §§ 234.105, 234.106, or 234.107; (i.e., the appropriate train crews being notified, Stop and Flag order issued, proceed with caution maximum speed 15 mph order issued, flaggers at crossing, appropriate law enforcement notified, etc.).
4. Time and date of action taken to make final repair or correction (explanation of the type of 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 (i.e., an activation failure, a partial activation, or a false activation) 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.A1 Record not kept of credible report of malfunctioning highway-rail grade crossing warning system.
- 234.109.A2 Record of credible report of malfunctioning highway-rail grade crossing warning system not complete.
- 234.109.A3 Record of credible report of malfunctioning highway-rail grade crossing warning system not correct.
- 234.109.B1 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.
- 234.109.B2 Record of credible report of malfunctioning highway-rail grade crossing warning system not made available to FRA for inspection or replication.

### **Subpart D – Maintenance, Inspection, and Testing**

#### ***Maintenance Standards***

#### **§ 234.201 Location of plans.**

Plans required for proper maintenance and testing shall be kept at each highway-rail grade crossing warning system location. Plans shall be legible and correct.

#### **Application:**

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.

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

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

While manufacturer's manuals are not required by this section, specific information necessary for the installation setup, inspection, maintenance, testing, and repair of the train detection equipment shall be included on the plans or otherwise kept at the location.

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.

## CLASSIFICATION OF DEFECTS

- 234.201.A1 Plans not kept at crossing location.

234.201.A2 Plans not legible.

234.201.A3 Plans not correct.

### **§ 234.203 Control circuits.**

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

#### Application:

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.

This section includes all train detection track circuits and control circuits through which a highway-rail grade crossing warning system is activated. The 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. An example of noncompliance would be a fouling circuit on a switch turnout that extends into the crossing island.

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

### CLASSIFICATION OF DEFECTS

234.203.A1 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.**

Operating characteristics of electromagnetic, electronic, or electrical apparatus of each highway-rail crossing warning system shall be maintained in accordance with the limits within which the system is designed to operate.

#### Application:

This section requires the operating characteristics of electromagnetic, 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.

Sections 234.247 through 234.271 of this part address those devices that are 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:

- Pick-up value too high
- Pick-up value too low
- Release value too high
- 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:

- Electronic train detection devices.
- Hold-clear devices in gate mechanisms.

#### CLASSIFICATION OF DEFECTS

234.205.A1 Pick-up value of electromagnetic device not in accordance with the limits within which it is designed to operate.

234.205.A2 Drop-away value of electromagnetic device not in accordance with the limits within which it is designed to operate.

234.205.A3 Working values of electromagnetic, electronic, or electrical device not in accordance with the limits within which the apparatus is designed to operate.

234.205.A4 Operating characteristics of other electromagnetic, electronic, or electrical device not within prescribed limits.

234.205.A5 Operating characteristics of electromagnetic, electronic, or electrical device not maintained in proper operation.

#### **§ 234.207 Adjustment, repair, or replacement of component.**

(a) When any essential component of a highway-rail grade crossing warning system fails to perform its intended function, the cause shall be determined and the faulty component adjusted, repaired, or replaced without undue delay.

(b) Until repair of an essential component is completed, a railroad shall take appropriate action under § 234.105, “Activation failure,” § 234.106, Partial activation, or § 234.107, “False activation,” of this part.

Application:

This section requires a railroad to determine the cause of a highway-rail grade crossing 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; 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 §§ 234.105, 234.106, or 234.107.

A highway-rail grade crossing active 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 §§ 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 promptly 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. (*See Technical Bulletin S-96-08*)

#### CLASSIFICATION OF DEFECTS

- 234.207.A1 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.A2 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.A3 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.A4 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.B1 Train operation not in compliance with the applicable §§ 234.105, 234.106, or 234.107 until corrective action is completed.

**§ 234.209 Interference with normal functioning of system.**

(a) The normal functioning of any system shall not be interfered with in testing or otherwise without first taking measures to provide for safety of highway traffic that depends on normal functioning of such system.

(b) Interference includes, but is not limited to:

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

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

Application:

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.

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 that 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 while 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 overrides 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 §§ 234.105, 234.106, and 234.107 of this part.

### CLASSIFICATION OF DEFECTS

234.209.A1 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.**

Highway-rail grade crossing warning system apparatus shall be secured against unauthorized entry.

#### Application:

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

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.A1 Warning system instrument case not secured against unauthorized entry.

234.211.A2 Other component housing not secured against unauthorized entry.

### **§ 234.213 Grounds.**

Each circuit that affects the proper functioning of a highway-rail grade crossing warning system shall be kept free of any ground or combination of grounds that will permit a current flow of 75 percent or more of the release value of any relay or electromagnetic device in the circuit. This requirement does not apply to: circuits that include track rail; alternating current power

distribution circuits that are grounded in the interest of safety; and common return wires of grounded common return single break circuits.

Application:

This section requires that circuits that 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.

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. 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.

Alternating current (AC) power shall be interrupted during tests in order to check AC lighting circuits having direct current (DC) standby. (*See Technical Bulletin S-99-03*)

CLASSIFICATION OF DEFECTS

234.213.A1     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 the circuit.

**§ 234.215 Standby power system.**

A standby source of power shall be provided with sufficient capacity 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 required by § 234.201 of this part.

Application:

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 § 234.201.

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 certain 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 § 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 § 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.A1 Standby power source not provided.
- 234.215.A2 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.A3 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.

234.215.A4 Designated capacity of standby power source not specified on plans.

**§ 234.217 Flashing light unit.**

(a) Each flashing light unit shall be properly positioned and aligned and shall be visible to a highway user approaching the crossing.

(b) 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.

(c) All light units shall flash alternately. The number of flashes per minute for each light unit shall be 35 minimum and 65 maximum.

Application:

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.

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 judgment of the signal maintainer if that individual is acting in a manner consistent with established railroad policy or practice.

CLASSIFICATION OF DEFECTS

234.217.A1 Flashing light not visible to approaching highway user.

234.217.B1 Flashing light unit not maintained to prevent dust or moisture from entering the unit.

234.217.B2 Roundels or reflectors not maintained in good condition.

234.217.C1 Flashing lights do not flash alternately.

234.217.C2 Flash rate less than 35 times per minute.

234.217.C3 Flash rate more than 65 times per minute.

**§ 234.219 Gate arm lights and light cables.**

Each gate arm light shall be maintained in such condition to be properly visible to approaching highway users. Lights and light wire shall be secured to the gate arm.

Application:

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

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.A1 Gate arm light burned out or missing.
- 234.219.A2 Gate arm light unit defective, not visible, or missing.
- 234.219.A3 Light unit not securely fastened to gate arm.
- 234.219.A4 Light wires not securely fastened to gate arm.
- 234.219.A5 Gate arm light unit not maintained per design specifications.

#### **§ 234.221 Lamp Voltage.**

The voltage at each lamp shall be maintained at not less than 85 percent of the prescribed rating for the lamp.

#### Application:

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

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. See § 234.253 for testing procedures for flashing light units. (*See Technical Bulletin S-96-07*)

#### CLASSIFICATION OF DEFECTS

- 234.221.A1 Lamp voltage on primary power less than 85 percent of prescribed lamp rating.
- 234.221.A2 Lamp voltage on standby power less than 85 percent of prescribed lamp rating.

## **§ 234.223 Gate Arm.**

Each gate arm, when in the downward position, shall extend across each lane of approaching highway traffic and shall 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 three seconds after flashing lights begin to operate and shall assume the horizontal position at least five seconds before the arrival of any normal train movement through the crossing. At those crossings equipped with four quadrant gates, the timing requirements of this section apply to entrance gates only.

### Application:

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.

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 circuit 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 Manual on Uniform Traffic Control Devices (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.A1 When horizontal, gate arm does not sufficiently extend across each lane of approaching highway traffic.
- 234.223.A2 Gate arm not maintained in a condition to be clearly viewed by approaching highway users.
- 234.223.A3 Gate arm starts its downward motion less than 3 seconds after flashing lights begin to operate.

234.223.A4 Gate arm not in horizontal position at least 5 seconds (when required) prior to arrival of a train at the crossing.

234.223.A5 Gate arm not in horizontal position.

234.223.A6 Gate arm broken or missing.

#### **§ 234.225 Activation of warning system.**

A highway-rail grade crossing warning system shall 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 trains before the grade crossing is occupied by rail traffic.

##### Application:

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.

Both the intended warning time and 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 in a safe manner 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. (*See Technical Bulletin S-08-02*)

Note: Defect 234.225.A1 applies to instances where the system warning time differs significantly from the designed warning time.

#### CLASSIFICATION OF DEFECTS

234.225.A1 Crossing warning time not in accordance with the design of the warning system.

234.225.A2 Crossing warning system does not provide at least 20 seconds warning time.

#### **§ 234.227 Train detection apparatus.**

(a) Train detection apparatus shall be maintained to detect a train or railcar in any part of a train detection circuit, in accordance with the design of the warning system.

(b) If the presence of sand, rust, dirt, grease, or other foreign matter is known to prevent effective shunting, a railroad shall take appropriate action under § 234.105, “Activation failure,” to safeguard highway users.

Application:

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 § 234.105. The alternative protection provided by § 234.105 is meant to be a temporary measure since conditions affecting effective shunting must be corrected without undue delay as required by § 234.207.

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 devices or constant warning time devices, 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.A1 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.B1 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 train detection circuit when occupied by a train, locomotive, or car.

**§ 234.229 Shunting sensitivity.**

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

Application:

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.



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, 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 devices or constant warning time devices, 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.A1 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.**

Each set of fouling wires in a highway-rail grade crossing train detection circuit shall consist of at least two discrete conductors. Each conductor shall be of sufficient conductivity and shall be maintained in such condition to ensure proper operation of the train detection apparatus when the train detection circuit is shunted. Installation of a single duplex wire with single plug acting as fouling wires is prohibited. Existing installations having single duplex wires with a single plug for fouling wires may be continued in use until they require repair or replacement.

#### Application:

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 § 234.227.

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.A1 Fouling wires do not consist of at least two discrete conductors.
- 234.231.A2 Fouling wires not of sufficient conductivity to detect occupancy when train detection circuit is shunted.
- 234.231.A3 Fouling wires not maintained in such condition to detect occupancy when train detection circuit is shunted.

#### **§ 234.233 Rail joints.**

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

##### Application:

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.A1 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.**

Each insulated rail joint used to separate train detection circuits of a highway-rail grade crossing warning system shall be maintained to prevent current from flowing between rails separated by the insulation in an amount sufficient to cause a failure of the train detection circuit.

##### Application:

This section requires that each insulated rail joint used in train detection circuits of a highway-rail grade crossing warning system 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.A1 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.A2 Insulation in insulated rail joint in bad condition.

### **§ 234.237 Reverse switch cut-out circuit.**

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

#### Application:

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.

Tests shall be made by placing an 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 the 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.A1 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.A2 Contact opening of switch circuit controller contact less than one-sixteenth inch.
- 234.237.A3 Switch circuit controller not securely fastened in place.
- 234.237.A4 Switch circuit controller connections not securely fastened.

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

Each wire shall 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 the apparatus. This requirement 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. The local wiring on a solid state crossing controller rack does not require tags if the wiring is an integral part of the solid state equipment.

#### Application:

This section requires that each wire be tagged or otherwise 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.

This section 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 noncompliance.

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.A1 Wire not tagged or otherwise marked so that it can be identified at terminal.
- 234.239.A2 Nomenclature of tag or wire identification does not correspond to that of the circuit plan.
- 234.239.A3 Tag interferes with moving parts of apparatus.
- 234.239.A4 Wire interferes with moving parts of apparatus.
- 234.239.A5 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.**

Insulated wire shall 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:

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.

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.A1 Insulated wire not protected from mechanical injury.
- 234.241.A2 Insulation of insulated wire punctured for test purposes.
- 234.241.A3 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.**

Wire on a pole line shall be securely attached to an insulator that is properly fastened to a cross arm or bracket supported by a pole or other support. Wire shall not interfere with, or be interfered with by, other wires on the pole line. Aerial cable shall be supported by messenger wire. An open-wire transmission line operating at voltage of 750 volts or more shall be placed not less than 4 feet above the nearest cross arm carrying active warning system circuits.

#### Application:

This section requires that all wires be securely tied 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.

This section 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.A1 Wire carried on pole line not securely tied on insulator.
- 234.243.A2 Wire not secured because of broken, missing, or burnt pole.
- 234.243.A3 Wire not secured because of broken, missing, or burnt crossarm.
- 234.243.A4 Wire interferes with or is interfered with by another wire.
- 234.243.A5 Cable used aerially not supported on insulators or by messenger.
- 234.243.A6 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.**

Each sign mounted on a highway-rail grade crossing signal post shall be maintained in good condition and be visible to the highway user.

### Application:

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.

This section applies to any sign that is attached to a signal pole located at a highway-rail grade crossing and is associated with warning highway motorists. (*See Technical Bulletin S-96-09*)

### CLASSIFICATION OF DEFECTS

234.245.A1 Sign not clearly visible to highway user.

234.245.A2 Sign not in good condition.

234.245.A3 Sign missing or not secure.

### ***Inspections and Tests***

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

(a) The inspections and tests set forth in §§ 234.249 through 234.271 are required at highway-rail grade crossings 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.

(b) If a railroad elects not to comply with the requirements of §§ 234.249 through 234.271 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.

(c) 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:

This section requires that the inspections and tests set forth in §§ 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.

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 are 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.A1 Required inspections and tests not made on highway-rail grade crossing located on in-service track.
- 234.247.B1 Required inspections and tests not made on highway-rail grade crossing located on track temporarily out of service with railroad operations suspended, prior to operations resuming.
- 234.247.C1 Electronic device, relay, or other electromagnetic device that fails to meet the requirements of specified tests not removed from service.
- 234.247.C2 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.**

A test for grounds on each energy bus furnishing power to circuits that affect the safety of warning system operation shall be made when such energy bus is placed in service and at least once each month thereafter.

#### Application:

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.

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.

Tests 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 the ground, a current reading shall be taken to determine whether the ground is in excess of that permitted by § 234.213. In no case shall a reading be taken when a train is approaching closely or passing, nor shall a meter connected between an energy bus and the 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. *(See Technical Bulletin S-99-03)*

#### CLASSIFICATION OF DEFECTS

234.249.A1 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.

#### **§ 234.251 Standby Power**

Standby power shall be tested at least once each month.

#### Application:

This section requires that standby power be tested at least once each month to determine its capability to operate the warning system in instances of primary power interruption. *(See Technical Bulletin S-04-01)*

#### CLASSIFICATION OF DEFECTS

234.251.A1 Standby power not tested at least once each month.

#### **§ 234.253 Flashing light units and lamp voltage.**

(a) Each flashing light unit shall be inspected when installed and at least once every twelve months for proper alignment and frequency of flashes in accordance with installation specifications.

(b) Lamp voltage shall be tested when installed and at least once every 12 months thereafter.

(c) Each flashing light unit shall be inspected for proper visibility, dirt, and damage to roundels and reflectors at least once each month.



### Application:

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, dirt, and damage to roundels and reflectors at least once each month. A visual external inspection of the flashing light unit is an acceptable means of compliance.

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 § 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 § 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 no less than 2 minutes and not more than 5 minutes before lamp voltage readings are taken.

### CLASSIFICATION OF DEFECTS

- 234.253.A1 Each flashing light unit not inspected for alignment and frequency of flashes when installed and at least once every 12 months thereafter.
- 234.253.B1 Lamp voltage not tested when system is installed and at least once every 12 months thereafter.
- 234.253.C1 Each flashing light unit not inspected for proper visibility, dirt, and damage to roundels and reflectors at least once each month.

### **§ 234.255 Gate arm and gate mechanism.**

- (a) Each gate arm and gate mechanism shall be inspected at least once each month.
- (b) Gate arm movement shall be observed for proper operation at least once each month.
- (c) Hold-clear devices shall be tested for proper operation at least once every 12 months.

### Application:

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

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.A1 Gate arm and gate mechanism not inspected at least once each month.

234.255.B1 Gate arm movement not observed for proper operation at least once each month.

234.255.C1 Hold-clear device not tested for proper operation at least once every 12 months.

#### **§ 234.257 Warning system operation.**

(a) Each highway-rail crossing warning system shall be tested to determine that it functions as intended when it is placed in service. Thereafter, it shall be tested at least once each month and whenever modified or disarranged.

(b) Warning bells or other stationary audible warning devices shall be tested when installed to determine that they function as intended. Thereafter, they shall be tested at least once each month and whenever modified or disarranged.

#### Application:

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.

“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. (*See Technical Bulletin S-96-10*)

#### CLASSIFICATION OF DEFECTS

234.257.A1 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.A2 Highway-rail grade crossing warning system not tested at least once each month to determine that it functions as intended.

234.257.B1 Warning bell or other stationary audible warning device not tested when placed in service or when modified or disarranged.

234.257.B2 Warning bell or other stationary audible warning device not tested at least once each month.

### **§ 234.259 Warning time.**

Each crossing warning system shall 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. Electronic devices that accurately determine actual warning time may be used in performing such tests.

#### Application:

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.

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 mph to feet per second. The resulting feet per second train speed would then be multiplied by the number of seconds of the prescribed warning time. This product would then represent a point, in feet, of 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. *(See Technical Bulletin S-08-02)*

### CLASSIFICATION OF DEFECTS

234.259.A1 Crossing warning system not tested for the prescribed warning time at least once every 12 months.

234.259.A2 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.**

Highway traffic signal pre-emption interconnections, for which a railroad has maintenance responsibility, shall be tested at least once each month.

#### Application:

This section requires that highway traffic signal pre-emption interconnections, for which a railroad has maintenance responsibility, be tested at least once each month. (*See Technical Bulletin S-04-01*)

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.A1 Highway traffic signal pre-emption interconnections, for which a railroad has maintenance responsibility, not tested at least once each month.

### **§ 234.263 Relays.**

(a) Except as stated in paragraph (b) of this section, each relay that affects the proper functioning of a crossing warning system shall be tested at least once every four years.

(b)(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 two years.

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

(c) Testing of relays requiring testing on four year intervals shall be completed in accordance with the following schedule:

(1) Not less than 50% by the end of calendar year 1996;

(2) Not less than a total of 75% by the end of calendar year 1997; and

(3) One hundred percent by the end of calendar year 1998.

(d) Testing of relays requiring testing on two year intervals shall be completed by the end of calendar year 1996.

### Application:

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, 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.

This section applies to in-service relays used in vital circuits of highway-rail grade crossing warning systems. Such relays include power off (POR) or power transfer relays (PTR), and flasher relays (FLR). It 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 considered properly maintained and is prohibited.

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

#### CLASSIFICATION OF DEFECTS

- 234.263.A1 Tests of relay in service not made at least once every 4 years.
- 234.263.B1 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.B2 Tests of AC centrifugal type relay in service not made at least once every 12 months.

#### **§ 234.265 Timing relays and timing devices.**

Each timing relay and timing device shall be tested at least once every twelve 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. 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.

#### Application:

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.

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.A1 Timing relay or timing device not tested at least once every 12 months.
- 234.265.A2 Timing of timing relay or timing device less than 90 percent of predetermined time interval.
- 234.265.A3 Timing of timing relay or timing device more than 110 percent of predetermined time interval.

234.265.A4 Predetermined time interval not shown on plans or marked on timing relay or timing device.

**§ 234.267 Insulation resistance tests.**

(a) Insulation resistance tests shall be made when wires or cables are installed and at least once every ten years thereafter.

(b) Insulation resistance tests shall be made between all conductors and ground, between conductors in each multiple conductor cable, and between conductors in trunking. Insulation resistance tests shall be performed when wires, cables, and insulation are dry.

(c) Subject to paragraph (d) of this section, when insulation resistance of wire or cable is found to be less than 500,000 ohms, prompt action shall be taken to repair or replace the defective wire or cable. Until such defective wire or cable is replaced, insulation resistance tests shall be made annually.

(d) A circuit with a conductor having an insulation resistance of less than 200,000 ohms shall not be used.

(e) Required insulation resistance testing that does not conform to the required testing schedule of this section shall be completed in accordance with the following schedule:

- (1) Not less than 50% by the end of calendar year 1996;
- (2) Not less than a total of 75% by the end of calendar year 1997; and
- (3) One hundred percent by the end of calendar year 1998.

Application:

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

Insulation resistance tests shall be made between all conductors and the 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 the acquisition of cable or scheduling of workforces. 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.A1 Tests of insulation resistance not made when installed, or at least once every 10 years thereafter.

234.267.B1 Tests of insulation resistance not made between all conductors and the ground, and between all conductors one to another.

- 234.267.C1 Action not taken to promptly repair or renew conductor having insulation resistance value less than 500,000 ohms.
- 234.267.C2 Tests of insulation resistance not made at least annually of a conductor having insulation resistance value less than 500,000 ohms.
- 234.267.D1 Circuit permitted to function on a conductor having insulation resistance value less than 200,000 ohms.

#### **§ 234.269 Cut-out circuits.**

Each cut-out circuit shall be tested at least once every three months to determine that the circuit functions as intended. For purposes of this section, a cut-out circuit is any circuit which overrides the operation of automatic warning systems. This includes both switch cut-out circuits and devices which enable personnel to manually override the operation of automatic warning systems.

##### Application:

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

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 that 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.A1 Cut-out circuit not tested at least once every 3 months.

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

Insulated rail joints, bond wires, and track connections shall be inspected at least once every three months.

##### Application:

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

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

Each bond wire shall be inspected at least once every 3 months for compliance with § 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.A1 Insulated rail joint, bond wire, or track connection not inspected at least once every 3 months.

### **§ 234.273 Results of inspections and tests.**

(a) Results of inspections and tests made in compliance with this part shall 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, AAR/DOT inventory number, place and date, equipment tested, results of tests, repairs, replacements, adjustments made, and condition in which the apparatus was left.

(b) 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. Records required to be kept shall be made available to FRA as provided by 49 U.S.C. 20107 (formerly § 208 of the Federal Railroad Safety Act of 1970 (45 U.S.C. 437)).

(c) 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:

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 Railroad Safety. Each record shall show the name of the railroad, AAR/DOT 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 no less than one year from the date of the test.

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

FRA requires that railroads adopting electronic means of recording results of inspections and tests first obtain FRA approval through an application process. Requiring FRA approval will establish a process whereby FRA can ensure all the proper information (prescribed in paragraph (a)) is recorded. FRA will also be able to determine where and how the electronic records will be available for inspection.

Any railroad wanting to implement electronic recordkeeping is required to obtain approval from FRA's Associate Administrator for Railroad Safety. This process consists of a railroad submitting the following information to FRA's Signal and Train Control Division Staff Director:

1. A written action plan with a schedule for the implementation of the system.



2. A copy of each of the recordkeeping forms indicating how the results of all the applicable inspections or tests will be electronically recorded.
3. A copy of the instructional or procedural manual for the use of the system.
4. A written description of how FRA is expected and able to inspect the records.
5. A written description of the training program concerning employee's use of the recordkeeping system.

FRA will then review the materials and subsequently notify the railroad of the result of our approval process.

Electronic or automated tracking systems used to meet the requirements contained in paragraph (a) of this section must be capable of being reviewed and monitored by FRA at any time to ensure the integrity of the system. FRA's Associate Administrator for Railroad Safety may prohibit or revoke a railroad's authority to use an electronic or automated tracking system in lieu of preprinted forms if FRA finds that the electronic or automated tracking system is not properly secured; is inaccessible to FRA or FRA-certified State inspectors, or to railroad employees requiring access to discharge their assigned duties; or fails to adequately track and monitor the equipment. The Associate Administrator for Railroad Safety will provide the affected railroad with a written statement of the basis for his or her decision prohibiting or revoking the railroad from using an electronic or automated tracking system. *(See Technical Bulletin S-99-06)*

#### CLASSIFICATION OF DEFECTS

- 234.273.A1 Record of the results of inspections and tests not made.
- 234.273.A2 Results of the results of inspections and tests not recorded on prescribed form or by electronic means.
- 234.273.A3 Record of the results of inspection and test does not show name of railroad, DOT inventory number, place and date, equipment tested, results of tests, repairs, replacements, adjustments made, and condition in which apparatus was left.
- 234.273.B1 Record of the results of inspection and test not signed or electronically coded by employee making the test.
- 234.273.B2 Record of the results of inspection and test not filed in the office of a supervisory official having jurisdiction.
- 234.273.B3 Record of the results of inspections and tests not readily available for FRA inspection.
- 234.273.C1 Record of the results of inspections and tests not retained as required.

#### ***Requirements for Processor-Based Systems***

#### **§ 234.275 Processor-Based Systems.**

*(a) Applicable definitions.* The definitions in § 236.903 of this chapter shall apply to this section, where applicable.

(b) *Use of performance standard authorized or required.* (1) In lieu of compliance with the requirements of this subpart, a railroad may elect to qualify an existing processor-based product under part 236, subparts H or I of this chapter.

(2) Highway-rail grade crossing warning systems, subsystems, or components that are processor-based and that are first placed in service after June 6, 2005, which contain new or novel technology, or which provide safety-critical data to a railroad signal or train control system that is governed by part 236, subpart H or I of this chapter, shall also comply with those requirements. New or novel technology refers to a technology not previously recognized for use as of March 7, 2005.

(3) Products designed in accordance with subparts A through D of this part, which are not in service but are in the developmental stage prior to December 5, 2005 (or for which a request for exclusion was submitted prior to June 6, 2005, pursuant to § 236.911 of this chapter), may be excluded from the requirements of part 236, subpart H of this chapter upon notification to FRA by March 6, 2006, if placed in service by December 5, 2008 (or March 7, 2008 for those products for which a request for exclusion was submitted to FRA prior to June 6, 2005). Railroads may continue to implement and use these products and components from these existing products. A railroad may at any time elect to have products that are excluded made subject to 49 CFR part 236, subpart H, by submitting a Product Safety Plan as prescribed in § 236.913 of this chapter and otherwise complying with part 236, subpart H of this chapter.

(c) *Product safety plan justifications.* The Product Safety Plan in accordance with 49 CFR 236.907 – or a PTC Development Plan and PTC Safety Plan required to be filed in accordance with 49 CFR 236.1013 and 236.1015 – must explain how the performance objective sought to be addressed by each of the particular requirements of this subpart is met by the product, why the objective is not relevant to the product's design, or how safety requirements are satisfied using alternative means. Deviation from those particular requirements is authorized if an adequate explanation is provided, making reference to relevant elements of the applicable plan, and if the product satisfies the performance standard set forth in § 236.909 of this chapter. (See § 236.907(a)(14) of this chapter.)

(d) *Specific requirements.* The following exclusions from the latitude provided by this section apply:

(1) Nothing in this section authorizes deviation from applicable design requirements for automated warning devices at highway-rail grade crossings in the Manual on Uniform Traffic Control Devices (MUTCD), 2000 Millennium Edition, Federal Highway Administration (FHWA), dated December 18, 2000, including Errata #1 to MUTCD 2000 Millennium Edition dated June 14, 2001 (<http://mutcd.fhwa.dot.gov/>).

(2) Nothing in this section authorizes deviation from the following requirements of this subpart:

- (i) § 234.207(b) (Adjustment, repair, or replacement of a component);
- (ii) § 234.209(b) (Interference with normal functioning of system);
- (iii) § 234.211 (Security of warning system apparatus);
- (iv) § 234.217 (Flashing light units);
- (v) § 234.219 (Gate arm lights and light cable);
- (vi) § 234.221 (Lamp voltage);
- (vii) § 234.223 (Gate arm);
- (viii) § 234.225 (Activation of warning system);
- (ix) § 234.227 (Train detection apparatus)—if a train detection circuit is employed to determine the train's presence;
- (x) § 234.229 (Shunting sensitivity)—if a conventional track circuit is employed;
- (xi) § 234.231 (Fouling wires)—if a conventional train detection circuit is employed;

- (xii) § 234.233 (Rail joints)—if a track circuit is employed;
- (xiii) § 234.235 (Insulated rail joints)—if a track circuit is employed;
- (xiv) § 234.237 (Reverse switch cut-out circuit); or
- (xv) § 234.245 (Signs).

(e) *Separate justification for other than fail-safe design.* Deviation from the requirement of § 234.203 (Control Circuits) that circuits be designed on a fail-safe principle must be separately justified at the component, subsystem, and system level using the criteria of § 236.909 of this chapter.

(f) *Software management control for certain systems not subject to a performance standard.* Any processor-based system, subsystem, or component subject to this part, which is not subject to the requirements of part 236, subpart H or I of this chapter but which provides safety-critical data to a signal or train control system shall be included in the software management control plan requirements as specified in § 236.18 of this chapter.

#### Application:

This section contains standards applicable to highway-rail grade crossing active warning systems that use new or novel technology. This section is equally applicable to all highway-rail grade crossing warning systems that provide safety-critical data to a product subject to the provisions of Part 236, Subpart H or I. The provisions contained in this section are relevant only to Part 234, Subpart D.

Definitions contained in §§ 236.903 and 236.1003 are applicable, as appropriate, to equipment and systems subject to this section.

New or novel technology refers to a technology not previously recognized for use in highway-rail grade crossing warning systems prior to March 7, 2005. Some examples of new or novel technology captured by the provisions of this section are systems envisioned by the Intelligent Transportation System (ITS) where data is transmitted to and integrated with highway traffic control/information systems, systems that do not use conventional track circuits for train detection, and systems that may use data transmitted from approaching trains to warn motor vehicle operators of their approach to or occupancy of a crossing.

Processor-based equipment and systems in service on or before June 6, 2005, and not interconnected with a signal and train control system, may continue to be installed and utilized subject to all other requirements of Part 234.

There are two ways existing systems excluded by design and implementation may become subject to the provisions of this section: (1) a railroad may elect to qualify an existing product under Subpart H; or (2) installation of a signal and train control system subject to the provisions of Part 236, Subpart H or I, in which existing highway-rail grade crossing warning systems are modified to provide safety-critical data to that newly installed system (e.g., pre-start warnings for higher train speeds).

Highway-rail grade crossing warning systems subject to this section must be developed in accordance with either a Product Safety Plan (PSP) meeting the definition identified in § 236.903, or a Positive Train Control (PTC) Development Plan (PTCDP) or PTC Safety Plan (PTCSP) meeting the definition identified in § 236.1003. Additionally, the PSP, or PTCDP or PTCSP must explain how the performance objective sought to be addressed by each of the

particular requirements of Part 234 is met by the product, why the objective is not relevant, or how safety requirements are satisfied by alternative means. This section provides for deviation from those particular requirements of Part 234 if an adequate explanation is provided, making reference to relevant elements of the applicable plan, and if the product satisfies the performance standard prescribed in § 236.909.

Processor-based equipment used in highway-rail grade crossing warning systems which provide safety-critical data to a railroad signal or train control system are required to be included in the software management control plan prescribed in § 236.18.

Nothing in this section authorizes deviation from applicable design requirements for automated warning devices at highway-rail grade crossings in the MUTCD, 2000 Millennium Edition, FHWA, dated December 18, 2000, including Errata #1 to MUTCD 2000 Millennium Edition, dated June 14, 2001.

Further, nothing in this section authorizes deviation from the following requirements of Subpart D:

- § 234.207(b) Adjustment, repair, or replacement of a component.
- § 234.209(b) Interference with normal functioning of a system.
- § 234.211 Security of warning system apparatus.
- § 234.217 Flashing light units.
- § 234.219 Gate arm lights and light cable.
- § 234.221 Lamp voltage.
- § 234.223 Gate arm.
- § 234.225 Activation of the warning system.
- § 234.227 Train detection apparatus—if a train detection circuit is employed to determine the train's presence.
- § 234.229 Shunting sensitivity—if a conventional track circuit is employed.
- § 234.231 Fouling wires—if a conventional train detection circuit is employed.
- § 234.233 Rail joints—if a track circuit is employed.
- § 234.235 Insulated rail joints—if a track circuit is employed.
- § 234.237 Reverse switch cut-out circuit.
- § 234.245 Signs.

This section does authorize deviation from the requirements of § 234.203 (Control circuits) requiring that circuits be designed on a fail-safe principle provided the deviation is separately justified at the component, subsystem, and system level using the criteria set forth in § 236.909.

Any processor-based system, subsystem, or component subject to this part, which is not subject to the requirements of Part 236, Subpart H or I of this chapter, but which provides safety-critical data to a signal or train control system, shall be included in the software management control plan requirements as specified in § 236.18 of this chapter. (*See Technical Bulletins S-06-01 and S-07-01*)

## CLASSIFICATION OF DEFECTS

- 234.275.A1 Definition contained in §§ 236.903 or 236.1003, where applicable, not applied to processor-based highway-rail grade crossing active warning system using new or novel technology.
- 234.275.A2 Definition contained in §§ 236.903 or 236.1003, where applicable, not applied to processor-based highway-rail grade crossing active warning system providing safety-critical data to a product governed by Part 236, Subpart H or I.
- 234.275.A3 Definition used for product subject to this section does not comply with the definition contained in §§ 236.903 or 236.1003.
- 234.275.B1 Highway-rail grade crossing active warning system using new or novel technology does not comply with requirements contained in Part 236, Subpart H or I.
- 234.275.B2 Highway-rail grade crossing active warning system which provides safety-critical data to a railroad signal or train control system does not comply with requirements contained in § 236.18.
- 234.275.C1 Highway-rail grade crossing active warning system using new or novel technology implemented without an FRA-approved PSP, or PTCDP or PTCSP as applicable.
- 234.275.D1 Highway-rail grade crossing warning system does not comply with applicable design requirements of the Manual on Uniform Traffic Control Devices.
- 234.275.E1 Deviation from the requirements of § 234.203 not separately justified at the component, subsystem, and/or system level.
- 234.275.E2 Justification for deviation from the requirements of § 234.203 does not conform to the criteria of § 236.909.
- 234.275.F1 Software management control plan not implemented for highway-rail grade crossing warning system which provides safety-critical data to a railroad signal or train control system as required by § 236.18.

**Alternate Means of Warning**  
**Under 49 CFR §§ 234.105(c), 234.106, and 234.107(c)**  
**This is a summary—See body of text for complete requirements**

	<b>Flagger For Each Direction of Traffic</b>	<b>Police Officer Present</b>	<b>Flagger Present, But Not One For Each</b>	<b>No Flagger/ No Police</b>
<b>False Activation</b>	Normal Speed	Normal Speed	Proceed with caution—maximum speed of 15 mph	Proceed with caution—maximum speed of 15 mph
<b>Partial Activation*</b>	Normal Speed	Normal Speed	Proceed with caution—maximum speed of 15 mph	Proceed with caution—maximum speed of 15 mph
<b>Activation Failure**</b>	Normal Speed	Normal Speed	Proceed with caution—maximum speed of 15 mph	Stop: Crew member flag traffic and reboard

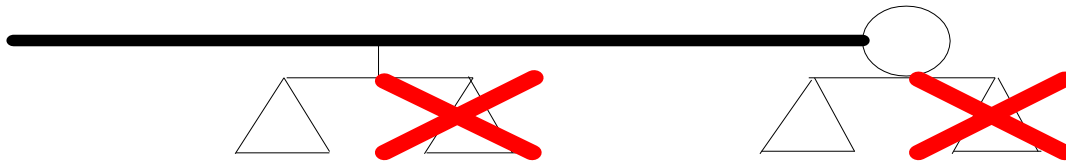
\* Partial activation—full warning not given.

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).

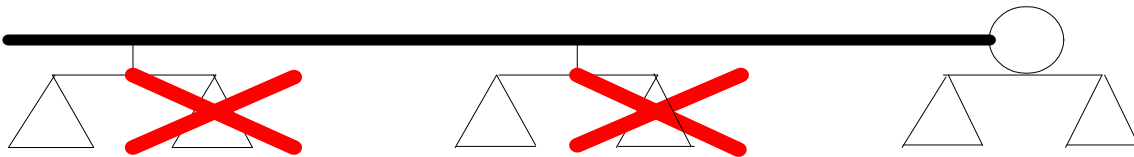
Gated crossing—gate arm not horizontal; or any portion of a gate arm is missing if that portion had held a gate arm flashing light.

\*\*Activation failure includes—if more than 50 percent 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.

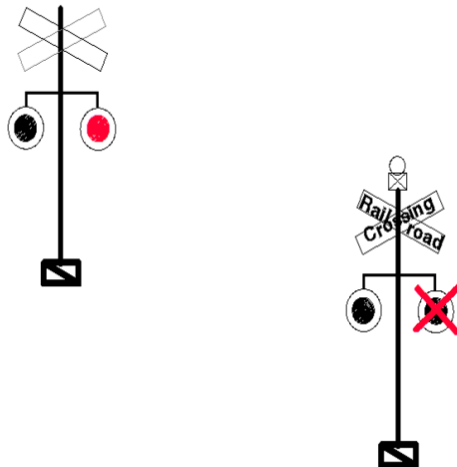
*Activation Failure; Not one operating pair.*



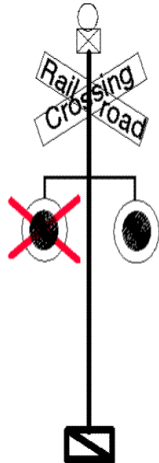
*Partial Activation; Full warning not given for each lane of approaching traffic.*



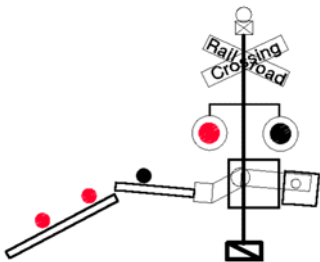
*Track speed, facing pair of back lights visible to highway user.*



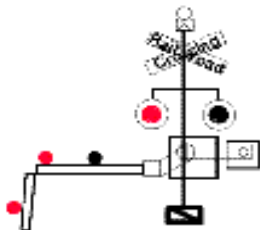
*Partial Activation, single pair of flashing lights on approach to crossing, no back lights visible.*



*Partial Activation, gate arm broken holding flashing marker light.*



*Track Speed; Gate arm tip broken outside of flashing gate lights.*





## **49 CFR Part 235 – Instructions Governing Applications for Approval of a Discontinuance or Material Modification of a Signal System or Relief from the Requirements of Part 236**

- § 235.1 Scope.
- § 235.3 Application.
- § 235.5 Changes requiring filing of application.
- § 235.7 Changes not requiring filing of application.
- § 235.8 Relief from the requirements of part 236 of this title.
- § 235.9 Civil penalty.
- § 235.10 Contents of applications.
- § 235.12 Additional required information-prints.
- § 235.13 Filing procedure.
- § 235.14 Notice.
- § 235.20 Protests.

### ***Investigation of Applications and Field Report Format***

### **§ 235.1 Scope.**

This part prescribes application for approval to discontinue or materially modify block signal systems, interlockings, traffic control systems, automatic train stop, train control, or cab signal systems, or other similar appliances, devices, methods, or systems, and provides for relief from part 236 of this title.

#### Application:

This section identifies those changes in signal and train control systems, methods, and appliances that require FRA approval, those that are exempt from approval, and provides for relief from the RS&I.

This section is applicable to all:

- Block signal systems
- Interlockings
- Traffic control systems
- Automatic train stop, automatic train control, or automatic cab signal systems
- Other similar appliances, methods, or systems

### **§ 235.3 Application.**

(a) Except as provided in paragraph (b) of this section, this part applies to railroads that operate on standard gage track which is part of the general railroad system of transportation.

(b) 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 system of railroad transportation.

#### Application:

This section makes this part applicable to each common carrier by rail subject to the Signal Inspection Act, 49 U.S.C. 205.

This part applies to each railroad that is part of the general railroad system of transportation.

This part does not apply to rapid transit systems or privately owned systems not transporting interstate commerce.

### **§ 235.5 Changes requiring filing of application.**

(a) Except as provided in § 235.7, applications shall be filed to cover the following:

- (1) The discontinuance of a block signal system, interlocking, traffic control system, automatic train stop, train control, or cab signal system or other similar appliance or device;
- (2) The decrease of the limits of a block signal system, interlocking, traffic control system, automatic train stop, train control, or cab signal system; or
- (3) The modification of a block signal system, interlocking, traffic control system, automatic train stop, train control, or cab signal system.

(b) [Reserved]

### Application:

This section prescribes application (1) for approval of discontinuance, (2) to decrease of limits of a system, or (3) for material modification, except as exempted in § 235.7.

Failure of a railroad to adhere to the conditions of an approval shall be cited as a discontinuance of, decrease in the limits of, or material modification of a system without approval under this section.

Except as provided in § 235.7, an application must be filed to cover the discontinuance of a block signal system, interlocking, traffic control system, automatic train stop, automatic train control, or automatic cab signal system, or other similar appliances or devices. Except as provided in § 235.7, an application must also be filed to cover the decrease of the limits or modification of a block signal system, interlocking, traffic control system, automatic train stop, train control, or cab signal system.

Other similar appliances or devices are considered to be signal arrangements or protective devices (such as slide detectors, high-water detectors, or earthquake detectors) that are interconnected with a signal system.

A signal arrangement comprises signaling installations (such as tunnel protection, spring switch protection, etc.) that govern train movements but do not meet the requirements of Subpart B, C, or D.

This section does not apply to automatic classification yards or highway-rail grade crossing warning devices.

Except as provided in § 235.7, a material modification includes, but is not limited to, the following:

1. Change in type of interlocking from manual to automatic.
2. Change in type of signal system from traffic control to automatic block; interlocking to traffic control; or traffic control to interlocking.
4. Signal respacing projects involving the removal of signals to reduce maintenance costs.
5. Conversion of power-operated switches/derails to hand or spring operation.

### CLASSIFICATION OF DEFECTS

235.5.A1 Discontinuance without FRA approval.

235.5.A2 Decrease of the limits without FRA approval.

235.5.A3 Material modification without FRA approval.

### **§ 235.7 Changes not requiring filing of application.**

(a) It is not necessary to file an application for approval of the following discontinuances:

(1) Removal of block signal system, interlocking, traffic control system, automatic train stop, train control, or cab signal system from track approved for abandonment by formal

proceeding;

(2) Removal of devices and associated signals used to provide protection against unusual contingencies such as landslide, burned bridge, high water, high and wide load, or tunnel protection when the unusual contingency no longer exists;

(3) Removal of an interlocking where a drawbridge has been permanently closed by the formal approval of another government agency; or

(4) Removal from service not to exceed 6 months of block signal system, interlocking, or traffic control system necessitated by catastrophic occurrence such as derailment, flood, fire, or hurricane; or,

(5) Removal of an intermittent automatic train stop system in conjunction with the implementation of a positive train control system approved by FRA under subpart I of part 236 of this chapter.

(b) When the resultant arrangement will comply with part 236 of this title, it is not necessary to file for approval to decrease the limits of a system as follows:

(1) Decrease of the limits of an interlocking when interlocked switches, derails, or movable-point frogs are not involved;

(2) Removal of electric or mechanical lock, or signal used in lieu thereof, from hand-operated switch in automatic block signal or traffic control territory where train speed over switch does not exceed 20 miles per hour; or

(3) Removal of electric or mechanical lock, or signal used in lieu thereof, from hand-operated switch in automatic block signal or traffic control territory where trains are not permitted to clear the main track at such switch.

(c) When the resultant arrangement will comply with part 236 of this title, it is not necessary to file an application for approval of the following modifications:

(1) A modification that is required to comply with an order of the Federal Railroad Administration or any section of part 236 of this title;

(2) The installation of an automatic block signal or a traffic control system to replace manual block or non-signaled territory;

(3) The installation of a traffic control system to replace a roadway automatic block signal system (discontinuance of an automatic train stop, train control, or cab signal system is not permitted without FRA approval);

(4) The installation of an automatic train stop, train control, or cab signal system in an existing automatic block or traffic control system;

(5) The installation of a continuous inductive automatic train stop system to replace an existing intermittent inductive automatic train stop system;

(6) The installation of a continuous inductive automatic train stop system to supplement an existing automatic cab signal system;

(7) The installation of an automatic train control system to replace an existing automatic train stop system or to supplement an existing automatic cab signal system;

(8) The installation of an interlocking to replace existing stop signs, gates, or pipe-connected derails protecting a railroad crossing at grade;

(9) The installation of all relay type locking to replace existing mechanical or electro-mechanical locking of an interlocking;

(10) The installation of an additional controlled point in existing traffic control system;

(11) The installation of an interlocking in an existing block signal system;

(12) The conversion of a hand-operated switch, a hand-operated switch locked either electrically or mechanically, or a spring switch to a power-operated switch;

(13) The conversion of a spring switch to a hand-operated switch, or to a hand-operated switch locked either electrically or mechanically;

- (14) The removal or relocation of signals associated with a spring switch converted to hand operation;
- (15) The installation, relocation, or removal of signals to specifically provide adequate stopping distance;
- (16) The change of aspects;
- (17) The relocation of a signal to improve preview of signal aspect visibility;
- (18) To replace a signal with a signal of another type;
- (19) To change an approach signal to operative or inoperative signal, or remove an approach signal not required by § 236.310 of this title;
- (20) The change in location of a machine from which an interlocking or traffic control system is controlled;
- (21) The closing of a manual block station or the change in hours during which a manual block station is attended;
- (22) The change in hours during which a manual interlocking is attended provided the interlocking operates for all routes over which train movements are permitted;
- (23) The installation of devices used to provide protection against unusual contingencies such as landslide, burned bridges, high water, high and wide loads, or dragging equipment;
- (24) The installation, relocation, or removal of signals, interlocked switches, derails, movable-point frogs, or electric locks in an existing system directly associated with:
  - (i) The installation of new track;
  - (ii) The elimination of existing track other than a second main track;
  - (iii) The extension or shortening of a passing siding;
  - (iv) Elimination of second main track where signal system on retained main track is arranged to provide both opposing and following protection for train movements provided second main track is physically removed; or
  - (v) A line relocation; or
  - (vi) The conversion of pole line circuits to electronic (coded) track circuits provided that the railroad gives notice and a profile plan of the change to the FRA regional office having jurisdiction over that territory at least 60 days in advance of the change. The railroad must also at the same time provide a copy of the notice and profile plan to representatives of employees responsible for maintenance, inspection and testing of the signal system under 49 CFR Part 236. The signal system modification will be deemed acceptable, unless within 60 days, the Regional Administrator stays action by written notice to the railroad and refers the issue to the Railroad Safety Board for decision.
- (25) The temporary or permanent arrangement of existing systems necessitated by highway-rail grade crossing separation construction. Temporary arrangements shall be removed within 6 months following completion of construction.

Application:

This section specifically identifies those changes permitted without FRA approval.

Signal changes not shown in this section are considered to be discontinuances, decrease of the limits, or material modifications that require FRA approval.

**§ 235.8 Relief from the requirements of part 236 of this title.**

Relief from the requirements of the rules, standards, and instructions contained in part 236 of this title will be granted upon an adequate showing by an individual carrier. Relief heretofore

granted to any carrier shall constitute relief to the same extent as relief granted under the requirements of this part.

Application:

This section is to indicate that relief from any requirement contained in the RS&I will be granted if adequate justification is provided in the request submission to the FRA. It is intended to indicate that the FRA Railroad Safety Board will make such a decision, in the same manner as it does related to requests for signal or train control system discontinuance, decrease in limits, or a material modification, based upon a sufficient and acceptable safety case being included with each such request which supports that the relief being granted would be in the interest of public safety.

The provisions of this section were formerly contained in § 236.0. Relief from the requirements of the RS&I previously granted to any carrier constitutes relief to the same extent as relief granted under the requirements of this part.

**§ 235.9 Civil penalty.**

Any person (an entity of any type covered under 1 U.S.C. 1, including but not limited to the following: a railroad; a manager, supervisor, official, or other employee or agent of a railroad; any owner, manufacturer, lessor, or lessee of railroad equipment, track, or facilities; any independent contractor providing goods or services to a railroad; and any employee of such owner, manufacturer, lessor, lessee, or independent contractor) who violates any requirement of this part or causes the violation of any such requirement is subject to a civil penalty of at least \$650 and not more than \$25,000 per violation, except that: Penalties may be assessed against individuals only for willful violations, and, where a grossly negligent violation or a pattern of repeated violations has created an imminent hazard of death or injury to persons, or has caused death or injury, a penalty not to exceed \$100,000 per violation may be assessed. Each day a violation continues shall constitute a separate offense. See appendix A to this part for a statement of agency civil penalty policy.

Application:

This section establishes a civil penalty for failure to comply with the requirements of this part.

Where, for any reason, a carrier does not file an application to cover a discontinuance, decrease in limits, or a material modification, this section prescribes a maximum civil penalty of \$25,000 per violation, except in extraordinary circumstances where the maximum penalty may be increased to \$100,000 per violation. Each day a failure to file continues is a separate offense.

**§ 235.10 Contents of applications.**

(a) The application may be submitted by letter and shall contain the following information:

- (1) The corporate name of each applicant;
- (2) The manner in which applicant is involved;
- (3) The location of the project, giving name of operating division and nearest station;
- (4) The track or tracks involved;
- (5) A complete description of proposed changes as they would affect the existing facilities

or of the section from which relief is sought;

- (6) The reason for proposed changes or justification for relief from the requirements;
  - (7) The approximate dates of beginning and completion of project;
  - (8) Changes in operating practices, temporary or permanent;
  - (9) Whether safety of operation will be affected, and if so, how; and
  - (10) Whether proposed changes will conform to the Federal Railroad Administration's Rules, Standards, and Instructions (part 236 of this title).
- (b) [Reserved]

#### **§ 235.12 Additional required information-prints.**

(a) A print or prints, size 8 inches by 10½ inches, or 8½ inches by 11 inches, or folded to 8 inches by 10½ inches or to 8½ inches by 11 inches, shall be furnished with each application.

(b) The print or prints shall be to scale or by indicated dimensions, using Association of American Railroads graphic symbols.

(c) The following information shall be shown on the print or prints:

- (1) Present and proposed arrangement of tracks and signal facilities;
- (2) Name of carrier;
- (3) Operating division;
- (4) Place and State; and
- (5) Timetable directions of movements.

(d) If stopping distances are involved, the following information shall also be shown:

- (1) Curvature and grade;
  - (2) Maximum authorized speeds of trains; and
  - (3) Length of signal control circuits for each signal indication displayed.
- (e) The following color scheme is suggested on prints:

(1) Installations, relocations, and added signal aspects should be colored, preferably in yellow;

(2) Removals, discontinuances, and abandonments should be colored, preferably in red; and

(3) Existing facilities not pertinent to change proposed in application should be shown uncolored.

#### **Application:**

These sections set forth the information that is required when submitting an application.

These sections itemize the information that is required on block signal applications and applications for relief from the RS&I.

#### **§ 235.13 Filing procedure.**

(a) Applications or requests for reconsideration of an application shall be submitted by an authorized officer of the carrier.

(b) The original and two copies of each application with supporting papers should be filed.

(c) The application and correspondence in reference thereto should be addressed to the Associate Administrator for Safety, Federal Railroad Administration, Washington, DC 20590.

(d) A separate application shall be filed for each project.

(e) At a joint facility where changes are proposed in the automatic block signal system, interlocking, traffic control system, automatic train stop, train control, or cab signal system on the tracks of more than one carrier, or if more than one carrier will be affected by the proposed changes or relief sought, a joint application signed by all carriers affected shall be filed.

(f) Where only one carrier at a joint facility is affected by the discontinuance or modification of the installation or relief sought, it shall be responsible for filing the application. It shall also certify that the other joint carriers have been notified of the filing of its application.

#### Application:

This section sets forth the procedure for filing an application.

This section prescribes the manner in which block signal applications and applications for relief are to be filed.

At a joint facility, where the proposed changes affect more than one carrier, the application must be executed between the joint carriers before submitting to FRA.

At a joint facility, where the proposed changes or relief sought affect only one carrier, that carrier shall certify when filing that the other joint carriers have been notified of the application.

#### **§ 235.14 Notice.**

The FRA will publish notice of the filing of an application or a request for reconsideration of an application in the FEDERAL REGISTER and a copy of such notice will be available at the U.S. Department of Transportation, Docket Operations (M-30), West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue, SE., Washington, DC 20590, and on the Federal Docket Management System's Web site at <http://www.regulations.gov>.

#### Application:

This section provides for the posting of a public notice in connection with the filing of each application or request for reconsideration.

FRA will post a public notice of the filing of an application or request for reconsideration of an application in the FRA Office of Public Affairs. This public notice may be examined at FRA's headquarters in Washington, DC, during regular business hours. A copy of each public notice will be mailed to all interested parties.

#### **§ 235.20 Protests.**

(a) A protest against the granting of an application shall set forth specifically the grounds upon which it is made, and contain a concise statement of the interest of protestant in the proceeding.

(b) Protests shall be filed with the Associate Administrator for Safety, Federal Railroad Administration, Washington, DC 20590, and one copy shall be furnished to each applicant.

(c) Protests should be filed within the time limit set forth in the public notice.

(d) The protestant shall certify that service of a copy of its protest was made upon each applicant.



(e) Request for hearing must be accompanied with a showing why the protestant is unable to properly present his or her position by written statements.

Effective Date Note: At 49 FR 3380, Jan. 26, 1984, part 235 was revised. This section contains information collection and recordkeeping requirements and will not become effective until approval has been given by the Office of Management and Budget.

Application:

This section explains how a protest can be made against granting any application.

This rule prescribes the method and procedure for filing a protest against granting a block signal application or an application for relief from the requirements of the RS&I. Protests not filed in the prescribed time limit may not be considered.

## ***Investigation of Applications***

A thorough investigation and a complete report are required on each application for relief from the requirements of the RS&I (RS&I-Ap) and on each application for approval of a discontinuance, decrease in the limits, or material modification of a block signal system, interlocking, automatic train stop, train control, and cab signal device (BS-Ap).

The information submitted by the carrier in accordance with the provisions contained in 49 CFR Part 235, *Instructions Governing Applications for Approval of a Discontinuance or Material Modification of a Signal System or Relief from the Requirements of Part 236*, will form the basis for the investigation report associated with each BS-Ap and RS&I-Ap. This information should be checked at the time of investigation to ensure that it is correct for use in the preparation of the report, and so that any additional information needed to complete the report may be obtained promptly. Two copies of this information will be provided with each application assigned for field investigation. One copy is to be retained in the inspector's file.

Each application should be promptly investigated. A field investigation report should be prepared and mailed in time to reach the headquarters staff in Washington, DC, prior to the closing date shown on the public notice.

The field investigation report shall be prepared on the inspector's "Report Form for BS-Ap and RS&I-Ap Applications" according to the instructions contained herein.

***On the first line***, the FRA docket number should be inserted, the type "RS&I-Ap" or "BS-Ap" should be struck out as appropriate, and the filing date inserted. The filing date is the date the application was received in headquarters and is stamped on the application letter.

***On the second line***, insert the inspector's name, headquarters location, and date the report is prepared.

***On the third line***, insert the name of the railroad filing the application. For joint applications, each railroad that is a party to the application shall be shown. Do not show the name of the railroad official filing the application or the address of the carrier.

***On the fourth and fifth lines***, show the required information. Be sure to indicate the carrier or organization with which the representatives are associated.

***In paragraph (a)***, the inspector certifies whether the public notice is correct by placing an "X" in the appropriate parenthesis. Where the public notice is found to be in error, the inspector should insert the correct language. It is also recommended that the inspector edit the correction into a copy of the public notice and return it with the report.

***In paragraph (b)***, the inspector should identify other railroads that operate in the facilities involved through joint ownership, trackage rights, tenant agreement, switching agreement, etc., that will be affected by the proposed changes but were not shown in the public notice. The inspector should describe the manner in which each railroad will be affected. In addition, the inspector should determine whether the carriers have been made party to the application or duly notified of the proposed changes or relief as required.

***In paragraph (c),*** the inspector should identify any additional documents obtained during the field investigation and included as part of the field report. A timetable, or a copy of the scheduled page involved, along with applicable special instructions should be included with each application.

Photographs of the application area and related devices should be included to assist the Safety Board in its deliberations.

***Paragraphs (d) 1, 2, 3, 4, and 5*** shall be prepared on pages 1a, 1b, 1c, etc., as necessary.

***In (d) 1,*** the inspector should provide a thorough technical description of the existing signal installation and equipment (i.e., derails, defect detectors, and other pertinent devices). Descriptions of terrain, methods of operation, etc., should be avoided. Examples of technical descriptions required are:

- “An automatic block signal system on two main tracks arranged for movements with the current of traffic having US&S P-5 colorlight type signals controlled by d.c. non-coded track and line circuits.”
- “A traffic control system on a single main track having US&S H-2 searchlight type signals and US&S M-23 electric power-operated switch machines controlled by d.c. coded track circuits operated from a GRS CAD control machine located in Springfield, Missouri.”
- “A manual interlocking having GRS Model 2A upper quadrant semaphore signals and GRS Model 5A electric power-operated switch machines controlled by d.c. non-coded track and line circuits operated from a 27-lever GRS Model 2 interlocking machine.”

***In (d) 2,*** the inspector should describe the proposed changes or relief requested.

***In (d) 3,*** the inspector should describe any proposed changes not described in the public notice. Do not use this paragraph for correction of mechanical errors corrected in paragraph (a).

Use this paragraph to describe the proposed changes where the public notice does not clearly do so.

***In (d) 4,*** the inspector should provide an adjective description of the present and proposed methods of operation. The inspector should also describe the methods of operation on the trackage on either side of the limits covered by the application.

The inspector should verify the present method of operation with the carrier’s timetable and operating rules.

The proposed method of operation should include specific details and procedures at locations such as an unprotected crossing at grade or an unprotected movable bridge.

Do not show operating rules as methods of operation. Examples of adjective descriptions are:

- “The present method of operation is by timetable and train orders supplemented by the indications of an automatic block signal system. The proposed method of operation is by signal indications of a traffic control system.”
- “The present method of operation is by timetable, train orders, and signal indications of an automatic block signal system on two main tracks arranged for movements with the current of traffic. The proposed method of operation is by signal indication of a traffic control system.”
- “The present method of operation is by signal indications of an automatic interlocking and will not be affected by the proposed changes.”

***In the second paragraph of (d) 4,*** the inspector should describe the daily number of trains or other movements in the area involved. Train averages should be based on a 30-day period that is representative of normal traffic. Avoid periods having seasonal traffic, such as grain harvests, planting seasons, or a period of train detours. Train movements should be expressed distinguishing passenger trains from freight trains; through freight trains from local switchers. Train movements may be expressed in columned format or adjectivally. Where the average number of trains is less than one daily, show the average number per week.

Train movements should be broken down separately for each carrier operating over the application area.

The areas of operation for local train movements should be specifically defined if they do not operate over the entire application area.

Where there are numerous switching movements in terminal or yard areas, the number of daily switch engine assignments may be shown.

The inspector should make his or her best effort to determine the potential for traffic or interchange growth on the line.

The inspector should note whether the involved trackage is subject to detours, and should state the last 2-year detour history.

In addition, it should be noted whether the involved trackage is part of the Strategic Rail Network (STRACNET).

***In the last paragraph of (d) 4,*** the inspector should address speed restrictions and authorizations. The present and proposed maximum authorized speeds should be shown. Where various speeds are prescribed for different trains, the trains should be identified, e.g., passenger trains, trailer-on-flatcar or van trains, hazardous materials trains, and other freight trains but not including work trains, cranes, scale cars, etc. Speed restrictions that have a bearing on the proposed changes should be identified.

The inspector should reconcile that the proposed maximum authorized speed corresponds with the proposed method of operation.

***In (d) 5***, the inspector should state in the first paragraph whether the National Railroad Passenger Corporation (Amtrak) operated trains over the trackage involved in the application on February 1, 1979.

***The second paragraph of (d) 5*** should show the number of hazardous materials cars transported annually over the trackage involved in the application. Any discrepancies in carrier's hazardous material information must be reconciled.

***When applicable, the third paragraph of (d) 5*** should show the BS-Ap or RS&I-Ap number filed concurrently with the application. ***In subsequent paragraphs of (d) 5***, the inspector should provide additional information deemed necessary to fully understand the proposal, such as changed traffic patterns and their causes, design problems, maintenance practices, obsolescence, vandalism, terrain, adverse weather conditions, etc.

On page 2, the inspector should complete items (e) and (f) on BS-Ap's only.

***In (e) 1***, describe the work, if any, found accomplished in connection with the proposed changes.

***In (e) 2***, the inspector should provide complete details on proposed changes found placed in service without approval. Use additional pages if more space is needed, numbering them 2a, 2b, 2c, etc.

***In (f)***, the inspector should show whether the proposed changes of a BS-Ap will comply with the requirements contained in RS&I-Ap. If not, identify the rule number and provide details on the deficiency.

***In (g)***, the inspector should check the appropriate description which most aptly states the consequences, in the inspector's opinion, if the proposed changes or relief are approved. The inspector's opinion and reasoning should not be based on personal preferences, but should be fair and impartial within the guidelines and provisions contained in the RS&I-Ap, and with due regard for the safety of train operations.

***In (h)***, the inspector must provide a recommendation as to the disposition of the application. Keep in mind that this is where the initial agency policy begins concerning the proposed changes. The inspector may recommend that the application be approved, approved in part and denied in part, denied, or approved with provisions. The inspector must state the reasons upon which his or her recommendations are based. Where provisions are recommended, the inspector should clearly support the need for each provision. Use additional pages if more space is necessary, numbering 2a, 2b, 2c, etc.

The investigative report should be based on factual remarks and documented information, and should support the inspector's ultimate conclusion and recommendation. Ambiguous statements should be avoided.

Inspectors are encouraged to insert appropriate information on the plans furnished with the applications. Notations on the plans are to be made in lead pencil and initialed. In no case shall a plan be marked in color.

***In (i)***, the appropriate S&TC regional supervisory specialist should review the inspector's report, and subsequently make a recommendation as to the disposition of the application. If the

supervisory specialist's recommendation differs from that of the inspector, the supervisory specialist should state the reasons and provide additional information, if necessary.

Every March and September, inspectors shall submit a Progress and Completion Report, Form FRA F6180.50 for each BS-Ap until completed. Progress and completion reports are not required for RS&I-Aps. When progress and completion reports indicate that a railroad has not started or completed approved changes, FRA may request that the railroad withdraw the BS-Ap.

DEPARTMENT OF TRANSPORTATION  
FEDERAL RAILROAD ADMINISTRATION

Report in re: \_\_\_\_\_ RS&I-Ap.  
Docket No. FRA-\_\_\_\_\_ - \_\_\_\_\_ Type: BS-Ap. Date Filed

From Inspector \_\_\_\_\_ Place \_\_\_\_\_ Date

Railroad(s) filing application:

Inspection: Date Location Railroad and other representatives

Furnish the following information:

- (a) Description of proposed changes or relief sought, location with respect to place and operating division, and mileage between designated places is correctly stated in the public notice ( ), or should be changed to read as follows ( ):
- (b) Name of any other railroads affected by the proposed changes not shown in public notice and manner in which each is affected:
- (c) List of prints and any bulletins, orders, timetables, etc., obtained during the investigation:
- (d)
  - 1. Brief description of existing installation and equipment.
  - 2. Brief description of proposed changes or relief requested.
  - 3. Information relative to proposed changes not fully described in the public notice.
  - 4. Present and proposed method of operation, number of trains or other movements per day, and the speed authorizations and restrictions.
  - 5. Other pertinent facts and remarks.

(Use additional blank sheets, numbered la, lb, lc, etc.)

Docket No. FRA - \_\_\_\_\_ - \_\_\_\_\_

(Complete Items (e) and (f) in Block Signal Applications only)

- (e) 1. If any field work has been started, describe the nature of work performed to date.
2. If any of the proposed changes have been placed in service, give a description of such changes, the date such changes were placed in service, and the reasons for making the changes before approval of the application.

(f) Will proposed changes conform to the Rules, Standards and Instructions?

If not, state the rule number and in what respect they fail to conform.

(g) Inspector's opinion: The proposed changes will:

- ☐ Reduce protection and safety.
- ☐ Provide adequate protection for existing operating conditions without materially reducing safety.
- ☐ Maintain the existing protection and safety.
- ☐ Increase protection and safety.

State reasons:

(h) Inspector's recommendation as to disposition of application.

State reasons:

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Inspector



Docket No. FRA - \_\_\_\_\_ - \_\_\_\_\_

(i) S&TC regional supervisory specialist's recommendation as to the disposition of the application.

If different than the inspector's; state reasons:

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S&TC Regional Supervisory Specialist

## **49 CFR Part 236 – Rules, Standards, and Instructions Governing the Installation, Inspection, Maintenance, and Repair of Signal and Train Control Systems, Devices, and Appliances**

- § 236.0 Applicability, minimum requirements, and penalties.

### **Subpart A – Rules and Instructions: All Systems**

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- § 236.1049 Training specific to roadway workers.

Appendix A to Part 236 – Civil Penalty Schedule – refer to 49 CFR  
Appendix B to Part 236 – Risk Assessment Criteria  
Appendix C to Part 236 – Safety Assurance Criteria and Processes  
Appendix D to Part 236 – Independent Review of Verification and Validation  
Appendix E to Part 236 – Human-Machine Interface (HMI) Design  
Appendix F to Part 236 – Minimum Requirements of FRA Directed Independent Third-Party  
Assessment of PTC System Safety Verification and Validation

**Added for ready reference:**

Reference A - FRA – Fouling Section Clearance Point Measurement Diagram  
Reference B - FRA – Copy of January 3, 1985, Himmel Letter  
Reference C - FRA – Signal Related Technical Bulletins and Safety Advisories

## **§ 236.0 Applicability, minimum requirements, and penalties.**

(a) Except as provided in paragraph (b) of this section, this part applies to all railroads.

(b) This part does not apply to-

(1) A railroad that operates only on track inside an installation that is not part of the general railroad system of transportation; or

(2) Rapid transit operations in an urban area that are not connected to the general railroad system of transportation.

(c)(1) Prior to January 17, 2012, where a passenger train is operated at a speed of 60 or more miles per hour, or a freight train is operated at a speed of 50 or more miles per hour-

(i) A block signal system complying with the provisions of this part shall be installed; or,

(ii) A manual block system shall be placed permanently in effect that shall conform to the following conditions:

(A) A passenger train shall not be admitted to a block occupied by another train except when absolutely necessary and then only by operating at restricted speed;

(B) No train shall be admitted to a block occupied by a passenger train except when absolutely necessary and then only by operating at restricted speed;

(C) No train shall be admitted to a block occupied by an opposing train except when absolutely necessary and then only while one train is stopped and the other is operating at restricted speed; and

(D) A freight train, including a work train, may be authorized to follow a freight train, including a work train, into a block and then only when the following train is operating at restricted speed.

(2) On and after January 17, 2012, where a passenger train is permitted to operate at a speed of 60 or more miles per hour, or a freight train is operated at a speed of 50 or more miles per hour, a block signal system complying with the provisions of this part shall be installed, unless an FRA approved PTC system meeting the requirements of this part for the subject speed and other operating conditions is installed.

(d)(1) Prior to December 31, 2015, where any train is permitted to operate at a speed of 80 or more miles per hour, an automatic cab signal, automatic train stop, or automatic train control system complying with the provisions of this part shall be installed, unless an FRA approved PTC system meeting the requirements of this part for the subject speed and other operating conditions, is installed.

(2) On and after December 31, 2015, where any train is permitted to operate at a speed of 80 or more miles per hour, a PTC system complying with the provisions of subpart I shall be installed and operational, unless FRA approval to continue to operate with an automatic cab signal, automatic train stop, or automatic train control system complying with the provisions of this part has been justified to, and approved by, the Associate Administrator.

(3) Subpart H of this part sets forth requirements for voluntary installation of PTC systems, and subpart I of this part sets forth requirements for mandated installation of PTC systems, each under conditions specified in their respective subpart.

(e) Nothing in this section authorizes the discontinuance of a block signal system, interlocking, traffic control system, automatic cab signal, automatic train stop, or automatic train control system, or PTC system, without approval by the FRA under part 235 of this title. However, a railroad may apply for approval of discontinuance or material modification of a signal or train control system in connection with a request for approval of a Positive Train Control Development Plan (PTCDP) or Positive Train Control Safety Plan (PTCSP) as provided in subpart I of this part.

(f) Any person (an entity of any type covered under 1 U.S.C. 1, including but not limited to the following: a railroad; a manager, supervisor, official, or other employee or agent of a

railroad; any owner, manufacturer, lessor, or lessee of railroad equipment, track, or facilities; any independent contractor providing goods or services to a railroad; and any employee of such owner, manufacturer, lessor, lessee, or independent contractor) who violates any requirement of this part or causes the violation of any such requirement is subject to a civil penalty of at least \$650 and not more than \$25,000 per violation, except that: Penalties may be assessed against individuals only for willful violations, and, where a grossly negligent violation or a pattern of repeated violations has created an imminent hazard of death or injury to persons, or has caused death or injury, a penalty not to exceed \$100,000 per violation may be assessed. Each day a violation continues shall constitute a separate offense. See appendix A to this part for a statement of agency civil penalty policy.

(g) A person may also be subject to criminal penalties for knowingly and willfully making a false entry in a record or report required to be made under this part, filing a false record or report, or violating any of the provisions of 49 U.S.C. 21311.

(h) The requirements of subpart H of this part apply to safety-critical processor-based signal and train control systems, including subsystems and components thereof, developed under the terms and conditions of that subpart.

(i) *Preemptive effect.* (1) Under 49 U.S.C. 20106, issuance of these regulations preempts any state law, regulation, or order covering the same subject matter, except an additional or more stringent law, regulation, or order that is necessary to eliminate or reduce an essentially local safety or security hazard; is not incompatible with a law, regulation, or order of the United States Government; and that does not impose an unreasonable burden on interstate commerce.

(2) This part establishes federal standards of care for railroad signal and train control systems. This part does not preempt an action under state law seeking damages for personal injury, death, or property damage alleging that a party has failed to comply with the federal standard of care established by this part, including a plan or program required by this part. Provisions of a plan or program which exceed the requirements of this part are not included in the federal standard of care.

(3) Under 49 U.S.C. 20701-20703, issuance of these regulations preempts the field of locomotive safety, extending to the design, the construction, and the material of every part of the locomotive and tender and all appurtenances thereof.

#### Application:

This section specifies that the RS&I apply to each railroad that operates on standard gauge which is part of the general system of railroad transportation. Further, this section also prescribes the criteria requiring the installation of block signal systems, automatic train stop, train control, or cab signal systems.

This rule requires that a block signal system, complying with the provisions of Part 236, or prior to January 17, 2012, a manual block system complying with the provisions of this section, be installed where passenger trains are permitted to operate at 60 mph or more, or freight trains are permitted to operate at 50 mph or more. On and after January 17, 2012, a manual block system is no longer accepted as allowing passenger trains to operate at 60 mph or more, or freight trains to operate at 50 mph or more. In such instances, a block signal system complying with the provisions of Part 236 shall be installed, unless an FRA approved PTC system meeting the requirements of Part 236 for the subject speed and other operating conditions is installed. Further, prior to December 31, 2015, an automatic train stop, train control, or cab signal system shall be installed where any train operates at 80 mph or more. On and after December 31, 2015, where any train is permitted to operate at a speed of 80 mph or more, a PTC system complying with the provisions of Subpart I

shall be installed and operational, unless FRA approval to continue to operate with an automatic cab signal, automatic train stop, or automatic train control system complying with the provisions of this part has been justified to, and approved by, the Associate Administrator.

This section details how a manual block system shall operate, and requires that the system be permanently in effect, i.e., all trains must be operated by manual block system rules.

A manual block system is a method of train operation by mandatory directives or voice rules, in nonsignaled territory (or against current of traffic), which authorizes movements between defined limits or blocks, and conforms with §§ 236.0(c)(1)(ii)(A), (B), (C), and (D).

The individual operating rules of a carrier will determine if the method of operation conforms to a manual block system.

Note: A methodology such as the track warrant control rules of some carriers, which permit and establish yard limits within designated blocks, does not conform to the above manual block system requirements because trains are permitted to enter the main track within designated yard limit areas without direct authority or regard for block occupancy.

This section does not authorize the discontinuance of any signal system without FRA approval being obtained through the processes prescribed in § 236.0(e).

#### CLASSIFICATION OF DEFECT CODES

- 236.0.C1 Block signal system not installed on line where freight train operates at 50 mph or more.
- 236.0.C2 Block signal system not installed on line where passenger train operates at 60 mph or more.
- 236.0.C3 Manual block system permits a passenger train to be admitted into a block occupied by another train where not absolutely necessary and then only by operating at restricted speed.
- 236.0.C4 Manual block system permits a train to be admitted into a block occupied by a passenger train where not absolutely necessary and then only by operating at restricted speed.
- 236.0.C5 Manual block system permits a train to be admitted into a block occupied by an opposing train where not absolutely necessary and then only while one train is stopped and the other is operating at restricted speed.
- 236.0.C6 Manual block system permits a freight train to enter into a block occupied by a preceding freight train in excess of restricted speed.
- 236.0.C7 Prior to December 31, 2015, an automatic cab signal, automatic train stop, automatic train control, or FRA approved PTC system is not installed where a train is permitted to operate at 80 mph or more.
- 236.0.C8 On or after December 31, 2015, a PTC system is not installed, unless FRA approval

to continue to operate with an automatic cab signal, automatic train stop, or automatic train control system is obtained, where a train is permitted to operate at 80 mph or more.

## **Subpart A – Rules and Instructions: All Systems**

### ***General***

#### **§ 236.1 Plans, where kept.**

As required for maintenance, plans shall be kept at all interlockings, automatic signals, and controlled points. Plans shall be legible and correct.

#### **Application:**

Plans are necessary for the installation, inspection, maintenance, and repair of signal systems and are required to be correct and legible.

The track layout plan, circuit plan including circuits to approach signals, and locking sheet and dog chart where mechanical locking is used, shall be kept at each interlocking.

The circuit plan including circuits to approach signals shall be kept at each controlled point.

Circuit plans shall be kept at each automatic signal in automatic block signal territory, traffic control territory, automatic train stop, train control, or signal territory in other systems such as spring switch protection, slide protection, etc.

Plans are required to be legible and correct. Plans that are torn, faded, or those having experienced more than one change in colored pencil are not considered to be legible and correct.

If more than one set of plans are at a location, they all must be legible and correct or the noncompliant sets must be corrected or removed.

### **CLASSIFICATION OF DEFECTS**

236.1.A1 Track layout plan not kept at interlocking.

236.1.A2 Circuit plan not kept at interlocking.

236.1.A3 Locking sheet and dog chart not kept at interlocking where mechanical locking is used.

236.1.A4 Circuit plan not kept at controlled point.

236.1.A5 Circuit plan not kept at automatic signal.

236.1.A6 Track layout plan for interlocking not correct.

236.1.A7 Circuit plan for interlocking not correct.

- 236.1.A8 Locking sheet and dog chart for interlocking where mechanical locking is used not correct.
- 236.1.A9 Circuit plan for controlled point not correct.
- 236.1.A10 Circuit plan for automatic signal not correct.
- 236.1.A11 Profile plan not correct. (Includes plan not drawn to scale or not showing location of all signals, grades, and alignment).
- 236.1.A12 Track layout plan for interlocking not legible.
- 236.1.A13 Circuit plan for interlocking not legible.
- 236.1.A14 Locking sheet and dog chart for interlocking not legible.
- 236.1.A15 Circuit plan for controlled point not legible.
- 236.1.A16 Circuit plan for automatic signal not legible.
- 236.1.A17 Profile plan not legible.
- 236.1.A18 Profile plan not available.

## **§ 236.2 Grounds.**

Each circuit, the functioning of which affects the safety of train operations, shall be kept free of any ground or combination of grounds which will permit a flow of current equal to or in excess of 75 percent of the release value of any relay or other electromagnetic device in the circuit, except circuits which include any track rail and except the common return wires of single-wire, single-break, signal control circuits using a grounded common, and alternating current power distribution circuits which are grounded in the interest of safety.

### Application:

Vital circuits shall be kept free of grounds equal to or in excess of 75 percent of the release value of relay or electromagnetic device in circuits. Track circuits, common return wires of single-wire, single-break signal control circuits grounded by design, and alternating current power distribution circuits grounded in the interest of safety are excluded.

Vital circuits designed to be ground free are required to be kept free of any ground current equal to or in excess of 75 percent of the release value of any relay or electromagnetic device in the circuit. There is no difference between an accidental or intentional ground.

Electronic devices designed to be ground free shall be kept free of grounds having a value that affects the proper functioning of the device. *(See Technical Bulletin S-99-03)*

Extreme care shall be exercised when testing for grounds. The carrier employee shall perform the testing. Testing shall not be conducted while trains are approaching or passing, and the meter shall be watched at all times. If the meter indicates the energization of a relay, the meter shall be



immediately disconnected. An unobserved meter shall never be left connected to a vital circuit and ground.

Ground test shall be performed at every instrument case or house inspected. The preliminary test shall be with a voltmeter connected from the 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.

These requirements apply to highway-rail grade crossing warning devices, dragging equipment protection, slide detectors, etc., where signal control circuits are selected through relays energized by the power supply of such protection.

The railroad should take prompt action to correct a ground.

### CLASSIFICATION OF DEFECTS

236.2.A1 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.

236.2.A2 Circuit grounded sufficiently to affect the proper functioning of electronic device.

### **§ 236.3 Locking of signal apparatus housings.**

[Signal apparatus housings shall be secured against unauthorized entry.](#)

#### Application:

Housings of signal apparatus shall be secured to prevent unauthorized entry.

All outdoor housing of mechanical or power-operated devices used to operate signal or interlocked units must be kept locked, sealed, or secured. This includes signal cases, instrument cases, switch circuit controllers, facing-point locks, switch machines, junction or terminal boxes and battery boxes.

Power interlocking machine cabinets shall be locked or sealed to such extent that entry to or manipulation of the devices contained in the cabinet can only be accomplished by unlocking the lock or breaking the seal.

Time release and exposed electric locks must be locked or sealed.

Cabinets or cases containing apparatus designed to release locking in emergencies shall be locked or sealed.

Wrench or nut-locking with bell is acceptable.

### CLASSIFICATION OF DEFECTS

236.3.A1 Signal case or housing not secured against unauthorized entry.

236.3.A2 Instrument case not secured against unauthorized entry.

236.3.A3 Power interlocking machine cabinet not secured against unauthorized entry.

236.3.A4 Time release not secured against unauthorized entry.

236.3.A5 Exposed electric lock not secured against unauthorized entry.

#### **§ 236.4 Interference with normal functioning of device.**

The normal functioning of any device shall not be interfered with in testing or otherwise without first taking measures to provide for safety of train operation which depends on normal functioning of such device.

##### Application:

Safety of train operation must be provided before interfering with the normal functioning of any device.

The intent of this rule is to ensure that carriers maintain the integrity of signal systems by prohibiting procedures or practices that defeat or nullify the minimum requirements of the RS&I.

Interference is any condition that circumvents, hinders, impedes, or diminishes whatsoever the intended protection of a device and may be accomplished by testing, installing, repairing, replacing, operating, or manipulating a signal component indicating or affecting the indication of safe passage for trains. There is no difference between accidental or intentional interference with respect to the enforcement of this rule.

Tests of signal equipment should not be conducted until it has been ascertained that no train movements will be affected. No test should be conducted during the passage of a train, hi-rail vehicle, or motor car.

Areas where interference can occur include all components, devices, mechanisms, or apparatus in vital circuits including shunt and fouling wires of switches and turnouts.

Unless measures are taken to provide safety of train operation, the following are some examples of interference with various types of equipment and procedures:

1. Testing such as falsely energizing relays, jumpering contacts, turning relays upside down; operating hand-operated switch, adjusting switch circuit controller or shunt fouling circuit, in advance of approaching train; operating power-operated switch without permission of dispatcher or operator; performing ground tests while train is approaching or moving over power-operated switch; defeating predetermined time interval of time release or time relay; and release of electric or mechanical locking.
2. Performing efficiency tests by removal of a signal lamp bulb while not providing an approach indication to the darkened signal; or placing a shunt in advance of a signal after a train has passed its approach signal.
3. At interlockings, the unnecessary breaking of seals to force indications, defeat time, or approach or route locking requirements. Note: The procedure to move trains through

interlockings under flag protection and appropriate rules is not considered interference.

4. Defeat of protective features to avoid train delay or to expedite train movements such as disconnecting shunt or fouling wires, turning relays upside down, jumpering contacts, falsely energizing relays or circuits, or releasing electrical locking.

The following will be considered interference under all circumstances:

Performing repairs and replacements of equipment or apparatus such as relays, cables, and conductors without proper testing afterwards; replacing rails in shunt fouling circuits leaving fouling wires and rail bonds broken and disconnected; replacing ties under switch machines or switch circuit controllers and leaving the circuit controller improperly adjusted; and leaving a switch in mid-stroke position.

### CLASSIFICATION OF DEFECTS

236.4.A1 Interference with normal functioning of device without taking measures to provide for safety of train operation.

**Excerpt from letter of January 3, 1985**

**From: FRA Associate Administrator, Mr. J. W. Walsh**

**To: Mr. L. M. Himmel, Sr., Executive Director**

**Communications and Signal Division, AAR**

#### Section 236.4 Interference with normal functioning of device.

The AAR requested that during operational tests of locomotive engineers, a signal made dark without establishing an approach aspect not be considered as interference. The AAR recommends that FRA's Technical Manual be revised to make the requirements of this rule applicable only at controlled points and automatic interlockings.

This rule imposes on each carrier the requirement to prohibit procedures or practices which defeat or nullify the safety of its signal systems without first taking measures to provide for the safety of train operations.

The comments of the AAR clearly indicated that a dark signal is regarded as the most restrictive indication that can be given at that signal and that an engineer is required to act on the preview of the dark signal to reduce train speed or stop in compliance with the restrictive indication.

Section 236.23 requires that a yellow light, a lunar light, or a series of lights or a semaphore blade in the upper or lower quadrant at an angle of 45 degrees to the vertical be used to indicate that speed is to be restricted and stop may be required.

The FRA cannot condone a practice that is hazardous to the safety of train operation or that is contrary to its regulations. Accordingly, an aspect complying with § 236.23 is required in approach to any signal made dark for operational tests.

### **§ 236.5 Design of control circuits on closed circuit principle.**

All control circuits the functioning of which affects safety of train operation shall be designed on the closed circuit principle, except circuits for roadway equipment of intermittent automatic train stop system.

#### Application:

This rule requires that control circuits which affect the safety of train operation be designed on the closed circuit principle.

This rule excludes circuits for roadway equipment of intermittent automatic train-stop systems, shunt fouling circuits, and normally open track circuits on auxiliary tracks used to approach light wayside signals.

This rule includes all vital circuits and track circuits through which signal control circuits are selected.

Circuits should be so designed that failure of any part or component of the circuit will cause signals to display their most restrictive aspects.

### CLASSIFICATION OF DEFECTS

236.5.A1 Control circuit, the function of which affects safety of train operation, not designed on closed circuit principle.

### **§ 236.6 Hand-operated switch equipped with switch circuit controller.**

Hand-operated switch equipped with switch circuit controller connected to the point, or with facing-point lock and circuit controller, shall be so maintained that when point is open one-fourth inch or more on facing-point switch and three-eighths inch or more on trailing-point switch, track or control circuits will be opened or shunted or both, and if equipped with facing-point lock with circuit controller, switch cannot be locked. On such hand-operated switch, switch circuit controllers, facing-point locks, switch-and-lock movements, and their connections shall be securely fastened in place, and contacts maintained with an opening of not less than one-sixteenth inch when open.

#### Application:

A hand-operated switch equipped with switch circuit controller connected to the point, or hand-operated switch equipped with facing-point lock and circuit controller, is required to shunt track circuit or open control circuits, or both, when the point is open one-fourth inch or more on facing-point switch and three-eighths inch or more on trailing-point switch. The facing-point lock shall be so adjusted that it cannot be locked when point is so opened. Switch circuit controllers, facing-point locks, and switch-and-lock movements, and their connections must be securely fastened in place.

Contacts must open at least one-sixteenth inch when the contacts are fully open. Where switch circuit controller is connected to the point, the switch circuit controller shall be connected to the

normally closed switch point.

FRA has in the past and will continue to require each switch circuit controller to be connected to the switch point over which train movements are governed by signal indications. The use of a rigid front rod can meet this requirement in instances where signal indication is provided over the switch in either position.

This rule does not apply to power-operated switches, spring switches, or to the electric lock mechanisms on hand-operated switches.

A test should be made by placing the appropriate gage between the point and stock rail, 6 inches from the end of the point, and applying pressure against the gage until it cannot be removed.

Where control circuits are opened through switch circuit controller or through switch repeating relay, it is not a requirement that shunt wires be provided or that shunt wires be doubled.

### CLASSIFICATION OF DEFECTS

- 236.6.A1 Switch circuit controller on hand-operated facing-point switch not adjusted to shunt track circuit or open control circuits when switch point is open one-fourth inch or more.
- 236.6.A2 Switch circuit controller on hand-operated trailing-point switch not adjusted to shunt track circuit or open control circuits when switch point is open three-eighths inch or more.
- 236.6.A3 Hand-operated facing-point switch equipped with facing-point lock and circuit controller can be locked when switch point is open one-fourth inch or more.
- 236.6.A4 Hand-operated trailing-point switch equipped with facing-point lock and circuit controller can be locked when switch point is open three-eighths inch or more.
- 236.6.A5 Switch circuit controller not securely fastened in place.
- 236.6.A6 Facing-point lock not securely fastened in place.
- 236.6.A7 Switch-and-lock movement not securely fastened in place.
- 236.6.A8 Contact opening of switch circuit controller contact less than one-sixteenth inch.
- 236.6.A9 Switch circuit controller connections not securely fastened.
- 236.6.A10 Switch-and-lock movement connections not securely fastened.
- 236.6.A11 Facing-point lock connections not securely fastened.
- 236.6.A12 Switch circuit controller not connected to normally closed switch point.

### **§ 236.7 Circuit controller operated by switch-and-lock movement.**

Circuit controller operated by switch-and-lock movement shall be maintained so that normally open contacts will remain closed and normally closed contacts will remain open until the switch is locked.

#### Application:

Applies to hand-operated, mechanical, or power-operated switch-and-lock movements including such machines as models M-22, M-23, 5, 55, T-20, etc. Before locking bar is completely withdrawn from lock rod, normally closed contacts must open and normally open contacts must close and remain so until locking bar has again engaged lock rod.

### CLASSIFICATION OF DEFECTS

236.7.A1 Contacts of circuit controller operated by switch-and-lock movement not adjusted so that normally open contacts remain closed until the switch is locked.

236.7.A2 Contacts of circuit controller operated by switch-and-lock movement not adjusted so that normally closed contacts remain open until the switch is locked.

### **§ 236.8 Operating characteristics of electromagnetic, electronic, or electrical apparatus.**

Signal apparatus, the functioning of which affects the safety of train operation, shall be maintained in accordance with the limits within which the device is designed to operate.

#### Application:

Operating characteristics of electromagnetic, electronic, or electrical apparatus in service shall be in accordance with the limits within which it is designed to operate.

Rules 101, 102, 105, 106, 107, 108, 109, 551, 552, 588, and 589 address those devices so important to safety of train operation that periodic tests are required to ascertain that operating characteristics remain unchanged.

Applies to all electromagnetic, electronic, or electrical devices used in or associated with vital circuitry or switch machine operation.

Each carrier 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 on its property. Some examples of deficient operating characteristics are:

- Pick-up value too high.
- Pick-up value too low.
- Release value too high.
- Release value too low.

Manufacturer specifications or carrier standards compatible with manufacturer specifications shall be used to determine such values.

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

- Switch machine controllers.
- Thermal relays of switch machine controllers.
- Indicating magnets on interlocking machines.
- Coils of forced-drop electric locks.

#### CLASSIFICATION OF DEFECTS

236.8.A1 Pick-up value of electromagnetic device not in accordance with the limits within which it is designed to operate.

236.8.A2 Drop-away value of electromagnetic device not in accordance with the limits within which it is designed to operate.

236.8.A3 Working value of electronic or electrical apparatus not in accordance with the limits within which the apparatus is designed to operate.

#### **§ 236.9 Selection of circuits through indicating or annunciating instruments.**

Signal control and electric locking circuits shall not be selected through the contacts of instruments designed primarily for indicating or annunciating purposes in which an indicating element attached to the armature is arranged so that it can in itself cause improper operation of the armature.

##### Application:

Signal control and electric locking circuits are required to be selected through contacts of safety relays.

This rule does not prohibit the use of annunciating or indicating devices, but does prohibit selecting vital circuits through contacts operated by such devices.

Some examples of annunciating or indicating devices are:

- a. Switch indicator
- b. Block indicator
- c. Cab indicator
- d. Approach indicator
- e. Track indicator
- f. OSing device
- g. Semaphore indicator
- h. Manually operated call-on device

Test such devices that are in noncompliance by manually moving indicator to energized position and observing if armature and contacts are actuated. If so, contacts of such devices may not be used in vital circuitry.

## CLASSIFICATION OF DEFECTS

- 236.9.A1 Signal control circuit selected through contacts of indicator or annunciator in which the indicating element attached to the armature is arranged so that it can in itself cause improper operation of the armature.
- 236.9.A2 Electric locking circuit selected through contacts of indicator or annunciator in which the indicating element attached to the armature is arranged so that it can in itself cause improper operation of the armature.

### **§ 236.10 Electric locks, forced-drop type; where required.**

Electric locks on new installations and new electric locks applied to existing installations shall be of the forced-drop type.

#### Application:

This rule requires that electric locks applied to new installations and new electric locks applied to existing installations be of the forced-drop type.

This rule applies to all electric locks installed after October 1, 1950, on new locations.  
This rule applies to all electric locks on hand-operated switches and interlocking machines.

Tests should be made to determine that the locking dog is forced down into the locking sector. This test can be made by observing movement of the locking dog as the switch lock is locked in normal position.

Since most forced-drop type locks are spring loaded, they should be checked to determine that the spring is of sufficient strength so that normal operation does not release the locking dog unless the lock is energized.

A non-forced-drop electric lock may be removed from service, repaired, and restored to service without replacing it with a forced-drop type electric lock.

## CLASSIFICATION OF DEFECTS

- 236.10.A1 Electric lock not forced-drop type. (Applies only to electric lock installed after October 1, 1950.)
- 236.10.A2 New electric lock applied to existing installation not forced-drop type.

### **§ 236.11 Adjustment, repair, or replacement of component.**

When any component of a signal system, the proper functioning of which is essential to the safety of train operation, fails to perform its intended signaling function or is not in correspondence with known operating conditions, the cause shall be determined and the faulty component adjusted, repaired, or replaced without undue delay.



### Application:

This rule requires a carrier to determine the cause of a signal aspect that is not in accordance with known operating conditions and requires that a failed signaling component (which adversely affects safety of train operation) be adjusted, repaired, or replaced without undue delay.

A signal aspect “not in correspondence with known operating conditions” means a signal aspect other than that intended by normal signal system operation.

A carrier is required to determine the cause of each “Stop” or “Stop and Proceed” aspect resulting from an unknown condition. If that condition is the result of the failure of a signaling component and is a hazard to the safety of train operation, corrective action is required before the next train movement. Should train operation require nighttime or weekend corrections, they must be made.

Conditions which cause false stop or false restrictive indications may cause inconvenience and additional expense to train movements. Examples of such conditions that do not necessarily pose a threat to safety of train operation are a burned out lamp, a broken track circuit connector, or a broken line wire.

This rule applies to adjustable components which, when improperly adjusted, create safety hazards such as (1) circuit controller, point detector, and lock rod adjustments exceeding the requirements;

(2) insufficient predetermined time intervals; and (3) excessive track circuit values.

This rule applies to components which, if not repaired, create safety hazards such as (1) grounded circuits; (2) insecure circuit controllers, switch machines, pipeline carriers and cranks; and (3) bent, worn, or insecure connecting rods, lock rods, and point detector rods.

This rule also applies to components which, if not replaced, create safety hazards such as (1) a broken connecting rod, lock rod, point detector rod, pipeline, or crank; (2) broken fouling wires, shunt wires, and bond wires in fouling circuit; and (3) defective relays, cable, and conductors.

Test equipment and instruments are excluded.

### CLASSIFICATION OF DEFECTS

236.11.A1      Component, essential to the safety of train operation, failing to perform its intended function not adjusted without undue delay.

236.11.A2      Component, essential to the safety of train operation, failing to perform its intended function not repaired without undue delay.

236.11.A3      Component, essential to the safety of train operation, failing to perform its intended function not replaced without undue delay.

236.11.A4      Cause not determined for signal component out of correspondence with known operating conditions.

## **§ 236.12 Spring switch signal protection, where required.**

Signal protection shall be provided for facing and trailing movements through spring switch within interlocking limits and through spring switch installed in automatic block signal, train stop, train control or cab signal territory where train movements over the switch are made at a speed exceeding 20 miles per hour, except that signal protection shall be required only with the current of traffic on track signaled for movement in only one direction.

Note: Does not apply to spring switch installed prior to October 1, 1950, in automatic block signal, automatic train stop, or automatic train control territory.

### Application:

This rule prescribes signal protection for spring switches in interlockings and for spring switches installed after October 1, 1950, in automatic block signal, train stop, train control or cab signal territory where movements over the switch exceed 20 mph.

This rule prescribes where spring switch protection is required. Rules 236.13 and 236.14 prescribe how it will operate.

On all spring switches installed after October 1, 1950, in automatic block signal, train stop, train control, and cab signal territory where the speed exceeds 20 mph, signal protection is required in the facing and both trailing routes.

Protection is required only with the current of traffic on track signaled for movement in one direction.

Protection is required for movements against the current of traffic from the reverse main of main tracks to a single main track.

### CLASSIFICATION OF DEFECTS

- |           |   |
|-----------|---|
| 236.12.A1 | Signal protection not provided for facing movements through spring switch within interlocking limits.   |
| 236.12.A2 | Signal protection not provided for trailing movements through spring switch within interlocking limits.   |
| 236.12.A3 | Signal protection not provided for facing movements over spring switch in track signaled for movements in both directions within automatic block signal, train stop, train control, or cab signal territory where train movements over switch exceed 20 mph. (Applies only to spring switch installed after October 1, 1950.) |
| 236.12.A4 | Signal protection not provided for trailing movements through spring switch in automatic block signal, train stop, train control, or cab signal territory where train movements over switch exceed 20 mph. (Applies only to spring switch installed after October 1, 1950.)   |

### **§ 236.13 Spring switch; selection of signal control circuits through circuit controller.**

The control circuits of signals governing facing movements over a main track spring switch shall be selected through the contacts of a switch circuit controller, or through the contacts of relay repeating the position of such circuit controller, which, when normally closed switch point is open ¼-inch or more, will cause such signals to display their most restrictive aspects, except that where a separate aspect is displayed for facing movements over the switch in the reverse position the signal shall display its most restrictive aspect when the switch points are open ¼-inch or more from either the normal or reverse position.

#### Application:

This rule requires that control circuits (of signals governing facing movements over a main track spring switch) be selected through the switch circuit controller or a relay repeating the position of such circuit controller.

This rule applies to interlockings, automatic block signal, and other protective systems. Rules 236.303 and 236.342 apply to spring switches in interlocking and traffic control systems.

This rule requires point protection for facing movements over spring switch. Trailing protection is not required.

Control circuits for facing movements must be selected through either switch circuit controller or track relay where switch shunting circuit is used.

This rule applies to spring switch provided with signal protection in nonsignaled territory. It does not require such protection be provided, but if protection is provided, it must meet these requirements.

Testing a spring switch shall be made by placing a 1/4-inch gage 6 inches from the end of the switch point on either the normal or reverse side and then placing the spring switch throw lever in either the full normal or reverse position as appropriate.

#### CLASSIFICATION OF DEFECTS

- 236.13.A1 Control circuits of signal governing facing movements over main track spring switch not selected through contacts of switch circuit controller or through contacts of relay repeating the position of switch circuit controller.
- 236.13.A2 Signal governing facing movements over main-track spring switch does not display its most restrictive aspect when normally closed switch point is open ¼-inch or more. (Does not apply where separate aspect is displayed for facing movement over the switch in the reverse position.)
- 236.13.A3 Signal governing facing movements over main-track spring switch in both the normal and reverse positions does not display its most restrictive aspect when the switch points are open ¼-inch or more from either the normal or reverse position.

## **§ 236.14 Spring switch signal protecting; requirements.**

(a) The indication of signal governing movements from siding to main track with the current of traffic on track signaled for movements in only one direction through a spring switch in automatic block signal territory shall be not less restrictive than “Proceed at Restricted Speed” when the block, into which movements are governed by the signal, is occupied, and shall be “Stop” when the main track is occupied by a train approaching the switch within at least 1,500 feet in approach of the approach signal located stopping distance from the main track signal governing trailing movements over switch, except that the indication may be caused to be less restrictive if approach or time locking is used.

(b) The indication of signal governing movements against the current of traffic from the reverse main of main tracks to a single track, or signal governing movements from a siding to a main track signaled for movements in either direction, through a spring switch, in automatic block signal territory, shall be not less restrictive than “Proceed at Restricted Speed” when the block, into which movements are governed by the signal, is occupied by a preceding train, and shall be “Stop” when the block on the single track into which the signal governs is occupied by an opposing train.

(c) The indication of signal governing movements against the current of traffic from the reverse main of main tracks to a single track or signal governing movements from a siding to a main track signaled for movements in either direction through a spring switch in automatic block signal territory shall be “Stop” when the normal direction main track of the double track or the single track signaled for movements in both directions is occupied by a train approaching the switch within at least 1,500 feet in approach of the approach signal located stopping distance from the main track signal governing trailing movements over switch, except that indication may be caused to be less restrictive if approach or time locking is used.

### Application:

This rule prescribes how spring switch signal protection required by Rule 236.12 shall operate in automatic block signal territory (1) when it governs movements with the current of traffic from a siding to main track signaled for movements in one direction; (2) when it governs movements from a siding to a main track signaled for movements in either direction; and (3) when it governs movements from the end of double track territory signaled for movements in one direction with the current of traffic to single track territory. It permits the use of approach or time locking.

This rule applies to automatic block signal territory only.

Paragraph (a) sets forth the requirements for signals governing movements from siding to main track signaled for movements with the current of traffic.

Paragraph (b) sets forth the requirements for signals governing movements against the current of traffic from the reverse main of main tracks to single track or from siding to main track signaled for movements in either direction when block into which signal governs is occupied by preceding trains or by opposing trains.

Paragraph (c) sets forth the requirements for signals governing movements against the current of traffic from the reverse main of main tracks to single track or from siding to main track signaled for movements in either direction when a train is approaching the switch within 1,500 feet in approach of the approach signal located stopping distance from the main track signal governing trailing movements over the spring switch.

Tests to determine compliance with paragraph (a) should be conducted by placing a shunt in the block of the signal governing movements from siding to main track. The signal should then be observed to determine whether its aspect is not more favorable than “Proceed at Restricted Speed.”

Tests should then be made by shunting each track circuit on the main track, from at least 1,500 feet in approach to the approach signal to the main track signal governing trailing movements over the switch. The leave siding signal should be observed to determine that its aspect is “Stop” when each track circuit is shunted. This test procedure is the same whether the main track signal governing trailing movements over the switch is located adjacent to the leave-siding signal or located a mile or more in approach of the switch.

A time release, pushbutton, or key release may be provided that, when operated, causes the main track signal to indicate “Stop” or “Stop and Proceed” and will permit the leave siding signal to clear after a predetermined time interval.

Test to determine compliance with paragraph (b) should be conducted by making an operational shunt test in approach to and then in the block of the main track signal governing trailing movements over the switch into single track and observing the reverse main or leave siding signal aspect to determine if it is not more favorable than “Proceed at Restricted Speed” for a following movement. Test should then be made by making an operational shunt test on single track in the facing direction and observing the reverse main or leave siding signal aspect to determine whether it is “Stop” for an opposing movement.

Tests to determine compliance with paragraph (c) should be conducted by making an operational shunt test from at least 1,500 feet in approach to the approach signal to the main track signal governing trailing movements over the switch and observing the reverse main or leave siding signal aspect to determine that it indicates “Stop” until the switch is passed.

#### CLASSIFICATION OF DEFECTS

- 236.14.A1      Indication of signal governing movements from siding to main track with the current of traffic on track signaled for movements in only one direction through spring switch in automatic block signal territory, less restrictive than “Proceed at Restricted Speed” when the block, into which movements are governed by the signal, is occupied.
- 236.14.A2      Indication of signal governing movements from siding to main track with the current of traffic on track signaled for movements in only one direction through spring switch in automatic block signal territory, not “Stop” when main track is occupied by a train approaching switch within at least 1,500 feet in approach of the approach signal for the main track signal governing trailing movements over switch.
- 236.14.B1      Indication of signal governing movements against the current of traffic from the reverse main of main tracks to single track through spring switch in automatic block signal territory, less restrictive than “Proceed at Restricted Speed” when the

block, into which movements are governed by the signal, is occupied by a preceding train.

- 236.14.B2 Indication of signal governing movements from siding to main track signaled for movements in either direction, through spring switch in automatic block signal territory, less restrictive than “Proceed at Restricted Speed” when the block, into which movements are governed by the signal, is occupied by a preceding train.
- 236.14.B3 Indication of signal governing movements against the current of traffic from reverse main of main tracks to single track through spring switch in automatic block signal territory, not “Stop” when the block on the single track into which the signal governs is occupied by an opposing train.
- 236.14.B4 Indication of signal governing movements from siding to main track signaled for movements in either direction through spring switch in automatic block signal territory, not “Stop” when the block on the single track into which the signal governs is occupied by an opposing train.
- 236.14.C1 Indication of signal governing movements against the current of traffic from the reverse main of main tracks to single track through spring switch in automatic block signal territory, not “Stop” when the normal direction main track of the double track is occupied by a train approaching the switch within at least 1,500 feet in approach of the approach signal for the main-track signal governing trailing movements over switch.
- 236.14.C2 Indication of signal governing movements from siding to main track signaled for movements in either direction through spring switch in automatic block signal territory, not “Stop” when the single track signaled for movements in both directions is occupied by a train approaching the switch within at least 1500 feet in approach of the approach signal for the main-track signal governing trailing movements over the switch.
- 236.14.C3 Indication of signal governing movements from siding to main track with the current of traffic on track signaled for movements in only one direction through spring switch in automatic block signal territory less restrictive than “Proceed at Restricted Speed” when the block into which movements are governed by the signal is occupied and approach or time locking is ineffective.
- 236.14.C4 Indication of signal governing movements from siding to main track, with the current of traffic, on track signaled for movements in only one direction through spring switch in automatic block signal territory, not “Stop” when main track is occupied by a train approaching switch within at least 1,500 feet in approach of the approach signal for the main track signal governing trailing movements over the switch and approach or time locking is ineffective.

## **§ 236.15 Timetable instructions.**

Automatic block, traffic control, train stop, train control, and cab signal territory shall be designated in timetable instructions.

Application:

This rule requires automatic block, traffic control, train stop, train control, and cab signal territory be designated in timetable instructions.

The required territorial information may be published either in the timetable or special instructions in any manner the carrier chooses which accurately and uniformly identifies the type territory. Interlockings are not required to be so designated.

CLASSIFICATION OF DEFECTS

236.15.A1 Automatic block signal territory not designated in timetable instructions.

236.15.A2 Traffic control territory not designated in timetable instructions.

236.15.A3 Automatic train stop territory not designated in timetable instructions.

236.15.A4 Automatic train control territory not designated in timetable instructions.

236.15.A5 Automatic cab signal territory not designated in timetable instructions.

**§ 236.16 Electric lock, main track releasing circuit.**

When an electric lock releasing circuit is provided on the main track to permit a train or an engine to diverge from the main track without time delay, the circuit shall be of such length to permit occupancy of the circuit to be seen by a crewmember stationed at the switch. When the releasing circuit extends into the fouling circuit, a train or engine on the siding shall be prevented from occupying the releasing circuit by a derail either pipe-connected to switch point or equipped with an independently-operated electric lock.

Application:

This rule sets forth the requirements for main track releasing circuit for electric lock on hand-operated switch.

This rule does not require that a mainline quick release circuit be installed at electrically locked switches. However, where such circuits are installed, the rule prohibits the electric lock releasing circuit on the main track from being of such length that distance or curvature of track will prevent a crewmember standing at the switch from observing a train or car occupying the releasing circuit.

The rule also requires that where the electric lock releasing circuit extends into the fouling section of turnout, a train shall be prevented from occupying the fouling section by pipe-connected or independently operated, electrically locked derail at the clearance point. The releasing circuit shall be considered as extending into the fouling section if it extends further than the heel of the switch points.

Note: The provisions of § 236.205(d) are applicable to the relay used to provide quick release as it is considered a “track circuit relay.” If that relay is in its state of allowing quick release (i.e., normally energized relay being de-energized, or normally de-energized relay being energized), it

shall affect the opening of the control circuits for signals governing movements over the switch in either direction.

#### CLASSIFICATION OF DEFECTS

- 236.16.A1 Length of electric lock releasing circuit on main track too long to permit crewmember standing at the switch to see a train or car occupying the releasing circuit.
- 236.16.A2 Curvature of track on which electric lock releasing circuit is provided prevents crewmember standing at the switch from seeing a train or car occupying the releasing circuit.
- 236.16.A3 Electric lock releasing circuit on main track extends into fouling circuit where the turnout is not equipped with a derail at the clearance point either pipe-connected to the switch or independently locked, electrically.

#### **§ 236.17 Pipe for operating connections; requirements.**

(a) Steel or wrought-iron pipe 1 inch or larger, or members of equal strength, shall be used for operating connections for switches, derails, movable-point frogs, facing-point locks, rail-locking devices of movable bridge protected by interlocking, and mechanically operated signals, except up-and-down rod which may be  $\frac{3}{4}$ -inch pipe or solid rod. Pipe shall be fully screwed into coupling and both ends of each pipe shall be riveted to pipe plug with 2 rivets.

(b) Pipeline shall not be out of alignment sufficiently to interfere with proper operation, shall be properly compensated for temperature changes, and supported on carriers spaced not more than 8 feet apart on tangent and curve of less than  $2^{\circ}$  and not more than 7 feet apart on curve of  $2^{\circ}$  or more. With lever in any position, couplings in pipeline shall not foul carriers.

#### Application:

This rule prescribes a steel or wrought-iron pipe, 1 inch or larger, for operating connections of pipe-

connected appliances, with each joint fully screwed into coupling with each end of the pipe secured by two rivets. Pipe shall be supported on carriers not more than 8 feet apart on tangent and curves of less than 2 degrees and not more than 7 feet apart on curves of more than 2 degrees. Pipeline shall be properly aligned and compensated and couplings shall not foul carriers. Up-and-down rods of mechanically operated signals may be  $\frac{3}{4}$ -inch pipe or solid rod.

The steel or wrought-iron pipe prescribed by this rule is a 1-inch nominal inside diameter pipe, or 1.315-inch actual outside diameter pipe. A  $\frac{3}{4}$ -inch pipe measures 1.05-inch actual outside diameter.

Pipelines should be operated and carefully observed for bowing when pipe is under compression. The pipeline shall be so installed that when a device is obstructed, the pipeline shall be prevented from bowing enough to permit latching of lever or full drive of power-operated machine.

Carriers must be complete and properly assembled and spacing strictly adhered to. Pipeline must



be kept in proper alignment and carrier foundations must be secure and permit no movement when pipeline is operated. Bent or damaged pipe is prohibited.

This rule does not apply to pipeline used as “helper rods” associated with power-operated switch machines.

#### CLASSIFICATION OF DEFECTS

- 236.17.A1 Operating connection for switch, derail, movable-point frog, facing-point lock, rail-locking device of movable bridge protected by interlocking, or mechanically operated signal, not made of steel or wrought-iron pipe 1 inch or larger, or member of equal strength. (Does not apply to up-and-down rod of mechanically operated signal.)
- 236.17.A2 Pipe not fully screwed into coupling.
- 236.17.A3 Pipe not riveted to pipe plug with two rivets.
- 236.17.B1 Pipeline out of alignment sufficiently to interfere with proper operation.
- 236.17.B2 Pipeline not properly compensated for temperature changes.
- 236.17.B3 Pipeline carriers spaced more than 8 feet apart on tangent or on curve of less than 2 degrees.
- 236.17.B4 Pipeline carriers spaced more than 7 feet apart on curve of 2 degrees or more.
- 236.17.B5 Coupling in pipeline fouls carrier.

#### **§ 236.18 Software management control plan.**

(a) Within 6 months of June 6, 2005, each railroad shall develop and adopt a software management control plan for its signal and train control systems. A railroad commencing operations after June 6, 2005, shall adopt a software management control plan for its signal and train control systems prior to commencing operations.

(b) Within 30 months of the completion of the software management control plan, each railroad shall have fully implemented such plan.

(c) For purposes of this section, “software management control plan” means a plan designed to ensure that the proper and intended software version for each specific site and location is documented (mapped) and maintained through the life-cycle of the system. The plan must further describe how the proper software configuration is to be identified and confirmed in the event of replacement, modification, or disarrangement of any part of the system.

#### Application:

This rule requires that each railroad develop and adopt a software management control plan for existing processor-based signal and train control systems. Each railroad must develop and adopt a software management control plan on or before December 6, 2005. Each railroad commencing

operations after June 6, 2005, is required to adopt a software management control plan prior to commencing operations.

Each railroad is then required to have its software management control plan fully implemented no later than 30 months after its adoption. The deadline for implementation is June 6, 2008.

“Software management control plan” means a plan designed to ensure that the proper and intended software version for each specific site and location is documented (mapped) and maintained through the life-cycle of the system. The plan must further describe how the proper software configuration is to be identified and confirmed in the event of replacement, modification, or disarrangement of any part of the system.

The requirements of this section apply to all software of processor-based signal and train control equipment in service on or after June 6, 2005, including that which is specifically excluded under § 236.911.

Section 236.18 does not, however, cover products subject to the provisions contained in Part 236, Subpart H, which are required to be developed, installed, implemented, and maintained in strict accordance with a configuration management control plan contained in an FRA-approved Product Safety Plan (PSP). While the requirements of this section do not apply to configuration management required within a PSP, a railroad may combine its software management control plan with the configuration management control plan and subject those products to the requirements in Subpart H.

The requirements do not apply to hardware except in limited circumstances, such as when upgrades in hardware require new or modified software. Disarrangement of hardware also should be considered for those occurrences of natural disasters (e.g., lightning, floods, etc.) or accidents (e.g., fires, derailments, automobiles that strike instrument housings, etc.) that destroy or damage equipment locations to the extent it requires replacement of processor-based equipment.

A software management control plan is an inventory of software at each equipment location of a signal or train control system which includes each wayside location, each highway-rail grade crossing warning system that provides safety-critical data to a signal or train control system, onboard each equipped locomotive, and each departure test point. The plan must reflect the existing software, software changes resulting from modifications, upgrades in software, upgrades in hardware that require new or modified software, and changes in operating conditions such as removal or addition of switches or signals, respacing, and increased speeds. The plan should be updated to reflect each change to previous versions

of software. FRA inspectors and FRA-certified State inspectors should be able to determine from the software management control plan precisely what software is installed at each location.

A software management control plan will track the version of software that should be and is in use in all equipment locations of a signal and train control system. The plan should identify and document, for each equipment location, devices that contain software. FRA is not requiring railroads to track changes deeper than that at the program memory device (PROM, PROMS, EPROMS, EEPROMS, etc.) level. Accordingly, circuit boards with embedded memory and programmable memory devices should be identified in the plan. The plan should identify the name of the executive or application software, software version number, software revision

number, date of software revision, and a description of the software cyclic redundancy check. In addition, the location of each spare PROM and circuit board with embedded memory should be identified. The installation of a spare PROM or circuit board with embedded memory and the disposition of each shall be recorded in the software management control plan. The software management control plan should stipulate that when testing or otherwise, no PROM or circuit board with embedded memory may be replaced with another until it has been verified the replacement is correct.

A software management control plan must require the software to be maintained as specified, i.e., software shall be maintained strictly as required by design. The plan should require revisions (additions, modifications, and deletions) to processor-based equipment be made only upon written approval of the railroad's designated responsible officer or his/her designated representative. Each revision of the software shall be supported by documentation which includes and originates from a change request initiated by the railroad or the vendor and be attached to the revision document. Software revision control shall require documentation that describes the reason for making the change and a description of the change, the supporting hardware and compatible interfaces. Each software revision shall contain documentation that describes the functional description, change summary, and compatibility summary to ensure the revision meets the railroad's requirements. The documentation for each revision shall contain instructions for verifying and field testing any change not covered in the railroad's rules, standards, and procedures that govern installation, maintenance, and testing of processor-based equipment. Unless otherwise specifically identified in the documentation, each revision shall be installed and tested in accordance with the railroad's rules, standards, and procedures.

The software management control plan should specify that a safety-critical software upgrade, patch, or revision from a supplier, must be installed without undue delay. The plan should identify interim steps to be taken to ensure safety of train operations and the motoring public until the safety-critical upgrade, patch, or revision has been installed.

Upon completion of each revision, the software management control plan shall be updated to reflect the change, including software revision number, version number, and date and time installed, and name of individual performing the installation. A record of the revision installation shall be submitted to the responsible railroad official or his/her designated representative, to document that the revision has been installed. The results of tests validating each revision should be included, and must be recorded and made part of the software management control plan record.

The software management control plan is required to be maintained on file at a designated railroad office, or offices, and available for review or replication by FRA inspectors or FRA-certified State inspectors. (*See Technical Bulletin S-06-01 and S-07-01*)

#### CLASSIFICATION OF DEFECTS

- |           |   |
|-----------|---|
| 236.18.A1 | Software management control plan not developed within prescribed timeframe.         |
| 236.18.A2 | Software management control plan not adopted within prescribed timeframe.           |
| 236.18.B1 | Software management control plan not fully implemented within prescribed timeframe. |

- 236.18.B2 Software management control plan process or procedure not complied with.
- 236.18.C1 Software management control plan process or procedure incomplete or inadequate.
- 236.18.C2 Software management control plan equipment inventory incomplete or inadequate in process or procedure.
- 236.18.C3 Software version or configuration in service that is unauthorized, incorrect, or inappropriate.
- 236.18.C4 Software management control plan does not include necessary signal or train control processor-based equipment.
- 236.18.C5 Software version or configuration in service within a signal or train control system, subsystem, or component not included, or inaccurate, in the software management control plan equipment inventory.
- 236.18.C6 Software management control plan does not include processor-based equipment of a highway-rail grade crossing warning system, subsystem, or component which provides safety-critical data to a signal or train control system. See § 234.275(f).
- 236.18.C7 Software version or configuration in service within a highway-rail grade crossing warning system, subsystem, or component which provides safety-critical data to a signal or train control system not included, or inaccurate, in the software management control plan equipment inventory. See § 234.275(f).
- 236.18.C8 Software management control plan does not include processor-based equipment of other similar systems or protective devices.
- 236.18.C9 Software version or configuration in service within an other similar system or protective device not included, or inaccurate, in the software management control plan equipment inventory.

### ***Roadway Signals and Cab Signals***

#### **§ 236.21 Location of roadway signals.**

Each roadway signal shall be positioned and aligned so that its aspects can be clearly associated with the track it governs.

#### **Application:**

This rule requires that each signal be positioned and aligned so that the aspect it displays is clearly associated with the track it governs.

Inspectors must be alert for installations where it is possible to mistake the aspect of one signal for that of another or where the aspect displayed is not clearly associated with the track it is intended to govern.

The FRA relies heavily on the inspector's judgment to determine whether the location and alignment of a signal complies with the intent of this rule.

#### CLASSIFICATION OF DEFECTS

236.21.A1      Roadway signal not positioned and aligned so that the aspects it displays can be clearly associated with the track it governs.

#### **§ 236.22 Semaphore signal arm; clearance to other objects.**

At least one-half inch clearance shall be provided between semaphore signal arm, and any object that may interfere with its operation.

##### Application:

This rule requires one-half inch clearance between a semaphore arm and any object which may interfere with its operation.

Operational test of semaphore signal should be made to insure any object, including light unit, clears the arm and spectacle at least one-half inch throughout its arc of travel.

#### CLASSIFICATION OF DEFECTS

236.22.A1      Clearance between semaphore arm and object that may interfere with its operation is less than one-half inch.

#### **§ 236.23 Aspects and indications.**

(a) Aspects shall be shown by the position of semaphore blades, color of lights, position of lights, flashing of lights, or any combination thereof. They may be qualified by marker plate, number plate, letter plate, marker light, shape and color of semaphore blades or any combination thereof, subject to the following conditions:

(1) Night aspects of roadway signals, except qualifying appurtenances, shall be shown by lights; day aspects by lights or semaphore arms. A single white light shall not be used.

(2) Reflector lenses or buttons or other devices which depend for visibility upon reflected light from an external source shall not be used hereafter in night aspects, except qualifying appurtenances.

(b) The aspects of cab signals shall be shown by lights or by illuminated letters or numbers.

(c) Each aspect displayed by a signal shall be identified by a name and shall indicate action to be taken. Only one name and indication shall apply to those aspects indicating the same action to be taken; the same aspect shall not be used with any other name and indication.

(d) The fundamental indications of signal aspects shall conform to the following:

(1) A red light, a series of horizontal lights or a semaphore blade in a horizontal position shall be used to indicate stop.

(2) A yellow light, a lunar light, or a series of lights or a semaphore blade in the upper or lower quadrant at an angle of approximately 45 degrees to the vertical, shall be used to indicate that speed is to be restricted and stop may be required.

(3) A green light, a series of vertical lights, or a semaphore blade in a vertical position in the upper quadrant or 60° or 90° in the lower quadrant shall be used to indicate proceed at authorized

speed.

(e) The names, indications, and aspects of roadway and cab signals shall be defined in the carrier's Operating Rule Book or Special Instructions. Modifications shall be filed with the FRA within thirty days after such modifications become effective.

(f) The absence of a qualifying appurtenance, the failure of a lamp in a light signal, or a false restrictive position of an arm of a semaphore signal shall not cause the display of a less restrictive aspect than intended.

#### Application:

This rule prescribes how aspects shall be shown, that each aspect shall be named and indicate action to be taken, and the fundamental indications of the aspects.

This rule provides that signals may be qualified, and prohibits the use of reflector lenses or buttons or other devices depending upon reflected light for visibility in lieu of signal aspects. It prescribes that the names, indications, and aspects be defined in the carrier's operating rule books or special instructions on file with the FRA.

This rule applies to all systems. Each aspect and indication is required to be defined in carrier's rule book or special instructions.

Use of single white light is prohibited except for indicators of protective devices such as hotbox or dragging equipment detectors, and for use as a qualifying appurtenance.

It is permissible for carriers to qualify red aspect to permit its use to indicate "Proceed at Restricted Speed" without requiring stop. (*See* § 236.204.) Yellow or lunar aspect must be used to approach such signals.

The absence of a semaphore arm on a semaphore signal is an imperfectly displayed signal and does not meet these requirements.

A fixed signal aspect, without lights or which depends for visibility upon a reflected light from an external source, is in violation of this part for night train operation.

This rule prohibits future installation of reflective devices in lieu of signal aspects such as the yellow triangle that will permit a higher speed when certain aspects are displayed.

The failure of a lamp in a light signal, a false restrictive position of a semaphore arm or the absence of a qualifying appurtenance shall not cause a signal to display a more favorable aspect than intended. (*See Technical Bulletin S-99-01*)

#### CLASSIFICATION OF DEFECTS

- 236.23.A1 Aspects of roadway signal shown by means other than position of semaphore blade, color of lights, position of lights, flashing of lights, or combination thereof.
- 236.23.A2 Night aspects of roadway signal not shown by lights.
- 236.23.A3 Day aspects of roadway signal not shown by lights or semaphore arms.

- 236.23.A4 Single white light used for aspect of roadway signal.
- 236.23.A5 Reflector lenses, buttons, or other devices which depend for visibility upon reflected light from an external source used in night aspect of roadway signal.
- 236.23.B1 Aspects of cab signals shown by means other than lights, illuminated letters, or illuminated numbers.
- 236.23.C1 Signal aspect not identified by name.
- 236.23.C2 Signal aspect does not indicate action to be taken.
- 236.23.C3 More than one name and indication applies to aspects indicating the same action to be taken.
- 236.23.C4 Same aspect used with more than one name and indication.
- 236.23.D1 Aspect other than a red light, a series of horizontal lights or a semaphore blade in the horizontal position, used to indicate stop.
- 236.23.D2 Aspect other than a yellow light, a lunar light, a series of lights, or a semaphore blade in the upper or lower quadrant at an angle of approximately 45 degrees to the vertical, used to indicate that speed is to be restricted and stop may be required.
- 236.23.D3 Aspect other than a green light, a series of vertical lights, or a semaphore blade in a vertical position in the upper or 60° or 90° in the lower quadrant, used to indicate proceed at authorized speed.
- 236.23.E1 Names, indications and aspects of roadway signals and/or cab signals not defined in carrier's block signal and interlocking rules currently in effect.
- 236.23.E2 Copy of modification of carrier's block signal and interlocking rules not filed with the Federal Railroad Administration within thirty days after such modification became effective.
- 236.23.F1 Signal displays a less restrictive aspect than intended when a qualifying appurtenance is missing from its normal location on the signal mast.
- 236.23.F2 Signal displays a less restrictive aspect than intended when a lamp fails in a light signal.
- 236.23.F3 Signal displays a less restrictive aspect than intended when arm of semaphore signal assumes a false restrictive position.

#### **§ 236.24 Spacing of roadway signals.**

Each roadway signal shall be located with respect to the next signal or signals in advance which govern train movements in the same direction so that the indication of a signal displaying a restrictive aspect can be complied with by means of a brake application, other than an emergency application, initiated at such signal, either by stopping at the signal where a stop is

required, or by a reduction in speed to the rate prescribed by the next signal in advance where reduced speed is required.

Application:

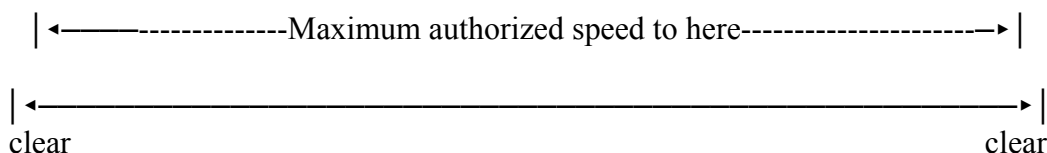
This rule requires signals to be adequately spaced to provide proper distances for reducing speeds or stopping by use of other than an emergency brake application before reaching the point where reduced speed or stopping is required.

This rule also requires that in automatic cab signal, train control, and train stop territory, these braking distances be adequate to compensate for the 8-second delay time that is designed into almost all these systems. Section 236.563 states in part, "...and the spacing of signals to meet the requirements of

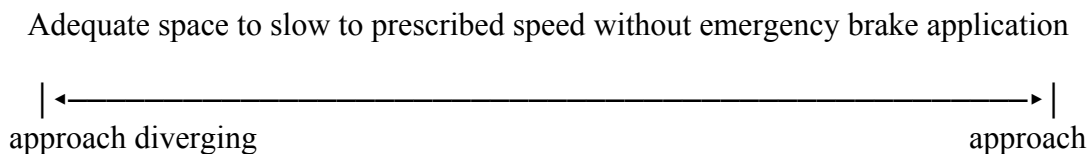
§ 236.24 shall take into consideration the delay time." Thus, the proper spacing of signals must also include the spacing of code change points so that a train may comply with the indications of a cab signal, train stop, or train control system without using an emergency brake application before reaching the point where reduced speed or a stop is required.

Carrier's braking distance charts shall be used to determine proper spacing. In the event that a carrier does not have a braking distance chart, braking tests may be required at suspected locations.

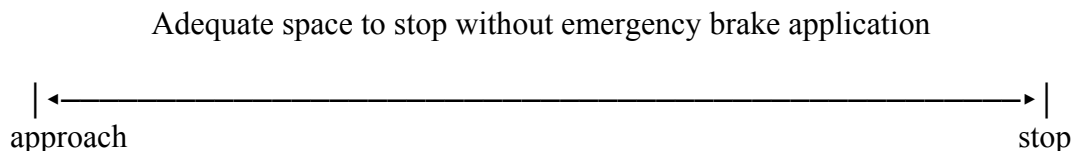
A proceed aspect authorizes maximum authorized speed to next signal without regard of preview of next signal:



A reduced speed aspect requires spacing adequate to slow to prescribed speed before reaching next signal:



An aspect requiring stop at next signal, whether operative or inoperative, requires spacing adequate enough to stop without emergency brake application before reaching next signal:



These requirements apply to all systems including protective devices such as slide protection, high water protection, movable bridges, spring switches, etc.



Where speed is increased, profiles and circuit plans should be reviewed for proper braking distances.

Where yellow or lunar aspect does not provide stopping distance to stop aspect, an advance approach or a successive restrictive signal is necessary.

#### CLASSIFICATION OF DEFECTS

- 236.24.A1 Roadway signal not located with respect to the next signal or signals in advance which governs train movements in the same direction, so that when it displays a restrictive aspect the indication of that aspect can be complied with by means of a brake application, other than an emergency application initiated at such signal, by stopping at the signal where a stop is required.
- 236.24.A2 Roadway signal not located with respect to the next signal in advance governing movements in the same direction, so that when it displays a restrictive aspect the indication of that aspect can be complied with by means of a brake application, other than an emergency application, initiated at such signal, by a reduction in speed to the rate prescribed by the next signal in advance.

#### **§ 236.26 Buffing device, maintenance.**

Buffing device shall be maintained so as not to cause the signal to display a less restrictive aspect than intended.

##### Application:

This rule requires that buffing device be so maintained that it cannot cause a signal to display a less restrictive aspect than intended.

Operational testing should be conducted in order to observe that oil or air buffers operate properly.

In the event the buffing device causes a signal to display a less restrictive aspect than intended, a false proceed report shall be filed with FRA.

#### CLASSIFICATION OF DEFECTS

- 236.26.A1 Buffing device causes signal to display a less restrictive aspect than intended.

#### ***Track Circuits***

#### **§ 236.51 Track circuit requirements.**

Track relay controlling home signals shall be in deenergized position, or device that functions as a track relay controlling home signals shall be in its most restrictive state, and the track circuit of an automatic train stop, train control, or cab signal system shall be deenergized in the rear of the point where any of the following conditions exist:

(a) When a rail is broken or a rail or switch-frog is removed except when a rail is broken or removed in the shunt fouling circuit of a turnout or crossover, provided, however, that shunt fouling circuit may not be used in a turnout through which permissible speed is greater than 45 miles per hour. It shall not be a violation of this requirement if a track circuit is energized:

(1) When a break occurs between the end of rail and track circuit connector; within the limits of rail joint bond, appliance or other protective device, which provides a bypath for the electric current, or

(2) As result of leakage current or foreign current in the rear of a point where a break occurs.

(b) When a train, locomotive, or car occupies any part of a track circuit, including fouling section of turnout except turnouts of hand-operated main track crossover. It shall not be a violation of this requirement where the presence of sand, rust, dirt, grease, or other foreign matter prevents effective shunting, except that where such conditions are known to exist adequate measures to safeguard train operation must be taken.

(c) Where switch shunting circuit is used:

(1) Switch point is not closed in normal position.

(2) A switch is not locked where facing-point lock with circuit controller is used.

(3) An independently-operated fouling-point derail equipped with switch circuit controller is not in derailing position.

#### Application:

This rule is the standard by which all track circuits that control home signals or locking circuits shall be designed and installed. This rule is not applicable to track circuits that do not affect the safety of train operation.

This rule applies to all types of track circuits that control home signals or locking circuits. It does not apply to track circuits that do not affect safety of train operation such as annunciator circuits or approach lighting circuits on nonsignaled sidings.

Automatic train stop, train control, and cab signal system track circuits required to be deenergized under this rule include those superimposed on track circuits of the conjunctive system.

Maximum authorized speed is 45 mph through a turnout equipped with shunt fouling circuit. Exception should not be taken to series, or parallel-type track circuits, where a small section of the turnout is provided with a shunt fouling circuit.

Track relay shall be deenergized, or the device that functions as a track relay shall be in its most restrictive state when a rail is broken or a rail or switch frog is removed; when any part of the track circuit or fouling section is occupied by a train, locomotive, or car; and, where switch shunting circuit is used, when switch is not in proper position, facing-point lock is not locked, or independently operated derail is not in derailing position.

It is not a violation if the track relay is not deenergized or the device that functions as a track relay is not in its most restrictive state when a rail is broken or removed in a shunt fouling circuit, or when a break occurs between the end of a rail and track circuit connector, within the limits of a rail joint bond appliance, or other protective device; as a result of leakage current or foreign current in the rear of a point where a break occurs, or as a result of sand, rust, dirt, grease, or other foreign matter preventing shunting.

Where sand, rust, dirt, grease, or other foreign matter is known to prevent, or possibly prevent, effective shunting, the carrier is required to take adequate measures to safeguard safety of train operation.

The track relay must be in the deenergized position or the device that functions as a track relay must be in its most restrictive state when a rail is removed.

Non-shunting sections caused by insulated rail joint stagger on short track circuits and in connection with crossing frogs are some of the most overlooked variances with this rule. Staggered insulated rail joints in excess of 5 feet create the possibility of cars or locomotives occupying part of a track circuit undetected.

### CLASSIFICATION OF DEFECTS

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|-----------|--|
| 236.51.A1 | Track relay not in deenergized position or device that functions as track relay not in its most restrictive state in the rear of a broken rail.  |
| 236.51.A2 | Track circuit of an automatic train stop, train control, or cab signal system not deenergized in the rear of a broken rail.  |
| 236.51.A3 | Track relay not in deenergized position or device that functions as a track relay not in its most restrictive state in the rear of where a rail or switch frog is removed from track.  |
| 236.51.A4 | Track circuit of an automatic train stop, train control, or cab signal system not deenergized in the rear of where a rail or switch frog is removed from track.  |
| 236.51.A5 | Shunt fouling circuit used where permissible speed through turnout is greater than 45 mph.   |
| 236.51.B1 | Track relay not in deenergized position or device that functions as a track relay not in its most restrictive state in the rear of where a train, locomotive, or car occupies any part of the track circuit except fouling section of turnout of hand-operated main track crossover. (Fully explain the condition of the rails with respect to the presence of sand, rust, dirt, grease, or other foreign matter). |
| 236.51.B2 | Track circuit of automatic train stop, train control, or cab signal not deenergized in the rear of where a train, locomotive, or car occupies any part of a track circuit except fouling section of turnout of hand-operated main track crossover. (Fully explain the condition of the rails with respect to the presence of sand, rust, dirt, grease, or other foreign matter.)                                   |
| 236.51.B3 | Adequate measures to safeguard 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 deenergization of a track circuit when occupied by a train, locomotive, or car.  |
| 236.51.B4 | Adequate measures to safeguard 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 deenergization of a track circuit of automatic train stop, train control, or cab signal system when occupied by a train, locomotive, or car.

- 236.51.C1 Track relay not in deenergized position or device that functions as a track relay not in its most restrictive state in the rear of where a switch point is not closed in normal position, where switch shunting circuit is used.
- 236.51.C2 Track circuit of automatic train stop, train control, or cab signal system not deenergized in the rear of where a switch point is not closed in normal position, where switch shunting circuit is used.
- 236.51.C3 Track relay not in deenergized position or device that functions as a track relay not in its most restrictive state in the rear of where a switch is not locked, where switch is equipped with facing-point lock with switch circuit controller and, where switch shunting circuit is used.
- 236.51.C4 Track circuit of automatic train stop, train control, or cab signal system not deenergized in the rear of where a switch is not locked, where switch is equipped with facing-point lock with circuit controller and, where switch shunting circuit is used.
- 236.51.C5 Track relay not in deenergized position or device that functions as a track relay not in its most restrictive state in the rear of where an independently operated fouling-point derail equipped with switch circuit controller is not in derailing position, where switch shunting circuit is used.
- 236.51.C6 Track circuit of automatic train stop, train control, or cab signal system not deenergized in the rear of where an independently operated fouling-point derail equipped with switch circuit controller is not in derailing position, where switch shunting circuit is used.

#### **§ 236.52 Relayed cut-section.**

Where relayed cut-section is used in territory where non-coded direct-current track circuits are in use the energy circuit to the adjoining track shall be open and the track circuit shunted when the track relay at such cut-section is in deenergized position.

#### Application:

This rule requires that where energy of non-coded direct-current track circuit is supplied through contacts of adjoining non-coded track relay, energy circuit shall be opened and track circuit shunted when relay is deenergized.

Apply this rule at relayed cut-section of non-coded direct-current track circuit only, including polar, neutral, or biased relays.

#### CLASSIFICATION OF DEFECTS

- 236.52.A1 Where relayed cut-section is used in territory where non-coded direct-current

track circuits are in use, the energy circuit to the adjoining track circuit not open when the track relay at the cut-section is in deenergized position.

- 236.52.A2 Where relayed cut-section is used in territory where non-coded direct-current track circuits are in use, the adjoining track circuit not shunted when the track relay at the cut-section is in deenergized position.

### **§ 236.53 Track circuit feed at grade crossing.**

At grade crossing with an electric railroad where foreign current is present, the electric energy for non-coded direct current track circuit shall feed away from the crossing.

#### Application:

At a crossing-at-grade of a non-electrified railroad using non-coded direct current track circuits with an electrified railroad, this rule requires the battery end of direct current track circuit be located at the crossing.

This rule is not applicable unless foreign current is proven to be present.

### CLASSIFICATION OF DEFECTS

- 236.53.A1 At grade crossing with an electric railroad where foreign current is present, the electric energy for non-coded direct current track circuit feeds toward the crossing.

### **§ 236.54 Minimum length of track circuit.**

When a track circuit shorter than maximum inner wheelbase of any locomotive or car operated over such track circuit is used for control of signaling facilities, other means shall be used to provide the equivalent of track circuit protection.

#### Application:

This rule permits the use of track circuits shorter than the inner wheelbase of any locomotive or car, provided other means are used to provide the equivalent of track circuit protection.

Track circuits shorter than the inner wheelbase of any locomotive or car operating over the track are prohibited unless supplemented with other protective devices or circuits that provide protection equivalent to a track circuit.

This rule is applicable to all track circuits that control home signals or electric locking circuits. The rule does not apply to track circuits used exclusively for approach lighting circuits on sidings or auxiliary tracks, or as annunciator circuits or other non-vital-type track circuits.

In addition to trap circuits, directional stick circuits, and check-in check-out circuits permitted in the past, carriers may now provide devices that detect the presence of locomotives or cars (e.g., presence detectors) if such devices are so interconnected with the signaling system that it will perform equivalent to a track circuit of proper length.

## CLASSIFICATION OF DEFECTS

236.54.A1 Length of track circuit used for controlling signaling facilities that is less than maximum inner wheelbase of locomotive or car, not supplemented by special circuit or protective device that provides the equivalent of track circuit protection.

### **§ 236.55 Dead section; maximum length.**

Where dead section exceeds 35 feet, a special circuit shall be installed. Where shortest outer wheelbase of a locomotive operating over such dead section is less than 35 feet, the maximum length of the dead section shall not exceed the length of the outer wheelbase of such locomotive unless special circuit is used.

#### Application:

This rule prohibits the use of a dead section longer than the shortest outer wheelbase of a carrier's locomotive, but in no case longer than 35 feet, without protecting it with a special circuit.

This rule applies to the outer wheelbase of locomotives only and does not apply to cars.

Trap circuits are more commonly used to protect dead sections; however, directional stick circuits fall into the category of special circuits.

A presence detector or other such devices satisfy the requirement of this part.

This rule is not applicable to non-shunting section caused by the stagger of insulated rail joints.

Apply

§ 236.51 where stagger of insulated rail joints permits cars to span a live rail of the track circuit.

## CLASSIFICATION OF DEFECTS

236.55.A1 Dead section exceeds 35 feet and special circuit is not installed.

236.55.A2 Length of dead section exceeds the length of the outer wheelbase of a locomotive operating over such dead section and special circuit is not installed. (Applies where the length of the outer wheelbase of a locomotive is less than 35 feet.)

### **§ 236.56 Shunting sensitivity.**

Each track circuit controlling home signal or approach locking shall be so maintained that track relay is in deenergized position, or device that functions as a track relay shall be in its most restrictive state if, when track circuit is dry, a shunt of 0.06 ohm resistance is connected across the track rails of the circuit, including fouling sections of turnouts.

#### Application:

This rule requires that a track circuit controlling signal aspects or electric locking shall be maintained so that when a shunt of 0.06 ohm resistance is connected across the rails of the track

circuit at any location in the circuit, including fouling sections of turnouts, the track relay shall assume the deenergized position or if an electronic device is used in lieu of a track relay, such electronic device shall assume its most restrictive state.

This rule applies to any type track circuit of which the rails form a part of the circuit and which is used for controlling signal aspects or electric locking. It does not apply to approach lighting circuits on nonsignaled track, annunciator circuits, etc.

The most difficult time to shunt a track circuit is when the ballast is dry or frozen.

Car frame type track circuit must comply with this section.

Each turnout has three locations within the fouling section that should be tested. Those locations are both sides of the turnout blocking joints and at the clearance end of the circuit.

“Most restrictive state” is defined in § 236.813a as the mode of an electronic device that is equivalent to a track relay in its deenergized position. Regardless of the type of track circuit, this rule requires that signals governing movements over the track circuit must display their most restrictive aspects when the track circuit, including fouling sections of turnouts within the circuit, is shunted with a shunt of 0.06 ohms resistance.

#### CLASSIFICATION OF DEFECTS

236.56.A1      Track relay not in deenergized position or device that functions as a track relay not in its most restrictive state with a shunt of 0.06 ohm resistance connected across rails of the track circuit, when track circuit is dry.

#### **§ 236.57 Shunt and fouling wires.**

(a) Except as provided in paragraph (b) of this section, shunt wires and fouling wires hereafter installed or replaced shall consist of at least two discrete conductors, and each shall be of sufficient conductivity and maintained in such condition that the track relay will be in deenergized position, or device that functions as a track relay will be in its most restrictive state, when the circuit is shunted.

(b) This rule does not apply to shunt wires where track or control circuit is opened by the switch circuit controller.

#### Application:

Shunt wires and fouling wires are each required to be of sufficient conductivity and maintained in such condition that the track relay will be deenergized, or device that functions as a track relay in its most restrictive state, when the track circuit is shunted. Two completely separate conductors are required, except where switch circuit controller is used to both open control circuits and shunt the track circuit.

The reasoning for the two separate conductors is that these wires do not meet the closed circuit principle in that one or both may be missing, broken, or otherwise ineffective, yet no indication of that condition would occur within the signal system. An unsafe situation could therefore be undetected thus two separate conductors are required to help assure their proper and intended conductivity.

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

A conductor consisting of many small strands, such as that with the trade name “Bondstrand,” can be only considered as a single conductor.

Two fouling wires are required at the heel of the reverse switch point, at the toe and heel of the switch frog, and between the outer rails of the main track and turnout.

Shunt wires to switch circuit controller shall consist of two separate conductors connected to each rail and extending to the terminals of switch circuit controller.

This rule applies to not only shunt wires of switches or derails located on the signaled track, but also to those used at inside switches or fouling point derails located on a nonsignaled track leading to a signaled track where the railroad elects to install a switch circuit controller equipped with switch shunting circuit to detect the position of the inside switch or fouling point derail (see application language for § 236.60). Should such an inside switch or fouling point derail be found equipped with only a switch shunting circuit, and one where the shunt wires do not consist of two separate conductors, a defect should be cited for noncompliance with this section.

This rule is not applicable to rail joint bonds in fouling section.

Note: The points of connection to the main or signaled track rail of the two separate conductors of fouling wires, or of shunt wires if strapped together in the switch circuit controller, must not be “excessively” spaced apart from one another (e.g., greater than one foot apart). This condition may result in a loss of broken rail protection, necessitated by § 236.51, that is equivalent to the length of the spacing between the points of connection of the wires to the rail.

#### CLASSIFICATION OF DEFECTS

- 236.57.A1 Shunt or fouling wires do not consist of at least two discrete conductors. (Does not apply to shunt wires to switch circuit controller through which signal control circuits are controlled and track circuits are shunted, or where track circuit is opened and relay side of track circuit is shunted.)
- 236.57.A2 Shunt wires not of sufficient conductivity so that track relay is in deenergized position or device that functions as track relay is in its most restrictive state when circuit is shunted.
- 236.57.A3 Shunt wires not maintained in such condition that track relay is in deenergized position or device that functions as track relay is in its most restrictive state when circuit is shunted.
- 236.57.A4 Fouling wires not of sufficient conductivity so that track relay is in deenergized position or device that functions as track relay is in its most restrictive state when circuit is shunted.



236.57.A5      Fouling wires not maintained in such condition that track relay is in deenergized position or device that functions as track relay is in its most restrictive state when circuit is shunted.

#### **§ 236.58 Turnout, fouling section.**

Rail joints within the fouling section shall be bonded, and fouling section shall extend at least to a point where sufficient track centers and allowance for maximum car overhang and width will prevent interference with train, locomotive, or car movement on the adjacent track.

##### Application:

This rule requires that each rail joint within all fouling sections be bonded; however, it does not require double bonding of those rail joints.

This rule requires that the fouling section of each turnout shall extend at least to a point on the turnout where a standing standard-sized car or locomotive will clear a movement of other standard-sized cars or locomotives on the main track, under all circumstances, including with consideration of such as overhang of cars, track curvature, etc. This minimum clearance is not applicable to crossovers between tracks as they are protected by a combination of switch position and track circuit detection.

An acceptable method of determining the absolute least clearance point consists of taking a measurement 11 feet (to account for car overhang) ahead of the effective joint at the end of the fouling section (toward the switch points) and the measurement from the field side of that point on the near rail of the fouling section to the field side of the near main track rail must not be less than 6 feet 6 inches (to account for car width). Curved track areas may necessitate a minimal additional length be added to the 6-foot-6-inch measurement to allow for the near front corner of a car being skewed toward the adjacent track account being in a curve.

Note: See the fouling section clearance point diagram included at the end of this manual for detailed explanation of measurements.

#### CLASSIFICATION OF DEFECTS

236.58.A1      Rail joint in shunt fouling section not bonded.

236.58.A2      Fouling section of turnout does not extend to clearance point.

#### **§ 236.59 Insulated rail joints.**

Insulated rail joints shall be maintained in condition to prevent sufficient track circuit current from flowing between the rails separated by the insulation to cause a failure of any track circuit involved.

##### Application:

Insulated rail joints are required to be maintained in such condition as to prevent energy from flowing between adjoining track circuits.

This rule applies to all insulated rail joints in all systems.

An insulated rail joint is considered defective when intended insulation is clearly seen to be in bad condition or missing, or tests prove insulation is worn, deteriorated, or otherwise bypassed so as to conduct sufficient current between adjoining track circuits to cause track circuit failure. Where the intended insulation is visibly seen to be in bad condition or missing, testing of the insulated joint should be conducted in order to determine if the joint is currently failing so as to necessitate immediate repair or replacement.

The breakdown of insulation in a single insulated rail joint is considered a failure of a track circuit even though the insulated rail joint on the other rail is in good condition.

### CLASSIFICATION OF DEFECTS

- 236.59.A1 Insulated rail joint not maintained in condition to prevent flow of sufficient track circuit current between rails separated by the insulation to cause failure of the track circuit.
- 236.59.A2 Insulated rail joint not maintained in such a condition that the track circuit through the switch circuit controller can be opened when switch point open.
- 236.59.A3 Insulation in insulated rail joint in bad condition.

### **§ 236.60 Switch shunting circuit, use restricted.**

Switch shunting circuit shall not be hereafter installed, except where track or control circuit is opened by the circuit controller.

#### Application:

This rule applies to all systems, including signal arrangements such as tunnel protection, slide detector, or high water detector.

This rule applies to not only switches or derails located on the signaled track, but also to those inside switches or fouling point derails located on a nonsignaled track leading to a signaled track where the railroad elects to install a switch circuit controller to detect the position of the inside switch or fouling point derail.

In the latter case, as is stated in the Himmel Letter of 1985, “The FRA will consider granting relief from the requirements of this section at such installations upon an adequate showing by individual carriers.” Should such an inside switch or fouling point derail be found equipped only with a switch shunting circuit, a defect should be cited for noncompliance with this section and the railroad advised to either correct the deficiency, or timely submit a request for relief.

This rule prohibits the use of a switch shunting circuit as the only method of protection.

The rule permits the use of a circuit to shunt the track circuit only if the circuit controller also opens the track circuit or a signal control circuit.

This rule permits the continued use of existing installations of switch shunting circuits.

This rule applies to all new switch locations in revenue service. FRA has defined a new switch as:

- An additional switch installed in a system existing on February 27, 1984.
- All switches of each system installed after February 26, 1984.
- A switch installed as the result of the shortening or lengthening of a siding or other auxiliary track except when such switch is moved for routine track maintenance (including rail relay) or the angle of the switch frog is changed as the result of a change in carrier track standards.

### CLASSIFICATION OF DEFECTS

236.60.A1 Switch shunting circuit installed where track circuit or control circuit not opened by switch circuit controller. (Does not apply to installations made before February 27, 1984.)

### ***Wires and Cable***

#### **§ 236.71 Signal wires on pole line and aerial cable.**

Signal wire on pole line shall be securely tied in on insulator properly fastened to crossarm or bracket supported by pole or other support. Signal wire shall not interfere with, or be interfered by, other wires on the pole line. Aerial cable shall be supported by messenger.

#### Application:

Signal wires carried on pole lines are required to be securely tied in on insulators properly fastened to a crossarm or bracket which is supported by a pole or other support. Cable used aerially is required to be supported by messenger.

The intent of this rule is that all signal wires, including AC power supply carried on pole line, are required to be tied in on insulators that are securely fastened to a crossarm or bracket attached to a pole or other fixture, such that each signal wire is maintained clear of all other wires. Further, aerial cable is to be supported by a messenger wire such that the weight of the cable is not being supported by the cable itself.

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

236.71.A1 Signal wire carried on pole line not securely tied in on insulator.

236.71.A2 Signal wire not secured because of broken, burnt, or missing crossarm.

236.71.A3 Signal wire not secured because of broken, burnt, or missing pole.

236.71.A4 Signal wire interferes with or is interfered by another wire.

236.71.A5 Cable used aerially not supported by messenger.

**§ 236.73 Open-wire transmission line; clearance to other circuits.**

Open-wire transmission line operating at voltage of 750 volts or more shall be placed not less than 4 feet above the nearest cross arm carrying signal or communication circuits.

Application:

This rule requires that open-wire transmission lines of 750 volts or more be placed at least 4 feet above the nearest crossarm carrying signal or communication wires. This rule applies where power of 750 volts or more is transmitted by open-wire line.

CLASSIFICATION OF DEFECTS

236.73.A1 Open-wire transmission line operating at voltage of 750 volts or more, less than 4 feet above nearest crossarm carrying signal or communication circuits.

**§ 236.74 Protection of insulated wire; splice in underground wire.**

Insulated wire shall be protected from mechanical injury. The insulation shall not be punctured for test purposes. Splice in underground wire shall have insulation resistance at least equal to the wire spliced.

Application:

This rule requires that insulated wire be protected from mechanical injury. It prohibits puncturing insulation for test purposes, and requires that a splice in an underground wire has insulation resistance at least equal to that of the wire spliced.

Insulated wire shall be placed in wire runs, strung on pole line, supported by messenger wire, or buried in a manner that it cannot be damaged by the operation of apparatus, vehicles, tools, workmen, or by closing doors or other enclosure covers or lids.

No insulated wire or conductor, whether in housing or outside, should be punctured for test purposes.

This rule does not permit the extended use of temporary installation of cable or wires on top of the ground. Such necessary temporary use shall be made permanent without undue delay or, as quickly as possible.

CLASSIFICATION OF DEFECTS

236.74.A1 Insulated wire not protected from mechanical injury.

236.74.A2 Insulation of insulated wire punctured for test purposes.

236.74.A3 Splice in underground wire does not have insulation resistance value at least equal to that of the wire spliced.

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

Each wire shall 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:

Each wire is required to be tagged or otherwise marked so it can be identified at each terminal. Nomenclature shall correspond to that of the circuit plan. Tags, or other marks of identification, are required to be made of insulating material. Wires and tags are prohibited from interfering with moving parts of signal apparatus.

This rule applies to each wire at each terminal in all housings, including switch circuit controllers, switch machines, and terminal or junction boxes.

Shunt wires inside switch circuit controllers are not required to be tagged as long as the carrier's nomenclature is uniform and corresponds to its circuit plans.

Signal wiring shall be tagged or otherwise marked at a terminal. A terminal is any point 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.

Breaks in a relay or other breaks that are identified on the circuit plan by the terminal post number meet the requirements of this rule. However, the circuit plan must be available in the signal case in such instances.

If a carrier identified their wires in this manner, it would require every signal and cut section to have a circuit plan. If they do not, and the wires cannot be identified, the installation does not comply with this section.

All tag or wire identification should correspond with the circuit plan. All tags and identification should be of insulating material. Wires and tags shall not interfere with the moving parts or apparatus. This includes the contact members of relays, switch machines, interlocking machines, semaphore signal mechanism and other moving apparatus, etc.

If it is necessary to pull the wire in order to identify the circuit it carries, the carrier is in noncompliance with this section.

CLASSIFICATION OF DEFECTS

236.76.A1 Wire not tagged or otherwise marked so it can be identified at terminal.

236.76.A2 Nomenclature of tag or wire identification does not correspond to that of circuit plan.

- 236.76.A3 Tag or other mark of identification in instrument case or apparatus housing not made of insulating material.
- 236.76.A4 Tag interferes with moving parts of apparatus.
- 236.76.A5 Wire interferes with operating part of mechanism.

### ***Inspections and Tests; All Systems***

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

The following inspections and tests shall be made in accordance with specifications of the carrier, subject to approval of the FRA, to determine if the apparatus and/or equipment is maintained in condition to perform its intended function. Electronic device, relay, or other electromagnetic device which fails to meet the requirements of specified tests 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:**

This rule prescribes that certain inspections and tests of vital importance be made. The inspections and tests must be performed in accordance with carrier specifications, which are subject to FRA approval. Electronic device, relay or other electromagnetic device that fails to meet the requirements of specified tests, must be removed from service and not restored to service until its operating characteristics are within the limits prescribed by the manufacturer. The rule is applicable to all systems.

The purpose of inspections and tests are to determine if operating characteristics of relays, electronic apparatus, and electromagnetic devices are within specified values, and that apparatus and equipment are being maintained in a condition to assure safety of train operation.

#### **CLASSIFICATION OF DEFECTS**

- 236.101.A1 Relay which failed to meet requirements of specified tests not removed from service.
- 236.101.A2 Relay which failed to meet requirements of specified tests restored to service with operating characteristics not in accordance with the limits within which the relay is designed to operate.
- 236.101.A3 Relay with broken glass, high resistance or burnt contacts, burnt ribbons, broken or bent contacts, improperly installed ribbons, excessive moisture or other foreign matter inside it's housing, not replaced or removed from service.
- 236.101.A4 Electromagnetic device other than relay, which failed to meet requirements of specified tests, not removed from service.
- 236.101.A5 Electromagnetic device other than relay, which failed to meet requirements of

specified tests, restored to service with operating characteristics not in accordance with the limits within which the electromagnetic device is designed to operate.

236.101.A6 Electronic device which failed to meet requirements of specified tests not removed from service.

236.101.A7 Electronic device which failed to meet requirements of specified test restored to service with operating characteristics not in accordance with the limits within which the electronic device is designed to operate.

#### **§ 236.102 Semaphore or searchlight signal mechanism.**

(a) Semaphore signal mechanism shall be inspected at least once every 6 months, and tests of the operating characteristics of all parts shall be made at least once every 2 years.

(b) Searchlight signal mechanism shall be inspected, and the mechanical movement shall be observed while operating the mechanism to all positions, at least once every 6 months. Tests of the operating characteristics shall be made at least once every 2 years.

##### Application:

This rule requires a visual inspection of semaphore and searchlight signal mechanisms at least once every 6 months. Tests of the operating characteristics of these mechanisms are required to be made every 2 years.

This rule applies to all semaphore and searchlight type signal mechanisms. Record of the 6-month inspections is not required. This rule requires the observation of the searchlight mechanism while it is operated in all positions during the 6-month inspection.

Tests of operating characteristics include pickup, release, and working values. They may be recorded in either voltage or current values, and a record of these tests is required.

#### CLASSIFICATION OF DEFECTS

236.102.A1 Semaphore signal mechanism not inspected at least once every 6 months.

236.102.A2 Test of semaphore signal mechanism operating characteristics not made at least once every 2 years.

236.102.B1 Searchlight signal mechanism not inspected, with the mechanical movement to all positions of searchlight mechanism being observed, at least once every 6 months.

236.102.B2 Test of searchlight signal mechanism operating characteristics not made at least once every 2 years.

#### **§ 236.103 Switch circuit controller or point detector.**

Switch circuit controller, circuit controller, or point detector operated by hand-operated switch or by power-operated or mechanically-operated switch-and-lock movement shall be inspected and tested at least once every 3 months.

Application:

Switch circuit controllers and point detectors are required to be inspected and tested at least once every 3 months.

Applies to all switch circuit controllers and point detectors in all systems required by 49 CFR §§ 236.6, 236.13, 236.51, 236.57, 236.202, 236.203, 236.334, and 236.342.

Inspection should determine general condition, such as extent of wear of bushings, bearings, and connections, secureness of fastenings, condition of contacts and shunt wires, wiring, gaskets, etc., in compliance with these rules.

Test should be made with the obstruction gage placed between the stock rail and the switch point, 6 inches from the end of the switch point, to determine proper adjustment and operation.

This rule is not applicable to a switch that is removed from revenue service and is effectively spiked, clamped, or blocked in proper position. Inspectors should be aware of the carrier's procedure for the removal of the switches from service.

CLASSIFICATION OF DEFECTS

236.103.A1 Switch circuit controller not inspected at least once every 3 months.

236.103.A2 Tests of switch circuit controller not made at least once every 3 months.

236.103.A3 Point detector not inspected at least once every 3 months.

236.103.A4 Tests of point detector not made at least once every 3 months.

**§ 236.104 Shunt fouling circuit.**

Shunt fouling circuit shall be inspected and tested at least once every 3 months.

Application:

Each shunt fouling circuit is required to be inspected and tested at least once every 3 months. This rule applies to all shunt fouling circuits in all systems.

Inspections should determine if bonds and fouling wires are applied and maintained in compliance with 49 CFR §§ 236.51, 236.56, 236.57, and 236.58, at the proper places, and are intact and in good condition. If visual inspection of fouling wires is unavailable due to being hidden from view (e.g., their being covered by ballast), noncompliance with this rule should be cited.

Test should be made at the defined limit of the fouling circuit (i.e., at the far insulated joints) and on both sides of the insulated rail joints located between the switch points and the frog, by connecting a 0.06 ohm shunt across the rails and determining if the associated track relay is in a deenergized position, or the device that functions as a track relay is in its most restrictive condition. If a fouling circuit is found without a clearly defined limit (no limiting insulated joints), it must be found to be effective at least to the clearance point.



A switch removed from revenue service does not eliminate the requirements of this rule.

#### CLASSIFICATION OF DEFECTS

236.104.A1 Shunt fouling circuit not inspected at least once every 3 months.

236.104.A2 Tests of shunt fouling circuit not made at least once every 3 months.

#### **§ 236.105 Electric lock.**

Electric lock, except forced-drop type, shall be tested at least once every 2 years.

##### Application:

This rule requires that electric locks be tested once every 2 years. It excludes forced-drop type electric locks. This rule applies to all systems and interlocking machines.

Locks failing to meet test requirements must be replaced. Electric locks of the non-forced-drop type may be removed from service, repaired, and replaced in service.

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

#### CLASSIFICATION OF DEFECTS

236.105.A1 Test of electric lock not made at least once every 2 years. (Does not apply to electric locks of forced-drop type.)

#### **§ 236.106 Relays.**

Each relay, the functioning of which affects the safety of train operations, shall be tested at least once every 4 years except:

- (a) Alternating current centrifugal type relay shall be tested at least once every 12 months;
- (b) Alternating current vane type relay and direct current polar type relay shall be tested at least once every 2 years; and
- (c) Relay with soft iron magnetic structure shall be tested at least once every 2 years.

##### Application:

This rule requires that each relay used in vital circuits of wayside equipment be tested at intervals prescribed for its type of design. This rule applies to relays used in vital circuits of wayside equipment in all systems.

Each relay is required to be tested at least once every 4 years except:

1. Centrifugal relays shall be tested at least once every 12 months.
2. Vane relays and DC polar relays shall be tested at least once every 2 years.
3. Relays with soft iron magnetic structure, which tends to become permanently

magnetized, shall be tested at least once every 2 years.

This rule is applicable only to relays in service. A new relay placed in service shall be tested at intervals prescribed for its type of design. A shopped relay, after being tested or repaired in the shop, is not considered in service until it is installed within a signal system.

A visual inspection of each relay is intended to be an integral part of the testing. A 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 pickup, release, and working values. They may be recorded in either voltage or current values.

### CLASSIFICATION OF DEFECTS

236.106.A1 Tests of relay in service not made at least once every 4 years.

236.106.A2 Tests of centrifugal relay in service not made at least once every 12 months.

236.106.B1 Tests of AC vane relay not made at least once every 2 years.

236.106.B2 Tests of DC polar relay not made at least once every 2 years.

236.106.C1 Tests of relay with soft iron magnetic structure not made at least once every 2 years.

### **§ 236.107 Ground tests.**

(a) Except as provided in paragraph (b) of this section, a test for grounds on each energy bus furnishing power to circuits, the functioning of which affects the safety of train operation, shall be made when such energy bus is placed in service, and shall be made at least once every 3 months thereafter.

(b) The provisions of this rule shall not apply to track circuit wires, common return wires of grounded common single-break circuits, or alternating current power distribution circuits grounded in the interest of safety.

#### Application:

This rule requires that a test for grounds on vital circuitry be made when placed in service and at least once every 3 months thereafter.

This test shall be made at energy buses supplying power to signal control circuits. Use of an appropriate external battery source is an acceptable means of testing. This test is 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.

This test shall be made by measuring the voltage potential between each energy bus and the ground. If a voltage potential is detected between the energy bus and the ground, a current reading shall be taken to determine whether the ground is in excess of that permitted by § 236.2.

In no case shall a current reading be taken when a train is closely approaching or passing, or a meter connected between an energy bus and the ground be left unattended.

This ground test should also 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. (*See Technical Bulletin S-99-03*)

### CLASSIFICATION OF DEFECTS

236.107.A1 Ground test on energy bus which furnishes power to circuits, the functioning of which affects the safety of train operation, not made when energy bus is placed in service.

236.107.A2 Ground test on energy bus which furnishes power to circuits, the functioning of which affects the safety of train operation, not made at least once every 3 months.

### **§ 236.108 Insulation resistance tests, wires in trunking and cables.**

(a) Insulation resistance of wires and cables, except wires connected directly to track rails, shall be tested when wires, cables, and insulation are dry. Insulation resistance tests shall be made between all conductors and ground, and between conductors in each multiple conductor cable, and between conductors in trunking, when wires or cables are installed and at least once every 10 years thereafter.

(b) When insulation resistance of wire or cable is found to be less than 500,000 ohms, prompt action shall be taken to repair or replace the defective wire or cable and until such defective wire or cable is replaced, insulation resistance test shall be made annually.

(c) In no case shall a circuit be permitted to function on a conductor having an insulation resistance to ground or between conductors of less than 200,000 ohms during the period required for repair or replacement.

#### Application:

This rule requires tests of insulation resistance of wires in trunking and cable be made when installed, and at least once every 10 years thereafter. Conductors found having insulation resistance of less than 500,000 ohms shall be tested annually. In no case shall a conductor with insulation resistance found of less than 200,000 ohms be left in service.

Tests must be made when wires, cables, and insulation are dry. However, wet conditions do not, under any circumstances, provide relief from § 236.2.

Insulation resistance tests of each wire within trunking or within a cable must be tested to ground, and tested against all other wires within the trunking or cable.

Single-conductor wire buried underground shall be tested to ground, but is not required to be tested against all other wires in the cable run.

This rule applies to conductors and cables used for signal power.

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 the defective wire or cable is repaired or replaced, insulation resistance tests must be made annually. The reason for this provision is to allow lead time for the acquisition of new cable or the scheduling of manpower. However, if material and manpower are available to affect repairs or replacement, corrective action shall be taken immediately.

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

### CLASSIFICATION OF DEFECTS

- 236.108.A1 Test of insulation resistance not made when wires or cables are installed.
- 236.108.A2 Test of insulation resistance not made at least once every ten years.
- 236.108.B1 Prompt action not taken to repair or replace conductor when its insulation resistance is found below 500,000 ohms.
- 236.108.B2 Test of insulation resistance not made at least annually until defective wire or cable is repaired or replaced when its insulation resistance is found below 500,000 ohms.
- 236.108.C3 Circuit permitted to function on a conductor having insulation resistance found of less than 200,000 ohms.

### **§ 236.109 Time releases, timing relays, and timing devices.**

Time releases, timing relays, and timing devices shall be tested at least once every 12 months. The timing shall be maintained at not less than 90 percent of the predetermined time interval, which shall be shown on the plans or marked on the time release, timing relay, or timing device.

#### Application:

This test requires that time releases, timing relays, and timing devices be tested once every 12 months, and that timing be maintained at not less than 90 percent of the predetermined time interval, which shall be shown on the plans or marked on the time release, time relay, or timing device. This rule applies to all systems.

Tests should not be conducted while rail traffic is approaching or within any route involved in the test.

This test is required to determine the length of time that a time release, timing relay, or timing device must run before the associated locking is released.

Tests shall be conducted by starting the time release, timing relay, or timing device and checking the length of time from the instant the device is started, or from the opening of the check contact (if used), until the release of the lever lock or energization of electric stick locking relay.

Releasing time must not be less than 90 percent of that shown. It may be any amount of time over the predetermined time. Predetermined time interval must be shown on plans or marked on the time release, time relay, or timing device.

#### CLASSIFICATION OF DEFECTS

- 236.109.A1 Time release not tested at least once every 12 months.
- 236.109.A2 Timing relay not tested at least once every 12 months.
- 236.109.A3 Timing device not tested at least once every 12 months.
- 236.109.A4 Timing of time release less than 90 percent of predetermined time interval.
- 236.109.A5 Timing of timing relay less than 90 percent of predetermined time interval.
- 236.109.A6 Timing of timing device less than 90 percent of predetermined time interval.
- 236.109.A7 Predetermined time interval not shown on plans or marked on time release, timing relay, or timing device.

#### **§ 236.110 Results of tests.**

(a) Results of tests made in compliance with §§ 236.102 to 236.109, inclusive; 236.376 to 236.387, inclusive; 236.576; 236.577; 236.586 to 236.589, inclusive; and 236.917(a) must be recorded on preprinted forms provided by the railroad or by electronic means, subject to approval by the FRA Associate Administrator for Safety. These records must show the name of the railroad, place and date, equipment tested, results of tests, repairs, replacements, adjustments made, and condition in which the apparatus was left. Each record must be:

(1) Signed by the employee making the test, or electronically coded or identified by number of the automated test equipment (where applicable);

(2) Unless otherwise noted, filed in the office of a supervisory official having jurisdiction; and

(3) Available for inspection and replication by FRA and FRA-certified State inspectors.

(b) Results of tests made in compliance with § 236.587 must be retained for 92 days.

(c) Results of inspections and tests made in compliance with § 236.917(a) must be retained as follows:

(1) Results of inspections and tests that pertain to installation or modification must be retained for the life-cycle of the equipment tested and may be kept in any office designated by the railroad; and

(2) Results of periodic inspections and tests required for maintenance or repair of the equipment tested must be retained until the next record is filed but in no case less than 1 year.

(d) Results of all other tests listed in this section must be retained until the next record is filed but in no case less than 1 year.

(e) Electronic or automated tracking systems used to meet the requirements contained in paragraph (a) of this section must be capable of being reviewed and monitored by FRA at any time to ensure the integrity of the system. FRA's Associate Administrator for Safety may prohibit or revoke a railroad's authority to utilize an electronic or automated tracking system in lieu of preprinted forms if FRA finds that the electronic or automated tracking system is not

properly secured, is inaccessible to FRA, FRA-certified State inspectors, or railroad employees requiring access to discharge their assigned duties, or fails to adequately track and monitor the equipment. The Associate Administrator for Safety will provide the affected railroad with a written statement of the basis for his or her decision prohibiting or revoking the railroad from utilizing an electronic or automated tracking system.

#### Application:

This rule requires that the results of tests be recorded and filed in the office of the responsible division officer. It specifies those results to be recorded, prescribes the general format to be used, and requires that the recording be signed by the employee making the test, or electronically coded or identified by the number of the automated test equipment used (where applicable).

The result of each required test must be recorded on preprinted or computerized forms designed for that purpose, or by electronic means, subject to approval by the FRA Associate Administrator for Railroad Safety/Chief Safety Officer. Results of the tests must be recorded in the manner prescribed by the rule.

The form must show name of carrier, place, date, equipment tested, results of tests, repairs, replacements, adjustments, condition in which apparatus was left, and signature of the employee making the tests, or electronically coded or identified by a unique number of the automated test equipment used (where applicable). This required information may be shown in any order the carrier chooses and forms may provide for several tests. Equipment tested refers to each piece of equipment tested in compliance with 49 CFR §§ 236.102 to 236.109, inclusive; 236.376 to 236.387, inclusive; 236.576; 236.577; 236.586 to 236.589, inclusive; and 236.917(a).

Each test record required by this rule shall be filed in the office of a supervisory official having jurisdiction. The divisional officer may be an assistant signal supervisor, signal supervisor, or any other divisional officer. ATC, ATS, and ACS test records shall be kept at the locomotive office nearest to the test point locations.

Except for the results of tests made in compliance with §§ 236.587 and 236.917(a), all such records of tests shall be kept on file until the next record of the same tests are made and put on file. The records of tests made at intervals of less than 1 year shall be retained for at least 1 year.

The records of results of tests made in compliance with § 236.587 shall be kept on file for at least 92 days.

The records for results of inspections and tests made in compliance with § 236.917(a) must be retained as follows:

1. Results of inspections and tests that pertain to installation or modification must be retained for the life-cycle of the equipment tested and may be kept at any designated office on the railroad.
2. Results of periodic inspections and tests required for maintenance or repair of the equipment inspected and tested must be retained until the next record is filed but in no case less than 1 year.

FRA requires that railroads adopting electronic means of recording test results first obtain FRA's

approval through an electronic recordkeeping approval process. Requiring FRA approval will establish a process whereby FRA can ensure all the proper information (prescribed in paragraph (a)) is recorded. FRA will also be able to determine where and how the electronic records will be available for inspection. FRA notes that if tests are performed by automatic test equipment (ATE), the test equipment shall be identified by a unique number, and the test record must reflect that number.

Any railroad wanting to implement electronic recordkeeping is required to obtain approval from FRA's Associate Administrator for Railroad Safety/Chief Safety Officer. This process consists of a railroad submitting to FRA's Signal and Train Control Division Staff Director the following information:

1. An action plan with a schedule for the implementation of the system.
2. A copy of the recordkeeping forms indicating how the results of all the applicable inspections or tests will be electronically recorded.
3. A copy of the instruction or procedure manual for the use of the system.

FRA will then review the materials and subsequently notify the railroad of the result of our approval process.

Electronic or automated tracking systems used to meet the requirements contained in paragraph (a) of this section must be capable of being reviewed and monitored by FRA at any time to ensure the integrity of the system. FRA's Associate Administrator for Railroad Safety/Chief Safety Officer may prohibit or revoke a railroad's authority to use an electronic or automated tracking system in lieu of preprinted forms if FRA finds that the electronic or automated tracking system is not properly secured; is inaccessible to FRA, FRA-certified State inspectors, or railroad employees requiring access to discharge their assigned duties; or fails to adequately track and monitor the equipment. The Associate Administrator for Railroad Safety/Chief Safety Officer will provide the affected railroad with a written statement of the basis for the decision prohibiting or revoking the railroad from using an electronic or automated tracking system. (*See Technical Bulletin S-96-05*)

#### CLASSIFICATION OF DEFECTS

- 236.110.A1 Record of the results of tests not made.
- 236.110.A2 Record of the results of tests not recorded on prescribed form.
- 236.110.A3 Record of the results of tests recorded by unapproved electronic means.
- 236.110.A4 Record of the results of tests not complete.
- 236.110.A5 Record of the results of test does not show name of railroad, place and date, equipment tested, results of tests, repairs, replacements, adjustments made, condition in which apparatus was left.

- 236.110.A6 Record of the results of test is not signed or electronically coded by the employee making the test, or identified by the unique number of the automated test equipment performing the test (where applicable).
- 236.110.A7 Record of the results of tests not filed with a supervisory official having jurisdiction.
- 236.110.A8 Record of the results of tests not available for inspection and replication during normal business hours.
- 236.110.B1 Record of the results of tests made in compliance with § 236.587 not retained for 92 days.
- 236.110.C1 Record of the results of inspections and tests required by § 236.917(a) for installation or modification not retained for the life-cycle of the equipment or filed in designated railroad office.
- 236.110.C2 Record of the results of periodic inspections and tests required by § 236.917(a) for maintenance or repair of the equipment not retained until next record is filed but in no case less than one year.
- 236.110.D1 Record of the results of all tests listed in paragraph (a) of this section not retained until next record is filed but in no case less than one year.
- 236.110.E1 Electronic or automatic tracking system used to meet the requirements contained in paragraph (a) of this section is not properly accessible by FRA, or FRA-certified State inspectors.
- 236.110.E2 Electronic or automatic tracking system used to meet the requirements contained in paragraph (a) of this section is not properly secured.
- 236.110.E3 Electronic or automatic tracking system used to meet the requirements contained in paragraph (a) of this section is not properly accessible to railroad employees requiring access to discharge their assigned duties.
- 236.110.E4 Electronic or automatic tracking system used to meet the requirements contained in paragraph (a) of this section fails to adequately track and monitor the equipment.

## **Subpart B – Automatic Block Signal Systems**

### ***Standards***

#### **§ 236.201 Track circuit, control of signals.**

The control circuits for home signal aspects with indications more favorable than “proceed at restricted speed” shall be controlled automatically by track circuits extending through the entire block.



### Application:

This rule requires that aspects of signals with indications more favorable than “proceed at restricted speed” be controlled automatically by track circuits extending through the entire block.

This rule applies to automatic block and traffic control systems.

Title 49 CFR § 236.708 requires the limits of the block be defined for the last signal. This may be accomplished by the use of wayside signage, or by specific designation in the carrier’s timetable or special instructions.

The aspect and indication determine compliance with this rule. A carrier is in noncompliance if any aspect with an indication more favorable than “proceed at restricted speed” is used, even though the speed may be 20 mph or less.

A block extends from signal to signal, or from a signal to its defined limits at end of the system.

This rule is not applicable to so-called distant or approach signals outside of a system.

### CLASSIFICATION OF DEFECTS

236.201.A1 The control circuits for home signal aspects more favorable than “proceed at restricted speed” not controlled automatically by track circuits extending through the entire block.

### **§ 236.202 Signal governing movements over hand-operated switch.**

Signal governing movements over hand-operated switch in the facing direction shall display its most restrictive aspect when the points are open one-fourth inch or more and, in the trailing direction, three-eighths inch or more, except that where a separate aspect is displayed for facing movements over the switch in the normal and in the reverse position, the signal shall display its most restrictive aspect when the switch points are open one-fourth inch or more from either the normal or reverse position.

### Application:

Signal governing movements over hand-operated switch is required to display its most restrictive aspect when the points are not in the proper position. This rule applies to both automatic block and traffic control systems.

This rule requires each switch to be so interconnected with the signal system so that when the switch is not in proper position, each signal governing movements over the switch will display its most restrictive aspect.

This rule does not apply to spring switches.

This rule is a signal system design requirement and it applies to the circuitry necessary to comply with the requirements of the rule, but does not apply to defective conditions such as circuit controller adjustments, absence of shunt wires, etc.

## CLASSIFICATION OF DEFECTS

- 236.202.A1 Signal does not display its most restrictive aspect when points of facing-point hand-operated switch over which it governs movements are open one-fourth inch or more.
- 236.202.A2 Signal does not display its most restrictive aspect when points of trailing-point hand-operated switch over which it governs movements is open three-eighths inch or more.
- 236.202.A3 Signal which displays a separate aspect for facing movements over hand-operated switch in the normal and in the reverse position does not display its most restrictive aspect when the switch points are open one-fourth inch or more from either the normal or reverse position.

### **§ 236.203 Hand-operated crossover between main tracks; protection.**

At hand-operated crossover between main tracks, protection shall be provided by one of the following:

- (a) An arrangement of one or more track circuits and switch circuit controllers,
- (b) Facing-point locks on both switches of the crossover, with both locks operated by a single lever, or
- (c) Electric locking of the switches of the crossover. Signals governing movements over either switch shall display their most restrictive aspect when any of the following conditions exist:
  - (1) Where protection is provided by one or more track circuits and switch circuit controllers, and either switch is open or the crossover is occupied by a train, locomotive or car in such a manner as to foul the main track. It shall not be a violation of this requirement where the presence of sand, rust, dirt, grease, or other foreign matter on the rail prevents effective shunting;
  - (2) Where facing-point locks with a single lever are provided, and either switch is unlocked;
  - (3) Where the switches are electrically-locked, before the electric locking releases.

#### Application:

This rule requires that hand-operated crossover between main tracks provide protection for train movements by either an arrangement of one or more track circuits and switch circuit controllers, facing-

point locks on both switches operated from a single lever, or electric locks on both switches of the crossover.

Signals governing movements over either switch must display their most restrictive aspect where switch circuit controller and track circuits are used, when either switch is not in proper position, or the crossover is occupied by a train, locomotive, or car; where facing-point locks are used, either switch is unlocked; and, where electric locks are used, before the electric locking releases. Relief is provided for certain conditions adverse to shunting.

This rule applies to both automatic block and traffic control systems.

Relief of the shunting requirements does not exceed that of § 236.51. Where such conditions are known to exist, adequate measures to safeguard train operation must be taken.

These requirements apply to crossovers between main tracks in either automatic block or traffic control territory, and between a main track and a signaled siding in traffic control territory.

Time or approach locking must be provided for electric locking.

Inspectors should be alert for staggered insulated rail joints that will permit undetected occupancy by a locomotive or car, where one or more track circuits and circuit controllers are used. Such defective conditions are prohibited by § 236.51.

Arrangements meeting the requirements of paragraph (2) or (3) do not require the use of track circuits.

This rule prohibits the use of only shunt fouling circuits to provide protection against the occupancy of the turnouts between the two main tracks.

#### CLASSIFICATION OF DEFECTS

- 236.203.A1 At hand-operated crossover between main tracks, protection is not provided by one of the following: (1) An arrangement of track circuits and switch circuit controllers; (2) facing-point locks on both switches of the crossover, with both locks operated by a single lever; or, (3) electric locking of the switches of the crossover.
- 236.203.C1 Signal governing movements over switch of hand-operated crossover between main tracks does not display its most restrictive aspect when either switch of the crossover is open, where crossover protection is provided by track circuits and switch circuit controllers.
- 236.203.C2 Signal governing movements over switch of hand-operated crossover between main tracks does not display its most restrictive aspect when crossover is occupied by a train, locomotive, or car in such manner as to foul the main track, where crossover protection is provided by track circuits and switch circuit controllers. (Fully explain the condition of rail with respect to presence of sand, rust, dirt, grease, or other foreign matter.)
- 236.203.C3 Signal governing movements over switch of hand-operated crossover between main tracks does not display its most restrictive aspect when either switch of crossover is unlocked, where switches of crossover are provided with facing-point locks operated by a single lever.
- 236.203.C4 Signal governing movements over switch of hand-operated crossover between main tracks does not display its most restrictive aspect before electric locking releases, where switches are electrically locked.
- 236.203.C5 Electric locking releases before the expiration of predetermined time interval after signals display their most restrictive aspect. (Applies only to electric locking of switches of hand-operated crossover between main tracks.)

## **§ 236.204 Track signaled for movements in both directions, requirements.**

On track signaled for movements in both directions, a train shall cause one or more opposing signals immediately ahead of it to display the most restrictive aspect, the indication of which shall be not more favorable than “proceed at restricted speed.” Signals shall be so arranged and controlled that if opposing trains can simultaneously pass signals displaying proceed aspects and the next signal in advance of each such signal then displays an aspect requiring a stop, or its most restrictive aspect, the distance between opposing signals displaying such aspects shall be not less than the aggregate of the stopping distances for movements in each direction. Where such opposing signals are spaced stopping distance apart for movements in one direction only, signals arranged to display restrictive aspects shall be provided in approach to at least one of the signals. Where such opposing signals are spaced less than stopping distance apart for movements in one direction, signals arranged to display restrictive aspects shall be provided in approach to both such signals. In absolute permissive block signaling, when a train passes a head block signal, it shall cause the opposing head block signal to display an aspect with an indication not more favorable than “stop.”

### Application:

This rule requires that on track signaled for movements in both directions a train shall cause one or more opposing signals ahead of it to display the most restrictive aspect. Signals are required to be spaced or arranged to provide stopping distance for opposing trains.

In absolute permissive block signaling, when a train passes a head block signal, it must cause the opposing head block signal to display an aspect indicating not more favorable than “stop.”

Head block signal is defined by Part 1.1.1 of the AAR Signal Manual as “a home signal governing entrance into the block between sidings on single track.”

Braking distances should be obtained from the carrier’s braking distance chart.

### CLASSIFICATION OF DEFECTS

- 236.204.A1 On track signaled for movements in both directions a train does not cause one or more opposing signals immediately ahead of it to display the most restrictive aspect the indication of which is not more favorable than "proceed at restricted speed."
- 236.204.A2 On track signaled for movements in both directions where opposing signals are spaced stopping distance apart for movements in one direction only, signals not arranged so that a restrictive aspect will be displayed by an least one of the signals in approach of the opposing signals, when such approach signals are passed simultaneously by opposing trains.
- 236.204.A3 On track signaled for movements in both directions where opposing signals are spaced less than stopping distance apart for movements in one direction, signals not arranged so that restrictive aspects will be displayed by both signals in approach of the opposing signals for trains passing such approach signals simultaneously.

236.204.A4 In APB signaling, train passing head block signal does not cause opposing head block signal to display an aspect with an indication not more favorable than “stop.”

### **§ 236.205 Signal control circuits; requirements.**

The circuits shall be so installed that each signal governing train movements into a block will display its most restrictive aspect when any of the following conditions obtain within the block:

- (a) Occupancy by a train, locomotive, or car,
- (b) When points of a switch are not closed in proper position,
- (c) When an independently-operated fouling-point derail equipped with switch circuit controller is not in derailing position,
- (d) When a track relay is in deenergized position or a device which functions as a track relay is in its most restrictive state; or when signal control circuit is deenergized.

#### Application:

Control circuits are required to be installed so that each signal will display its most restrictive aspect when the block it governs is occupied by a train, locomotive, or car; a switch is not in proper position; an independently operated derail equipped with switch circuit controller is not in derailing position; a track relay is in deenergized position or a device that functions as a track relay is in its most restrictive state; or when a signal control circuit is deenergized.

This rule applies to both automatic block signal and traffic control systems.

A signal must display its most restrictive aspect when any of the conditions listed under (a), (b), (c), or (d) of this rule occur. However, it is permissible, after the signal’s most restrictive aspect has been displayed for such conditions, for a pushbutton, switch, lever, or other device to be operated manually by the operator or trainman and an indication not more favorable than “proceed at restricted speed” then be obtained.

This rule is applicable to the design and installation of control circuits, and does not apply to defective conditions which appear to affect this rule, such as circuit controller adjustments, missing shunt or fouling wires, dead section, track circuit adjustments, grounds, etc.

This rule does not require that the most restrictive aspect be a red or a stop indication.

### CLASSIFICATION OF DEFECTS

- 236.205.A1 Circuits not so installed that signal will display its most restrictive aspect when the block into which it governs train movements is occupied by a train, locomotive, or car.
- 236.205.B1 Circuits not so installed that signal will display its most restrictive aspect when points of a switch in the block into which it governs train movements are not closed in proper position.
- 236.205.C1 Circuits not so installed that signal will display its most restrictive aspect when an independently operated fouling-point derail equipped with switch circuit

controller in the block into which it governs train movements is not in derailing position.

236.205.C2     Circuits not so installed that signal will display its most restrictive aspect when a track relay within the block into which it governs train movements is in deenergized position.

236.205.C3     Circuits not so installed that signal will display its most restrictive aspect when a device that functions as a track relay within the block into which it governs train movements is in its most restrictive state.

236.205.C4     Circuits not so installed that signal will display its most restrictive aspect when its control circuit is deenergized.

### **§ 236.206 Battery or power supply with respect to relay; location.**

The battery or power supply for each signal control relay circuit, where an open-wire circuit or a common return circuit is used, shall be located at the end of the circuit farthest from the relay.

#### Application:

This rule requires that the source of energy be located at the end of the circuit farthest from the relay, where open-wire circuit or common return circuit is used.

This rule applies to automatic block signal and traffic control systems. (It does not apply to interlockings.)

This rule prohibits the use of loop circuits in vital circuitry.

### CLASSIFICATION OF DEFECTS

236.206.A1     Battery or power supply for signal control relay circuit not located at the end of the circuit farthest from the relay. (Applies only to open-wire circuit or common return circuit.)

### **§ 236.207 Electric lock on hand-operated switch; control.**

Electric lock on hand-operated switch shall be controlled so that it cannot be unlocked until control circuits of signals governing movements over such switch have been opened. Approach or time locking shall be provided.

#### Application:

Electric locks on hand-operated switches are prohibited from being unlocked before control circuits of signals governing movement over switches are opened.

Approach or time locking must be provided.

This rule is applicable only to automatic block signal systems.

There are no requirements for the installation of electric locks in automatic block signal territory. However, if an electric lock is installed on a hand-operated switch in automatic block signal territory, the electric lock must comply with this rule, including the provision that approach or time locking be provided. The testing requirements for approach and time locking do not apply to automatic block signal systems, therefore the carrier is not required to make periodic tests of the approach or time locking within automatic block signal systems.

### CLASSIFICATION OF DEFECTS

- 236.207.A1 Electric lock on hand-operated switch can be unlocked before control circuits of signals governing movements over such switch have been opened.
- 236.207.A2 Approach or time locking not provided for electric lock on hand-operated switch.
- 236.207.A3 Electric lock on hand-operated switch can be unlocked before expiration of predetermined time interval where time locking is provided.
- 236.207.A4 Electric lock on hand-operated switch can be unlocked before expiration of predetermined time interval with approach circuit occupied where approach locking is provided.
- 236.207.A5 Approach locking not effective.
- 236.207.A6 Time locking not effective.
- 236.207.A7 Approach or time locking of electric lock on hand-operated switch can be defeated by the unauthorized use of emergency device which is not kept sealed in the non-release position.

### **Subpart C – Interlocking**

#### ***Standards***

#### **§ 236.301 Where signals shall be provided.**

Signals shall be provided to govern train movements into and through interlocking limits, except that a signal shall not be required to govern movements over a hand-operated switch into interlocking limits if the switch is provided with an electric lock and a derail at the clearance point, either pipe-connected to the switch or independently locked, electrically. Electric locks installed under this rule must conform to the time and approach locking requirements of Rule 314 (without reference to the 20 mile per hour exceptions), and those of either Rule 760 or Rule 768, as may be appropriate.

#### **Application:**

This rule requires that a signal be provided to govern train movements into and through interlocking limits, except over electrically locked hand-operated switch equipped with either a pipe-connected derail or independently operated electrically locked derail.

This rule applies to interlocking only. It does not apply to controlled points in traffic control systems.

Electric locks installed under this rule must conform to requirements of Rules 314, 760, and 768, without regard to speed.

All interlocked signals must be operative unless relief has been heretofore granted. The word “into” is defined as “to or toward the inside of from outside; past or through the outer boundary or limit.” The word “through” is defined as, “into one side, end, or point and out of the other.” Therefore, an inoperative red signal aspect does not meet these requirements.

Signals shall be provided to govern movements into and through interlocking limits. A carrier using inoperative red signal aspects for movement of trains or engines into and through interlocking limits is not in compliance.

A signal is not required to govern movements over a hand-operated switch into interlocking limits if the hand-operated switch is equipped with an electric lock and a derail is provided at the clearance point that is either pipe-connected or locked electrically. There are no restrictions on train speed at such installations.

A non-electrically locked switch without derail may be utilized within interlocking limits provided a signal is provided to govern movements on all routes, and speed over the switch does not exceed 20 mph.

An electrically locked switch without derail, but with signal governing movements out of the switch, may be utilized without restriction on train speed.

Where an electrically locked switch and/or derail is used within the interlocking, locking must protect against all possible conflicting routes, and once the locking has been released, it should be impossible to clear a conflicting route.

All electrically locked switches and derails within interlocking limits must have approach or time locking.

### CLASSIFICATION OF DEFECTS

- 236.301.A1 Signal not provided to govern train movements into and through interlocking limits. (Note: This does not apply to a turnout over a hand-operated switch into interlocking limits if the switch is provided with an electric lock and a derail at the clearance point, either pipe-connected to the switch or independently locked, electrically. Electric locks installed under this rule must conform to the time and approach locking requirements of § 236.314 (without reference to the 20 mph exceptions), and those of either § 236.760 or § 236.768, as may be appropriate).



## **§ 236.302 Track circuits and route locking.**

Track circuits and route locking shall be provided and shall be effective when the first pair of wheels of a locomotive or a car passes a point not more than 13 feet in advance of the signal governing its movement, measured from the center of the mast, or if there is no mast, from the center of the signal.

### Application:

This rule requires track circuits and route locking where power-operated switches are used, be provided throughout interlocking limits. This rule applies to interlocking only.

Route locking shall be effective at a point not more than 13 feet in advance of the signal, measured from the center of the signal mast portion on which it is mounted (e.g., from center of tall mast, or from center of offset or extension mast), or if there is no mast, from the center of the signal.

When a train or engine passes a signal displaying any type of proceed indication, including "proceed at restricted speed," track circuits and route locking shall be provided. Electric locking, either in the interlocking machine or the wayside equipment, that prevents the movement of any switch, movable-point frog, or derail in the route entered, is required. However, it may be so arranged that after a train clears a track section of the route, the locking affecting that section may be released.

Route locking is not required nor provided where there is an absence of a power-operated switch, movable-point frog, or derail in the route. Route locking is also not required by this rule in an instance of a train crew receiving permission to pass a stop signal indication (i.e., occupancy of the track circuit alone not locking the switch). Where any location is found not having the equivalent of route locking in that instance, and it is equipped with one or more dual-controlled power-operated switches, assurance should be gained that the carrier's special instructions for hand-operation of such a switch provides for the safe movement of trains (e.g., the switch may not be restored to power operation until the rear of the train has passed over and beyond it).

### CLASSIFICATION OF DEFECTS

236.302.A1 Track circuits not provided throughout interlocking limits.

236.302.A2 Route locking not provided throughout interlocking limits. (Note: Route locking shall be effective when the first pair of wheels of a locomotive or car passes a point not more than 13 feet in advance of the signal governing the movement.)

236.302.A3 Route locking not effective.

## **§ 236.303 Control circuits for signals, selection through circuit controller operated by switch points or by switch locking mechanism.**

The control circuit for each aspect with indication more favorable than "proceed at restricted speed" of power-operated signal governing movements over switches, movable-point frogs, and derails shall be selected through circuit controller operated directly by switch points or by switch

locking mechanism, or through relay controlled by such circuit controller, for each switch, movable-point frog, and derail in the routes governed by such signal. Circuits shall be arranged so that such signal can display an aspect indicating more favorable than “proceed at restricted speed,” only when each switch, movable-point frog, and derail in the route is in proper position.

Application:

This rule is a standard that requires control circuits of signal aspects with indications more favorable than “proceed at restricted speed” be selected through switch circuit controller or relay controlled by circuit controller of each hand-operated, power-operated, or mechanically-operated switch; movable-point frog; or derail in the route governed. It requires each switch, movable-point frog, or derail to be in proper position before such signal aspect can be displayed.

This rule applies to both interlocking and traffic control systems. It is not applicable to control circuits of aspects indicating “proceed at restricted speed.”

Each switch, movable-point frog, or derail shall be equipped with a switch circuit controller operated directly by the switch points or by a circuit controller operated by a switch locking mechanism. An aspect with an indication more favorable than “proceed at restricted speed” must be selected through such switch, movable-point frog, or derail circuit controller, or through a relay controlled by the circuit controller.

This rule applies to all hand-operated, power-operated, or mechanically-operated switches within interlockings or traffic control systems. These include power-operated switches of any kind, (electric, electro-pneumatic, or hydraulic) and pipe-connected switches operated from a lever of a mechanical interlocking machine.

Noncompliance with this rule should be reflected in indication locking tests for power-operated switches, movable-point frogs, and derails. Test hand-operated switches by opening contacts of switch circuit controller.

Title 49 CFR § 236.6 is a maintenance standard that is applicable to hand-operated switches, (both electrically locked and non-electrically locked).

Title 49 CFR § 236.13 is a design standard that is applicable to spring switches installed in interlockings, traffic control systems, and automatic block signal systems. This rule prescribes the requirements for signal control circuits governing facing-point movements where spring switches are installed in interlockings, traffic control, and automatic block signal systems. It should be noted that 49 CFR

§ 236.13 does not require the signal control circuits for aspects governing trailing movements over a spring switch to check the position of the switch points.

Title 49 CFR §§ 236.334 and 236.342 are maintenance standards that dictate that the circuit controllers be maintained in such condition as to fulfill the requirements of 49 CFR § 236.303.

The combination of indication and/or mechanical locking, as provided by an electro-mechanical interlocking machine, does not comply with this rule. A circuit controller is required at each switch through which control circuits of aspects with an indication of more favorable than “proceed at restricted speed” must be selected.

Switch selection circuits are required for each aspect of a power-operated signal with an indication more favorable than “proceed at restricted speed” regardless of whether the speed through the interlocking is restricted by carrier operating rule or civil speed restriction.

#### CLASSIFICATION OF DEFECTS

236.303.A1 Control circuit for signal aspect with indication more favorable than “proceed at restricted speed” of power-operated signal governing movements over switches, movable-point frogs, and derails not selected through circuit controller operated directly by switch points or by switch locking mechanism, or through relay controlled by such switch circuit controller on each switch, movable-point frog, and derail in the routes governed by the signal.

236.303.A2 Control circuit for signal aspect with indication more favorable than “proceed at restricted speed” is not so arranged that such aspect can only be displayed by a signal when each switch, movable-point frog, and derail in the route governed is in proper position.

#### **§ 236.304 Mechanical locking or same protection effected by circuits.**

[Mechanical locking, or the same protection effected by means of circuits, shall be provided.](#)

##### Application:

This rule requires that mechanical locking, or the equivalent protection by means of circuits, be provided at each interlocking.

Each interlocking is required to be arranged either mechanically and/or electrically so that the operation of controlling devices or apparatus must succeed each other in proper sequence before any proceed indication can be displayed.

#### CLASSIFICATION OF DEFECTS

236.304.A1 Mechanical locking, or the same protection effected by means of circuits, not provided.

#### **§ 236.305 Approach or time locking.**

[Approach or time locking shall be provided in connection with signals displaying aspects with indications more favorable than “proceed at restricted speed.”](#)

##### Application:

This rule requires approach or time locking must be provided in connection with any interlocking signals displaying aspects with indications more favorable than “proceed at restricted speed.”

This is applicable to any aspect indicating more favorable than “proceed at restricted speed” no matter what speed restriction the carrier has on the track. For example, a green aspect interlocking signal that does not have approach or time locking, where the speed is 10 mph, does not comply with these requirements.

This rule requires that the approach or time locking be effective for the maximum authorized speed permitted on each route.

#### CLASSIFICATION OF DEFECTS

236.305.A1 Approach or time locking not provided in connection with signal displaying aspects with indication more favorable than “proceed at restricted speed.”

236.305.A2 Approach locking not effective.

236.305.A3 Time locking not effective.

#### **§ 236.306 Facing-point lock or switch-and-lock movement.**

Facing-point lock or switch-and-lock movement shall be provided for mechanically-operated switch, movable-point frog, or split-point derail.

##### Application:

Facing-point lock or switch-and-lock movement is required for mechanically-operated switch, movable-point frog, or split-point derail.

Mechanically-operated, as applied to this part, refers to a switch, movable-point frog, or split-point derail operated by the control operator from a central point by means of pipe connection. It would also apply to a mechanically-operated cabin-type interlocking with the appurtenances operated by trainmen. It does not apply to hand-operated derails or switches.

#### CLASSIFICATION OF DEFECTS

236.306.A1 Facing-point lock or switch-and-lock movement not provided for mechanically-operated switch, movable-point frog, or split-point derail.

#### **§ 236.307 Indication locking.**

Indication locking shall be provided for operative approach signals of the semaphore type, power-operated home signals, power-operated switches, movable-point frogs, and derails, and for all approach signals except light signals, all aspects of which are controlled by polar or coded track circuits or line circuits so arranged that a single fault will not permit a more favorable aspect than intended to be displayed.

##### Application:

This rule requires indication locking for operative approach signals of the semaphore type, power-operated home signals, power-operated switches, movable-point frogs, and derails, and for all approach signals, except light signals with all aspects controlled by polar or coded track circuits, or line circuits so installed that a single fault will not permit a more favorable aspect than intended to be displayed.

This rule applies to both interlocking and traffic control systems.

Indication locking is electric locking which assures that the operation of signal appliances succeed each other in proper sequence. Indication locking falls into three primary categories: levers, signals, and switches.

Depending upon the type of interlocking machine, indication locking of levers prevents the lever from being operated full-stroke until the operated unit has properly completed its movement, or prevents the final lever from being operated until all units have properly completed their required movements.

Indication locking of home signals prevents the established route from being changed. It prevents the operation of all switches, movable-point frogs, derails, and other operative units in the route, and prevents the clearing of conflicting signals. Indication locking of approach signals prevents the route governed by a home signal from being changed until the associated approach signal displays an aspect not more favorable than "Approach Next Signal Prepared to Stop."

Indication locking of switches, movable-point frogs, derails, and other operative units, such as bridge locking members, prevents the clearing of signals governing movements over the unit until each operative unit has completed its required movement.

Inoperative approach signals, and mechanically operated (pipe-connected) home signals and switches, are excluded from these requirements.

Each operative approach signal of the semaphore type, power-operated home signal, power-operated switch, movable-point frog, or derail is required to be provided with indication locking.

Each operative approach signal of the light type shall be provided with indication locking, except where its aspects are controlled by polar or coded track circuits, or by line circuits so arranged that a single fault will not permit a false proceed signal to be displayed. A line circuit is not so arranged if a short between two wires on the line, regardless of their position, results in a more favorable aspect than intended to be displayed on the approach signal.

#### CLASSIFICATION OF DEFECTS

- 236.307.A1 Indication locking not provided for semaphore type operative approach signal.
- 236.307.A2 Indication locking not provided for power-operated home signal.
- 236.307.A3 Indication locking not provided for power-operated switch, movable-point frog, or derail.
- 236.307.A4 Indication locking not provided for approach signal of the light type. (Applies to each light signal except light signal all aspects of which are controlled by polar or coded track circuits or line circuits so arranged that a single fault will not permit a more favorable aspect than intended to be displayed.)
- 236.307.A5 Single fault in line circuit controlling approach signal aspect, where indication locking is not provided, permits more favorable aspect than intended to be displayed.
- 236.307.A6 Indication locking not effective.

## **§ 236.308 Mechanical or electric locking or electric circuits; requisites.**

Mechanical or electric locking or electric circuits shall be installed to prevent signals from displaying aspects which permit conflicting movements except that opposing signals may display an aspect indicating proceed at restricted speed at the same time on a track used for switching movements only, by one train at a time. Manual interlocking in service as of the date of this part at which opposing signals on the same track are permitted simultaneously to display aspects authorizing conflicting movements when interlocking is unattended, may be continued, provided that simultaneous train movements in opposite directions on the same track between stations on either side of the interlocking are not permitted.

Note: Relief from the requirement of this section will be granted upon an adequate showing by an individual carrier to allow opposing signals on the same track simultaneously to display aspects to proceed through an interlocking which is unattended, provided that train movements in opposite directions on the same track between stations on either side of the interlocking are not permitted at the same time.

### Application:

This rule prohibits display of conflicting permissive aspects, except opposing signals on track used for switching movements only by one train at a time. Manual interlockings installed prior to October 1, 1950, are excluded, provided simultaneous opposing movements are not permitted between stations on either side of the interlocking when it is unattended.

Mechanical locking, electric locking, or electric circuits are required to be installed so that signals cannot display aspects that permit conflicting movements.

Opposing signals on track used for switching movements only are excluded and may display aspects indicating "Proceed at Restricted Speed" when used by only one train at a time. This arrangement is prohibited for use by through trains. It is prohibited for more than one switch crew to perform movements on track used for switching only.

This rule applies to interlockings only.

Unattended manual interlockings having signals that display conflicting aspects that are interconnected with automatic block signal systems meet the requirements of this rule.

### CLASSIFICATION OF DEFECTS

- 236.308.A1 Signals can display aspects which permit conflicting movements. (Does not apply to signals that may display restricting aspects at the same time on a track used for switching movements only, by one train at a time, or to opposing signals on the same track at manual interlocking which are permitted simultaneously to display aspects authorizing conflicting movements when interlocking is unattended, provided that simultaneous train movements in opposite directions on the same track between stations on either side of the interlocking are not permitted.)

### **§ 236.309 Loss of shunt protection; where required.**

(a) A loss of shunt of 5 seconds or less shall not permit an established route to be changed at an automatic interlocking.

(b) A loss of shunt of 5 seconds or less shall not permit the release of the route locking circuit of each power-operated switch hereafter installed.

#### Application:

This rule requires that a loss of shunt of 5 seconds or less, regardless if it occurs on the approach circuit or on a track circuit within the limits of an automatic interlocking, must not permit the established route to be changed. It also requires that a loss of shunt of 5 seconds or less shall not permit the release of route locking.

This rule applies to all automatic interlockings whether or not they are connected to other signal systems, and to traffic control systems. Automatic drawbridges, manual interlockings arranged for automatic operation when unattended, and interlockings having both automatic and controlled routes are included. This rule is applicable to route locking of any power-operated switch installed after February 26, 1984.

Test for compliance on approach circuits that activate approach locking should be made by placing a shunt on the approach circuit to establish a route. The route is established when the interlocked signal displays an aspect authorizing movement into interlocking limits. After the route is established, remove the shunt while observing the interlocked signal to assure its aspect does not change until the expiration of more than 5 seconds. Each track circuit in the approach circuit should be tested.

Test for compliance on approach circuits that activate time locking should be made by placing a shunt on the approach circuit to establish a route. The route is established when the interlocked signal displays an aspect authorizing movement into interlocking limits. After the route is established, remove the shunt and determine that when the interlocked signal obtains an aspect indicating stop, a predetermined time interval is activated which prevents the clearing of a conflicting signal or operation of an interlocked device. Each track circuit in the approach circuit should be tested.

Test for compliance on track circuits within interlocking limits should be conducted by making an operating shunt test into interlocking limits, then place a shunt on the approach circuit of a conflicting route. Remove the shunt from the track circuit within interlocking limits while observing the conflicting route home signal to assure it does not clear until after the expiration of more than 5 seconds. Each track circuit within interlocking limits should be tested.

Test for compliance at a power-operated switch should be conducted by clearing the signal governing movement over the switch; place a shunt on the track circuit in approach to the signal; place a shunt on the track circuit in advance of signal; remove shunt from the track circuit in approach to signal; remove shunt in advance of the signal, and determine that the switch cannot be operated until after the expiration of more than 5 seconds. If more than one track circuit is in the route locking circuit, check each circuit in turn.

## CLASSIFICATION OF DEFECTS

- 236.309.A1 Loss of shunt of 5 seconds or less permits established route at automatic interlocking to be changed. (This includes automatic drawbridges, manual interlockings arranged for automatic operation when unattended, and interlockings having both automatic and controlled routes.)
- 236.309.B1 Loss of shunt of 5 seconds or less permits the release of route locking of power-operated switch, movable-point frog, or derail. (Does not apply to power-operated switch, movable-point frog, or derail installed prior to February 27, 1984.)

### **§ 236.310 Signal governing approach to home signal.**

A signal shall be provided on main track to govern the approach with the current of traffic to any home signal except where the home signal is the first signal encountered when leaving yards or stations and authorized speed approaching such signal is not higher than slow speed. When authorized speed between home signals on route governed is 20 miles per hour or less, an inoperative signal displaying an aspect indicating “approach next signal prepared to stop” may be used to govern the approach to the home signal.

#### Application:

This rule requires that a signal be provided on main track to govern the approach with the current of traffic to any home signal. It excludes the condition where the home signal is the first signal encountered when leaving yards or stations and the authorized speed approaching the home signal is not higher than slow speed. It provides for use of an inoperative approach signal when authorized speed between home signals on route governed is 20 mph or less.

This rule applies to both interlocking and traffic control systems.

A signal to govern the approach to a home signal is required on main track only. Auxiliary tracks are excluded regardless of how heavily traveled.

An approach signal is required for current of traffic only, where normal operation is with the current of traffic.

A signal is not required to govern the approach to a home signal where it is the first signal encountered when leaving a yard or station where all trains originate or stop if the authorized speed approaching the first signal encountered is not higher than slow speed. If trains are operated that do not stop at the yard or station, an approach signal must be provided. In addition, the home signal being the first signal encountered must be within yard or station limits. If it is outside yard or station limits, it becomes the first signal encountered after leaving the yard or station, and requires that an approach signal be provided.

Where speed between home signals of an interlocking or controlled point exceeds 20 mph, an operative approach signal must be provided.

An operative approach signal must comply with 49 CFR § 236.803, i.e., its aspects must convey



advance information about the indication of the home signal it is in approach to. This requires that operative approach signals be capable of displaying aspects less restrictive than, “approach next signal prepared to stop,” when the home signal displays an aspect indicating more permissive than stop or restricting (i.e., warranting a more permissive indication than approach at the approach signal).

An approach signal capable of displaying a single aspect, yellow or lunar, is an inoperative signal.

An approach signal capable of displaying two aspects, red and yellow, is an inoperative signal in the application of this rule. It cannot furnish advance information about the indication of the home signal when the home signal displays an aspect indicating proceed.

An approach signal in nonsignaled territory capable of displaying two aspects, yellow and green, is an operative signal.

An approach signal capable of displaying three aspects, red, yellow, and green, is an operative signal.

#### CLASSIFICATION OF DEFECTS

236.310.A1 Approach signal not provided for home signal on main track. (Does not apply where home signal is the first signal encountered when leaving yard or station where authorized speed approaching such signal is not higher than slow speed).

236.310.A2 Inoperative approach signal provided for home signal where authorized speed between home signals on the route governed is greater than 20 mph.

#### **§ 236.311 Signal control circuits, selection through track relays or devices functioning as track relays and through signal mechanism contacts and time releases at automatic interlocking.**

(a) The control circuits for aspects with indications more favorable than “proceed at restricted speed” shall be selected through track relays, or through devices that function as track relays, for all track circuits in the route governed.

(b) At automatic interlocking, signal control circuits shall be selected (1) through track relays, or devices that function as track relays, for all track circuits in the route governed and in all conflicting routes within the interlocking; (2) through signal mechanism contacts or relay contacts closed when signals for such conflicting routes display “stop” aspects; and (3) through normal contacts of time releases, time element relays, or timing devices for such conflicting routes, or contacts of relays repeating the normal position or normal state of such time releases, time element relays, or timing devices.

#### Application:

This rule requires that at all interlockings, the control circuit for aspects with indications more favorable than “Proceed at Restricted Speed,” be selected through relays or devices that function as track relays of all track circuits in the route governed, or through repeating relays for such track circuits. Additionally, at automatic interlocking, such control circuits shall be selected through relays, or devices that function as track relays, of track circuits in all conflicting routes,

or through repeating relays for such track circuits; through signal mechanism contacts, or through relay contacts closed when conflicting signals display stop aspects; and through normal contacts of time releases or timing devices for conflicting routes or contact of relays repeating the normal position of contacts on such time releases or timing devices.

This rule applies to both interlocking and traffic control systems.

This rule does not require control circuits at manual or remote controlled interlockings or controlled points be selected through track relays or devices that function as track relays on conflicting routes, nor through contacts of signal mechanisms, or relay contacts closed when such signals display “Stop” for conflicting routes, nor through “check contacts” closed when timing relays, releases, or devices are in their normal state.

This rule does not apply to control circuits of signals displaying aspects with indications of “Proceed at Restricted Speed” except at automatic interlockings.

#### CLASSIFICATION OF DEFECTS

- 236.311.A1 Control circuit for aspect with indication more favorable than “proceed at restricted speed”
- not selected through track relays, or devices that function as track relays, for all track circuits in the route governed, or through repeating relays for such track circuits.
- 236.311.B1 Signal control circuit at automatic interlocking not selected through track relays, or devices that function as track relays, for all track circuits in the route governed, or through repeating relays for such track circuits.
- 236.311.B2 Signal control circuit at automatic interlocking not selected through track relays, or devices that function as track relays, for all track circuits in all conflicting routes within interlocking limits, or through repeating relays for such track circuits.
- 236.311.B3 Signal control circuit at automatic interlocking not selected through signal mechanism contacts for signals on all conflicting routes, or through relay contacts closed when such signals display stop aspects.
- 236.311.B4 Signal control circuit at automatic interlocking not selected through normal contacts of time releases, time element relays, or timing devices for all conflicting routes, or through contacts of relays repeating the normal position or normal state of such time releases, time element relays, or timing devices.

#### **§ 236.312 Movable bridge, interlocking of signal appliances with bridge devices.**

When movable bridge is protected by interlocking the signal appliances shall be so interlocked with bridge devices that before a signal governing movements over the bridge can display an aspect to proceed the bridge must be locked and the track aligned, with the bridge locking members within one inch of their proper positions and with the track rail on the movable span within three-eighths inch of correct surface and alignment with rail seating device on bridge

abutment or fixed span. Emergency bypass switches and devices shall be locked or sealed.

Application:

This rule requires that interlocking of movable bridge be so interconnected with bridge devices that the bridge must be properly locked and track properly aligned before a signal governing movements over the bridge can display an aspect to proceed.

There are three types of movable spans, bascule, lift, and swing. Regardless of the type of bridge, the sequence of operation for rail traffic is as follows:

1. The bridge must be seated, then locked.
2. The movable rails must be determined to be in proper surface and alignment with the rails on the abutment or fixed span.
3. Derails, if any, must be placed in non-derailing position.
4. Interlocked signal may then be operated to display proceed aspect. For water traffic the sequence of operation is precisely the opposite.

Bascule and lift spans require bridge locking devices that can drive locking members between the movable span and abutment or fixed span only when the bridge is properly seated. Locking devices are required on both ends of lift spans. Only the lift end of bascule spans must be locked. When the locking members are within 1 inch of being fully driven, the bridge is considered to be properly locked. Bridge locks are not designed to hold the movable span down, but rather to determine that the bridge is properly seated. The movable rails of bascule and lift bridges often correctly align before the bridge seats, hence the need of bridge locks.

Swing spans are properly seated when the wedges are driven to lift the span off the center pier. Consider swing spans locked when the wedges are within 1 inch of being fully driven. The latches of swing spans are not bridge locking members but are provided to stop swing bridges in proper alignment as it is being closed.

Rails which slide or lower to butt with those of the abutment or fixed span, or risers that slide into position in the movable joint, must be locked in proper alignment.

Conley frogs are designed to be self-aligning and are not required to be locked or electrically checked for alignment. They are required to be checked for surface.

All movable joints are required to be locked or electrically determined to be in proper surface except for those on the hinged end of bascule bridges. If surface is checked electrically, closely inspect plungers and mechanical connections for binding.

Movable joints are “soft” joints. The three-eighths inch requirement of this rule was not revised by the Track Safety Standards and movable joints are not required to be maintained to meet these standards.

At automatic and remote-controlled movable bridge interlockings, those devices used to detect and govern movement of water traffic such as audible devices, signal aspects, and electric eyes

are considered interlocking appliances and must operate in their proper sequence and perform their intended function.

All the rules of Subpart C are applicable to interlocked drawbridges.

Test of bridge locking is determined by withdrawing the locking member or wedge more than 1 inch and determining whether or not control circuits are opened.

Test of movable rails for alignment is made by measuring the difference in aligned rails.

Slide and lift rails should also be tested by manually applying lateral force to the movable rails.

Test of movable rails for surface should be made by placing an obstruction of more than three-eighths inch (e.g., one-half inch gage) on each rail seat and determining whether the rail can be locked or, if electrically checked, whether the circuit controller contacts are opened.

The RS&I does not define bridge locking, therefore, it is permissible for the carrier to use any type of bridge locking desired. The only requirement for the bridge lock is that the movable span must be locked with the fixed span.

Where an emergency release is provided at bridge locking, it is required to be kept locked or sealed to prevent the emergency release from being used for routine day-to-day operation. Operation of the emergency release shall not defeat the time or approach locking circuits. (*See Technical Bulletin S-05-01*)

#### CLASSIFICATION OF DEFECTS

- 236.312.A1 Signal appliances at movable bridge protected by interlocking not so interlocked with bridge devices that before a signal governing movements over the bridge can display an aspect to proceed, the bridge must be locked and the track properly aligned.
- 236.312.A2 Signal governing movements over movable bridge protected by interlocking can display aspect to proceed with bridge locking member displaced more than one inch from its proper position.
- 236.312.A3 Signal governing movements over movable bridge protected by interlocking can display aspect to proceed with the track rail on the movable span more than three-eighths inch from correct surface with the rail seating device on the bridge abutment or fixed span.
- 236.312.A4 Signal governing movements over movable bridge protected by interlocking can display aspect to proceed with the track rail on the movable span more than three-eighths inch from correct alignment with the rail seating device on the bridge abutment or fixed span.
- 236.312A5 Emergency bypass switch or device not locked or sealed.
- 236.312A6 Operation of the emergency release defeats the time or approach locking circuits.

## **§ 236.314 Electric lock for hand-operated switch or derail.**

Electric lock shall be provided for each hand-operated switch or derail within interlocking limits, except where train movements are made at not exceeding 20 miles per hour. At manually operated interlocking it shall be controlled by operator of the machine and shall be unlocked only after signals governing movements over such switch or derail display aspects indicating stop. Approach or time locking shall be provided.

### Application:

This rule requires each hand-operated switch or derail within interlocking limits, where train speeds exceed 20 mph, be electrically locked. At manually operated interlocking, it shall be controlled by the operator of the machine. Approach or time locking shall be provided.

This rule applies to interlockings only. It applies to all hand-operated switches and derails in interlocking limits where speeds exceed 20 mph.

This rule applies to each electric lock applied to a hand-operated switch or derail installed under provisions of § 236.301, regardless of speed.

Approach or time locking must be provided for each electrically locked switch or derail regardless of speed.

### CLASSIFICATION OF DEFECTS

- 236.314.A1 Electric lock not provided for hand-operated switch or derail within interlocking limits. (Does not apply where train movements are made at speeds not exceeding 20 mph.)
- 236.314.A2 Electric lock on hand-operated switch or derail at manually operated interlocking not controlled by operator of the machine.
- 236.314.A3 Electric lock on hand-operated switch or derail within interlocking limits can be unlocked before signals governing movements over such switch or derail display aspects indicating stop.
- 236.314.A4 Approach or time locking not provided for electric lock on hand-operated switch or derail within interlocking limits.
- 236.314.A5 Electric lock on hand-operated switch or derail within interlocking limits can be unlocked before the expiration of the predetermined time interval, where time locking is provided.
- 236.314.A6 Electric lock on hand-operated switch or derail within interlocking limits can be unlocked before the expiration of the predetermined time interval, with approach section occupied, where approach locking is provided.
- 236.314.A7 Approach or time locking of electric lock at hand-operated switch or derail can be defeated by the unauthorized use of emergency device which is not kept sealed in the non-release position.

236.314.A8 Approach locking not effective.

236.314.A9 Time locking not effective.

### ***Rules and Instructions***

#### **§ 236.326 Mechanical locking removed or disarranged; requirements for permitting train movements through interlocking.**

When mechanical locking of interlocking machine is being changed or is removed from the machine, or locking becomes disarranged or broken, unless protection equivalent to mechanical locking is provided by electric locking or electric circuits, train movements through the interlocking shall not be permitted until each switch, movable-point frog, or derail in the route is spiked, clamped, or blocked in proper position so that it cannot be moved by its controlling lever, and then train movements shall not exceed restricted speed until the interlocking is restored to normal operation. It will not be necessary to comply with this requirement at interlockings where protection is in service in accordance with section 303, provided that the signal controls are arranged so that the signals cannot display an aspect the indication of which is less restrictive than “proceed at restricted speed.”

#### **Application:**

This rule prescribes the procedures for train operation through interlocking when the mechanical interlocking is being changed or is removed from the machine, or locking becomes disarranged or broken.

The procedures prescribed by this rule apply when mechanical locking is being modified, is broken and during repairs, becomes disarranged and is inoperable or uncertain in its operation, is being replaced by electric circuits, and on those occasions when the interlocking is destroyed or heavily damaged by such as fire, derailment, or storm.

When mechanical locking is inoperable, equivalent protection may be provided by electric locking or electric circuits. If such equivalent protection is not provided, each switch, movable-point frog, or derail in the route must be spiked, clamped, or blocked in proper position before train movement is permitted, such movement not to exceed restricted speed. It is not necessary to spike, clamp, or block each switch, movable-point frog, or derail if protection is provided in accordance with § 236.303 and control circuits are arranged to prevent display of aspects which indicate more favorable than “Proceed at Restricted Speed.”

#### **CLASSIFICATION OF DEFECTS**

236.326.A1 Train movement permitted through interlocking while mechanical locking of interlocking machine is being changed or is removed, or when locking is disarranged or broken, without each switch, movable-point frog, and derail in route over which movement is made being spiked, clamped, or blocked so that it cannot be moved by its controlling lever. (Does not apply if protection equivalent to mechanical locking is provided by electric locking or electric circuits, or where protection is in service in accordance with § 236.303 for all signal aspects, and

signal controls are arranged so that the signals cannot display an aspect the indication of which is less restrictive than "Proceed at restricted speed.")

- 236.326.A2 Train movement exceeds restricted speed through interlocking while mechanical locking of interlocking machine is being changed, is removed from the machine, or is disarranged or broken.

**§ 236.327 Switch, movable-point frog, or split-point derail.**

Switch, movable-point frog, or split-point derail equipped with lock rod shall be maintained so that it can not be locked when the point is open three-eighths inch or more.

Application:

This rule requires that lock rod of switch, movable-point frog, or split-point derail be so adjusted that locking is prevented when the switch point is obstructed by three-eighths inch or more obstruction.

This rule applies to both interlocking and traffic control systems.

Applies to power-operated or mechanically operated switches, movable-point frogs, and split-point derails.

Test should be made by placing three-eighths inch obstruction between the switch point and stock rail, about 6 inches from the end of the point, and then operating switch until the locking dog on the slide bar strikes the lock rod.

Test may be made either under power or by operation of the hand operation lever or crank where such machine is designed to lock up in hand operation. Inspector should be alert for instances where excessive switch point pressure prevents the locking dog from moving far enough to strike the lock rod. Until that action is verified, the test is not performed.

CLASSIFICATION OF DEFECTS

- 236.327.A1 Switch, movable-point frog, or split-point derail can be locked when switch point is open three-eighths inch or more.

**§ 236.328 Plunger of facing-point lock.**

Plunger of lever operated facing-point lock shall have at least 8-inch stroke. When lock lever is in unlocked position, the end of the plunger shall clear the lock rod not more than 1 inch.

Application:

This rule requires that plunger of lever operated facing-point lock have at least an 8-inch stroke and, when unlocked, clear the lock rod not more than 1 inch. This rule applies to both interlocking and traffic control systems.

This rule applies only to independently operated mechanical pipe-connected facing-point lock.

This rule does not apply to hand-operated switch machines or mechanically operated switch-and-lock movements.

#### CLASSIFICATION OF DEFECTS

236.328.A1 Stroke of plunger of facing-point lock less than 8 inches.

236.328.A2 End of lock plunger clears lock rod more than 1 inch when lock lever is in unlocked position.

#### **§ 236.329 Bolt Lock.**

Bolt lock shall be so maintained that signal governing movements over switch or derail and displaying an aspect indicating stop cannot be operated to display a less restrictive aspect while derail is in derailing position, or when switch point is open one-half inch or more.

##### Application:

This rule requires that bolt lock be so maintained that signal governing movement over a switch or derail cannot display any aspect to proceed unless derail is in non-derailing position and switch is within one-half inch of its proper position.

This rule applies to mechanically operated signal governing movements over switch or derail equipped with bolt lock.

#### CLASSIFICATION OF DEFECTS

236.329.A1 Bolt lock does not prevent signal from being operated to display an aspect less restrictive than “Stop” while derail is in derailing position.

236.329.A2 Bolt lock does not prevent signal from being operated to display an aspect less restrictive than “Stop” when switch point is open one-half inch or more.

#### **§ 236.330 Locking dog of switch-and-lock movement.**

Locking dog of switch-and-lock movement shall extend through lock rod one-half inch or more in either normal or reverse position.

##### Application:

This rule requires that locking dog of switch-and-lock movement extend through lock rod one-half inch or more when locked in either normal or reverse position.

This rule applies to both interlocking and traffic control systems.

This rule applies only to pipe-connected, mechanically operated switch-and-lock movements. It does not apply to power-operated switch machines such as US&S M2, M3, M22, or M23 machines; or GRS Model 5 or 55 switch machines.



Holes and notches in lock rod should have square edges to prevent forcing locking dog or plunger into lock rod. Section 236.11 may be cited in instances where the edges are excessively shaven or rounded. (*See Technical Bulletin S-96-01*)

### CLASSIFICATION OF DEFECTS

236.330.A1 Locking dog of switch-and-lock movement extends through lock rod less than one-half inch in normal or reverse position.

#### **§ 236.334 Point detector.**

Point detector shall be maintained so that when switch mechanism is locked in normal or reverse position, contacts cannot be opened by manually applying force at the closed switch point. Point detector circuit controller shall be maintained so that the contacts will not assume the position corresponding to switch point closure if the switch point is prevented by an obstruction, from closing to within one-fourth inch where latch-out device is not used, and to within three-eighths inch where latch-out device is used.

#### Application:

This rule requires that point detector be so maintained that contacts cannot be opened by manually applying force at the closed point when switch is locked in either normal or reverse position. Its circuit controller contacts shall not assume the position corresponding to switch point closure if the switch point is prevented, by an obstruction, from closing to within one-fourth inch where latch-out device is not used, and three-eighths inch where latch-out device is used.

This rule applies to power-operated switches only in both interlocking and traffic control systems.

Tests for compliance should be made in the same manner as switch obstruction tests described under § 236.327, by placing an appropriate gauge between the stock rail and switch point, about 6 inches from the end of the switch point, and closing the switch point on the gauge. The switch must be caused to lock up so that the contacts are known to be opened by the point detection function with the switch point gapping rather than by an incomplete movement of the locking mechanism.

Where carriers maintain lock rods to obstruct on a one-fourth inch obstruction, it may be necessary to either loosen the lock rod, or simulate movement of the point by displacement of the point detector rod in order to test the point detector contact adjustment.

Lateral force should be applied to the closed switch point to determine if contacts can be opened because of excessive size of notch in lock rod, loose lock rod connections, or improper point detector rod adjustment.

The inspector should determine the latch-out device is properly adjusted and functioning within prescribed limits. If latch-out is not connected or functioning properly, point detector adjustment must comply with one-fourth inch requirements. Section 236.11 may be cited in instances where a latch-out is provided; however, it does not hold open the circuit controller contacts when latched out.

### CLASSIFICATION OF DEFECTS

- 236.334.A1 Point detector contacts can be opened by manually applying force at the closed switch point when switch mechanism is locked in normal or reverse position.
- 236.334.A2 Point detector circuit controller contacts assume the position corresponding to switch point closure when switch point is prevented by an obstruction from closing to within one-fourth inch. (Applies only to point detector where latch-out device is not used or is not effective.)
- 236.334.A3 Point detector circuit controller contacts assume position corresponding to switch point closure when switch point is prevented by an obstruction from closing to within three-eighths inch. (Applies only to point detector where a latch-out device is used and is effective.)

### **§ 236.335 Dogs, stops, and trunnions of mechanical locking.**

Driving pieces, dogs, stops, and trunnions shall be rigidly secured to locking bars. Swing dogs shall have full and free movement. Top plates shall be maintained securely in place.

#### Application:

This rule requires that driving pieces, dogs, stops, and trunnions be rigidly fastened to locking bars; that swing dogs have full and free movement; and that top plates be securely fastened in place.

This rule applies to mechanical locking beds only. It does not apply to locking of switch machines.

Mechanical locking cabinets should be opened to fully expose locking and a close inspection should be made to ensure compliance.

The floor of and around interlocking machine cabinets should be closely observed for parts that have fallen from locking; and for parts such as screws, rivets, shavings, chips, and other evidence of poor maintenance or abuse of locking.

### CLASSIFICATION OF DEFECTS

- 236.335.A1 Driving piece not rigidly secured to locking bar.
- 236.335.A2 Dog not rigidly secured to locking bar.
- 236.335.A3 Stop not rigidly secured to locking bar.
- 236.335.A4 Trunnion not rigidly secured to locking bar.
- 236.335.A5 Swing dog does not have full or free movement.
- 236.335.A6 Top plate not secured in place.

### **§ 236.336 Locking bed.**

The various parts of the locking bed, locking bed supports, and tappet stop rail shall be rigidly secured in place and aligned to permit free operation of locking.

#### Application:

This rule requires that various parts of the locking bed, locking bed supports, and tappet stop rail be rigidly secured in place and aligned to permit free operation of locking.

Locking bed must be securely fastened in place for proper operation.

#### CLASSIFICATION OF DEFECTS

236.336.A1 Locking bed parts, supports, or tappet stop rail not rigidly secured in place.

236.336.A2 Locking bed parts, supports, or tappet stop rail not aligned to permit free operation of locking.

### **§ 236.337 Locking faces of mechanical locking; fit.**

Locking faces shall fit squarely against each other with a minimum engagement when locked of at least one-half the designed locking face.

#### Application:

This rule requires locking faces fit squarely against each other when locked with minimum engagement of at least one-half the designed locking face.

Apply this rule to broken or badly worn locking pieces, dogs, tappets, and cross-locking.

Some cross-locking may require removal of cover plates for inspection.

#### CLASSIFICATION OF DEFECTS

236.337.A1 Locking faces do not fit squarely against each other.

236.337.A2 Locking faces fit with a minimum engagement when locked of less than one-half the designed locking face.

### **§ 236.338 Mechanical locking required in accordance with locking sheet and dog chart.**

Mechanical locking shall be in accordance with locking sheet and dog chart currently in effect.

#### Application:

This rule requires that mechanical locking in service shall be in accordance with locking sheet and dog chart.

Section 236.1 requires locking sheet and dog chart to be kept at mechanical interlocking and to be correct and legible. Locking should be carefully examined to determine compliance with locking sheet and dog chart.

Most mechanical locking, being old, has been altered. Locking that is no longer in service is not required to be removed from locking bed and not required to be shown on locking sheet and dog chart.

### CLASSIFICATION OF DEFECTS

236.338.A1 Mechanical locking not in accordance with locking sheet and dog chart currently in effect.

#### **§ 236.339 Mechanical locking; maintenance requirements.**

Locking and connections shall be maintained so that, when a lever or latch is mechanically locked the following will be prevented:

(a) Mechanical machine.

(1) Latch-operated locking. Raising lever latch block so that bottom thereof is within three-eighths inch of top of quadrant.

(2) Lever-operated locking. Moving lever latch block more than three-eighths inch on top of quadrant.

(b) Electro-mechanical machine.

(1) Lever moving in horizontal plane. Moving lever more than five-sixteenths inch when in normal position or more than nine-sixteenths inch when in reverse position.

(2) Lever moving in arc. Moving lever more than 5 degrees.

(c) Power machine.

(1) Latch-operated locking. Raising lever latch block so that bottom thereof is within seven thirty-seconds inch of top of quadrant.

(2) Lever moving in horizontal plane. Moving lever more than five-sixteenths inch when in normal position or more than nine-sixteenths inch when in reverse position.

(3) Lever moving in arc. Moving lever more than 5 degrees.

#### Application:

This rule requires that locking and connections be maintained so that motion of levers or latches, when locked, do not exceed prescribed tolerances.

#### Mechanical Machine:

When this rule was first adopted, more than 90 percent of mechanical interlocking machines installed were of two types: Saxby and Farmer (S&F) and Style A. Both have latch-operated locking. They are easily recognizable in that S&F machines have rocker arms that stand above the quadrants and Style A machines have rocker arms that stand below the quadrants. Other latch-operated machines are dwarf S&F, Johnson, and National.

When locked, the latch block of each lever may not be raised so that the bottom is within three-eighths inch of top of quadrant.

The balance of the machines installed have lever-operated locking. The majority of these were Style C and Stevens, which are almost identical, and dwarf machines other than S&F. These machines are easily recognizable by the absence of rocker arms.

When locked, the lever latch block may not be moved more than the three-eighths inch on top of the quadrant.

#### Electro-Mechanical Machine:

Electro-mechanical machines are combinations of electric machines and mechanical machines. The electric machine levers are located above the mechanical levers and are usually Model 14, Model 2, Model 5 or Style S-8 type machines, which control electrical circuits and operate miniature type locking to release or lock the mechanical levers.

When locked, electric levers operating in horizontal plane may not be moved more than five-sixteenths inch in normal position or more than nine-sixteenths inch in reverse position.

When locked, electric levers moving in an arc may not be moved more than 5 degrees.

When locked, the mechanical levers must comply with requirements for mechanical machines.

#### Power Machine:

At some large manual interlockings, power (electric) interlocking machines manufactured by the Federal Railway Signal Company were installed. These machines are a miniature Type S&F mechanical machine with dwarf type of S&F locking with latch locking. When locked, the latch block of each lever may not be raised so that the bottom thereof is within seven thirty-seconds inch of top of quadrant.

The majority of power interlocking machines installed at large manual interlockings were Model 2, Model 14, and Model 5. At small interlockings, Style TC and Type A table interlocking machines are frequently found. Model 2 and Model 5 machines have levers that move in a horizontal plane. The levers of these machines must meet the same requirements as the electric levers of electro-mechanical machines.

### CLASSIFICATION OF DEFECTS

- 236.339.A1    Lever latch block can be raised so that its bottom is within three-eighths inch of top of quadrant when latch is mechanically locked. (Applies only to mechanical interlocking machine with latch-operated locking.)
- 236.339.A2    Lever latch block can be moved more than three-eighths inch on top of quadrant when lever is mechanically locked. (Applies only to mechanical interlocking machine with lever-operated locking.)
- 236.339.B1    Lever which is mechanically locked in normal position can be moved more than five-sixteenths inch. (Applies only to electromechanical interlocking machine with levers moving in a horizontal plane.)
- 236.339.B2    Lever which is mechanically locked in reverse position can be moved more than

nine-sixteenths inch. (Applies only to electro-mechanical interlocking machine with levers moving in a horizontal plane.)

- 236.339.B3 Lever which is mechanically locked can be moved more than 5 degrees. (Applies only to electromechanical machine with levers moving in an arc.)
- 236.339.C1 Lever latch block can be raised so that its bottom is within seven thirty-seconds inch of top of quadrant, when latch is mechanically locked. (Applies only to power interlocking machine with latch-operated locking.)
- 236.339.C2 Lever which is mechanically locked in normal position can be moved more than five-sixteenths inch. (Applies only to power interlocking machine with levers moving in a horizontal plane.)
- 236.339.C3 Lever which is mechanically locked in reverse position can be moved more than nine-sixteenths inch. (Applies only to power interlocking machine with levers moving in a horizontal plane.)
- 236.339.C4 Lever which is mechanically locked can be moved more than 5 degrees. (Applies only to power interlocking machines with levers moving in an arc.)

**§ 236.340 Electro-mechanical interlocking machine; locking between electrical and mechanical levers.**

In electro-mechanical interlocking machine, locking between electric and mechanical levers shall be maintained so that mechanical lever cannot be operated except when released by electric lever.

Application:

This rule requires that locking between electric and mechanical levers of electro-mechanical interlocking machine be maintained so that mechanical lever cannot be operated except when released by an electric lever.

The mechanical levers that operate switches, movable-point frogs, and derails must be locked by the electric levers.

CLASSIFICATION OF DEFECTS

- 236.340.A1 Locking between electric and mechanical levers of electro-mechanical interlocking machine not effective to prevent operation of mechanical lever without being released by electric lever.

**§ 236.341 Latch shoes, rocker, links, and quadrants.**

Latch shoes, rocker links, and quadrants of Saxby and Farmer machines shall be maintained so that locking will not release if a downward force not exceeding a man's weight is exerted on the rocker while the lever is in the mid-stroke position.

### Application:

This rule requires that latch shoes, rocker links, and quadrants of Saxby and Farmer machines be maintained so that locking will not release when a downward force not exceeding a man's weight is exerted on the rocker with the lever in mid-stroke position.

Care should be exercised when making this test. Rocker arms are cast metal and can easily be broken with lever in mid-stroke position. A cracked rocker arm or worn linkage will release the locking. If locking is worn, very little pressure is needed to ascertain a failure to meet the requirements.

### CLASSIFICATION OF DEFECTS

236.341.A1 Mechanical locking of Saxby and Farmer interlocking machine releases when a downward force not exceeding a man's weight is exerted on rocker while lever is in mid-stroke position.

### **§ 236.342 Switch circuit controller.**

Switch circuit controller connected at the point to switch, derail, or movable-point frog, shall be maintained so that its contacts will not be in position corresponding to switch point closure when switch point is open one-fourth inch or more.

### Application:

This rule requires that switch circuit controller connected at the point to switch, derail, or movable-point frog be maintained so that its contacts will not be in position corresponding to switch point closure when point is open one-fourth inch or more in either normal or reverse position.

This rule applies to both interlocking and traffic control systems.

Apply this rule where switch circuit controller is connected to spring switch, to pipe-connected switch, derail, or movable-point frog, and where external circuit controller is added to power-operated switch or to spring switch.

### CLASSIFICATION OF DEFECT

236.342.A1 Contacts of switch circuit controller connected at the point to switch, derail, or movable-point frog are in position corresponding to switch point closure when switch point is open one-fourth inch or more.

### ***Inspections and Tests***

### **§ 236.376 Mechanical locking.**

Mechanical locking in interlocking machine shall be tested when new locking is installed; and thereafter when change in locking is made, or locking becomes disarranged, or tested at least

once every 2 years, whichever shall occur first.

Application:

This rule requires testing of mechanical locking when new locking is installed, when there is a change in locking, or when locking is restored after being disarranged. It requires a complete test of all mechanical locking at least once every 2 years. (*See Technical Bulletin S-04-01*).

Mechanical locking tests should be made by establishing a route and trying all conflicting signal control levers before pulling the signal lever. The signal lever should then be pulled. This should lock out all opposing and conflicting route lineups and prevent the movement of any lever controlling any switch, movable-point frog, or derail in the route lined up.

On levers equipped with electric locks, the lock should be deenergized and the latch rattled and moved around to see that it is mechanically impossible to release the lock.

Test should be made to ensure that levers equipped with electric locks mechanically lock all levers previously operated in that lineup.

Check shall be made to determine that the locking is in accordance with the locking sheet and dog chart as required by § 236.338.

Test should not be made when the route has been cleared for a rail movement or if rail traffic is within the route or a conflicting route.

Compliance with §§ 236.326, 236.335, 236.336, 236.337, 236.338, 236.339, 236.340, and 236.341 is required.

CLASSIFICATION OF DEFECTS

- 236.376.A1 Mechanical locking of interlocking machine not tested when new locking is placed in service.
- 236.376.A2 Mechanical locking not tested when change in locking is made.
- 236.376.A3 Mechanical locking not tested when restored after being disarranged.
- 236.376.A4 Complete test of mechanical locking in interlocking machine not made at least once every 2 years.

**§ 236.377 Approach locking.**

Approach locking shall be tested when placed in service and thereafter when modified, disarranged, or at least once every 2 years, whichever shall occur first.

Application:

This rule requires that approach locking be tested when installed, modified, or disarranged, and at least once every 2 years thereafter. (*See Technical Bulletin S-04-01*)



This rule applies to both interlocking and traffic control systems. It applies to approach locking of both power-operated devices and electrically locked, hand-operated switches in both interlockings and traffic control systems.

Tests shall not be made if any route has been cleared for rail movement or if rail movement is within route to be tested or conflicting route.

#### Manual interlocking and controlled point:

Each track section within the limits of the approach circuit shall be shunted and inspection made to determine that the approach relay is deenergized by each shunt.

Signal shall then be cleared by regular operation and shunt placed in approach section or approach relay deenergized. Signal shall then be restored to its stop indication and inspection made to determine that timing relay or timing device, if provided, is energized. Each switch, movable-point frog, derail, or electrically locked switch in route governed shall be tried to ensure their positions cannot be changed, or a conflicting signal be cleared, during the predetermined time interval.

Where time release must be operated, each switch, movable-point frog, or derail must be tried to ensure their positions cannot be changed, or a conflicting signal be cleared, both prior to operation of time release and after its operation during its predetermined time interval.

Test each route governed by each signal.

#### Automatic interlockings:

Each track section within the limits of the approach circuit shall be shunted and inspection made to determine that the approach relay is deenergized by each shunt.

Clear home signal by placing a shunt in the approach section or by opening the approach circuit. Next, place a shunt in the approach section or open the approach circuit of a conflicting route. Then, operate the time release or pushbutton for the conflicting route, and determine that the home signal is immediately restored to its stop position and that the conflicting route is not established until the prescribed time interval has expired.

Some interlockings have superior routes that, when the approach section is occupied, cause any cleared signals governing conflicting routes to display stop indications and timing relay or timing device to operate, and after the expiration of the predetermined time interval, clears the signal governing the superior route. Some automatic interlockings have inferior routes that, when the approach section is occupied and home signal cleared, timing relay or timing device begins operating, and after the expiration of a predetermined time interval, restores the home signal to its stop indication. Regardless of the arrangement, changeover shall not occur until after the expiration of the prescribed predetermined time interval.

#### Hand-operated, electrically locked switches:

Signal shall be cleared for movement over the switch and a shunt placed on an approach section of the approach locking circuit. Then an attempt should be made to unlock the switch. The

locking should prevent the unlocking of the switch. Where time is also provided, the switch may be unlocked after the expiration of a predetermined time interval. Each approach circuit should be checked individually.

#### CLASSIFICATION OF DEFECTS

236.377.A1 Approach locking not tested when installed, modified, or after being disarranged.

236.377.A2 Approach locking not tested at least once every 2 years.

#### **§ 236.378 Time Locking.**

Time locking shall be tested when placed in service and thereafter when modified, disarranged, or at least once every 2 years, whichever shall occur first.

##### Application:

This rule requires time locking to be tested when installed, modified, or disarranged, and at least once every 2 years thereafter. (*See Technical Bulletin S-04-01*)

This rule applies to interlocking and traffic control systems.

This rule applies not only to power-operated devices but also to electrically locked, hand-operated switches within interlocking and traffic control systems, where such electric locks are provided with time locking.

Tests should not be made if rail traffic is approaching, or within route to be tested, or within conflicting routes.

Test shall be made by clearing a signal by regular operation. The signal shall then be restored to its stop indication, and check made to determine timing relay or timing device, if provided, is energized. Each switch, movable-point frog, derail, or electrically locked switch in route governed shall be tried to ensure their positions cannot be changed, or a conflicting signal established, during the predetermined time interval.

Where time release must be operated, the above units must be tried, both prior to operation of time release and after its operation during its predetermined time interval.

Test of time locking of electrically locked switch shall be made by clearing a signal governing movement over the switch and attempting to unlock the switch. The electric lock on such switch should not energize and unlock the switch until a predetermined time interval has expired after all signals governing movement over the switch have assumed their most restrictive aspects. This test should be made for each signal governing movement over the switch.

#### CLASSIFICATION OF DEFECTS

236.378.A1 Time locking not tested when installed, modified, or after being disarranged.

236.378.A2 Time locking not tested at least once every 2 years.

## **§ 236.379 Route locking.**

Route locking or other type of switch locking shall be tested when placed in service and thereafter when modified, disarranged, or at least once every 2 years, whichever shall occur first.

### Application:

This rule requires that route or any other type of switch locking be tested when installed, modified, or disarranged, and at least once every 2 years thereafter. (*See Technical Bulletin S-04-01*)

This rule applies to both interlocking and traffic control systems.

Tests should not be made if rail traffic is approaching, or within route to be tested, or within conflicting routes.

Test shall be made for all mechanical or power-operated switches and hand-operated, electrically locked switches or derails that are locked in both the reverse and normal positions.

Test shall be made by clearing signal for an established route, after which each track circuit within the route shall be progressively shunted beginning with the first track circuit in advance of the signal. While each track circuit is shunted, and while assuring time or approach locking is restored, each switch, movable-point frog, derail, and facing-point lock lever in the route, shall be tried to ensure their positions cannot be changed.

The rule permits sectional release locking that will release the locking of switches, movable-point frogs, derails, and facing-point lock levers in the rear of the progressive shunt. Inspection shall be made to determine that as each section is released, a route cannot be established that would result in improper clearance between train movements.

Route locking tests shall be conducted over each route governed by each signal and repeated in each direction for each route.

### CLASSIFICATION OF DEFECTS

236.379.A1 Route or other type of switch locking not tested when installed, modified, or after being disarranged.

236.379.A2 Route or other type of switch locking not tested at least once every 2 years.

## **§ 236.380 Indication locking.**

Indication locking shall be tested when placed in service and thereafter when modified, disarranged, or at least once every 2 years, whichever shall occur first.

### Application:

This rule requires that indication locking be tested when installed, modified, or disarranged, and at least once every 2 years thereafter. (*See Technical Bulletin S-96-02 and S-04-01*)

This rule applies to both interlocking and traffic control systems.

#### Indication locking for signals.

Home and approach signals shall be cleared by means of regular operation. Where a separate relay repeating only the red and yellow indications of the approach signal is used, visual check shall be made to ensure that the clearing of the approach signal causes such relay to become deenergized. Where such relay is not used, then a voltmeter shall be connected to the control wire for the indication lock at a point between the home and approach signals (line arresters) to ensure that the clearing of the approach signal removes energy from such wire. Where two or more approach signals are involved, test must be made to ensure that the clearing of each one of the approach signals accomplishes this result.

After this part of the test has been completed, the approach signal shall be set in its restrictive position by opening its control circuit. With the home signal clear, a visual check shall be made to ensure that the indication lock on the signal lever or lock lever is properly deenergized, or in the case of all relay-type locking, that the lock relay is deenergized.

Next, disconnect a coil wire of the home signal red repeater relay or lock relay, or open the control wire of the indication lock where the meter reading was previously taken and restore the home signal to stop indication. Visual check shall again be made to ensure that indication lock or lock relay is deenergized.

After above tests are made to ensure that the clearing of either the home or approach signal deenergizes the indication lock or lock relay, tests shall be made to ensure that switches, derails, and movable-point frogs in the route cannot be changed and that a conflicting signal cannot be obtained with the indication lock or lock relay deenergized.

The test is then completed, where indication lock is used on a lever, by deenergizing the lock by opening its control circuit at the coil terminal and clearing the home signal. If the lock is on the home signal lever, it shall be tried to ensure it cannot be latched full normal. If the indication lock is on a lock lever, the home signal lever shall be placed normal and the lock lever tried to ensure that it cannot be unlatched from the reverse position. Where all relay type locking is used, open lock circuit at each signal control relay or red repeater relay and visually check to ensure the lock relay becomes deenergized. At automatic interlocking, proceed as above except check stick locking circuits in lieu of indication locking circuits.

Where signals are of the semaphore type, visual inspection must also be made to ensure that locking becomes effective with the signal blade not over 5 degrees above the 45-degree position on upper

quadrant approach signals or 5 degrees below the 45-degree position on lower quadrant approach signal, and not over 5 degrees from horizontal on home signals.

#### Indication locking for switches:

Where indication lock is on control lever, with switch in full normal position, the reverse switch point shall be obstructed so that the switch cannot operate full throw. The lever shall then be operated so that the switch will operate against the obstruction and test made to ensure lever

cannot be latched reverse with the switch unlocked.

Where all relay type locking is used, the above method of obstruction and switch operation shall be followed. A visual check shall be made to ensure indication light on control panel remains unlighted, and a trial made to ensure signals governing movements over the switch cannot be cleared.

Above tests shall be made for both the normal and reverse positions of each switch.

#### CLASSIFICATION OF DEFECTS

236.380.A1 Indication locking not tested when installed, modified, or after being disarranged.

236.380.A2 Indication locking not tested at least once every 2 years.

#### **§ 236.381 Traffic locking.**

Traffic locking shall be tested when placed in service and thereafter when modified, disarranged, or at least once every 2 years, whichever shall occur first.

#### Application:

This rule requires that traffic locking be tested when installed, modified, or disarranged, and at least once every 2 years thereafter. (*See Technical Bulletin S-04-01*)

This rule applies only to interlockings. This testing rule does not apply to traffic control systems. Traffic control systems are required to have a similar functionality as prescribed within § 236.405. However, while it is required as a standard to function properly and as intended, there is no requirement to test it within this rule.

Tests should not be conducted if rail traffic is approaching or within the route to be tested.

Tests shall be performed by clearing signal governing entrance to the traffic block and checking that traffic levers cannot be changed, or opposing signal cleared, until signal is restored to “Stop” position and approach or time locking released. Drop each track relay in the traffic block section and ensure that traffic lever cannot be moved, direction of traffic changed, or opposing signal cleared.

#### CLASSIFICATION OF DEFECTS

236.381.A1 Traffic locking not tested when installed, modified, or after being disarranged.

236.381.A2 Traffic locking not tested at least once every 2 years.

Excerpt from Mr. Walsh’s letter of January 3, 1985

To: Mr. L. M. Himmel, Sr. Executive Director

Operations and Maintenance Department

Communications and Signals Division

Association of American Railroads

\* \* \* \* \*

Section 236.376 Mechanical locking.  
Section 236.377 Approach locking.  
Section 236.378 Time locking.  
Section 236.379 Route locking.  
Section 236.380 Indication locking.  
Section 236.381 Traffic locking.

The AAR requested clarity of the term “disarranged”; questioned whether the removal of two or more wires constituted a disarrangement which required the above tests be performed; and suggested FRA’s Technical Manual be revised to exempt the requirements of testing where a device is provided with plug couplers or the replacement is accomplished by removal of not more than one wire at a time.

These rules prescribe inspection and tests of the various types of locking. The rules require mechanical locking be tested when new locking is installed; electric locking be tested when placed in service; and all locking be tested thereafter when modified, disarranged, or at least once every two years, whichever shall occur first.

Major sources of false proceed failures for more than five years have been errors in connection and errors in design. The revision of these rules resulted in the requirements that tests be performed at the time such errors should be detected, before they present hazards to the safety of train operation.

Accordingly, mechanical locking is considered to be disarranged when (i) one or more pieces of locking are broken; or (ii) one or more pieces are removed.

Electric locking is considered to be disarranged when (i) a relay is replaced with another; (ii) when two or more signal line wires or a cable having two or more conductors are severed; (III) when a cable or conductor in a locking circuit is replaced with another; or (iv) when wires are removed at the same time from more than one terminal of a relay or terminal board.

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#### **§ 236.382 Switch obstruction test.**

Switch obstruction test of lock rod of each power-operated switch and lock rod of each hand-operated switch equipped with switch-and-lock-movement shall be made when lock rod is placed in service or changed out, but not less than once each month.

#### Application:

This rule requires that a switch obstruction test be made when lock rod is installed and at least once a month thereafter. *(See Technical Bulletin S-04-01)*

This rule applies to interlocking and traffic control systems.

Tests should not be conducted if rail traffic is approaching or within the route to be tested.

This rule applies to pipe-connected, mechanically operated switches; electric switches; electrohydraulic switches; electropneumatic switches; and hand-operated switch machines with

lock rods, where such hand-operated switch machines are located within interlockings or traffic control systems.

This rule does not apply to hand-operated switches not equipped with switch-and-lock movements.

To test power-operated and mechanical pipe-connected switches for compliance with § 236.327, place a  $\frac{3}{8}$ -inch obstruction between the switch point and stock rail, 6 inches from the end of the switch point, and attempt to lock up the switch. Assurance should be made that the locking dog strikes the lock rod.

To test a hand-operated switch-and-lock movement for compliance with § 236.6, follow the same procedure, but use a one-fourth inch obstruction to make the test.

### CLASSIFICATION OF DEFECTS

236.382.A1 Switch obstruction test not made when lock rod installed.

236.382.A2 Switch obstruction test not made at least once each month.

### **§ 236.383 Valve locks and valve magnets.**

Valve locks on valves of the non-cut-off type shall be tested at least once every 3 months, and valves and valve magnets shall be tested at least once every year.

#### Application:

This rule requires that valve locks on valves of the non-cut-off type be tested at least once every 3 months and valves and valve magnets be tested once every year. (*See Technical Bulletin S-04-01*)

This rule applies to interlocking and traffic control systems.

Tests should not be conducted while rail traffic is approaching or within any route that might be affected by the tests.

Tests shall be conducted by removing valve stem or control wire from lock magnet of electro-pneumatic switch. Switch should not move.

Where “CP” valves are used, place switch lever in normal, close globe valve, and remove plug in reverse side of switch cylinder. Then move lever to reverse indicating point. Indication should not be received when lever is moved to reverse. Restore plug and open globe valve, reverse switch, and repeat test.

Test “D” valve of non-cut-off type in normal and reverse positions by removing armature stem in lock valve magnet and operating controlling lever; switch should not respond.

Test each set of cut-off valves with switch in normal position by holding lock and reverse armature in for about 1 minute while normal magnet is energized; switch should not respond.

Repeat in reverse position, holding lock and normal armatures while reverse magnet is energized.

### CLASSIFICATION OF DEFECTS

- 236.383.A1 Valve lock in electro-pneumatic interlocking not tested at least every 3 months. (Applies only to valves of the non-cut-off type.)
- 236.383.A2 Valve in electro-pneumatic interlocking not tested at least once every year.
- 236.383.A3 Valve magnet in electro-pneumatic interlocking not tested at least once every year.

### **§ 236.384 Cross protection.**

Cross protection shall be tested at least once every 6 months.

#### Application:

This rule requires that cross protection be tested at least once every 6 months. (*See Technical Bulletin S-04-01*)

This rule applies only to those interlockings provided with cross protection devices.

Tests should not be conducted while rail traffic is approaching or within the section of interlocking to be tested.

This test ensures that switches, signals, etc., do not respond when current is improperly applied to circuits. It is recommended that a variable resistor be used in making the test.

Tests should be made when plant voltage is at the maximum.

Make temporary connection between normal and reverse operating wires for each switch at the pole changer. This should open polar relay or circuit breaker.

Make temporary positive battery connection from the nearest switch to the signal control wire as close as practicable to the signal motor. This should open the polar relay or circuit breaker.

If the signal control circuit is connected to the common return wire through one or more switch circuit controllers, the energy should be applied to this wire, first opening the connection to the main common to prevent blowing fuse in the switch circuit. If plant is sectionalized, one or more functions in each section should be crossed with wires taking energy from each of the other sections. In the event that functions in various sections are too widely separated, the temporary crosses can be made between the binding posts on the terminal board of the interlocking machine. This should open the section breakers.

### CLASSIFICATION OF DEFECTS

- 236.384.A1 Cross protection not tested at least once every 6 months.



## **§ 236.386 Restoring feature on power switches.**

Restoring feature on power switches shall be tested at least once every 3 months.

### Application:

This rule requires that restoring feature on power switches be tested once every 3 months. (See *Technical Bulletin S-04-01*)

This rule applies to interlocking and traffic control systems.

This rule applies only to electro-pneumatic switches. Air shall be removed from switch before testing. Test shall be made by using a bar and moving slide bar of switch movement toward opposite position where locking dog will become disengaged from lock rod. Test to ascertain that indication circuits are opened and/or lock magnet circuit is energized before locking dog is completely withdrawn from lock rod. Restore air to determine that slide bar is driven back to its original position.

### CLASSIFICATION OF DEFECTS

236.386.A1 Restoring feature on power switch not tested at least once every 3 months.

## **§ 236.387 Movable bridge locking.**

Movable bridge locking shall be tested at least once a year.

### Application:

This rule requires movable bridge locking to be tested at least once a year. (See *Technical Bulletin S-04-01*)

This rule applies to movable bridge interlockings. Test shall be made by displacing bridge locking members more than 1 inch from their proper position and determining that signals cannot be cleared to authorize movement over the movable bridge.

When movable bridge is equipped with circuit controllers with or without mechanical rail locks, movable rails shall be displaced more than three-eighths inch (e.g., one-half inch gage) from their correct surface or alignment with adjacent fixed rail by an obstruction.

With the movable rail thus displaced, the rail lock should not lock up and if rail lock is not provided, signals cannot be cleared to authorize movement over the movable bridge.

This test should be made for each rail lock or circuit controller on the bridge that checks for correct rail alignment or surface.

Check operation of all circuit controllers connected to the wedges, latches, rail locks, etc., to see that contacts make or break when corresponding functions are in their proper position.

## CLASSIFICATION OF DEFECTS

236.387.A1 Movable bridge locking not tested at least once a year.

### **Subpart D – Traffic Control Systems**

#### ***Standards***

#### **§ 236.401 Automatic block signal system and interlocking standards applicable to traffic control systems.**

The standards prescribed in §§ 236.201 to 236.203, inclusive, §§ 236.205, 236.206, 236.303, 236.307 and 236.309 to 236.311, inclusive, shall apply to traffic control systems.

#### **Application:**

This rule prescribes the following automatic block signal system and interlocking standards be applied to traffic control systems:

- § 236.201 Track-circuit control of signals.
- § 236.202 Signal governing movements over hand-operated switch.
- § 236.203 Hand-operated crossover between main tracks; protection.
- § 236.205 Signal control circuits; requirements.
- § 236.206 Battery or power supply with respect to relay; location.
- § 236.303 Control circuits for signals, selection through circuit controller operated by switch points or by switch locking mechanism.
- § 236.307 Indication locking.
- § 236.309 Loss of shunt protection; where required.
- § 236.310 Signal governing approach to home signal.
- § 236.311 Signal control circuits, selection through track relays, or devices functioning as track relays, and through signal mechanism contacts and time releases at automatic interlocking.

#### **§ 236.402 Signals controlled by track circuits and control operator.**

The control circuits for home signal aspects with indications more favorable than “proceed at restricted speed” shall be controlled by track circuits extending through entire block. Also in addition, at controlled point they may be controlled by control operator, and, at manually operated interlocking, they shall be controlled manually in cooperation with control operator.

#### **Application:**

This standard requires that all home signal aspects with indications more favorable than “proceed at restricted speed” be controlled by track circuit extending through the entire block. At a controlled point, the control circuits may be controlled by a control operator; and at manually operated interlockings, the home signals shall be controlled manually in cooperation with the control operator.

Any aspects with indications more favorable than “proceed at restricted speed” must be selected through track relays, regardless of any speed limit or restriction. The aspects and indications of the governing signals determine compliance with this standard, not the authorized train speed. A block extends from a signal to the next governing signal or from a signal to the limits or end of the system. The end of the system, absent a signal, may be identified by the use of wayside signage, or by specific designation in the carrier’s timetable or special instructions.

Control circuits do not have to be manually controlled by the operator and may be automatic. However, it is not the intention of this rule to give control to any other individual operation in opposition to or in conflict with the control operator.

#### CLASSIFICATION OF DEFECTS

- 236.402.A1 Signal control circuits for home signal aspect with indication more favorable than “proceed at restricted speed” not controlled by track circuits extending through the entire block.
- 236.402.A2 Signal at manually operated interlocking not controlled manually in cooperation with control operator.

#### **§ 236.403 Signals at controlled point.**

Signals at controlled point shall be so interconnected that aspects indicating to proceed cannot be displayed simultaneously for conflicting movements, except that opposing signals may display an aspect indicating “proceed at restricted speed” at the same time on a track used for switching movements only, by one train at a time.

#### Application:

This rule requires signals at a controlled point to be so interconnected that any aspects indicating to proceed cannot be displayed simultaneously for conflicting movements, except that opposing signals may display an aspect indicating “proceed at restricted speed” at the same time on track used for switching movements only.

This is a companion rule to § 236.308 in that it permits display of aspect indicating “proceed at restricted speed” on opposing signals at the same time on track used for switching movements only by one train at a time.

#### CLASSIFICATION OF DEFECTS

- 236.403.A1 Signals at controlled point can simultaneously display aspect indicating to proceed for conflicting train movements. (Does not apply to opposing signals on track used for switching movements only by one train at a time).
- 236.403.A2 Signals at controlled point can simultaneously display aspect indicating more favorable than “proceed at restricted speed” for opposing train movements. (Does not apply to opposing signals on track used for switching movements only by one train at a time).

#### **§ 236.404 Signals at adjacent controlled points.**

Signals at adjacent controlled points shall be so interconnected that aspects indicating to proceed on tracks signaled for movements at greater than restricted speed cannot be displayed simultaneously for conflicting movements.

##### Application:

This rule requires that signals at adjacent controlled points be interconnected so that aspects indicating to proceed on tracks signaled for movements at greater than restricted speed cannot be displayed simultaneously for conflicting movements.

This rule permits restricted speed aspects to be displayed simultaneously for opposing or converging routes at adjacent control points provided the speed restrictions between the control points do not exceed 20 mph. The rule was revised in 1964, primarily to permit restricted speed conflicting movements into a siding from each end. The maximum authorized speed between adjacent controlled points where signals can simultaneously display aspects indicating proceed at restricted speed shall not exceed 20 mph, regardless of more favorable aspects displayed and regardless of whether track is signaled.

#### CLASSIFICATION OF DEFECTS

236.404.A1 Signals at adjacent controlled points not so interconnected that aspects indicating to proceed, on tracks signaled for movements at greater than restricted speed, cannot be displayed simultaneously for conflicting movements.

#### **§ 236.405 Track signaled for movements in both directions, change of direction of traffic.**

On track signaled for movements in both directions, occupancy of the track between opposing signals at adjacent controlled points shall prevent changing the direction of traffic from that which obtained at the time the track became occupied, except that when a train having left one controlled point reaches a section of track immediately adjacent to the next controlled point at which switching is to be performed, an aspect permitting movement at not exceeding restricted speed may be displayed into the occupied block.

##### Application:

This rule prevents the changing of the direction of traffic from that which was obtained at the time the track was occupied between opposing signals at adjacent controlled points on track signaled for movement in both directions except that when a train having left one controlled point reaches a section of track immediately adjacent to the next controlled point at which switching is to be performed, an aspect permitting movement at not exceeding restricted speed may be displayed into the occupied block.

This rule requires that traffic control systems have nearly the functional equivalent as that of “traffic locking” installed and operating properly and as intended. However, there is no requirement for testing it as prescribed by § 236.381.

After a train or engine has passed a signal displaying an aspect permitting it to proceed into and through a controlled point, the opposing signals at the adjacent controlled point shall not display any aspect with an indication other than “stop,” as long as the section of track between controlled

points is occupied.

The exception to the traffic locking requirements (§ 236.405) applies only in instances when a train is left on the main track while its engine and/or cars move into an adjacent siding or yard for switching purposes and must, in returning to its train, reverse its direction for a short distance. It is permissible in such instances to permit such movements to be made with a signal aspect indicating “Proceed at Restricted Speed” into the occupied block.

#### CLASSIFICATION OF DEFECTS

236.405.A1 On track signaled for movements in both directions, occupancy of track between opposing signals at adjacent controlled points does not prevent changing the direction of traffic from that which obtained at the time the track became occupied. (Note: An exception added January 24, 1966, permits display of an aspect not less restrictive than that indicating “proceed at restricted speed” by a signal to permit a locomotive (with or without cars) to return to a standing portion of the train in the immediate approach to a controlled point during switching operations. Where a carrier provides the necessary arrangement to permit a locomotive to return to its train, as set forth in the exception, such an arrangement when actuated does not constitute a violation of § 236.405 and should not be reported as such.)

#### **§ 236.407 Approach or time locking; where required.**

[Approach or time locking shall be provided for all controlled signals where route or direction of traffic can be changed.](#)

#### Application:

This rule requires that approach or time locking be provided for each controlled signal where route or direction of traffic can be changed.

This rule applies to all controlled signals at controlled points where the route can be changed or where direction of traffic can be changed. It applies to all controlled signals at controlled points where the route can be changed regardless of the type of switch utilized to change the route. Does not apply to so-called “holding signals” between controlled points where the direction of traffic cannot be changed. (*See Technical Bulletin S-99-04*)

#### CLASSIFICATION OF DEFECTS

236.407.A1 Approach or time locking not provided for controlled signal where route or direction of traffic can be changed.

236.407.A2 Approach locking not effective.

236.407.A3 Time locking not effective.

## **§ 236.408 Route locking.**

Route locking shall be provided where switches are power-operated. Route locking shall be effective when the first pair of wheels of a locomotive or car passes a point not more than 13 feet in advance of the signal governing its movement, measured from the center of the signal mast or, if there is no mast, from the center of the signal.

### Application:

This rule specifies where route locking shall be provided and where it shall become effective in the route entered.

At any location in traffic control territory where switches are power-operated, route locking must be provided; and it must be effective when the first pair of wheels of a locomotive or car passes a point 13 feet in advance of the signal governing its movement.

The 13 feet shall be measured from the center of the signal mast portion on which it is mounted (e.g., from center of tall mast, or of off-set or extension mast) to the effective insulated joint. Where the signal is not mounted on a vertical ground mast, the 13 feet shall be measured from the center of the signal. This rule does not apply to automatic signals or controlled signals that do not have power-operated switches in the route governed.

Route locking is not required or provided where there is an absence of a power-operated switch, movable-point frog, or derail in the route. Route locking is also not required by this rule in an instance of a train crew receiving permission to pass a stop signal indication (i.e., occupancy of the track circuit(s) alone lock the switch). Where any location is found not having the equivalent of route locking in that instance, and it is equipped with one or more dual-controlled power-operated switches, assurance should be gained that the carrier's special instructions for hand-operation of such a switch provide for the safe movement of trains. (For example, the switch may not be restored to power operation until the rear of the train has passed over and beyond it.)

### CLASSIFICATION OF DEFECTS

236.408.A1 Route locking not provided where switches are power-operated.

236.408.A2 Route locking not effective.

236.408.A3 Route locking not effective until first pair of wheels of locomotive or car passes a point more than 13 feet in advance of the signal governing the movement.

## **§ 236.410 Locking, hand-operated switch.**

(a) Each hand-operated switch in main track shall be locked either electrically or mechanically in normal position, except:

- (1) Where train speeds over the switch do not exceed 20 miles per hour;
- (2) Where trains are not permitted to clear the main track;
- (3) Where a signal is provided to govern train movements from the auxiliary track to the signaled track; or
- (4) On a signaled siding without intermediate signals where the maximum authorized speed on the siding does not exceed 30 miles per hour.

(b) Approach or time locking shall be provided and locking may be released either automatically, or by the control operator, but only after the control circuits of signals governing movement in either direction over the switch and which display aspects with indications more favorable than "proceed at restricted speed" have been opened directly or by shunting of track circuit.

(c) Where a signal is used in lieu of electric or mechanical lock to govern movements from auxiliary track to signaled track, the signal shall not display an aspect indicating to proceed until after the control circuits of signals governing movement on main track in either direction over the switch have been opened, and either the approach locking circuits to the switch are unoccupied or a predetermined time interval has expired.

#### Application:

This rule requires that a hand-operated switch in main track be locked, either electrically or mechanically in normal position, or a signal be provided to govern train movements to the signaled track. It exempts those hand-operated switches on main track where train speeds do not exceed 20 mph, on signaled sidings without intermediate signals where train speeds do not exceed 30 mph, or where trains are not permitted to clear the signaled track. It requires approach or time locking, and provides that locking may be released either automatically or by the control operator after the control circuits of signals governing movements over the switch have been opened directly or by shunting of track circuit.

Any signaled track in traffic control territory is considered as main track. If speed on main track, except signaled sidings, exceeds 20 mph, each hand-operated switch must comply with this section. Speed may be controlled only by permanent speed restriction or by signal indication.

Sidings provided with signal protection and without intermediate signals are signaled sidings. If train speed exceeds 30 mph on a signaled siding, each hand-operated switch on such siding must comply with this section.

Hand-operated switches are not required to be electrically or mechanically locked, or to be equipped with a signal to govern train movements to the signaled track, where trains are not permitted to clear the main track. Trains may enter such switches provided a car is left on the main track, the switch is left open, or a derail equipped with switch circuit controller is left in non-derailing position. Note: This option may not be available to the railroad where a siding track, equipped with a hand-operated switch on either end, spans an intermediate or controlled point signal location. The reason it is not available is that even though a train may not clear one end (leaving a portion of the train on the main track or leaving the switch thrown reverse), and the signal governing movement over the switch at that end will therefore be displaying its most restrictive indication, the signal governing movement over the switch at the other end of the siding track in which the train is located may not be displaying its most restrictive indication (equivalent to the train being "cleared" in that track).

Approach or time locking must be provided for each lock, must be effective, and must be installed in such a manner that it cannot be defeated by any action of train crewmembers (except via operation of an emergency release device, if so equipped, and as addressed below).

Locks may be provided with an emergency release device, which must be kept sealed. An emergency release device with broken or missing seals is prohibited (except where such a release

device is equipped with a latch out feature that actuates when the emergency device is operated and which opens the signal control circuits until being reset by a signal employee).

Lock may be released either automatically or by control operator. Control circuits of signals governing movements over the switch which display aspects indicating more favorable than “proceed at restricted speed” must be opened, or track circuit must be shunted, before locking is released.

Electric or mechanical lock provided with time locking must not release until after expiration of a predetermined time interval sufficient to permit a train, having passed the signal governing movement over the switch displaying an aspect with an indication more favorable than proceed at restricted speed, to pass the switch; or, to permit a train approaching the signal governing movement over the switch displaying an aspect indicating “stop” or “stop and proceed,” to stop, or where the signal governing movement over the switch displays a “restricting” indication, to permit the train to reduce to restricted speed.

Electric or mechanical lock provided with approach locking must not release when approach section is occupied until after expiration of a predetermined time interval sufficient to permit a train to stop or to pass the switch, or where signal governing movement over the switch displays a “restricting” indication as its most restrictive aspect, the train can reduce its speed to restricted speed. If approach section is unoccupied, lock may release immediately after signal control circuits are opened.

Control circuit for electric lock must be so arranged and installed that shunting of turnout will not release lock for movement to main track. See § 236.16.

Locking member of electric or mechanical lock must be so maintained that it cannot be displaced from its locked position by quickly operating (jiggling) the lock lever or pedestal.

Where signal is provided in lieu of a lock to govern train movements to signaled track, an aspect permitting a train to proceed shall not be displayed until the control circuits for all signals governing movement over the switch on the signaled track are opened, and approach circuits in both directions are unoccupied, or a predetermined time interval has expired.

Where exception (1) is relied upon, it is permissible for trains, after approaching the switch at speeds not exceeding 20 mph, to accelerate after the locomotive occupies the switch points.

The provision of exception (2) does not apply to maintenance-of-way work equipment. Such maintenance-of-way equipment as motor cars and track machinery such as tampers, liners, burro cranes with or without cars, Sperry test cars, and Speno Rail Grinder equipment, is not considered to be a train, and may clear the main track in traffic control system (TCS) territory without regard to requirements of this rule.

A previous footnote to this rule since deleted required that all hand-operated switches in traffic control territory be brought into compliance with these provisions on or before December 31, 1986.



## CLASSIFICATION OF DEFECTS

- 236.410.A1 Hand-operated switch on main track not electrically or mechanically locked in normal position where signal is not provided to govern movement to main track and train movements are made at speeds in excess of 20 mph and train or engine movements may clear the main track.
- 236.410.A2 Hand-operated switch on signaled siding not electrically or mechanically locked in normal position where signal is not provided to govern movements to signaled siding and train movements are made at speeds in excess of 30 mph and train or engine movements may clear the signaled siding.
- 236.410.B1 Approach or time locking not provided for electric lock on hand-operated switch.
- 236.410.B2 Approach or time locking not provided in connection with mechanical lock on hand-operated switch.
- 236.410.B3 Approach or time locking not provided for signal used in lieu of electric or mechanical lock.
- 236.410.B4 Electric or mechanical lock on hand-operated switch can be unlocked before control circuits of signals governing movements over the switch, which display aspects indicating more favorable than “proceed at restricted speed,” have been opened directly or track circuit has been shunted.
- 236.410.B5 Electric or mechanical lock on hand-operated switch can be unlocked before expiration of predetermined time interval, with approach section occupied, where approach locking is provided.
- 236.410.B6 Electric or mechanical lock on hand-operated switch can be unlocked before expiration of predetermined time interval where time locking is provided.
- 236.410.B7 Approach or time locking of electric lock at hand-operated switch can be defeated by the unauthorized use of emergency release device of electric lock which is not kept sealed in the non-release position.
- 236.410.C1 Signal provided in lieu of electric or mechanical lock can display an aspect indicating to proceed before control circuits of signals governing movements over the switch have been opened.
- 236.410.C2 Signal provided in lieu of electric or mechanical lock can display an aspect indicating to proceed before expiration of predetermined time interval, with approach section occupied, where approach locking is provided.
- 236.410.C3 Signal provided in lieu of electric or mechanical lock can display an aspect indicating to proceed before expiration of predetermined time interval where time locking is provided.

## **§ 236.426 Interlocking rules and instructions applicable to traffic control systems.**

The rules and instructions prescribed in §§ 236.327 and 236.328, §§ 236.330 to 236.334, inclusive, and § 236.342 shall apply to traffic control systems.

### Application:

This rule prescribes the following interlocking rules and instructions be applied to traffic control systems.

- § 236.327 Switch, movable-point frog, or split-point derail.
- § 236.328 Plunger of facing-point lock.
- § 236.330 Locking dog of switch-and-lock movement.
- § 236.334 Point detector.
- § 236.342 Switch circuit controller.

## **§ 236.476 Interlocking inspections and tests applicable to traffic control systems.**

The inspections and tests prescribed in §§ 236.377 to 236.380, inclusive, and §§ 236.382, 236.383, and 236.386 shall apply to traffic control systems.

### Application:

This rule prescribes the following interlocking inspections and tests be made of traffic control systems. (*See Technical Bulletin S-04-01*)

- § 236.377 Approach locking.
- § 236.378 Time locking.
- § 236.379 Route locking.
- § 236.380 Indication locking.
- § 236.382 Switch obstruction test.
- § 236.383 Valve locks, valves, and valve magnets.
- § 236.386 Restoring feature on power switches.

Results of tests shall be recorded in compliance with § 236.110.

## **Subpart E – Automatic Train Stop, Train Control, and Cab Signal Systems**

### ***Standards***

## **§ 236.501 Forestalling device and speed control.**

(a) An automatic train stop system may include a device by means of which the automatic application of the brakes can be forestalled.

(b) Automatic train control system shall include one or more of the following features:

(1) Low-speed restriction, requiring the train to proceed under slow speed after it has either been stopped by an automatic application of the brakes, or under control of the engineman, its speed has been reduced to slow speed, until the apparatus is automatically restored to normal because the condition which caused the restriction no longer affects the movement of the train.

(2) Medium-speed restriction, requiring the train to proceed under medium speed after passing a signal displaying an approach aspect or when approaching a signal requiring a stop, or

a stop indication point, in order to prevent an automatic application of the brakes.

Note: Relief from the requirements of paragraphs (b)(1) and (2) of this section will be granted, insofar as speed limits fixed by definitions of Slow and Medium speeds are concerned, upon an adequate showing by an individual carrier where automatic train control systems now in service enforce speed restrictions higher than those required by definitions in §§ 236.700 to 236.838 inclusive.

(3) Maximum-speed restriction, effecting an automatic brake application whenever the predetermined maximum speed limit is exceeded.

#### Application:

This rule permits the use of a forestalling device in automatic train stop systems and sets forth the minimum requirements for control of speed in automatic train control systems.

This rule applies to automatic train stop and train control systems.

An automatic train stop system may, but is not required to, include an acknowledging device by means of which the automatic application of the brakes can be forestalled.

An automatic train control system is required to have one or more of the following features:

(1) A low-speed restriction, effective as long as the condition that causes the restriction exists, that prohibits movement exceeding slow speed either after the train has been stopped by automatic application of the brakes or its speed is reduced to slow speed by manual application of the brakes.

(2) A medium-speed restriction that, in order to prevent an automatic application of the brakes, requires the train to proceed under medium speed after passing a signal displaying an approach aspect, or when approaching a signal requiring a stop, or a stop indication point.

(3) A maximum-speed restriction that will effect an automatic brake application whenever the predetermined maximum authorized speed is exceeded.

The speeds imposed by the slow-speed or medium-speed restrictions must comply with the carrier's definition of slow speed or medium speed, which may not exceed that defined by §§ 236.813 or 236.811, respectively, without approval of FRA. Each carrier establishes its own maximum speed.

#### CLASSIFICATION OF DEFECTS

236.501.B1 Automatic train control system with low-speed restriction does not enforce slow speed after train has been stopped by an automatic application of the brakes, until the apparatus is automatically restored to normal because the condition which caused the restriction no longer affects the movement of the train.

236.501.B2 Automatic train control system with low-speed restriction does not enforce slow speed after the speed of the train, under control of the engineman, has been reduced to slow speed, until the apparatus is automatically restored to normal because the condition which caused the restriction no longer affects the movement of the train.

- 236.501.B3 Automatic train control system with medium-speed restriction does not require train to proceed under medium speed after passing a signal displaying an approach aspect in order to prevent an automatic application of the brakes.
- 236.501.B4 Automatic train control system with medium-speed restriction does not require train to proceed under medium speed when approaching a signal requiring a stop, or a stop indication point, in order to prevent an automatic application of the brakes.
- 236.501.B5 Automatic train control system with maximum-speed restriction does not require train to proceed at or under predetermined maximum authorized speed in order to prevent an automatic application of the brakes.

**§ 236.502 Automatic brake application, initiation by restrictive block conditions stopping distance in advance.**

An automatic train stop or train control system shall operate to initiate an automatic brake application at least stopping distance from the entrance to a block, wherein any condition described in § 236.205 obtains, and at each main track signal requiring a reduction in speed.

Application:

This is a companion rule to § 236.504 and requires that the automatic brake application be initiated at least stopping distance from the entrance of a block where any condition exists as described in § 236.205.

This rule applies to automatic train stop and train control systems.

This rule requires that an automatic train stop or train control system be so arranged that it will operate to initiate an automatic brake application at least stopping distance in approach to a block wherein any condition described in § 236.205 exists, and at each main track signal requiring a reduction in speed.

This rule is applicable to signals governing movements on or onto the main track. Signals on auxiliary tracks and sidings, whether signaled or nonsignaled, are exempt from the requirements of this rule.

CLASSIFICATION OF DEFECTS

- 236.502.A1 Automatic train stop or train control system does not operate to initiate an automatic brake application at least stopping distance from the entrance to a block occupied by a train, locomotive, or car.
- 236.502.A2 Automatic train stop or train control system does not operate to initiate an automatic brake application at least stopping distance from the entrance to a block in which the points of a switch are not closed in proper position.
- 236.502.A3 Automatic train stop or train control system does not operate to initiate an automatic brake application at least stopping distance from the entrance to a block

in which an independently operated fouling-point derail equipped with switch circuit controller is not in derailing position.

236.502.A4 Automatic train stop or train control system does not operate to initiate automatic brake application at least stopping distance from the entrance to a block in which a track relay is in deenergized position, or device which functions as a track relay is in its most restrictive state.

236.502.A5 Automatic train stop or train control system does not operate to initiate an automatic brake application at signal requiring a reduction in speed.

**§ 236.503 Automatic brake application; initiation when predetermined rate of speed exceeded.**

An automatic train control system shall operate to initiate an automatic brake application when the speed of the train exceeds the predetermined rate as required by the setting of the speed control mechanism.

Application:

This is a companion rule to § 236.501 and requires overspeed protection of all restrictive features used in automatic train control systems.

This rule applies to automatic train control systems only.

This rule requires that automatic train control apparatus function to initiate an automatic brake application whenever the speed of the train exceeds any predetermined setting of the speed control mechanism. A tolerance of 3 mph is permitted in excess of the predetermined setting of the speed control mechanism.

CLASSIFICATION OF DEFECTS

236.503.A1 Automatic train control system does not operate to initiate an automatic brake application when the speed of the train exceeds the predetermined rate as required by the setting of the speed control mechanism.

**§ 236.504 Operation interconnected with automatic block signal system.**

(a) A continuous inductive automatic train stop or train control system shall operate in connection with an automatic block signal system and shall be so interconnected with the signal system as to perform its intended function in event of failure of the engineer to acknowledge or obey a restrictive wayside signal or a more restrictive cab signal.

(b) An intermittent inductive automatic train stop system shall operate in connection with an automatic block signal system and shall be so interconnected with the signal system that the failure of the engineer to acknowledge a restrictive wayside signal will cause the intermittent inductive automatic train stop system to perform its intended function.

Application:

This rule prescribes the interconnection and operation of an automatic train stop or train control system with a wayside block signal system.

This rule applies to automatic train stop and train control systems.

This rule requires that an automatic train stop or train control system operate in connection with an automatic block signal system. The train stop or train control system must be so interconnected with the signal system that it will impose an automatic application of the brakes in event the engineer fails (1) to acknowledge or obey the indication of a wayside signal or a cab signal requiring a reduction in speed in a continuous inductive automatic train stop or train control system, or (2) to acknowledge a restrictive wayside signal in an intermittent inductive automatic train stop system.

This rule is applicable only to those signals governing movements on or onto the main track.

Signals on auxiliary tracks are exempt from the requirements of this rule.

#### CLASSIFICATION OF DEFECTS

- 236.504.A1 Automatic train stop or train control system does not operate in connection with an automatic block signal system.
- 236.504.A2 A continuous inductive automatic train stop or train control system not so interconnected with the signal system so as to perform its intended function in the event of failure of the engineer to acknowledge or obey a signal requiring a reduction in speed.
- 236.504.B1 An intermittent inductive automatic train stop system not so interconnected with the signal system so as to perform its intended function in the event of failure of the engineer to acknowledge a signal requiring a reduction in speed.

#### **§ 236.505 Proper operative relation between parts along roadway and parts on locomotive.**

Proper operative relation between the parts along the roadway and the parts on the locomotive shall obtain under all conditions of speed, weather, wear, oscillation, and shock.

##### Application:

This rule requires that proper operation occur between parts along the roadway and parts on the locomotive under all conditions.

This rule applies to automatic cab signal, train stop, and train control systems.

This rule requires that apparatus on locomotives and at wayside locations be properly interconnected and function as intended regardless of speed, weather, wear, oscillation, and shock.

#### CLASSIFICATION OF DEFECTS

- 236.505.A1 Proper operative relation between the parts along the roadway and the parts on the locomotive does not obtain under all conditions of speed, weather, wear,

oscillation, and shock.

**§ 236.506 Release of brakes after automatic application.**

The automatic train stop or train control apparatus shall prevent release of the brakes after automatic application until a reset device has been operated, or the speed of the train has been reduced to a predetermined rate, or the condition that caused the brake application no longer affects the movement of the train. If reset device is used, it shall be arranged so that the brakes cannot be released until the train has been stopped, or it shall be located so that it cannot be operated by engineer without leaving his/her accustomed position in the cab.

Application:

This rule prescribes the conditions under which the brakes may be released following an automatic brake application.

This rule applies to automatic train stop and train control systems.

An intermittent inductive automatic train stop system shall not permit release of the brakes following an automatic brake application until after the train has been stopped.

A continuous inductive automatic train stop system shall not permit release of the brakes following an automatic brake application until after the train has been stopped, unless the condition that caused the brake application no longer exists.

An automatic train control system shall not permit release of the brakes following an automatic brake application until the speed has been reduced to a predetermined rate or until the train has been stopped, unless the condition that caused the brake application no longer exists.

This rule prohibits use of a reset device in the control compartment that, when operated, permits release of the brakes before the train has been stopped.

CLASSIFICATION OF DEFECTS

- 236.506.A1 Automatic train stop apparatus permits release of the brakes after automatic application before a reset device has been operated, while the condition that caused the brake application still affects the movement of the train.
- 236.506.A2 Automatic train control apparatus permits release of the brakes after automatic application before the speed of the train has been reduced to a predetermined rate, while the condition that caused the brake application still affects the movement of the train.
- 236.506.A3 Reset device so located that it can be operated by engineer without leaving his/her accustomed position in the cab and not so arranged as to prevent release of the brakes until the train has been stopped.
- 236.506.A4 Brakes can be released following automatic brake application after reset device has been operated before train has been stopped, while the condition that caused

the brake application still affects the movement of the train.

**§ 236.507 Brake application; full service.**

The automatic train stop or train control apparatus shall, when operated, cause a full service application of the brakes.

Application:

This is a companion rule to § 236.502 and requires the apparatus on the locomotive, when operated, to impose a full service application of the brakes.

This rule applies to automatic train stop and train control systems.

This rule requires that an automatic train stop or train control brake application be a full service brake application as defined by § 236.701. The imposition of an emergency brake application is prohibited.

CLASSIFICATION OF DEFECTS

236.507.A1 Automatic train stop or train control apparatus, when operated, does not cause a full service application of the brakes.

**§ 236.508 Interference with application of brakes by means of brake valve.**

The automatic train stop, train control, or cab signal apparatus shall be so arranged as not to interfere with the application of the brakes by means of the brake valve and not to impair the efficiency of the brake system.

Application:

This rule prohibits use of apparatus that affects the proper functioning of the brake system.

This rule applies to automatic cab signal, train stop, and train control systems.

When devices covered by this subpart are cut in service, the air passage of the automatic brake valve is necessarily altered, especially in train stop and train control systems.

This rule prohibits the installation and use of apparatus that interferes with the manual application of the brakes by means of the independent or automatic brake valves, or that impairs the efficiency of the air brake or blended brake system when operated manually.

CLASSIFICATION OF DEFECTS

236.508.A1 Automatic train stop, train control, or cab signal apparatus interferes with the application of the brakes by means of the brake valves.

236.508.A2 Automatic train stop, train control, or cab signal apparatus impairs the efficiency of the brake system.



## **§ 236.509 Two or more locomotives coupled.**

The automatic train stop, train control, or cab signal apparatus shall be arranged so that when two or more locomotives are coupled, or a pushing or helping locomotive is used, it can be made operative only on the locomotive from which the brakes are controlled.

### Application:

This rule requires automatic train stop, train control, or cab signal apparatus be operative only on the locomotive from which the brakes are controlled.

This rule applies to automatic cab signal, train stop, and train control systems.

When two or more equipped locomotives are coupled together, or a pushing or helping locomotive is used, the automatic train stop, train control, or cab signal apparatus affecting movement of that train must be so arranged that it is operative only on the locomotive from which the brakes are controlled.

### CLASSIFICATION OF DEFECTS

236.509.A1 Automatic train stop, train control, or cab signal apparatus not arranged so that when two or more locomotives are coupled, or a pushing or helping locomotive is used, it can be made operative only on the locomotive from which the brakes are controlled.

## **§ 236.511 Cab signals controlled in accordance with block conditions stopping distance in advance.**

The automatic cab signal system shall be arranged so that cab signals will be continuously controlled in accordance with conditions described in § 236.205 that obtain at least stopping distance in advance.

### Application:

This rule requires that automatic cab signals be continuously controlled and provide proper aspects and stopping distances to conditions described in § 236.205.

Cab signals are required to be continuously controlled to indicate that speed is to be restricted and stop may be required at least stopping distance to all conditions described in § 236.205.

Conditions that cause wayside false restrictive aspects such as open or crossed light circuit conductors or burned out lamp bulbs, except where light-out protection is provided, are exempt from these requirements.

### CLASSIFICATION OF DEFECTS

236.511.A1 Automatic cab signal system not so arranged that cab signals are continuously controlled in accordance with conditions that obtain at least stopping distance in advance. (Applies only to conditions described in paragraphs (a), (b), (c), and (d) of § 236.205.)

**§ 236.512 Cab signal indication when locomotive enters block where restrictive conditions obtain.**

The automatic cab signal system shall be arranged so that when a locomotive enters or is within a block, wherein any condition described in § 236.205 obtains, the cab signals shall indicate “proceed at restricted speed.”

Application:

This is a companion rule to § 236.514 and requires the cab signal indicate “proceed at restricted speed” when a locomotive enters or is within a block in cab signal territory wherein a condition described in § 236.205 exists.

This rule requires that the cab signal indicate “proceed at restricted speed” when the locomotive enters or is within a block occupied by a train, locomotive, or car; in which the points of a switch are not closed in proper position; in which an independently operated fouling-point derail, equipped with switch circuit controller, is not in derailing position; or where there are two or more track circuits, a track relay is in deenergized position.

Section 236.514 permits the cab signal to change to a more favorable aspect after the train has passed the condition that exists or if the condition ceases to exist.

CLASSIFICATION OF DEFECTS

- 236.512.A1 Automatic cab signal does not indicate “proceed at restricted speed” when locomotive enters or is within a block occupied by a train, locomotive, or car.
- 236.512.A2 Automatic cab signal does not indicate “proceed at restricted speed” when locomotive enters or is within a block in which the points of a switch are not closed in proper position.
- 236.512.A3 Automatic cab signal does not indicate “proceed at restricted speed” when locomotive enters or is within a block in which an independently operated fouling-point derail equipped with switch circuit controller is not in derailing position.
- 236.512.A4 Automatic cab signal does not indicate “proceed at restricted speed” when locomotive enters a block in which a track relay is in deenergized position or device that functions as a track relay is in its most restrictive state. (Where there is more than one track circuit in the block.)

**§ 236.513 Audible indicator.**

(a) The automatic cab signal system shall be so arranged that when the cab signal changes to display a more restrictive aspect, an audible indicator will sound continuously until silenced by manual operation of an acknowledging device.

(b) The audible cab indicator of automatic cab signal, automatic train stop, or automatic train control system shall have a distinctive sound and be clearly audible throughout the cab under all operating conditions.

### Application:

This rule requires that when the cab signal aspect changes to a more restrictive indication, an audible indicator shall sound continuously until silenced by manual operation of an acknowledging device. It requires that the cab indicator have a distinctive sound that can be clearly audible throughout the cab under all conditions.

This rule applies to automatic cab signal, train stop, and train control systems.

This rule requires an audible indicator be provided in cab signal systems and so arranged that it will sound continuously, until silenced by manual operation of an acknowledging device, when the cab signal changes to display a more restrictive aspect. The audible indicator may be electrically or pneumatically operated, must have a distinctive sound that identifies it with the system, and must be clearly audible throughout the cab under all operating conditions. The audible indicator may be so arranged that it will sound continuously during an overspeed condition, and silenced only by reducing to proper speed.

Methods to silence or muffle the cab indicator, such as wrapping or plugging with paper or cloth or bending or breaking the air pipe to reduce air flow, are prohibited. If such tampering with this safety device is found, refer to § 218.55. Any individual who willfully disables or nullifies a safety device is subject to a civil penalty as provided in Appendix A to this part, and to disqualification from performing safety-sensitive functions on a railroad if found unfit for such duties under the procedures provided for in 49 CFR Part 209.

### CLASSIFICATION OF DEFECTS

- 236.513.A1 Audible cab indicator of automatic cab signal system does not sound continuously until silenced by manual operation of acknowledging device, when cab signal changes to a more restrictive aspect.
- 236.513.B1 Cab indicator does not have a distinctive sound.
- 236.513.B2 Cab indicator not clearly audible throughout the cab under all operating conditions.

### **§ 236.514 Interconnection of cab signal system with roadway signal system.**

The automatic cab signal system shall be interconnected with the roadway signal system so that the cab signal indication will not authorize operation of the train at a speed higher than that authorized by the indication of the roadway signal that governed the movement of a train into a block except when conditions affecting movement of trains in the block change after the train passes the signal.

### Application:

This rule prohibits the cab signal from indicating a speed higher than that authorized by roadway signal indication, except when the condition changes after the roadway signal has been passed.

This rule applies to automatic cab signal systems.

This rule requires the locomotive cab signal apparatus to be so interconnected to the wayside signal system that it will not authorize operation at a speed higher than that authorized by the wayside signal indication, except when conditions affecting the movement of trains in a block change after the train passes the wayside signal.

These requirements apply to all signaled track in automatic cab signal territory, including signaled sidings and signaled auxiliary tracks.

#### CLASSIFICATION OF DEFECTS

236.514.A1 Cab signal indication authorizes operation of train at a speed higher than that authorized by indication of roadway signal that governed movement of train into block. (Does not apply when conditions affecting movement of a train in the block change after train passes signal.)

#### **§ 236.515 Visibility of cab signals.**

The cab signals shall be plainly visible to member or members of the locomotive crew from their stations in the cab.

##### Application:

This rule requires that the cab signal be so located that the locomotive crewmember or members can plainly see the aspect.

This rule applies to automatic train stop, train control, and cab signal systems.

Cab signals are required to be so installed that the crewmember or members can plainly see the aspect displayed from their accustomed positions in the cab.

The cab signal is required to be properly illuminated, without cracked or broken roundels, and its view not obstructed by other equipment installed in the cab. If tampering with this safety device is found, refer to

§ 218.55. Any individual who willfully disables or nullifies a safety device is subject to a civil penalty as provided in Appendix A to this part, and to disqualification from performing safety-sensitive functions on a railroad if found unfit for such duties under the procedures provided for in 49 CFR Part 209.

#### CLASSIFICATION OF DEFECTS

236.515.A1 Cab signal not plainly visible to member of locomotive crew from his/her station in the cab.

#### **§ 236.516 Power supply.**

Automatic cab signal, train stop, or train control device hereafter installed shall operate from a separate or isolated power supply.

##### Application:

This rule requires that each automatic train stop, train control, or cab signal device hereafter installed on a locomotive operate from a separate or isolated power supply.

This rule applies to automatic train stop, train control, and cab signal systems.

This rule requires that the automatic train stop, train control, or cab signal device be provided with a dedicated power supply used solely to operate the device. It is prohibited to utilize the power supply to provide power to any other device or system.

Devices installed on a locomotive prior to the effective date of February 27, 1984, are exempt from this requirement.

#### CLASSIFICATION OF DEFECTS

- 236.516.A1 Automatic train stop, train control, or cab signal device not provided with an isolated or separate power supply. (Does not apply to devices installed prior to February 27, 1984.)
- 236.516.A2 Power supply used to operate equipment other than automatic train stop, train control, or cab signal device.

#### ***Rules and Instructions; Roadway***

#### **§ 236.526 Roadway element not functioning properly.**

When a roadway element except track circuit of automatic train stop, train control, or cab signal system is not functioning as intended, the signal associated with such roadway element shall be caused manually to display its most restrictive aspect until such element has been restored to normal operative condition.

#### Application:

This rule requires that when the roadway element, except track circuit, of an automatic train stop, train control, or cab signal system has failed to perform its intended function, the associated signal shall be caused manually to display the most restrictive aspect.

This rule applies to automatic train stop, train control, and cab signal systems.

This rule requires that when a roadway element such as a tripper, inductor, loop, or electric circuit, except track circuit, becomes defective or is being repaired or replaced, the signal associated with the device must be manually caused to display its most restrictive aspect. It is prohibited to permit the signal to display a less restrictive aspect until the defective device has been restored to its normal operative condition.

#### CLASSIFICATION OF DEFECTS

- 236.526.A1 Signal not caused manually to display its most restrictive aspect when roadway element associated with such signal is not functioning as intended. (Does not

apply to track circuit.)

- 236.526.A2 Signal which has been caused manually to display its most restrictive aspect when roadway element associated with the signal is not functioning as intended, is caused to display a less restrictive aspect before such element has been restored to normal operative condition. (Does not apply to track circuit.)

**§ 236.527 Roadway element insulation resistance.**

Insulation resistance between roadway inductor and ground shall be maintained at not less than 10,000 ohms.

Application:

This rule requires insulation resistance between roadway inductor winding and ground shall be maintained at not less than 10,000 ohms.

This rule applies to intermittent inductive automatic train stop systems.

This rule applies only to the roadway inductor winding. The insulation resistance of cable or conductors that connect the inductor to its associated signal must comply with the requirements of § 236.108.

Disconnect the coil wires and test each to ground. Do not test the coils against each other with an insulation resistance tester.

CLASSIFICATION OF DEFECTS

- 236.527.A1 Insulation resistance between roadway inductor winding and ground less than 10,000 ohms.

**§ 236.528 Restrictive condition resulting from open hand-operated switch; requirement.**

When a facing-point hand-operated switch is open one-fourth inch or more, a trailing-point hand-operated switch three-eighths inch or more, or hand-operated switch is not locked where facing-point lock with circuit controller is used, the resultant restrictive condition of an automatic train stop or train control device of the continuous type, or the resultant restrictive cab signal indication of an automatic cab signal device on an approaching locomotive shall be maintained to within 300 feet of the points of the switch.

Application:

This rule requires that the restrictive condition of continuous inductive automatic train stop or train control device or restrictive cab signal indication of an automatic cab signal device be maintained to within 300 feet of an open hand-operated switch or unlocked facing-point lock in equipped territory.

This rule applies to continuous inductive automatic train stop, train control, and cab signal systems.

This rule requires that switch shunting circuits or switch repeating circuits of hand-operated switch or facing-point lock with circuit controller effectively shunt the track circuit or open the signal control circuits to the extent that the restrictive condition of continuous inductive automatic train stop or train control device or restrictive aspect of cab signal device of an approaching locomotive is maintained to within 300 feet of a facing-point switch opened one-fourth inch or more, a trailing point switch opened three-eighths inch or more, or a facing-point lock that is not locked.

#### CLASSIFICATION OF DEFECTS

- 236.528.A1 Restrictive condition of automatic train stop or train control device of the continuous type on an approaching locomotive not maintained to within 300 feet of the points of a facing-point hand-operated switch which is open one-fourth inch or more.
- 236.528.A2 Restrictive condition of automatic train stop or train control device of the continuous type on an approaching locomotive not maintained to within 300 feet of the points of a trailing-point hand-operated switch which is open three-eighths inch or more.
- 236.528.A3 Restrictive condition of automatic train stop or train control device of the continuous type on an approaching locomotive not maintained to within 300 feet of the points of a hand-operated switch which is not locked, where such switch is equipped with facing-point lock with circuit controller.
- 236.528.A4 Restrictive cab signal indication of automatic cab signal device on an approaching locomotive not maintained to within 300 feet of the points of a facing-point hand-operated switch which is open one-fourth inch or more.
- 236.528.A5 Restrictive cab signal indication of automatic cab signal device on an approaching locomotive not maintained to within 300 feet of the points of a trailing-point hand-operated switch which is open three-eighths inch or more.
- 236.528.A6 Restrictive cab signal indication of automatic cab signal device on an approaching locomotive not maintained to within 300 feet of the points of a switch which is not locked, where such switch is equipped with facing-point lock with circuit controller.

#### **§ 236.529 Roadway element inductor; height and distance from rail.**

Inductor of the inert roadway element type shall be maintained with the inductor pole faces at a height above the plane of the tops of the rails, and with its inner edge at a horizontal distance from the gage side of the nearest running rail, in accordance with specifications of the carrier.

#### Application:

This rule requires that inductors of the inert roadway type be installed and maintained in position in accordance with specifications of the carrier.

This rule applies to intermittent inductive automatic train stop systems.

This rule requires that the inductor pole faces be maintained at a height above the plane of the tops of the rails, with its inner edge at a horizontal distance from the gage side of the nearest running rail in accordance with the carrier's specifications.

#### CLASSIFICATION OF DEFECTS

- 236.529.A1 Inductor of the inert roadway element type too high.
- 236.529.A2 Inductor of the inert roadway element type too low.
- 236.529.A3 Inductor of the inert roadway element too close to gage side of nearest running rail.
- 236.529.A4 Inductor of the inert roadway element type too far from gage side of nearest running rail.

#### **§ 236.531 Trip arm; height and distance from rail.**

Trip arm of automatic train stop device when in the stop position shall be maintained at a height above the plane of the tops of the rails, and at a horizontal distance from its center line to gage side of the nearest running rail, in accordance with specifications of the carrier.

#### Application:

This rule requires that trip arm of automatic train stop device, when in stop position, be installed and maintained in position in accordance with specifications of the carrier.

This rule applies to mechanical trip type automatic train stop system.

This rule requires that trip arm, when in stop position, be maintained at a height above the plane of the tops of the rails, with its centerline at a horizontal distance from the gage side of the nearest running rail in accordance with the carrier's specifications.

#### CLASSIFICATION OF DEFECTS

- 236.531.A1 Trip arm of automatic train stop device, in stop position, too high.
- 236.531.A2 Trip arm of automatic train stop device, in stop position, too low.
- 236.531.A3 Trip arm of automatic train stop device, in stop position, too close to gage side of running rail.
- 236.531.A4 Trip arm of automatic train stop device, in stop position, too far from gage side of running rail.



### **§ 236.532 Strap iron inductor; use restricted.**

No railroad shall use strap iron inductor or other roadway element with characteristics differing from its standard type on track where speed higher than restricted speed is permitted.

#### Application:

This rule restricts the use of strap iron inductors or other roadway elements with characteristics different from its standard type.

This rule applies to intermittent inductive automatic train stop system.

The use of strap iron inductors or other roadway elements with characteristics differing from its standard type is prohibited on track where speed is higher than 20 mph is permitted.

#### CLASSIFICATION OF DEFECTS

236.532.A1 Strap iron inductor or other roadway element with characteristics differing from standard type used on track where speed higher than restricted speed is permitted.

### **§ 236.534 Entrance to equipped territory; requirements.**

Where trains are not required to stop at the entrance to equipped territory, except when leaving yards and stations and speed until entering equipped territory does not exceed restricted speed, the automatic train stop, train control, or cab signal device shall be operative at least stopping distance from the entrance to such territory except where the approach thereto is governed by automatic approach signal.

#### Application:

This rule requires that where trains are not required to stop at the entrance to equipped territory, except when leaving yards and stations and speed until entering equipped territory does not exceed restricted

speed, the automatic train stop, train control, or cab signal device shall be operative at least stopping distance from the entrance to such territory except where the approach thereto is governed by automatic approach signal.

This rule applies to automatic train stop, train control, and cab signal systems.

This rule requires that automatic train stop, train control, or cab signal device be operative at least stopping distance from the entrance to equipped territory, except where trains are required to stop at the entrance to equipped territory; or the approach thereto is governed by an operative approach signal; or when leaving yards and stations where speed, until entering equipped territory, does not exceed restricted speed.

#### CLASSIFICATION OF DEFECTS

236.534.A1 Automatic train stop, train control, or cab signal device not operative at least stopping distance from entrance to equipped territory. (Does not apply where trains are required to stop at entrance to equipped territory or where the approach

thereto is governed by automatic approach signal.)

***Rules and Instructions: Locomotive***

**§ 236.551 Power supply voltage; requirement.**

The voltage of power supply shall be maintained within 10 percent of rated voltage.

Application:

This rule prescribes the tolerance within which the power supply voltage shall be maintained.

This rule applies to automatic train stop, train control, and cab signal systems.

The voltage of the power supply must be maintained to within 10 percent of the rated voltage.

CLASSIFICATION OF DEFECTS

236.551.A1 Voltage of power supply more than 10 percent above rated voltage.

236.551.A2 Voltage of power supply more than 10 percent below rated voltage.

**§ 236.552 Insulation resistance; requirement.**

When periodic test prescribed in § 236.588 is performed, insulation resistance between wiring and ground of continuous inductive automatic cab signal system, automatic train control system, or automatic train stop system shall be not less than one megohm, and that of an intermittent inductive automatic train stop system, not less than 250,000 ohms. Insulation resistance values between periodic tests shall be not less than 250,000 ohms for a continuous inductive automatic cab signal system, automatic train control system, or automatic train stop system, and 20,000 ohms for an intermittent inductive automatic train stop system.

Application:

This rule prescribes the minimum insulation resistance permitted between wiring and ground.

This rule applies to automatic train stop, train control, and cab signal systems.

The insulation resistance between wiring and ground of continuous inductive automatic train stop, train control, and cab signal systems shall be not less than one (1) megohm when periodic test is performed, and not less than 250,000 ohms between periodic tests.

The insulation resistance between wiring and ground of intermittent inductive automatic train stop system shall be not less than 250,000 ohms when periodic test is performed, and not less than 20,000 ohms between periodic tests.

CLASSIFICATION OF DEFECTS

236.552.A1 Insulation resistance between wiring and ground of continuous inductive type automatic train stop, train control, or cab signal device less than 1 megohm not

corrected when periodic test is performed.

- 236.552.A2 Insulation resistance between wiring and ground of continuous inductive type automatic train stop, train control, or cab signal device less than 250,000 ohms between periodic tests.
- 236.552.A3 Insulation resistance between wiring and ground of intermittent inductive automatic train stop device less than 250,000 ohms not corrected when periodic test performed.
- 236.552.A4 Insulation resistance between wiring and ground of intermittent inductive automatic train stop device less than 20,000 ohms between periodic tests.

### **§ 236.553 Seal; where required.**

Seal shall be maintained on any device other than brake pipe cut-out cock (double-heading cock), by means of which the operation of the pneumatic portion of automatic train stop or train control apparatus can be cut out.

#### Application:

This rule requires that a seal be maintained on any device other than brake pipe cut-out cock (double-heading cock), by means of which the operation of pneumatic portion of automatic train stop or train control apparatus can be cut out.

This rule applies only to automatic train stop and train control systems. Does not apply to automatic cab signal systems.

This rule requires that automatic train stop or train control apparatus be cut in and a seal applied to any device or cut-out cock, except double-heading cock, by means of which any part of the pneumatic portion of the apparatus can be cut out. The seal is required to be applied in such a manner that the device cannot be operated to cut out the apparatus without breaking the seal.

### CLASSIFICATION OF DEFECTS

- 236.553.A1 Device by means of which operation of pneumatic portion of apparatus can be cut out, not sealed. (Does not apply to brake pipe cut-out cock, or double-heading cock, of automatic train stop or train control equipped locomotive, or to the cut-out cock for the pneumatic whistle of an automatic cab signal system on an equipped locomotive.)

### **§ 236.554 Rate of pressure reduction; equalizing reservoir or brake pipe.**

The equalizing reservoir pressure or brake pipe pressure reduction during an automatic brake application shall be at a rate not less than that which results from a manual service application.

#### Application:

This is a companion rule to § 236.507 and requires that the equalizing reservoir pressure or brake pipe pressure reduction during an automatic brake application be at a rate not less than that which results from a manual service application.

This rule applies to automatic train stop and train control systems.

An automatic full service brake application is accomplished by piping and venting arrangements different than that accomplished manually. This rule requires that the efficiency of the automatic brake application be at least equal to the efficiency of the manual application of the brakes.

#### CLASSIFICATION OF DEFECTS

236.554.A1 Equalizing reservoir or brake pipe pressure during automatic brake application reduces at a rate less than that which obtains during a manual service application.

#### **§ 236.555 Repaired or rewound receiver coil.**

Receiver coil which has been repaired or rewound shall have the same operating characteristics which it possessed originally or as currently specified for new equipment.

##### Application:

This rule requires that a receiver coil which has been repaired or rewound have the same operating characteristics which it possessed originally, or as currently specified for new equipment.

This rule applies to automatic cab signal, train stop, and train control systems.

This rule requires receivers to be rewound with the same size wire and number of turns to achieve the resistive value and inductance it originally possessed or as currently specified for new equipment. The rule prohibits repair of receivers by removing turns of wire to eliminate shorts or opens.

#### CLASSIFICATION OF DEFECTS

236.555.A1 Receiver coil which has been repaired or rewound does not have same operating characteristics which it possessed originally or as currently specified for new equipment.

#### **§ 236.556 Adjustment of relay.**

Change in adjustment of relay shall be made only in a shop equipped for that purpose except when receiver coils, electro-pneumatic valve, or other essential part of the equipment is replaced. Irregularities in power supply voltage or other variable factors in the circuit shall not be compensated for by adjustment of the relay.

##### Application:

This rule prohibits the adjustment of a relay elsewhere than in a shop equipped for that purpose except when receiver coils, electro-pneumatic valve, or other essential part of the equipment is replaced.

This rule applies to automatic cab signal, train stop, and train control systems.

This rule requires that adjustment of relay be made only in a shop equipped for that purpose except when receiver coils, electro-pneumatic valve, or other essential part of the equipment is replaced. This rule prohibits adjustment of the relay to compensate for irregularities in power supply voltage or other variable factors in its circuit.

#### CLASSIFICATION OF DEFECTS

- 236.556.A1 Change in adjustment of relay made elsewhere than in a shop equipped for that purpose. (Does not apply when receiver coils, electro-pneumatic valve, or other essential part of equipment is replaced.)
- 236.556.A2 Relay adjusted to compensate for irregularities of power supply voltage or other variable factors in circuit.

#### **§ 236.557 Receiver; location with respect to rail.**

(a) Receiver of intermittent inductive automatic train stop device of the inert roadway element type shall be maintained with bottom of the receiver at a height above the plane of the tops of the rails, and with its outer edge at a horizontal distance from the gage side of the nearest rail, in accordance with specifications of the carrier.

(b) Receiver of continuous inductive automatic cab signal, train stop, or train control device of locomotive equipped with onboard test equipment, shall be maintained with the bottom of the receiver at a height above the plane of the tops of the rails, and with its outer edge at a horizontal distance from the gage side of the nearest rail, in accordance with specifications of the carrier.

#### Application:

This rule requires that the receiver of an intermittent inductive automatic train stop device, or the receiver of a continuous inductive automatic train stop, train control, or cab signal device on locomotive equipped with onboard test device, be maintained in accordance with specifications of the carrier.

This rule applies to all intermittent inductive automatic train stop systems and to those continuous inductive automatic train stop, train control, or cab signal devices that are installed on locomotives equipped with onboard test device.

This rule requires that the receiver of covered devices be maintained with bottom of the receiver at a height above the plane of the tops of the rails and with its outer edge at a horizontal distance from the gage side of the nearest rail in accordance with specifications of the carrier.

#### CLASSIFICATION OF DEFECTS

- 236.557.A1 Receiver of intermittent inductive automatic train stop device of the inert roadway element type, or continuous inductive automatic train stop, train control, or cab

signal device on locomotive equipped with onboard test device, too high.

236.557.A2 Receiver of intermittent inductive automatic train stop device of the inert roadway element type, or continuous inductive automatic train stop, train control, or cab signal device on locomotive equipped with onboard test device, too low.

236.557.A3 Receiver of intermittent inductive automatic train stop device of the inert roadway element type, or continuous inductive automatic train stop, train control, or cab signal device on locomotive equipped with onboard test device, too close to gage side of nearest rail.

236.557.A4 Receiver of intermittent inductive automatic train stop device of the inert roadway element type, or continuous inductive automatic train stop, train control, or cab signal device on locomotive equipped with onboard test device, too far from gage side of nearest rail.

### **§ 236.560 Contact element, mechanical trip type; location with respect to rail.**

Contact element of automatic train stop device of the mechanical trip type shall be maintained at a height above the plane of the tops of the rails, and at a horizontal distance from the gage side of the rail, in accordance with specifications of the carrier.

#### Application:

This rule requires that the contact element of automatic train stop device of the mechanical trip type be maintained in accordance with specifications of the carrier.

This rule requires that the contact element of automatic train stop device of the mechanical trip type be installed and maintained at a height above the tops of the plane of the rails, and at a horizontal distance from the nearest rail, in accordance with specifications of the carrier.

### CLASSIFICATION OF DEFECTS

236.560.A1 Contact element of automatic train stop device of the mechanical trip type too high.

236.560.A2 Contact element of automatic train stop device of the mechanical trip type too low.

236.560.A3 Contact element of automatic train stop device of the mechanical trip type too close to gage side of rail.

236.560.A4 Contact element of automatic train stop device of the mechanical trip type too far from gage side of rail.

### **§ 236.562 Minimum rail current required.**

The minimum rail current required to restore the locomotive equipment of continuous inductive automatic train stop or train control device to normal condition or to obtain a proceed indication of automatic cab signal device (pick-up) shall be in accordance with specifications of the carrier.

#### Application:

This rule requires that the minimum pick-up value of the locomotive apparatus be maintained in accordance with specifications of the carrier.

This rule applies to continuous inductive automatic cab signal, train stop, and train control systems.

This rule requires that minimum rail current required to restore the locomotive equipment of continuous inductive automatic train stop or train control device to normal condition, or to obtain a proceed indication of automatic cab signal device, be in accordance with specifications of the carrier.

### CLASSIFICATION OF DEFECTS

236.562.A1 Pick-up of locomotive equipment of continuous inductive automatic train stop, train control, or cab signal device too high.

236.562.A2 Pick-up of locomotive equipment of continuous inductive automatic train stop, train control, or cab signal device too low.

### **§ 236.563 Delay time.**

Delay time of automatic train stop or train control system shall not exceed 8 seconds and the spacing of signals to meet the requirements of § 236.24 shall take into consideration the delay time.

#### Application:

This rule prescribes that the delay time of automatic train stop or train control system not exceed 8 seconds and that the spacing of signals to meet the requirements of § 236.24 take into consideration the delay time.

This rule applies to both intermittent inductive and continuous inductive automatic train stop and train control systems.

Delay time is provided to give the engineer enough time to take proper action to prevent an automatic brake application. This rule prohibits the delay time from exceeding 8 seconds before the brakes begin to apply. The rule also requires that spacing of signals in equipped territory include the distance traveled at maximum authorized speed for 8 seconds in order that trains may be stopped by the automatic brake application at the signal where a stop is required, or by reduction in speed to the rate prescribed by the next signal in advance where reduced speed is required.

Delay time is defined in the “Definitions” section of the RS&I as follows: “§ 236.831 Time, delay. As applied to an automatic train stop or train control system, the time which elapses after the onboard apparatus detects a more restrictive indication until the brakes start to apply.”

When a test is made to determine the delay time, the elapsed time should be measured from the time the onboard device recognizes the change in track circuit current or code rate, or detects the passage over an inductor at a signal displaying an aspect less favorable than “proceed” until the actuation of the valves that initiate the braking. Or to put it more simply, the delay time is measured from the time the cab signal or indicator changes to a more restrictive aspect, until a reduction in brake pipe pressure is started and the pressure in the brake cylinders starts to increase. In the case of the intermittent inductive train stop system, the delay time is measured from the instant the alarm whistle or electronic tone starts to sound until the brakes start to apply. The application of the brakes can be detected by watching the brake pipe pressure gauge and the brake cylinder gauge, and by listening for venting of air from the braking system.

### CLASSIFICATION OF DEFECTS

236.563.A1 Delay time of automatic train stop or train control system exceeds 8 seconds.

236.563.A2 Spacing of signals to meet the requirements of § 236.24 not adequate in consideration of delay time during automatic train stop or train control brake application.

### **§ 236.564 Acknowledging time.**

[Acknowledging time of intermittent automatic train stop device shall be not more than 30 seconds.](#)

#### Application:

This rule prescribes that the acknowledging time of intermittent automatic train stop device not exceed 30 seconds.

This rule applies only to intermittent inductive automatic train stop systems.

Acknowledging time is provided in order to furnish the engineer an ample time period to forestall an automatic brake application by holding the acknowledging lever in reverse position while the locomotive passes a restricting signal. This rule prohibits the acknowledging lever from being held in the acknowledging position longer than 30 seconds before the brakes start to apply.

Acknowledging time is defined in the RS&I’s Definitions as: “§ 236.830 Time, acknowledging. As applied to an intermittent automatic train stop system, a predetermined time within which an automatic brake application may be forestalled by means of an acknowledging device.”

The acknowledging time should be tested by moving the handle to the acknowledging position and holding until the brakes start to apply. The application of the brakes can be detected by watching the brake pipe pressure gauge for a reduction and listening for the venting of air from the braking system.



## CLASSIFICATION OF DEFECTS

236.564.A1 Acknowledging time of intermittent automatic train stop device exceeds 30 seconds.

### **§ 236.565 Provision made for preventing operation of pneumatic brake-applying apparatus by double-heading cock; requirements.**

Where provision is made for preventing the operation of the pneumatic brake-applying apparatus of an automatic train stop or train control device when the double-heading cock is placed in double-heading position, the automatic train stop or train control device shall not be cut out before communication is closed between the engineman's automatic brake valve and the brake pipe, when operating double-heading cock toward double-heading position.

#### Application:

This rule requires that where provision is made for preventing the operation of the pneumatic brake-applying apparatus of an automatic train stop or train control device when the double-heading cock is placed in double-heading position, the double-heading cock shall be so arranged that the automatic brake valve is cut out in advance of or simultaneously with the train stop or train control apparatus.

This rule applies to automatic train stop and train control systems.

This rule prohibits operation of the double-heading cock to the extent that the automatic train stop or train control pneumatic apparatus is rendered inoperative before the automatic brake valve.

## CLASSIFICATION OF DEFECTS

236.565.A1 Automatic train stop or train control device is cut out before communication is closed between engineer's automatic brake valve and the brake pipe, when operating double-heading cock toward double-heading position.

### **§ 236.566 Locomotive of each train operating in automatic train stop, train control, or cab signal territory; equipped.**

The locomotive from which brakes are controlled, of each train operating in automatic train stop, train control, or cab signal territory shall be equipped with apparatus responsive to the roadway equipment installed on all or any part of the route traversed, and such apparatus shall be in operative condition.

#### Application:

This rule requires that the locomotive, from which brakes are controlled, of each train operating in automatic train stop, train control, or cab signal territory shall be equipped with apparatus responsive to the roadway equipment installed on all or any part of the route traversed, and such apparatus shall be in operative condition.

This rule applies to automatic cab signal, train stop, and train control systems.

This rule requires that each locomotive from which the brakes are controlled which traverses automatic train stop, train control, or cab signal territory be equipped with apparatus responsive to the roadway equipment installed on all or any part of the route traversed. The rule further requires that the apparatus of the locomotive be in operative condition upon departure from its initial terminal.

#### CLASSIFICATION OF DEFECTS

- 236.566.A1 Locomotive from which brakes are controlled on train operating in automatic train stop, train control, or cab signal territory not equipped with apparatus responsive to roadway equipment installed on all or any part of route traversed.
- 236.566.A2 Automatic train stop, train control, or cab signal apparatus on locomotive from which brakes are controlled of train operating in automatic train stop, train control, or cab signal territory not in operative condition.

#### **§ 236.567 Restrictions imposed when device fails and/or is cut out en route.**

Where an automatic train stop, train control, or cab signal device fails and/or is cut out en route, train may proceed at restricted speed or if an automatic block signal system is in operation according to signal indication but not to exceed medium speed, to the next available point of communication where report must be made to a designated officer. Where no automatic block signal system is in use train shall be permitted to proceed at restricted speed or where automatic block signal system is in operation according to signal indication but not to exceed medium speed to a point where absolute block can be established. Where an absolute block is established in advance of the train on which the device is inoperative train may proceed at not to exceed 79 miles per hour.

#### Application:

Section 236.566 requires that the locomotive from which brakes are controlled, of each train operating in automatic train stop, train control, or cab signal territory shall be equipped with apparatus responsive to the roadway equipment installed on all or any part of the route traversed, and such apparatus shall be in operative condition.

This rule sets forth the procedures and restrictions that shall be followed when an automatic train stop, train control, or cab signal device fails and/or is cut out en route.

This rule applies to automatic cab signal, train stop, and train control systems.

This rule requires that when an automatic cab signal, train stop, or train control device fails or is cut out en route, the train shall proceed not exceeding restricted speed (20 mph), or if an automatic block signal system is in operation according to signal indication not exceeding medium speed (40 mph), to the next available point of communication where a report must be made to a designated officer. Radio communications are permissible for this purpose.

Following the required report, in the event the train is in territory in which an automatic block signal system is not in use, the train may be permitted to proceed at not exceeding restricted

speed (20 mph) to a point where an absolute block is established. In the event an automatic block signal system is in operation in the territory in which the train is operating, the train may be permitted to proceed according to signal indication at not exceeding medium speed (40 mph) to a point where an absolute block is established.

An “absolute block” is defined by § 236.709 as “A block in which no train is permitted to enter while it is occupied by another train.”

An absolute block may be established in both signaled and nonsignaled territory by use of manual block rules, train orders, track warrants, or another method of train operation, defined by the carrier’s operating rules. An absolute block may also be established in block signal territory by designating in the carrier’s operating rules, that when an onboard train stop or train control device fails, all wayside signals displaying “Restricting” or “Stop and Proceed” aspects will be considered to be displaying a “Stop” aspect for the train with the failed device. Thus, an absolute block will essentially be established in front

of that train. Upon establishment of an absolute block in front of the train with the inoperative device, the train may then proceed at speeds not in excess of 79 mph.

The carrier’s operating rules shall effect these requirements. (*See Technical Bulletin S-96-03*)

#### CLASSIFICATION OF DEFECTS

- 236.567.A1 Train permitted to proceed at higher than restricted speed to next available point of communication when automatic train stop, train control, or cab signal device fails and/or is cut out en route and no automatic block signal system is in operation.
- 236.567.A2 Train permitted to proceed at higher than medium speed to next available point of communication when automatic train stop, train control, or cab signal device fails and/or is cut out en route and an automatic block signal system is in operation.
- 236.567.A3 Report not made to designated officer at next available point of communication after automatic train stop, train control, or cab signal device fails and/or is cut out en route.
- 236.567.A4 Train permitted to proceed at higher than restricted speed to point where absolute block can be established when automatic train stop, train control, or cab signal device fails and/or is cut out en route and no automatic block signal system is in use.
- 236.567.A5 Train permitted to proceed at higher than medium speed to point where absolute block can be established when automatic train stop, train control, or cab signal device fails and/or is cut out en route and an automatic block signal system is in use.
- 236.567.A6 Train permitted to proceed at a speed exceeding 79 mph where automatic train stop, train control, or cab signal device fails and/or is cut out en route when an absolute block is established in advance of the train on which the device is inoperative.

236.567.A7 Train permitted to proceed at a speed other than restricted speed after communications has been established, where automatic train stop, train control, or cab signal device fails and/or is cut out en route when an absolute block is not established in advance of the train on which the device is inoperative and no automatic block signal system is in operation.

**§ 236.568 Difference between speeds authorized by roadway signal and cab signal; action required.**

If for any reason a cab signal authorizes a speed different from that authorized by a roadway signal, when a train enters the block governed by such roadway signal, the lower speed shall not be exceeded.

Application:

The rule requires that in the event a cab signal authorizes a speed different from that authorized by a roadway signal, the most restrictive speed shall not be exceeded.

This rule applies to continuous inductive automatic cab signal, train stop, and train control systems.

This rule requires that if for any reason a cab signal authorizes a speed different from that authorized by a roadway signal, when a train enters the block governed by the signal, the lower speed shall not be exceeded.

The carrier's operating rules shall effect this requirement.

CLASSIFICATION OF DEFECTS

236.568.A1 Train operated at a speed higher than that authorized by the more restrictive indication when the speed authorized by the cab signal indication is different than that authorized by the indication of the roadway signal when train entered block governed by such signal.

***Inspection and Tests: Roadway***

**§ 236.576 Roadway element.**

Roadway elements, except track circuits, including those for test purposes, shall be gaged monthly for height and alignment, and shall be tested at least every 6 months.

Application:

This rule requires that roadway elements, except track circuits, including those for test purposes, shall be gaged monthly for height and alignment, and shall be tested at least once every 6 months.

This rule applies to automatic train stop systems.

This rule requires that inductor of the inert roadway type and trip arm be gaged monthly for height and alignment. This rule further requires testing of inductor for defective conditions in its winding or external controlling circuit, and of trip arm valves and return springs every 6 months.

#### CLASSIFICATION OF DEFECTS

236.576.A1 Roadway element not gaged monthly for height and alignment.

236.576.A2 Roadway element not tested at least once every 6 months.

#### **§ 236.577 Test, acknowledgment and cut-in circuits.**

Test, acknowledgment, and cut-in circuits shall be tested at least once every 12 months.

#### Application:

This rule requires that test, acknowledgment, and cut-in circuits shall be tested at least once every 12 months.

This rule applies to automatic cab signal, train stop, and train control systems.

This rule requires test at least once every 12 months of test circuits, including test equipment, acknowledgment, and cut-in circuits.

An acknowledgment circuit is installed between the track rails at each signal or stop indication point in territory where an automatic train stop system of the continuous inductive type with two-indication cab signals is in service, to enforce acknowledgment by the engineer of restrictive conditions in order to forestall an automatic brake application. The acknowledgment circuit is required to be continuously energized and, if interrupted, it must deenergize its associated track circuit.

A cut-in circuit is a roadway circuit located at the entrance of equipped territory by means of which locomotive equipment of continuous inductive type system is actuated so as to be in an operative condition. The cut-in circuit shall be so arranged that it requires acknowledgment by the engineer of all restrictive features provided by the device.

Test circuits, including portable and onboard test equipment, may be used for performing the prescribed tests of apparatus on equipped locomotives.

#### CLASSIFICATION OF DEFECTS

236.577.A1 Test circuit not tested at least once every 12 months.

236.577.A2 Acknowledgment circuit not tested at least once every 12 months.

236.577.A3 Cut-in circuit not tested at least once every 12 months.

236.577.A4 Onboard test equipment not tested at least once every 12 months.

#### ***Inspection and Tests; Locomotive***

## **§ 236.586 Daily or after trip test.**

(a) Except where tests prescribed by § 236.588 are performed at intervals of not more than 2 months, each locomotive equipped with an automatic cab signal, train stop, or train control device operating in equipped territory shall be inspected for damage to the equipment and tested at least once each calendar day or within 24 hours before departure upon each trip.

(b) Each equipped locomotive shall be tested to determine the locomotive equipment is responsive to the wayside equipment and shall be cycled to determine the device functions as intended.

(c) Each locomotive equipped with intermittent inductive automatic train stop, non-coded continuous inductive automatic train stop, or non-coded continuous inductive automatic train control device shall be tested to determine that the pick-up of the device is within specified limits.

### Application:

This rule prescribes inspection and test daily or after each trip of the automatic cab signal, train stop, or train control apparatus on each locomotive operating in equipped territory, except where periodic tests are performed on such locomotives at intervals of not more than 2 months.

This rule applies to automatic cab signal, train stop, and train control systems.

This rule requires that the automatic cab signal, train stop, or train control apparatus on each locomotive operating in equipped territory be inspected and tested either once every 24 hours or within 24 hours

before departure on each trip. Daily or after trip inspections and tests are not required for locomotives which are subject to periodic tests at intervals of not more than 2 months.

The purpose of the test is to determine the device is functioning properly before being dispatched into equipped territory. The test is required to be made by an employee capable of detecting defective conditions and taking corrective action prior to the locomotive being dispatched from its initial terminal.

In all systems the daily or after trip test shall consist of a general inspection of the apparatus for evidence of damage or wear and a complete cycle of the system's functions, in addition to the following:

1. In intermittent inductive automatic train stop system, the test shall determine:
  - a. If the apparatus is properly sensitive.
  - b. That an automatic application can be forestalled.
  - c. That an automatic application causes a full service application.
  - d. That the brakes cannot be released during an automatic application until sufficient time has elapsed to stop a train from maximum authorized speed (reset time).
  - e. That seals are properly applied unless device is to be cut out between initial terminal and equipped territory.
2. In continuous inductive automatic train stop system, the test shall determine that:
  - a. An automatic application can be forestalled.

- b. An automatic application causes a full service brake application.
  - c. The brakes cannot be released during an automatic application until sufficient time has elapsed to stop a train from maximum authorized speed (reset time), or the condition that caused the automatic application ceases to exist, and in non-coded continuous inductive automatic train stop system, that pick-up of the device is within specified limits.
  - d. Seals are properly applied unless device is to be cut out between initial terminal and equipped territory.
3. In continuous inductive automatic train control system, the test shall determine that:
- a. Overspeed causes an automatic brake application unless suppressed.
  - b. An automatic application causes a full service brake application.
  - c. The brakes cannot be released during an automatic application until sufficient time has elapsed to stop a train from maximum authorized speed (reset time) or the speed of the train has been slowed to a predetermined rate, or the condition that caused the automatic application ceases to exist, and in non-coded continuous inductive automatic train control system, that pick-up of the device is within specified limits.
  - d. Seals are properly applied unless device is to be cut out between initial terminal and equipped territory.
4. In automatic cab signal system, the test shall determine that:
- a. Cab signal indications correspond to proper codes or track conditions.
  - b. The audible indicator has a distinctive sound and can be heard clearly throughout the cab.
  - c. The audible indicator sounds continuously until silenced manually each time the cab signal changes to a more restrictive indication.

Results of the daily or after trip test are required to be recorded in accordance with § 236.110.

#### CLASSIFICATION OF DEFECTS

- 236.586.A1 Automatic train stop, train control, or cab signal apparatus on locomotive operating in equipped territory not tested either once every 24 hours, or within 24 hours before departure on each trip. (Does not apply to locomotive on which periodic test is made at least once every 2 months.)
- 236.586.B1 Equipped locomotive not tested to determine the locomotive equipment is responsive to the wayside equipment, or not cycled to determine the device functions as intended.
- 236.586.C1 Locomotive equipped with intermittent inductive automatic train stop, non-coded continuous inductive automatic train stop, or non-coded continuous inductive automatic train control device, not tested to determine that the pick-up of the device is within specified limits.

## **§ 236.587 Departure test.**

(a) The automatic train stop, train control, or cab signal apparatus on each locomotive, except a locomotive or a multiple-unit car equipped with mechanical trip stop, shall be tested using one of the following methods:

- (1) Operation over track elements;
- (2) Operation over test circuit;
- (3) Use of portable test equipment; or
- (4) Use of onboard test device.

(b) The test shall be made on departure of the locomotive from its initial terminal unless that apparatus will be cut out between the initial terminal and the equipped territory. If the apparatus is cut out between the initial terminal and the equipped territory, the test shall be made prior to entering equipped territory.

(c) If a locomotive makes more than one trip in any 24-hour period, only one departure test is required in such 24-hour period.

(d)(1) Whoever performs the test shall certify in writing that such test was properly performed. The certification and the test results shall be posted in the cab of the locomotive and a copy of the certification and test results left at the test location for filing in the office of the supervisory official having jurisdiction.

(2) If it is impractical to leave a copy of the certification and test results at the location of the test, the test results shall be transmitted to either (i) the dispatcher or (ii) one other designated individual at each location, who shall keep a written record of the test results and the name of the person performing the test. These records shall be retained for at least 92 days.

### Application:

This rule requires that the automatic train stop, train control, or cab signal apparatus on each locomotive be tested prior to entering equipped territory to determine if such apparatus is in service and functioning properly.

This rule applies to automatic cab signal, train stop, and train control systems, except automatic train stop system of the mechanical trip type.

This rule requires the departure test be made on departure of the locomotive from its initial terminal or before it enters equipped territory. If the apparatus is cut out between initial terminal and equipped territory, the departure test must be made prior to entering equipped territory.

The purpose of the test is to determine the apparatus is in service and is functioning properly.

This rule permits departure tests to be made over track elements or test circuits permanently installed for that purpose, with portable test equipment, or with onboard test equipment. In any case, it must be so arranged that it will produce any of the various track circuit, or restrictive conditions encountered in actual service.

If a locomotive makes more than one trip in a 24-hour period, only one departure test is required in such 24-hour period.

Section 236.587 requires that whoever performs the test shall certify in writing that the test was made and that the certification and results of the tests shall be posted in the cab of the locomotive. Further, a copy of the certification and results of the tests is required to be left at the



test location for filing in the office of the supervisory official having jurisdiction. If these records are left in some type of repository (e.g., mailbox) at the test location, it shall be of a design to provide reasonable protection from the elements (e.g., wind, rain, snow, etc.). Furthermore, all such test records left at outlying test locations must be picked up in a timely manner (e.g., at least once a week) and filed in the locomotive office nearest the test point locations. These records are required to be available for inspection and copying during normal business hours.

This rule takes cognizance of locations where it is impractical for a copy of the test to be left at the location being tested, by providing that the results of the tests may be transmitted to either the dispatcher or to one other designated individual at each location. In either case, the employee who receives the information is required to keep a written record of the results of the tests and the name of the person performing the tests.

This rule does not permit the railroad to use a third party for reporting purposes, should the person designated not be available for reporting of departure tests. If the designated person is not available, the engineer must report the results of the departure test and the name of the person making such test to the dispatcher, or else leave a written record of such test at the test location.

The records of departure tests must be retained for at least 92 days. Note: § 236.110 also requires that a record be made of the departure test.

#### CLASSIFICATION OF DEFECTS

- 236.587.A1 Departure test of automatic train stop, train control, or cab signal apparatus on locomotive not made by an acceptable method.
- 236.587.B1 Test of automatic train stop, train control, or cab signal apparatus on locomotive not made on departure of locomotive from its initial terminal if equipment on locomotive is not cut out between its initial terminal and equipped territory. (Does not apply to locomotives and multiple-unit cars equipped with mechanical trip stop, or locomotives making more than one trip in each 24 hours where a departure test has been made on the locomotive equipment within the corresponding 24-hour period.)
- 236.587.B2 Test of automatic train stop, train control, or cab signal apparatus on locomotive not made immediately prior to entering equipped territory, if equipment on locomotive is cut out between its initial terminal and equipped territory.
- 236.587.C1 Automatic train stop, train control, or cab signal apparatus on locomotive making more than one trip within a 24-hour period not given a departure test within the corresponding 24-hour period.
- 236.587.D1 Record of departure test of automatic train stop, train control, or cab signal equipment on locomotive not signed by employee making test.
- 236.587.D2 Record of departure test of automatic train stop, train control, or cab signal equipment not posted in cab of locomotive.
- 236.587.D3 Record of departure test of automatic train stop, train control, or cab signal equipment on locomotive not kept, at test location. (Does not apply where

impractical and, in lieu thereof, certification and results of test are transmitted to the dispatcher or the designated individual.)

236.587.D4 Record of departure test of automatic train stop, train control, or cab signal equipment on locomotive not transmitted to dispatcher or the designated individual. (Does not apply where it is practical to leave copy of record at test location.)

#### **§ 236.588 Periodic test.**

Except as provided in § 236.586, periodic test of the automatic train stop, train control, or cab signal apparatus shall be made at least once every 92 days, and on multiple-unit cars as specified by the carrier, subject to approval by the FRA.

##### Application:

This rule requires that, except as provided in § 236.586, periodic tests of the automatic train stop, train control, or cab signal apparatus shall be made at least once every 92 days, and on multiple-unit cars as specified by the carrier, subject to approval by FRA.

This rule applies to automatic cab signal, train stop, and train control systems.

In keeping with § 236.586, the prescribed 92-day requirement of this rule is not applicable where periodic tests are made on locomotives at intervals of not more than 2 months. No other deviation from these requirements is permissible without approval of FRA.

The daily or after trip test prescribed by § 236.586 is a test to determine the device is in good condition and functioning properly before being dispatched into equipped territory. The departure test prescribed by § 236.587 is a test to determine that the device is turned on, in service, and functioning as intended before actually departing into equipped territory. The purpose of the periodic test prescribed by § 236.588 is to provide a more thorough and in-depth test and inspection of the electrical and pneumatic equipment.

All defective conditions shall be immediately corrected during the periodic test which shall consist of at least the following tests and inspections:

1. Thorough examination of the electrical portion including measurement of the insulation resistance.
2. Measurement of the power supply voltage.
3. Measurement of the pick-up value required to restore the device to normal condition.
4. Measurement of the release value of the device in continuous non-coded systems.
5. Test of sensitivity of intermittent inductive automatic train stop system.
6. Measurement of acknowledging time.
7. Measurement of delay time.

8. Measurement of reset time in train stop and train control systems.
9. Measurement of height of receiver of intermittent inductive automatic train stop and continuous inductive systems having onboard test equipment, and of tripper of mechanical trip stop system.
10. Test of audible indicator.
11. Replacement of relays with dates that expire prior to next scheduled periodic test.
12. Replacement of pneumatic apparatus with cleaning dates that expire prior to next scheduled periodic test.
13. Measurement of accuracy of governor in train control systems.
14. Cycle test of apparatus to determine that it functions as intended.

Section 236.110 requires that the results of periodic tests be recorded on a form provided for that purpose.

#### CLASSIFICATION OF DEFECTS

- |            |  |
|------------|--|
| 236.588.A1 | Periodic tests of automatic train stop, train control, or cab signal apparatus not made at least once every 92 days.   |
| 236.588.A2 | Periodic tests of automatic train stop, train control, or cab signal apparatus not made at least once every 2 months where daily or after trip test is not performed.  |
| 236.588.A3 | Periodic tests of automatic train stop, train control, or cab signal apparatus on multiple-unit car not made at periods specified by carrier, and approved by the FRA. |

#### **§ 236.589 Relays.**

(a) Each relay shall be removed from service, subjected to thorough test, necessary repairs and adjustments made, and shall not be replaced in service unless its operating characteristics are in accordance with the limits within which such relay is designed to operate, as follows:

- (1) Master or primary relays of torque type depending on spring tension to return contacts to deenergized position in non-coded continuous inductive automatic train stop or train control system, at least once every 2 years; and
- (2) All other relays, at least once every 6 years.

#### Application:

This rule requires that each relay, except master or primary relay of torque type, be removed from service and shopped at least once every 6 years. Master or primary relay of torque type depending on spring tension to return contacts to deenergized position shall be removed from service and shopped at least once every 2 years.

This rule applies to automatic cab signal, train stop, and train control systems.

The rule requires that each relay be removed from service as prescribed, subjected to thorough test, and necessary repairs and adjustment made.

The rule prohibits the relay from being returned to service unless its operating characteristics are in accordance with the limits within which such relay is designed to operate. In order to preclude loss of shelf time, a date tag may be applied showing when the relay was placed in service. In the absence of a date tag, or where the date is altered or illegible, the shop date of the relay will be used to determine when the relay should be removed from service.

#### CLASSIFICATION OF DEFECTS

- 236.589.A1 Master or primary relay of torque type depending on spring tension to return contacts to deenergized position of non-coded system not removed from service for test and necessary repairs and adjustment at least once every 2 years.
- 236.589.A2 Relay, other than a master or primary relay of torque type, not removed from service for test and necessary repairs and adjustment at least once every 6 years.
- 236.589.A3 Relay replaced in service after test and repair with operating characteristics not in accordance with the limits within which such relay is designed to operate.

#### **§ 236.590 Pneumatic apparatus.**

Automatic train stop, train control, or cab signal pneumatic apparatus shall be inspected, cleaned, and the results of such inspection recorded as provided by § 229.29(a). When a locomotive with automatic train stop, train control, or cab signal pneumatic apparatus receives out-of-use credit pursuant to § 229.33, the automatic train stop, train control, or cab signal apparatus shall be tested in accordance with § 236.588 prior to the locomotive being placed in service.

#### Application:

This rule requires that automatic train stop, train control, or cab signal pneumatic apparatus be inspected, cleaned, and the results of such inspection recorded as provided by § 229.29(a).

This rule applies to automatic train stop, train control, and cab signal systems.

This rule requires that pneumatic apparatus of the automatic train stop, train control, or cab signal device be inspected and cleaned at least once every 736 days.

The results of such inspection are to be recorded as provided by § 229.29.

When a locomotive with automatic train stop, train control, or cab signal pneumatic apparatus receives out-of-use credit pursuant to § 229.33, the automatic train stop, train control, or cab signal apparatus shall be tested in accordance with § 236.588 prior to the locomotive being placed in service.

§ 236.590 Pneumatic apparatus.

Automatic train stop, train control, or cab signal pneumatic apparatus shall be inspected, cleaned, and the results of such inspection recorded as provided by § 229.29(a). When a locomotive with automatic train stop, train control, or cab signal pneumatic apparatus receives out-of-use credit pursuant to § 229.33, the automatic train stop, train control, or cab signal apparatus shall be tested in accordance with § 236.588 prior to the locomotive being placed in service.

CLASSIFICATION OF DEFECTS

- 236.590.A1 Automatic train stop, train control, or cab signal pneumatic apparatus not inspected and cleaned at least once every 736 calendar days.
- 236.590.A2 Automatic train stop, train control, or cab signal pneumatic apparatus not inspected and cleaned as provided by § 229.29.
- 236.590.A3 The results of inspection and cleaning not recorded as provided by § 229.29.

**TECHNICAL BULLETINS**

SUBJECT: CLASSIFICATION OF DEFECTS CODES FOR HARMON  
AUTOMATIC TRAIN CONTROL USED ON CONRAIL.

NUMBER: TB-89-2 ORIGINAL ISSUE NUMBER AND DATE: 1-18-89

DISCIPLINE: SIGNAL AND TRAIN CONTROL

REISSUE DATES: \_\_\_\_\_

On November 19, 1987, the Federal Railroad Administration issued a Notice of Final Orders of Particular Applicability (52 FR 44513) requiring that all trains operating on the Northeast Corridor (NEC) spine be controlled by locomotives equipped with automatic train control (ATC). At the time of issuance of those orders, FRA was conducting analyses to determine the optimally safe braking specifications for ATC devices on freight trains on the NEC. The FRA concluded its study and determined that ATC does not present any undue safety risk for freight service on the NEC. On January 19, 1988, FRA issued its supplement to the Final Orders of Applicability (53 FR 1433) that established specifications for a microprocessor based ATC system for freight train operation on the NEC. These specifications do not apply to passenger train operations.

Conrail is in the process of placing a microprocessor-based ATC device (braking profile system (BPS)) in service on 100 freight locomotives operating in the NEC. The Providence and Worcester Railroad has indicated it will install the same type ATC device as Conrail. The device is manufactured by Harmon Electronics and is programed with braking curves that permit the locomotive engineer to control the train by means other than a brake application as long as the train speed is within the parameters of the braking profile. Thus, this device provides equivalent protection as conventional ATC without the necessity of severe braking to forestall a penalty brake application.

The following is a paragraph-by-paragraph of FRA's specifications followed by enforcement instructions for S&TC inspectors.

\*Supplement to Final Orders:

In consideration of the foregoing, the Final Orders of Particular Applicability issued November 19, 1987, are supplemented as follows;

1. "Use of conventional ATC on freight train locomotives on the NEC is safe. Conventional ATC, which makes use of temporary suppression, results at most, in only moderate increases in buff forces. By careful use of the throttle during a temporary suppression application, the buff forces can be reduced. Therefore, no modification or specification changes are necessary for conventional ATC installation on freight train locomotives on the NEC."

For conventional Systems cite defective conditions using the classification of Defect Codes.

2. "Conrail's proposed ATC system utilizing a braking profile system, when used in conjunction with automatic cab signals supplemented with ATS, provides a safe alternative to conventional ATC systems." It is an acceptable ATC system for use on controlling locomotives of NEC freight train provided that:

- A. The BPS system complies with all provisions of 49 CFR Part 236 that apply to ATC systems, except as modified herein:

- B. "The BPS system shall operate to initiate an automatic brake application at least stopping distance from the entrance to a block in which any condition described in § 236.205 exists";

Cite conditions that do not comply with paragraph 2B using Classification of Defect Codes 502.01, 502.02, 502.03, and 502.04.

- C. "The BPS system shall operate to require a reduction in speed to that prescribed by a main track signal requiring a reduction in speed;"

Cite conditions that do not comply with paragraph 2C using Classification of Defect Code 502.05.

- D. "The BPS system shall operate to initiate an automatic brake application within 27 seconds after the locomotive, at speeds exceeding 20 mph, enters or is within a block described in § 236.205 occurs;"

Cite conditions that do not comply with paragraph 2D using Classification of Defect Code 235.5.05 and show the appropriate defect below in the "Description" column on the Signal and Train Control inspection report Form F 6180.5.

- Automatic train control does not operate to initiate an automatic brake application within 27 seconds after the locomotive, at speeds above 20 mph, enters or is within a block occupied by a train, locomotive, or car.

-- Automatic train control system does not operate to initiate an automatic brake application within 27 seconds after the locomotive, at speeds above 20 mph, enters or is within a block in which the points of a switch are not closed in proper position.

-- Automatic train control system does not operate to initiate an automatic brake application within 27 seconds after the locomotive, at speeds above 20 mph, enters or is within a block in which an independently operated fouling-point derail equipped with switch circuit controller is not in derailing position.

-- Automatic train control system does not operate to initiate an automatic brake application within 27 seconds after the locomotive, at speeds above 20 mph, enters or is within a block in which a track relay is in deenergized position or device which functions as a track relay is in its most restrictive state. (Where there is more than one track circuit in the block.)

E. “The BPS system shall operate to initiate an automatic brake application when speed of the train exceeds the rate permitted by the braking profile curve;”

Cite conditions that do not comply with paragraph 2E using Classification of Defect Code 501.05.

F. “The BPS system shall operate to initiate an automatic brake application if the system is deactivated while the speed of the locomotive exceeds 20 mph;”

Cite conditions that do not comply with paragraph 2F using Classification of Defect Code 235.5.05 followed by the defect code below in the “Description” column on the Signal and Train Control inspection report Form F 6180.5.

-- Automatic train control system does not operate to initiate an automatic brake application when the system is deactivated while speed of the locomotive exceeds 20 mph.

G. “The visual display of the status of BPS is plainly visible to members of the locomotive crew from their stations in the cab;”

Cite conditions that do not comply with paragraph 2G using Classification of Defect Code 235.5.05 followed by the defect code below in the “Description” column on the Signal and Train Control inspection report Form F 6180.5.

-- Automatic train control display not plainly visible to member of locomotive crew from his/her station in the cab.

H. “Indicators clearly visible from track side on both sides of each equipped locomotive are illuminated when BPS is activated and operating properly, and extinguished at all other times;”

Cite conditions that do not comply with Paragraph 2H using Classification of Defect Code 235.5.05 followed by the defect code below in the “Description” column on the Signal and Train Control inspection Form F 6180-5.

-- Indicator on side of locomotive not clearly visible from track side when ATC system is activated and functioning as intended.

-- Indicator on side of locomotive not illuminated when ATC system is activated and functioning as intended.

-- Indicator on side of locomotive not extinguished when ATC system is deactivated.

I. “The BPS system shall be connected to an operating event recorder which records each instance of activation and deactivation of the BPS so that the time and location of each activation and deactivation can be determined for at least 48 hours following that event;”

Cite conditions that do not comply with paragraph 2I using Classification of Defect Code 235.5.05 followed by the appropriate defect code below in the “Description” column on the Signal and Train Control inspection report Form F 6180.5.

-- Automatic train control system not connected to an operating event recorder.

-- Event recorder does not record when ATC system is deactivated.

-- Event recorder does not record when ATC is activated.

-- Time and location ATC system is activated or deactivated cannot be determined for at least 48 hours.

J. “Each profile braking curve program shall be identified by a unique identifying number that can be displayed on the BPS visual display for identification purposes;”

Cite conditions that do not comply with Paragraph 2J using Classification of Defect Code 235.5.05 followed by the appropriate defect code below in the “Description” column on the Signal and Train Control inspection report Form F 6180.5.

-- Profile braking curve identifying number not displayed on ATC system display unit.



- Profile braking curve identifying number not currently in effect.
- More than one profile braking curve currently in effect.
- K. “All components in the control circuits including, but not limited to programmable chips, are permanently installed by soldering;”  
  
Cite conditions that do not comply with paragraph 2K using Classification of Defect Code 235.5.05 followed by the defect below in the “Description” column on the Signal and Train Control inspection report Form F 6180.5.
- Control circuit component not soldered in place.
- L. “Installation is permanent on each controlling locomotive designated for operation on the NEC;”  
  
Cite conditions that do not comply with paragraph 2L using Classification of Defect Code 235.5.05 followed by the defect below in the “Description” column on the Signal and Train Control inspection report Form F 6180.5.
- Automatic train control system not permanently installed on locomotive.
- M. “Conrail and Amtrak issue operating rules governing operations of locomotives equipped with the BPS system that are in compliance with Part 236 and specifically address the situation in which the speed control system fails or is cut out en route;” and,  
  
Cite conditions that do not comply with paragraph 2M using Classification of Defect Codes 567.01, 567.02, 567.03, 567.04, 567.05, and 567.06.
- N. “No train having a controlling locomotive with a failed or cut-out BPS system is permitted to depart its last terminal before entering the NEC.”  
  
Cite conditions that do not comply with paragraph 2N using Classification of Defect Code 566.02.
- 3. “Nothing contained herein, or in the Final Orders issued November 16, 1987, permits operation of non-ATC-equipped controlling locomotives after dates specified in the Final Orders. Carriers desiring to operate non-ATC-equipped locomotives in switching, transfer or work train service must petition FRA for relief on a case-by-case basis through the waiver process as provided in 49 CFR Part 235.”  
  
Cite conditions that do not comply with paragraph 3 using Classification of Defect Code 566.01.

## **Subpart F – Dragging Equipment and Slide Detectors and Other Similar Protective Devices**

### ***Standards***

#### **§ 236.601 Signals controlled by devices; location.**

Signals controlled by devices used to provide protection against unusual contingencies, such as landslides, dragging equipment, burned bridges or trestles, and washouts shall be located so that stopping distance will be provided between the signal and the point where it is necessary to stop the train.

#### **Application:**

This rule requires that signals controlled by devices to protect against unusual contingencies such as landslides, dragging equipment, burned bridges or trestles, washouts, etc., shall be located so that stopping distance will be provided between the signal and the point where it is necessary to stop the train.

This rule is applicable to all signals or systems governing the movement of trains into one or more blocks that are not covered in Subparts B, C, D, and E of Part 236.

Part 236, Subpart A, contains the applicable sections to use when citing defective conditions of devices or systems covered by this rule.

Such protective devices are installed as safety features and shall not be removed without approval of FRA unless the condition that warranted their installation ceases to exist. If for some reason the signals or devices are removed from service for a temporary period, the carrier shall take appropriate measures to protect safety of train operation.

### **CLASSIFICATION OF DEFECTS**

236.601.A1 Signal controlled by device used to provide protection against unusual contingencies, such as landslides, dragging equipment, burned bridges or trestles, and washouts not located so that stopping distance is provided between the signal and the point where it is necessary to stop the train.

## **Subpart G – Definitions**

#### **§ 236.700 Definitions.**

For the purpose of these rules, standards, and instructions, the following definitions will apply.

#### **§ 236.701 Application, brake; full service.**

An application of the brakes resulting from a continuous or a split reduction in brake pipe pressure at a service rate until maximum brake cylinder pressure is developed. As applied to an

automatic or electro-pneumatic brake with speed governor control, an application other than emergency which develops the maximum brake cylinder pressure, as determined by the design of the brake equipment for the speed at which the train is operating.

**§ 236.702 Arm, semaphore.**

The part of a semaphore signal displaying an aspect. It consists of a blade fastened to a spectacle.

**§ 236.703 Aspect.**

The appearance of a roadway signal conveying an indication as viewed from the direction of an approaching train; the appearance of a cab signal conveying an indication as viewed by an observer in the cab.

**§ 236.704 [Reserved]**

**§ 236.705 Bar, locking.**

A bar in an interlocking machine to which the locking dogs are attached.

**§ 236.706 Bed, locking.**

That part of an interlocking machine that contains or holds the tappets, locking bars, cross-locking, dogs, and other apparatus used to interlock the levers.

**§ 236.707 Blade, semaphore.**

The extended part of a semaphore arm which shows the position of the arm.

**§ 236.708 Block.**

A length of track of defined limits, the use of which by trains is governed by block signals, cab signals, or both.

**§ 236.709 Block, absolute.**

A block in which no train is permitted to enter while it is occupied by another train.

**§ 236.710 Block, latch.**

The lower extremity of a latch rod which engages with a square shoulder of the segment or quadrant to hold the lever in position.

**§ 236.711 Bond, rail joint.**

A metallic connection attached to adjoining rails to ensure electrical conductivity.

**§ 236.712 Brake pipe.**

A pipe running from the engineman's brake valve through the train, used for the transmission of air under pressure to charge and actuate the automatic brake equipment and charge the reservoirs of the electro-pneumatic brake equipment on each vehicle of the train.

**§ 236.713 Bridge, movable.**

That section of a structure bridging a navigable waterway so designed that it may be displaced to permit passage of traffic on the waterway.

**§ 236.714 Cab.**

The compartment of a locomotive from which the propelling power and power brakes of the train are manually controlled.

**§ 236.715-716 [Reserved]**

**§ 236.717 Characteristics, operating.**

The measure of electrical values at which electrical or electronic apparatus operate (e.g., drop-away, pick-up, maximum and minimum current, and working value).  
[49 FR 3387, Jan. 26, 1984]

**§ 236.718 Chart, dog.**

A diagrammatic representation of the mechanical locking of an interlocking machine, used as a working plan in making up, assembling, and fitting the locking.

**§ 236.719 Circuit, acknowledgment.**

A circuit consisting of wire or other conducting material installed between the track rails at each signal in territory where an automatic train stop system or cab signal system of the continuous inductive type with 2-indication cab signals is in service, to enforce acknowledgement by the engineman at each signal displaying an aspect requiring a stop.

**§ 236.720 Circuit, common return.**

A term applied where one wire is used for the return of more than one electric circuit.

**§ 236.721 Circuit, control.**

An electrical circuit between a source of electric energy and a device which it operates.

**§ 236.722 Circuit, cut-in.**

A roadway circuit at the entrance to automatic train stop, train control, or cab signal territory by means of which locomotive equipment of the continuous inductive type is actuated so as to be in operative condition.

**§ 236.723 Circuit, double wire; line.**

An electric circuit not employing a common return wire; a circuit formed by individual wires throughout.

**§ 236.724 Circuit, shunt fouling.**

The track circuit in the fouling section of a turnout, connected in multiple with the track circuit in the main track.

**§ 236.725 Circuit, switch shunting.**

A shunting circuit which is closed through contacts of a switch circuit controller.

**§ 236.726 Circuit, track.**

An electrical circuit of which the rails of the track form a part.

**§ 236.727 Circuit, track; coded.**

A track circuit in which the energy is varied or interrupted periodically.

**§ 236.728 Circuit, trap.**

A term applied to a circuit used where it is desirable to provide a track circuit but where it is impracticable to maintain a track circuit.

**§ 236.729 Cock, double-heading.**

A manually operated valve by means of which the control of brake operation is transferred to the leading locomotive.

**§ 236.730 Coil, receiver.**

Concentric layers of insulated wire wound around the core of a receiver of an automatic train stop, train control, or cab signal device on a locomotive.

**§ 236.731 Controller, circuit.**

A device for opening and closing electric circuits.

**§ 236.732 Controller, circuit; switch.**

A device for opening and closing electric circuits, operated by a rod connected to a switch, derail, or movable-point frog.

**§ 236.733 Current, foreign.**

A term applied to stray electric currents which may affect a signaling system, but which are not a part of the system.

**§ 236.734 Current of traffic.**

The movement of trains on a specified track in a designated direction.

**§ 236.735 Current, leakage.**

A stray electric current of relatively small value which flows through or across the surface of insulation when a voltage is impressed across the insulation.

**§ 236.736 Cut-section.**

A location other than a signal location where two adjoining track circuits end within a block.

**§ 236.737 Cut-section, relayed.**

A cut-section where the energy for one track circuit is supplied through front contacts or through front and polar contacts of the track relay for the adjoining track circuit.

**§ 236.738 Detector, point.**

A circuit controller which is part of the switch operating mechanism and operated by a rod connected to a switch, derail, or movable-point frog to indicate that the point is within a specified distance of the stock rail.

**§ 236.739 Device, acknowledging.**

A manually operated electric switch or pneumatic valve by means of which, on a locomotive equipped with an automatic train stop or train control device, an automatic brake application can be forestalled, or by means of which, on a locomotive equipped with an automatic cab signal device, the sounding of the cab audible indicator can be silenced.

**§ 236.740 Device, reset.**

A device whereby the brakes may be released after an automatic train control brake application.

**§ 236.741 Distance, stopping.**

The maximum distance on any portion of any railroad which any train operating on such portion of railroad at its maximum authorized speed, will travel during a full service application of the brakes, between the point where such application is initiated and the point where the train comes to a stop.

**§ 236.742 Dog, locking.**

A steel block attached to a locking bar or tappet of an interlocking machine, by means of which locking between levers is accomplished.

**§ 236.743 Dog, swing.**

A locking dog mounted in such a manner that it is free to rotate on a trunnion which is riveted to a locking bar.

Cross Reference: Element, contact. See receiver, § 236.788.

**§ 236.744 Element, roadway.**

That portion of the roadway apparatus of automatic train stop, train control, or cab signal system, such as electric circuit, inductor, or trip arm to which the locomotive apparatus of such system is directly responsive.

[49 FR 3387, Jan. 26, 1984]

**§ 236.745 Face, locking.**

The locking surface of a locking dog, tappet, or cross-locking of an interlocking machine.

**§ 236.746 Feature, restoring.**

An arrangement on an electro-pneumatic switch by means of which power is applied to restore the switch movement to full normal or to full reverse position, before the driving bar creeps sufficiently to unlock the switch, with control level in normal or reverse position.

[49 FR 3388, Jan. 26, 1984]

**§ 236.747 ForeSTALL.**

As applied to an automatic train stop or train control device, to prevent an automatic brake application by operation of an acknowledging device or by manual control of the speed of the train.

**§ 236.748 [Reserved]**

**§ 236.749 Indication.**

The information conveyed by the aspect of a signal.

Cross Reference: Inductor, see § 236.744.

**§ 236.750 Interlocking, automatic.**

An arrangement of signals, with or without other signal appliances, which functions through the exercise of inherent powers as distinguished from those whose functions are controlled manually, and which are so interconnected by means of electric circuits that their movements must succeed each other in proper sequence, train movements over all routes being governed by signal indication.

**§ 236.751 Interlocking, manual.**

An arrangement of signals and signal appliances operated from an interlocking machine and so interconnected by means of mechanical and/or electric locking that their movements must succeed each other in proper sequence, train movements over all routes being governed by signal indication.

**§ 236.752 Joint, rail, insulated.**

A joint in which electrical insulation is provided between adjoining rails.

**§ 236.753 Limits, interlocking.**

The tracks between the opposing home signals of an interlocking.

**§ 236.754 Line, open wire.**

An overhead wire line consisting of single conductors as opposed to multiple-conductor cables.

**§ 236.755 Link, rocker.**

That portion of an interlocking machine which transmits motion between the latch and the universal link.

**§ 236.756 Lock, bolt.**

A mechanical lock so arranged that if a switch, derail, or movable-point frog is not in the proper position for a train movement, the signal governing that movement cannot display an aspect to proceed; and that will prevent a movement of the switch, derail, or movable-point frog unless the signal displays its most restrictive aspect.

**§ 236.757 Lock, electric.**

A device to prevent or restrict the movement of a lever, a switch, or a movable bridge, unless the locking member is withdrawn by an electrical device, such as an electromagnet, solenoid, or motor.

**§ 236.758 Lock, electric, forced-drop.**

An electric lock in which the locking member is mechanically forced down to the locked position.

**§ 236.759 Lock, facing-point.**

A mechanical lock for a switch, derail, or movable-point frog, comprising a plunger stand and a plunger which engages a lock rod attached to the switch point to lock the operated unit.



### **§ 236.760 Locking, approach.**

Electric locking effective while a train is approaching, within a specified distance, a signal displaying an aspect to proceed, and which prevents, until after the expiration of a predetermined time interval after such signal has been caused to display its most restrictive aspect, the movement of any interlocked or electrically-locked switch, movable-point frog, or derail in the route governed by the signal, and which prevents an aspect to proceed from being displayed for any conflicting route.

### **§ 236.761 Locking, electric.**

The combination of one or more electric locks and controlling circuits by means of which levers of an interlocking machine, or switches, or other units operated in connection with signaling and interlocking, are secured against operation under certain conditions.

### **§ 236.762 Locking, indication.**

Electric locking which prevents manipulation of levers that would result in an unsafe condition for a train movement if a signal, switch, or other operative unit fails to make a movement corresponding to that of its controlling lever, or which directly prevents the operation of a signal, switch, or other operative unit, in case another unit which should operate first fails to make the required movement.

### **§ 236.763 Locking, latch-operated.**

The mechanical locking of an interlocking machine which is actuated by means of the lever latch.

### **§ 236.764 Locking, lever-operated.**

The mechanical locking of an interlocking machine which is actuated by means of the lever.

### **§ 236.765 Locking, mechanical.**

An arrangement of locking bars, dogs, tappets, cross-locking and other apparatus by means of which interlocking is effected between the levers of an interlocking machine and so interconnected that their movements must succeed each other in a predetermined order.

### **§ 236.766 Locking, movable bridge.**

The rail locks, bridge locks, bolt locks, circuit controllers, and electric locks used in providing interlocking protection at a movable bridge.

### **§ 236.767 Locking, route.**

Electric locking, effective when a train passes a signal displaying an aspect for it to proceed, which prevents the movement of any switch, movable-point frog, or derail underneath or in advance of the train within the route entered. It may be so arranged that as a train clears a track section of the route, the locking affecting that section is released.

**§ 236.768 Locking, time.**

A method of locking, either mechanical or electrical, which, after a signal has been caused to display an aspect to proceed, prevents, until after the expiration of a predetermined time interval after such signal has been caused to display its most restrictive aspect, the operation of any interlocked or electrically-locked switch, movable-point frog, or derail in the route governed by that signal, and which prevents an aspect to proceed from being displayed for any conflicting route.

**§ 236.769 Locking, traffic.**

Electric locking which prevents the manipulation of levers or other devices for changing the direction of traffic on a section of track while that section is occupied or while a signal displays an aspect for a movement to proceed into that section.

**§ 236.770 Locomotive.**

A self-propelled unit of equipment which can be used in train service.

**§ 236.771 Machine, control.**

An assemblage of manually-operated devices for controlling the functions of a traffic control system; it may include a track diagram with indication lights.

**§ 236.772 Machine, interlocking.**

An assemblage of manually-operated levers or other devices for the control of signals, switches, or other units.

Cross Reference: Magnet, track, see § 236.744.

**§ 236.773 Movements, conflicting.**

Movements over conflicting routes.

**§ 236.774 Movement, facing.**

The movement of a train over the points of a switch which face in a direction opposite to that in which the train is moving.

**§ 236.775 Movement, switch-and-lock.**

A device, the complete operation of which performs the three functions of unlocking, operating, and locking a switch, movable-point frog, or derail.

**§ 236.776 Movement, trailing.**

The movement of a train over the points of a switch which face in the direction in which the train is moving.

**§ 236.777 Operator, control.**

An employee assigned to operate the control machine of a traffic control system.

**§ 236.778 Piece, driving.**

A crank secured to a locking shaft by means of which horizontal movement is imparted to a longitudinal locking bar.

**§ 236.779 Plate, top.**

A metal plate secured to a locking bracket to prevent the cross-locking from being forced out of the bracket.

**§ 236.780 Plunger, facing-point lock.**

That part of a facing-point lock which secures the lock rod to the plunger stand when the switch is locked.

**§ 236.781 [Reserved]**

**§ 236.782 Point, controlled.**

A location where signals and/or other functions of a traffic control system are controlled from the control machine.

**§ 236.783 Point, stop indication.**

As applied to an automatic train stop or train control system without the use of roadway signals, a point where a signal displaying an aspect requiring a stop would be located.

**§ 236.784 Position, deenergized.**

The position assumed by the moving member of an electromagnetic device when the device is deprived of its operating current.

**§ 236.785 Position, false restrictive.**

A position of a semaphore arm that is more restrictive than it should be.

**§ 236.786 Principle, closed circuit.**

The principle of circuit design where a normally energized electric circuit which, on being interrupted or deenergized, will cause the controlled function to assume its most restrictive condition.

**§ 236.787 Protection, cross.**

An arrangement to prevent the improper operation of a signal, switch, movable-point frog, or derail as the result of a cross in electrical circuits.

Cross Reference: Ramp, see § 236.744.

**§ 236.787a Railroad.**

Railroad means any form of non-highway ground transportation that runs on rails or electromagnetic guideways and any entity providing such transportation, including-

(a) Commuter or other short-haul railroad passenger service in a metropolitan or suburban area and commuter railroad service that was operated by the Consolidated Rail Corporation on January 1, 1979; and

(b) High speed ground transportation systems that connect metropolitan areas, without regard to whether those systems use new technologies not associated with traditional railroads; but does not include rapid transit operations in an urban area that are not connected to the general railroad system of transportation.

[70 FR 11052, March 07, 2005]

**§ 236.788 Receiver.**

A device on a locomotive, so placed that it is in position to be influenced inductively or actuated by an automatic train stop, train control, or cab signal roadway element.

**§ 236.789 Relay, timing.**

A relay which will not close its front contacts or open its back contacts, or both, until the expiration of a definite time interval after the relay has been energized.

**§ 236.790 Release, time.**

A device used to prevent the operation of an operative unit until after the expiration of a predetermined time interval after the device has been actuated.

**§ 236.791 Release, value.**

The electrical value at which the movable member of an electromagnetic device will move to its deenergized position.

**§ 236.792 Reservoir, equalizing.**

An air reservoir connected with and adding volume to the top portion of the equalizing piston chamber of the automatic brake valve, to provide uniform service reductions in brake pipe pressure regardless of the length of the train.

Cross Reference: Rocker, see § 236.755.

**§ 236.793 Rod, lock.**

A rod, attached to the front rod or lug of a switch, movable-point frog, or derail, through which a locking plunger may extend when the switch points or derail are in the normal or reverse position.

**§ 236.794 Rod, up-and-down.**

A rod used for connecting the semaphore arm to the operating mechanism of a signal.

**§ 236.795 Route.**

The course or way which is, or is to be, traveled.

**§ 236.796 Routes, conflicting.**

Two or more routes, opposing, converging, or intersecting, over which movements cannot be made simultaneously without possibility of collision.

**§ 236.797 Route, interlocked.**

A route within interlocking limits.

**§ 236.798 Section, dead.**

A section of track, either within a track circuit or between two track circuits, the rails of which are not part of a track circuit.

**§ 236.799 Section, fouling.**

The section of track between the switch points and the clearance point in a turnout.

**§ 236.800 Sheet, locking.**

A description in tabular form of the locking operations in an interlocking machine.

**§ 236.801 Shoe, latch.**

The casting by means of which the latch rod and the latch block are held to a lever of a mechanical interlocking machine.

**§ 236.802 Shunt.**

A by-path in an electrical circuit.

**§ 236.802a Siding.**

An auxiliary track for meeting or passing trains.

**§ 236.803 Signal, approach.**

A roadway signal used to govern the approach to another signal and if operative, so controlled that its indication furnishes advance information of the indication of the next signal.

**§ 236.804 Signal, block.**

A roadway signal operated either automatically or manually at the entrance to a block.

**§ 236.805 Signal, cab.**

A signal located in engineman's compartment or cab, indicating a condition affecting the movement of a train and used in conjunction with interlocking signals and in conjunction with or in lieu of block signals.

**§ 236.806 Signal, home.**

A roadway signal at the entrance to a route or block to govern trains in entering and using that route or block.

**§ 236.807 Signal, interlocking.**

A roadway signal which governs movements into or within interlocking limits.

**§ 236.808 Signals, opposing.**

Roadway signals which govern movements in opposite directions on the same track or route.

**§ 236.809 Signal, slotted mechanical.**

A mechanically-operated signal with an electromagnetic device inserted in its operating connection to provide a means of controlling the signal electrically, as well as mechanically.

**§ 236.810 Spectacle, semaphore arm.**

That part of a semaphore arm which holds the roundels and to which the blade is fastened.

**§ 236.811 Speed, medium.**

A speed not exceeding 40 miles per hour.

**§ 236.812 Speed, restricted.**

A speed that will permit stopping within one-half the range of vision, but not exceeding 20 miles per hour.

[49 FR 3388, Jan. 26, 1984]

**§ 236.813 Speed, slow.**

A speed not exceeding 20 miles per hour.

**§ 236.813a State, most restrictive.**

The mode of an electric or electronic device that is equivalent to a track relay in its deenergized position.

[49 FR 3388, Jan. 26, 1984]

**§ 236.814 Station, control.**

The place where the control machine of a traffic control system is located.

**§ 236.815 Stop.**

As applied to mechanical locking, a device secured to a locking bar to limit its movement.

**§ 236.816 Superiority of trains.**

The precedence conferred upon one train over other trains by train order or by reason of its class or the direction of its movement.

**§ 236.817 Switch, electro-pneumatic.**

A switch operated by an electro-pneumatic switch-and-lock movement.

**§ 236.818 Switch, facing-point.**

A switch, the points of which face traffic approaching in the direction for which the track is signaled.

**§ 236.819 Switch, hand-operated.**

A non-interlocked switch which can only be operated manually.

**§ 236.820 Switch, interlocked.**

A switch within the interlocking limits the control of which is interlocked with other functions of the interlocking.

**§ 236.820a Switch, power-operated.**

A switch operated by an electrically, hydraulically, or pneumatically driven switch-and-lock movement.

[49 FR 3388, Jan. 26, 1984]

**§ 236.821 Switch, sectionalizing.**

A switch for disconnecting a section of a power line from the source of energy.

**§ 236.822 Switch, spring.**

A switch equipped with a spring device which forces the points to their original position after being trailed through and holds them under spring compression.

**§ 236.823 Switch, trailing-point.**

A switch, the points of which face away from traffic approaching in the direction for which the track is signaled.

**§ 236.824 System, automatic block signal.**

A block signal system wherein the use of each block is governed by an automatic block signal, cab signal, or both.

**§ 236.825 System, automatic train control.**

A system so arranged that its operation will automatically result in the following:

(a) A full service application of the brakes which will continue either until the train is brought to a stop, or, under control of the engineman, its speed is reduced to a predetermined rate.

(b) When operating under a speed restriction, an application of the brakes when the speed of the train exceeds the predetermined rate and which will continue until the speed is reduced to that rate.

**§ 236.826 System, automatic train stop.**

A system so arranged that its operation will automatically result in the application of the brakes until the train has been brought to a stop.

**§ 236.827 System, block signal.**

A method of governing the movement of trains into or within one or more blocks by block signals or cab signals.

**§ 236.828 System, traffic control.**

A block signal system under which train movements are authorized by block signals whose indications supersede the superiority of trains for both opposing and following movements on the same track.

**§ 236.829 Terminal, initial.**

The starting point of a locomotive for a trip.

**§ 236.830 Time, acknowledging.**

As applied to an intermittent automatic train stop system, a predetermined time within which an automatic brake application may be forestalled by means of the acknowledging device.

**§ 236.831 Time, delay.**

As applied to an automatic train stop or train control system, the time which elapses after the onboard apparatus detects a more restrictive indication until the brakes start to apply.

[49 FR 3388, Jan. 26, 1984]



**§ 236.831a Track, main.**

A track, other than auxiliary track, extending through yards and between stations, upon which trains are operated by timetable or train orders, or both, or the use of which is governed by block signals.

**§ 236.832 Train.**

A locomotive or more than one locomotive coupled, with or without cars.

**§ 236.833 Train, opposing.**

A train, the movement of which is in a direction opposite to and toward another train on the same track or route.

**§ 236.834 Trip.**

A movement of a locomotive over all or any portion of automatic train stop, train control, or cab signal territory between the terminals for that locomotive; a movement in one direction.

Cross Reference: Trip-arm, see § 236.744.

**§ 236.835 Trunking.**

A casing used to protect electrical conductors.

**§ 236.836 Trunnion.**

A cylindrical projection supporting a revolving part.

**§ 236.837 Valve, electro-pneumatic.**

A valve electrically-operated which, when operated, will permit or prevent passage of air.

**§ 236.838 Wire, shunt.**

A wire forming part of a switch shunt circuit.

Application:

The definitions contained within Subpart G are provided in order to gain understanding of the proper application of the various regulations within Part 236 that utilize the terms defined. Frequent reference to these definitions is therefore of significant importance to the uniform application of the regulations.

## **Subpart H – Standards for Processor-Based Signal and Train Control Systems**

### **§ 236.901 Purpose and scope.**

(a) *What is the purpose of this subpart?* The purpose of this subpart is to promote the safe operation of processor-based signal and train control systems, subsystems, and components that are safety-critical products, as defined in § 236.903, and to facilitate the development of those products.

(b) *What topics does it cover?* This subpart prescribes minimum, performance-based safety standards for safety-critical products, including requirements to ensure that the development, installation, implementation, inspection, testing, operation, maintenance, repair, and modification of those products will achieve and maintain an acceptable level of safety. This subpart also prescribes standards to ensure that personnel working with safety-critical products receive appropriate training. Each railroad may prescribe additional or more stringent rules, and other special instructions, that are not inconsistent with this subpart.

(c) *What other rules apply?* (1) This subpart does not exempt a railroad from compliance with the requirements of Subparts A through G of this part, except to the extent a PSP explains to FRA Associate Administrator for Safety's satisfaction the following:

- (i) How the objectives of any such requirements are met by the product;
- (ii) Why the objectives of any such requirements are not relevant to the product; or
- (iii) How the requirement is satisfied using alternative means. (See § 236.907(a)(14)).

(2) Products subject to this subpart are also subject to applicable requirements of Parts 233, 234, and 235 of this chapter. See § 234.275 of this chapter with respect to use of this subpart to qualify certain products for use within highway-rail grade crossing warning systems.

(3) Information required to be submitted by this subpart that a submitter deems to be trade secrets, or commercial or financial information that is privileged or confidential under Exemption 4 of the Freedom of Information Act, 5 U.S.C. 552(b)(4), shall be so labeled in accordance with the provisions of § 209.11 of this chapter. FRA handles information so labeled in accordance with the provisions of § 209.11 of this chapter.

#### **Application:**

This section does not require any field enforcement. The critical element for field personnel is Subpart H compliance may or may not relieve the railroad from compliance with other regulatory requirements.

Inspectors must become familiar with the specific regulatory requirements for the product, contained within the product's PSP, and evaluate regulatory compliance accordingly.

### **§ 236.903 Definitions.**

As used in this subpart --

*Associate Administrator for Safety* means the Associate Administrator for Railroad Safety, FRA, or that person's delegate as designated in writing.

*Component* means an element, device, or appliance (including those whose nature is electrical, mechanical, hardware, or software) that is part of a system or subsystem.

*Configuration management control plan* means a plan designed to ensure that the proper and intended product configuration, including the hardware components and software version, is documented and maintained through the lifecycle of the products in use.

*Employer* means a railroad, or contractor to a railroad, that directly engages or compensates individuals to perform the duties specified in § 236.921(a).

*Executive software* means software common to all installations of a given product. It generally is used to schedule the execution of the site-specific application programs, run timers, read inputs, drive outputs, perform self-diagnostics, access and check memory, and monitor the execution of the application software to detect unsolicited changes in outputs.

*FRA* means the Federal Railroad Administration.

*Full automatic operation* means that mode of an automatic train control system capable of operating without external human influence, in which the locomotive engineer or operator may act as a passive system monitor, in addition to an active system controller.

*Hazard* means an existing or potential condition that can result in an accident.

*High degree of confidence*, as applied to the highest level of aggregation, means there exists credible safety analysis supporting the conclusion that the likelihood of the proposed condition associated with the new product being less safe than the previous condition is very small.

*Human factors* refers to a body of knowledge about human limitations, human abilities, and other human characteristics, such as behavior and motivation, that must be considered in product design.

*Human-machine interface (HMI)* means the interrelated set of controls and displays that allows humans to interact with the machine.

*Initialization* refers to the startup process when it is determined that a product has all required data input and the product is prepared to function as intended.

*Mandatory directive* has the meaning set forth in § 220.5 of this chapter.

*Materials handling* refers to explicit instructions for handling safety-critical components established to comply with procedures specified in the PSP.

*Mean Time to Hazardous Event (MTTHE)* means the average or expected time that a subsystem or component will operate prior to the occurrence of an unsafe failure.

*New or next-generation train control system* means a train control system using technologies not in use in revenue service at the time of PSP submission or without established histories of safe practice.

*Petition for approval* means a petition to FRA for approval to use a product on a railroad as described in its PSP. The petition for approval is to contain information that is relevant to determining the safety of the resulting system; relevant to determining compliance with this part; and relevant to determining the safety of the product, including a complete copy of the product's PSP and supporting safety analysis.

*Predefined change* means any post-implementation modification to the use of a product that is provided for in the PSP (see § 236.907(b)).

*Previous condition* refers to the estimated risk inherent in the portion of the existing method of operation that is relevant to the change under analysis (including the elements of any existing signal or train control system relevant to the review of the product).

*Processor-based*, as used in this subpart, means dependent on a digital processor for its proper functioning.

*Product* means a processor-based signal or train control system, subsystem, or component.

*Product Safety Plan (or PSP)* refers to a formal document that describes in detail all of the safety aspects of the product, including, but not limited to, procedures for its development, installation, implementation, operation, maintenance, repair, inspection, testing and modification, as well as analyses supporting its safety claims, as described in § 236.907.

*Railroad Safety Program Plan* (or *RSPP*) refers to a formal document that describes a railroad's strategy for addressing safety hazards associated with operation of products under this subpart and its program for execution of such strategy through the use of PSP requirements, as described in § 236.905.

*Revision control* means a chain-of-custody regimen designed to positively identify safety-critical components and spare equipment availability, including repair and replacement tracking in accordance with procedures outlined in the PSP.

*Risk* means the expected probability of occurrence for an individual accident event (probability) multiplied by the severity of the expected consequences associated with the accident (severity).

*Risk assessment* means the process of determining, either quantitatively or qualitatively, the measure of risk associated with use of the product under all intended operating conditions or the previous condition.

*Safety-critical*, as applied to a function, a system, or any portion thereof, means the correct performance of which is essential to safety of personnel or equipment, or both; or the incorrect performance of which could cause a hazardous condition, or allow a hazardous condition which was intended to be prevented by the function or system to exist.

*Subsystem* means a defined portion of a system.

*System* refers to a signal or train control system and includes all subsystems and components thereof, as the context requires.

*System Safety Precedence* means the order of precedence in which methods used to eliminate or control identified hazards within a system are implemented.

*Validation* means the process of determining whether a product's design requirements fulfill its intended design objectives during its development and lifecycle. The goal of the validation process is to determine "whether the correct product was built."

*Verification* means the process of determining whether the results of a given phase of the development cycle fulfill the validated requirements established at the start of that phase. The goal of the verification process is to determine "whether the product was built correctly."

#### Application:

This section does not require any field enforcement. Inspectors should be fully conversant with the above definitions, those contained in Subparts A through G, and those contained in AREMA Communications and Signal Manual, Section 17, which is incorporated into Subpart H at § 236.909(d)(i). Inspectors should assure that in discussions with railroads and vendors, the use of these definitions have the same meaning among all parties.

### **§ 236.905 Railroad Safety Program Plan.**

(a) *What is the purpose of an RSPP?* A railroad subject to this subpart shall develop an RSPP, subject to FRA approval, that serves as its principal safety document for all safety-critical products. The RSPP must establish the minimum PSP requirements that will govern the development and implementation of all products subject to this subpart, consistent with the provisions contained in § 236.907.

(b) *What subject areas must the RSPP address?* The railroad's RSPP must address, at a minimum, the following subject areas:

(1) *Requirements and concepts.* The RSPP must require a description of the preliminary safety analysis, including:

- (i) A complete description of methods used to evaluate a system's behavioral characteristics;
- (ii) A complete description of risk assessment procedures;

- (iii) The system safety precedence followed; and
- (iv) The identification of the safety assessment process.

(2) *Design for verification and validation.* The RSPP must require the identification of verification and validation methods for the preliminary safety analysis, initial development process, and future incremental changes, including standards to be used in the verification and validation process, consistent with Appendix C to this part. The RSPP must require that references to any non-published standards be included in the PSP.

(3) *Design for human factors.* The RSPP must require a description of the process used during product development to identify human factors issues and develop design requirements which address those issues.

(4) *Configuration management control plan.* The RSPP must specify requirements for configuration management for all products to which this subpart applies.

(c) *How are RSPPs approved?* (1) Each railroad is required to submit a petition for approval of an RSPP in triplicate to the Associate Administrator for Railroad Safety, FRA, 1200 New Jersey Avenue, SE., Mail Stop 25, Washington, DC 20590. The petition must contain a copy of the proposed RSPP, and the name, title, address, and telephone number of the railroad's primary contact person for review of the petition.

(2) Normally within 180 days of receipt of a petition for approval of an RSPP, FRA:

(i) Grants the petition, if FRA finds that the petition complies with applicable requirements of this subpart, attaching any special conditions to the approval of the petition as necessary to carry out the requirements of this subpart;

(ii) Denies the petition, setting forth reasons for denial; or

(iii) Requests additional information.

(3) If no action is taken on the petition within 180 days, the petition remains pending for decision. The petitioner is encouraged to contact FRA for information concerning its status.

(4) FRA may reopen consideration of any previously-approved petition for cause, providing reasons for such action.

(d) *How are RSPP's modified?* (1) Railroads shall obtain FRA approval for any modification to their RSPP which affects a safety-critical requirement of a PSP. Other modifications do not require FRA approval.

(2) Petitions for FRA approval of RSPP modifications are subject to the same procedures as petitions for initial RSPP approval, as specified in paragraph (c) of this section. In addition, such petitions must identify the proposed modification(s) to be made, the reason for the modification(s), and the effect of the modification(s) on safety.

### Application:

The RSPP is the overall safety plan for the implementation of new or novel processor-based signal and train control systems on the railroad. It is intended to be a living document. Headquarters' technical staff will review RSPPs and petitions for modifications of RSPPs for sufficiency, and prepare recommendations for approval, conditional approval, or denial. Once approved, close coordination between the headquarters and field staff will be required to ensure that the document is properly maintained and utilized by the railroad.

Inspectors must be familiar with their railroad's approved RSPP and the associated processor-based signal or train control systems that it covers. It is a violation if a safety-critical change to a railroad's RSPP is discovered and FRA has not approved it. While other modifications do not require FRA approval and are not violations, failure of a railroad to modify their RSPP when there is such a change required is a violation. It is also a violation where new or novel processor-

based signal or train control systems are found to have been deployed and (1) the railroad does not have an approved RSPP or (2) an approved RSPP exists, but the RSPP does not reflect the new product.

## CLASSIFICATION OF DEFECTS

236.905.A1 Failure to develop RSPP when required.

236.905.B1 Failure to address minimum required RSPP subject areas.

236.905.C1 Failure to submit RSPP when required.

236.905.D1 Failure to obtain FRA approval for a modification to the RSPP.

### § 236.907 Product Safety Plan.

(a) *What must a PSP contain?* The PSP must include the following:

(1) A complete description of the product, including a list of all product components and their physical relationship in the subsystem or system;

(2) A description of the railroad operation or categories of operations on which the product is designed to be used, including train movement density, gross tonnage, passenger train movement density, hazardous materials volume, railroad operating rules, and operating speeds;

(3) An operational concepts document, including a complete description of the product functionality and information flows;

(4) A safety requirements document, including a list with complete descriptions of all functions that the product performs to enhance or preserve safety;

(5) A document describing the manner in which product architecture satisfies safety requirements;

(6) A hazard log consisting of a comprehensive description of all safety-relevant hazards to be addressed during the lifecycle of the product, including maximum threshold limits for each hazard (for unidentified hazards, the threshold shall be exceeded at one occurrence);

(7) A risk assessment, as prescribed in § 236.909 and Appendix B to this part;

(8) A hazard mitigation analysis, including a complete and comprehensive description of all hazards to be addressed in the system design and development, mitigation techniques used, and system safety precedence followed, as prescribed by the applicable RSPP;

(9) A complete description of the safety assessment and verification and validation processes applied to the product and the results of these processes, describing how subject areas covered in Appendix C to this part are either addressed directly, addressed using other safety criteria, or not applicable;

(10) A complete description of the safety assurance concepts used in the product design, including an explanation of the design principles and assumptions;

(11) A human factors analysis, including a complete description of all human-machine interfaces, a complete description of all functions performed by humans in connection with the product to enhance or preserve safety, and an analysis in accordance with Appendix E to this part or in accordance with other criteria if demonstrated to the satisfaction of the Associate Administrator for Railroad Safety to be equally suitable;

(12) A complete description of the specific training of railroad and contractor employees and supervisors necessary to ensure the safe and proper installation, implementation, operation, maintenance, repair, inspection, testing, and modification of the product;

(13) A complete description of the specific procedures and test equipment necessary to ensure the safe and proper installation, implementation, operation, maintenance, repair, inspection, testing, and modification of the product. These procedures, including calibration requirements, shall be consistent with or explain deviations from the equipment manufacturer's recommendations;

(14) An analysis of the applicability of the requirements of Subparts A through G of this part to the product that may no longer apply or are satisfied by the product using an alternative method, and a complete explanation of the manner in which those requirements are otherwise fulfilled (see § 234.275 of this chapter and § 236.901(c));

(15) A complete description of the necessary security measures for the product over its lifecycle;

(16) A complete description of each warning to be placed in the Operations and Maintenance Manual identified in § 236.919, and of all warning labels required to be placed on equipment as necessary to ensure safety;

(17) A complete description of all initial implementation testing procedures necessary to establish that safety-functional requirements are met and safety-critical hazards are appropriately mitigated;

(18) A complete description of:

(i) all post-implementation testing (validation) and monitoring procedures, including the intervals necessary to establish that safety-functional requirements, safety-critical hazard mitigation processes, and safety-critical tolerances are not compromised over time, through use, or after maintenance (repair, replacement, adjustment) is performed; and

(ii) Each record necessary to ensure the safety of the system that is associated with periodic maintenance, inspections, tests, repairs, replacements, adjustments, and the system's resulting conditions, including records of component failures resulting in safety-relevant hazards (See § 236.917);

(19) A complete description of any safety-critical assumptions regarding availability of the product, and a complete description of all backup methods of operation; and

(20) A complete description of all incremental and predefined changes (See paragraphs (b) and (c) of this section).

(b) *What requirements apply to predefined changes?* (1) Predefined changes are not considered design modifications requiring an entirely new safety verification process, a revised PSP, and an Informational

Filing or petition for approval in accordance with § 236.915. However, the risk assessment for the product must demonstrate that operation of the product, as modified by any predefined change, satisfies the minimum performance standard.

(2) The PSP must identify configuration/revision control measures designed to ensure that safety-functional requirements and safety-critical hazard mitigation processes are not compromised as a result of any such change. (Software changes involving safety functional requirements or safety critical hazard mitigation processes for components in use are also addressed in paragraph (c) of this section.)

(c) *What requirements apply to other product changes?* (1) Incremental changes are planned product version changes described in the initial PSP where slightly different specifications are used to allow the gradual enhancement of the product's capabilities. Incremental changes shall require verification and validation to the extent the changes involve safety-critical functions.

(2) Changes classified as maintenance require validation.

(d) *What are the responsibilities of the railroad and product supplier regarding communication of hazards?* (1) The PSP shall specify all contractual arrangements with hardware and software suppliers for immediate notification of any and all safety critical software



upgrades, patches, or revisions for their processor-based system, subsystem, or component, and the reasons for such changes from the suppliers, whether or not the railroad has experienced a failure of that safety-critical system, subsystem, or component.

(2) The PSP shall specify the railroad's procedures for action upon notification of a safety-critical upgrade, patch, or revision for this processor-based system, subsystem, or component, and until the upgrade, patch, or revision has been installed; and such action shall be consistent with the criterion set forth in § 236.915(d) as if the failure had occurred on that railroad.

(3) The PSP must identify configuration/revision control measures designed to ensure that safety-functional requirements and safety-critical hazard mitigation processes are not compromised as a result of any such change, and that any such change can be audited.

(4) Product suppliers entering into contractual arrangements for product support described in a PSP must promptly report any safety-relevant failures and previously unidentified hazards to each railroad using the product.

#### Application:

Enforcement of this section is two-phased. The first phase does not normally involve field personnel but rather is accomplished by headquarters staff. This phase involves extensive review of the PSP for completeness and sufficiency, and demonstration that the required performance standard presented can be met. Headquarters staff will define the basic internal FRA review cycle and key functional roles and responsibilities of reviewers. This ensures that accountability for the timely review of the PSP is maintained throughout the review process, and that the PSP remain an effective tool in managing risks and maintaining public safety. Field personnel involvement during this phase is on a case-by-case basis. Unsatisfactory compliance to the requirements by the railroads during the approval process phase is not considered noncompliance with the regulation but rather, if remaining unresolved while working through the review process with the railroad, possible grounds for nonapproval.

The second phase requires significant field personnel involvement to ensure that the railroad is in compliance with the approved PSP once the product is in revenue service, and to advise headquarters of noncompliance with the terms and conditions associated with FRA's approval. Upon implementation of a product, certain PSP requirements are to be properly maintained throughout the lifecycle of the product to ensure safety of train operations is not impaired through product use, modification, or maintenance issues.

It is important for field personnel to understand, and accept, that the safety assessment done by headquarters will not prove that a product is absolutely safe. It only provides evidence that risks associated with the product have been carefully considered and that steps have been taken to eliminate or mitigate them. Hazards associated with product use are identified during the approval phase, and hazard analysis methods are employed to identify, eliminate, and mitigate hazards. It is highly important however that the railroad operates and maintains the system or product in the manner identified within the PSP. That is the principle that the field personnel will be most involved in.

Paragraph (a)(6) requires that a hazard log be included in the PSP. This log consists of a comprehensive description of all hazards to be addressed during the lifecycle of the product, including maximum threshold limits for each hazard (for unidentified hazards, the threshold shall be exceeded at one occurrence). The hazard log addresses safety-relevant hazards, or incidents and failures that affect the safety and risk assumptions of the product. Safety-relevant hazards



include events such as false proceed signal indications, failure to enforce speeds or stop where a stop is required, unexpected or sudden brake applications, and false restrictive signal indications. If false restrictive signal indications happen with any type of frequency, they could cause train crewmembers or other users (roadway workers, dispatchers, etc.) to develop a lackadaisical attitude towards complying with signal indications or instructions from the product, creating human factors problems. Incidents in which stop indications are inappropriately displayed may also necessitate sudden brake applications that may involve risk of derailment due to in-train forces. Other unsafe or wrong-side failures that affect the safety of the product must be recorded on the hazard log.

The intent of this requirement is to identify all possible safety-relevant hazards that would have a negative effect on the safety of the product, including derived hazards, e.g., hardware and software hazards introduced by the technology employed and all known hazards are identified and logged. Field inspectors should become familiar with the hazards identified, and accepted, so that they can recognize any new, previously undefined hazards that may arise during system operations and report them. Any single occurrence of a hazard that would have a negative impact on safety not previously identified is of serious concern, and the inspector should report it immediately to headquarters through their appropriate chain of command.

Paragraph (a)(12) requires the railroad to include in its PSP the training, qualification, and designation program for workers (railroad or non-railroad employees) who will perform inspection, testing, and maintenance tasks involving the product. FRA believes many benefits accrue from the investment in comprehensive training programs, which, among other things, are fundamental to creating a safe workforce. Effective training programs can result in fewer instances of human casualties and defective equipment, leading to increased operating efficiencies, less troubleshooting, and decreased costs. Where systems are implemented into revenue service, inspectors shall monitor the associated training program to ensure it is kept current and in compliance with the requirements set forth in the PSP.

Paragraph (a)(13) requires the PSP to identify specific procedures and test equipment necessary to ensure the safe operation, installation, repair, modification, and testing of the product. Requirements for operation of the system must be succinct in every respect. The procedures must be specific about the methodology to be employed for each test to be performed that is required for installation, repair, or modification; including documenting the results thereof. Where a product is placed in revenue service, inspectors shall monitor these procedures to ensure the product is properly installed, maintained, and tested.

Paragraph (a)(14) provides that products may be so designed that existing requirements contained in Part 236, Subparts A, B, C, D, E, and F may not be applicable. In this event, the PSP must identify each pertinent requirement considered to be inapplicable, fully describe the alternative method used that equates to that requirement, and explain how the alternative method fulfills or exceeds the provisions of the requirement. Certain sections of Part 236 may always be applicable to Subpart H products. For example, § 236.0 prescribes, among other requirements, the conditions and speeds for which block signal systems and automatic cab signal, train stop, and train control systems must be installed. These are benchmark safety levels related to operational considerations against which the safety performance of innovative newer systems will be compared. Inspectors must be familiar with what provisions have been waived, and what provisions have not. They should enforce those provisions of Part 236, Subparts A through G that have not been waived.

Paragraph (a)(15) requires the PSP to include a description of the security measures necessary to meet the specifications for each product. Security is an important element in the design and development of products and covers issues such as developing measures to prevent hackers from gaining access to software and developing measures to preclude sudden system shutdown. FRA inspectors should ensure that the approved security mechanisms are used by the railroad. Failure to use the approved security mechanism should be considered a violation.

Paragraph (a)(16) requires warnings to ensure safety is addressed in the Operations and Maintenance Manual and warning labels placed on the equipment of each product as necessary. Such warnings include, but are not limited to, means to prevent unauthorized access to the system; warnings of electrical shock hazards; cautionary notices about improper usage, testing, or operation; and configuration management of memory and databases. Where a product is placed in revenue service, inspectors shall monitor warnings to ensure they are kept current in the Operations and Maintenance Manual and warning labels are maintained as required.

Paragraph (a)(17) requires the railroad to develop comprehensive plans and procedures for product implementation. Implementation (validation or cutover) procedures must be prepared in detail and identify the processes necessary to verify the product is properly installed and documented, including measures to provide for the safety of train operations during installation. Test procedures identify the functionality to be tested, methodology to be used to perform the test, and contain pass/fail criteria. Once approved as part of the PSP, inspectors should review operating rules, any imposed conditions, and the cutover procedures to ensure railroad compliance during field tests or cutovers to assure safety of train operations are not impaired. The railroads' noncompliance with the requirement to use approved procedures, or failure to comply with them, is a violation.

Paragraph (a)(18)(i) requires the railroad to provide a complete description of the particulars concerning measures required to assure products, once implemented, continue to provide the expected safety level without degradation or variation over their lifecycle. The measures must be specific regarding prescribed intervals and criteria for testing; scheduled preventive maintenance requirements; procedures for configuration management; and procedures for modifications, repair, replacement, and adjustment of equipment. Inspectors will use this information, among other data, to monitor a product placed in service to assure it continues to function as intended. Failure of the railroad to comply with these measures is a violation.

Paragraph (a)(18)(ii) provides a PSP requirement to include a description of each record concerning safe operation. The description is required to identify each record necessary to ensure the safety of the system that is associated with periodic maintenance, inspections, tests, repairs, replacements, adjustments, and the system's resulting conditions, including records of component failures resulting in safety-relevant hazards (see § 236.917). Inspectors will monitor the records of test results of systems placed in service to assure they are properly maintained, inspected, and tested. Failure of the railroad to do so is a violation.

Paragraph (a)(19) requires that the PSP include a description of all backup methods of operation and safety-critical assumptions regarding availability of the product. FRA believes this information is essential for making determinations about the safety of a product and both the immediate and long term affect of its failure. It is a prerequisite of this rule that the safety-critical assumptions regarding availability of the product must be identified in the PSP. Availability is directly related to safety to the extent the backup means of controlling operations

involves greater risk (either inherently or because it is infrequently practiced). Further, it is required that the PSP describe all backup methods of operation in the event of product failure or removal from service. Inspectors are to ensure that the backup methods of operation, and their associated procedures, are followed by the railroad. Failure of the railroad to do so is a violation.

Paragraph (a)(20) requires that the PSP include a complete description of all incremental and predefined changes. Predefined change means any post-implementation modification to the use of a product that is provided for in the PSP. (See § 236.903 Definitions)

Paragraph (b)(1) addresses predefined changes. PSPs identify the various configurable applications of the product, since this rule mandates use of the product only in the manner described in its PSP (see § 236.915(d)). Also, the PSP must fully describe the procedures to be followed for each change and the inspections and tests necessary to assure the system functions as intended. Inspectors will monitor systems placed in service to ensure the product is implemented and maintained only in the manner described in the PSP.

Paragraph (c)(1) addresses the conditions associated with incremental and maintenance changes and with changes classified as safety-critical software upgrades, patches, or revisions. The term “incremental change” is intended to capture the concept of planned version changes to a product, usually software-type changes. These changes will be necessary in order for products to acquire capabilities to perform added functions as safety requirements change. This requirement is intended to encourage as many subsequent product modifications (as possible) to be considered by initial designers during the product development stage, in order to avoid, to the extent possible, changes made by persons with no link to initial safety design considerations. These changes may be undertaken by a railroad if approved as part of the PSP. Inspectors should be familiar with the approved incremental changes and alert for the implementation of non-approved changes. Railroads implementing non-approved incremental changes without submission and approval of a revised PSP are in violation of the approval conditions of their PSP.

Paragraph (c)(2) clarifies that incremental changes classified as maintenance also require validation. The inspector should ensure that these changes are validated, and that the railroad is following approved processes and procedures identified in the PSP. Railroads not doing so are in violation of the approval conditions of their PSP.

Paragraph (d)(1) sets forth the responsibilities of the railroad and product supplier regarding the communication of hazards. Railroads are required to specify the contractual arrangements with hardware and software suppliers for immediate notification of any safety-critical problems associated with the product. Hardware and software suppliers are in the best position to know about problems with the products used by the railroads. Suppliers likely have information regarding problems with their products. Given the importance of proper configuration management in safety-critical systems, it is essential that railroads learn of and take appropriate action to address all safety-critical software upgrades, patches, or revisions for their processor-based system, subsystem, or component, whether or not the railroads have experienced a specific failure of their system, subsystem, or component.

Railroads are required to either develop a mutually acceptable external contractual relationship with software developers capable of providing the required timely software support, or to demonstrate they have in-house software development capability to provide the necessary support. This support shall include providing the necessary safety software upgrade, patch, or revisions after determination of a need, identification of the specific product and software version involved, the nature of the risk, any recommended mitigation pending assurance of the corrected software, and any necessary regression testing. Lack of such a fundamental lifecycle software support capability calls into question the long term suitability of the software for safety-critical operations. Similar concerns apply to specialized hardware. Railroads are also required to develop a mutually acceptable external contractual relationship with developers of specialized hardware capable of providing the required timely software support.

Where systems are placed in service, inspectors will ensure the configuration/revision control measures are kept current, reflect each change in hardware and/or software, and can be audited. Inspectors shall monitor systems placed in service to ensure such contractual arrangements remain in place throughout the life-cycle of the product. Where it is found that no such arrangement exists, inspectors shall immediately report the circumstances to headquarters staff.

Paragraph (d)(2) requires the railroad to specify procedures to be followed upon notification by a supplier of a safety-critical problem. Upon such notification and provision of software changes by a supplier, the upgrade, patch, or revision must be installed without undue delay. Until the software upgrade, patch, or revision has been installed, a railroad must treat the product as if a safety-critical hazard exists and take the appropriate action specified in the PSP and by the supplier. This requirement is necessary to ensure that any needed component changes that would increase risk or interfere with the safety of train operations, if left uncorrected, are promptly addressed and that a common safety baseline is maintained. Similar action is required where suppliers of hardware provide notification and provision of hardware modifications. Inspectors should monitor systems placed in service to ensure railroad procedures remain in force, are invoked as necessary, and that necessary modifications are made without undue delay.

Paragraph (d)(3) requires railroads to identify configuration/revision control measures designed to ensure that safety-functional requirements and safety-critical hazard mitigation processes are not compromised as a result of changes made following notification by suppliers. Not all railroads may experience the same software faults or hardware failures. The developer's software development, configuration management, and fault reporting tracking system play a crucial role in the ability of the railroad and the FRA to be able to determine and fully understand the risks and their implications. Without an effective configuration management tracking system in place, it is difficult, if not impossible, to fairly evaluate risks associated with a product over the life of the product. Inspectors will monitor systems placed in service to ensure the approved configuration/revision control measures are put into effect and properly maintained.

Paragraph (d)(4) addresses the responsibilities of product suppliers. This requirement places a direct obligation on suppliers to report safety-relevant failures, which would include "wrong-side" failures and failures significantly impacting on availability where the PSP indicates availability to be a material issue in the safety performance of the larger railroad system. Suppliers take on this responsibility under contract to the railroad as disclosed in the PSP.

Inspectors shall monitor systems placed in service to ensure suppliers provide immediate notification of needed hardware and software changes to railroads using their products. Where it

is found a product supplier has not done so, or the product developer is no longer in business or is unwilling to support the product, headquarters staff shall be promptly notified of the circumstances surrounding the failure to perform.

## CLASSIFICATION OF DEFECTS

236.907.A1 Failure to address required PSP elements.

236.907.B1 Failure to identify or implement product configuration/revision control measures.

236.905.D1 Failure to communicate identified safety-critical hazards.

### **§ 236.909 Minimum performance standard.**

*(a) What is the minimum performance standard for products covered by this subpart?* The safety analysis included in the railroad's PSP must establish with a high degree of confidence that introduction of the product will not result in risk that exceeds the previous condition. The railroad shall determine, prior to filing its petition for approval or informational filing, that this standard has been met and shall make available the necessary analyses and documentation as provided in this subpart.

*(b) How does FRA determine whether the PSP requirements for products covered by subpart H have been met?* With respect to any FRA review of a PSP, the Associate Administrator for Railroad Safety independently determines whether the railroad's safety case establishes with a high degree of confidence that introduction of the product will not result in risk that exceeds the previous condition. In evaluating the sufficiency of the railroad's case for the product, the Associate Administrator for Railroad Safety considers, as applicable, the factors pertinent to evaluation of risk assessments, listed in § 236.913(g)(2).

*(c) What is the scope of a full risk assessment required by this section?* A full risk assessment performed under this subpart must address the safety risks affected by the introduction, modification, replacement, or enhancement of a product. This includes risks associated with the previous condition which are no longer present as a result of the change, new risks not present in the previous condition, and risks neither newly created nor eliminated whose nature (probability of occurrence or severity) is nonetheless affected by the change.

*(d) What is an abbreviated risk assessment, and when may it be used?* (1) An abbreviated risk assessment may be used in lieu of a full risk assessment to show compliance with the performance standard if:

- (i) No new hazards are introduced as a result of the change;
- (ii) Severity of each hazard associated with the previous condition does not increase from the previous condition; and
- (iii) Exposure to such hazards does not change from the previous condition.

(2) An abbreviated risk assessment supports the finding required by paragraph (a) of this section if it establishes that the resulting MTTHE for the proposed product is greater than or equal to the MTTHE for the system, component, or method performing the same function in the previous condition. This determination must be supported by credible safety analysis sufficient to persuade the Associate Administrator for Railroad Safety that the likelihood of the new product's MTTHE being less than the MTTHE for the system, component, or method performing the same function in the previous condition is very small.

(3) Alternatively, an abbreviated risk assessment supports the finding required by paragraph (a) of this section if:

(i) The probability of failure for each hazard of the product is equal to or less than the corresponding recommended Specific Quantitative Hazard Probability Ratings classified as more favorable than “undesirable” by AREMA Manual Part 17.3.5 (Recommended Procedure for Hazard Identification and Management of Vital Electronic/Software-Based Equipment Used in Signal and Train Control Applications), or—in the case of a hazard classified as undesirable—the Associate Administrator for Railroad Safety concurs that mitigation of the hazard within the framework of the electronic system is not practical and the railroad proposes reasonable steps to undertake other mitigation. The Director of the Federal Register approves the incorporation by reference of the entire AREMA Communications and Signal Manual, Volume 4, Section 17–Quality Principles (2005) in this section in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. You may obtain a copy of the incorporated standard from American Railway Engineering and Maintenance of Way Association, 8201 Corporation Drive, Suite 1125, Landover, MD 20785-2230. You may inspect a copy of the incorporated standard at the Federal Railroad Administration, Docket Clerk, 1200 New Jersey Avenue, SE., Washington, DC 20590 or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to [http://www.archives.gov/federal\\_register/code\\_of\\_federal\\_regulations/ibr\\_locations.html](http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html);

(ii) The product is developed in accordance with:

(A) AREMA Manual Part 17.3.1 (Communications and Signal Manual of Recommended Practices, Recommended Safety Assurance Program for Electronic/ Software Based Products Used in Vital Signal Applications);

(B) AREMA Manual Part 17.3.3 (Communications and Signal Manual of Recommended Practices, Recommended Practice for Hardware Analysis for Vital Electronic/Software-Based Equipment Used in Signal and Train Control Applications);

(C) AREMA Manual Part 17.3.5 (Communications and Signal Manual of Recommended Practices, Recommended Practice for Hazard Identification and Management of Vital Electronic/Software-Based Equipment Used in Signal and Train Control Applications);

(D) Appendix C of this subpart; and

(iii) Analysis supporting the PSP suggests no credible reason for believing that the product will be less safe than the previous condition.

(e) *How are safety and risk measured for the full risk assessment?* Risk assessment techniques, including both qualitative and quantitative methods, are recognized as providing credible and useful results for purposes of this section if they apply the following principles:

(1) Safety levels must be measured using competent risk assessment methods and must be expressed as the total residual risk in the system over its expected lifecycle after implementation of all mitigating measures described in the PSP. The total risk assessment must have a supporting sensitivity analysis. The analysis must confirm that the risk metrics of the system are not negatively affected by sensitivity analysis input parameters including, for example, component failure rates, human factor error rates, and variations in train traffic affecting exposure. In this context, “negatively affected” means that the final residual risk metric does not exceed that of the base case or that which has been otherwise established through MTTHE target. The sensitivity analysis must document the sensitivity to worst case failure scenarios. Appendix B to this part provides criteria for acceptable risk assessment methods. Other methods may be acceptable if demonstrated to the satisfaction of the Associate Administrator for Railroad Safety to be equally suitable.

(2) For the previous condition and for the lifecycle of the product, risk levels must be expressed in units of consequences per unit of exposure.

(i) In all cases exposure must be expressed as total train miles traveled per year over the relevant railroad infrastructure. Consequences must identify the total cost, including fatalities,

injuries, property damage, and other incidental costs, such as potential consequences of hazardous materials involvement, resulting from preventable accidents associated with the function(s) performed by the system. A railroad may, as an alternative, use a risk metric in which consequences are measured strictly in terms of fatalities.

(ii) In those cases where there is passenger traffic, a second risk metric must be calculated, using passenger-miles traveled per year as the exposure, and total societal costs of passenger injuries and fatalities, resulting from preventable accidents associated with the function(s) performed by the system, as the consequences.

(3) If the description of railroad operations for the product required by § 236.907(a)(2) involves changes to the physical or operating conditions on the railroad prior to or within the expected life-cycle of the product subject to review under this subpart, the previous condition shall be adjusted to reflect the lower risk associated with systems needed to maintain safety and performance at higher speeds or traffic volumes. In particular, the previous condition must be adjusted for assumed implementation of systems necessary to support higher train speeds as specified in § 236.0, as well as other changes required to support projected increases in train operations. The following specific requirements apply:

(i) If the current method of operation would not be adequate under § 236.0 for the proposed operations, then the adjusted previous condition must include a system as required under § 236.0, applied as follows:

(A) The minimum system where a passenger train is operated at a speed of 60 or more mph, or a freight train is operated at a speed of 50 or more mph, shall be a traffic control system;

(B) The minimum system where a train is operated at a speed of 80 or more mph, but not more than 110 mph, shall be an automatic cab signal system with automatic train control; and

(C) The minimum system where a train is operated at a speed of more than 110 mph shall be a system determined by the Associate Administrator for Railroad Safety to provide an equivalent level of safety to systems required or authorized by FRA for comparable operations.

(ii) If the current method of operation would be adequate under § 236.0 for the proposed operations, but the current system is not at least as safe as a traffic control system, then the adjusted previous condition must include a traffic control system in the event of any change that results in:

(A) An annual average daily train density of more than twelve trains per day; or

(B) An increase in the annual average daily density of passenger trains of more than four trains per day.

(iii) Subparagraph (e)(3)(ii)(A) of this section shall apply in all situations where train volume will exceed more than 20 trains per day but shall not apply to situations where train volume will exceed 12 trains per day but not exceed 20 trains per day, if in its PSP the railroad makes a showing sufficient to establish, in the judgment of the Associate Administrator for Safety, that the current method of operation is adequate for a specified volume of traffic in excess of 12 trains per day, but not more than 20 trains per day, without material delay in the movement of trains over the territory and without unreasonable expenditures to expedite those movements when compared with the expense of installing and maintaining a traffic control system.

(4) In the case review of a PSP that has been consolidated with a proceeding pursuant to part 235 of this subchapter (see § 236.911(b)), the base case shall be determined as follows:

(i) If FRA determines that discontinuance or modification of the system should be granted without regard to whether the product is installed on the territory, then the base case shall be the conditions that would obtain on the territory following the discontinuance or modification. Note: This is an instance in which the base case is posited as greater risk than the actual (unadjusted) previous condition because the railroad would have obtained relief from the requirement to maintain the existing signal or train control system even if no new product had been proffered.

(ii) If FRA determines that discontinuance or modification of the system should be denied without regard to whether the product is installed on the territory, then the base case shall remain the previous condition (unadjusted)

(iii) If, after consideration of the application and review of the PSP, FRA determines that neither paragraph (e)(4)(i) nor paragraph (e)(4)(ii) of this section should apply, FRA will establish a base case that is consistent with safety and in the public interest.

#### Application:

The purpose of the minimum performance standard is to establish the level of performance that must be achieved, but not how it must be achieved. The objective is to make certain that new or novel processor-based signal and train control systems are at least as safe as the systems they would replace. Headquarters personnel accomplish the majority of this section. Field involvement is generally limited to reevaluating compliance with the operational and traffic volume restrictions designated in the PSP.

The railroad must establish with a high degree of confidence through its safety analysis that introduction of the system will not result in a safety risk level that exceeds the level of safety risk in the previous condition. High degree of confidence, as applied to the highest level of aggregation, means that there exists credible safety analysis supporting the conclusion that “the likelihood of the proposed condition associated with the new product being less safe than the previous condition is very small.” In short, the railroad must prove that safety is not degraded. This standard places the burden on the railroad to demonstrate that the safety analysis provides a high degree of confidence.

Performance is evaluated as a comparison between the level of safety in the previous condition and the new or proposed condition. Previous condition refers to the estimated risk inherent in the portion of the existing method of operation (e.g., track warrant control, operation by signal indication of a traffic control system, etc.) that is relevant to the change under analysis, including the elements of any existing signal or train control system relevant to the review of the product. The exposure to the risk as related primarily to railroad operating practices (i.e., train speeds, train volumes, utilization of product, etc.), remains the same. Three variables must be provided with risk calculations: accident frequency, severity, and exposure. Traditionally, risk is defined as the expected frequency of unsafe events multiplied by the expected consequences. Exposure must be identified because increases in risk due to increased exposure can be easily distinguished from increases in risk due solely to implementation and use of the proposed product.

Railroads intending to implement products covered by Subpart H may change operational characteristics at the same time in order to take advantage of the benefits of the new technology. Increased train volumes, passenger volumes, or operating speeds, or all three, may be likely changes to accompany implementation of Subpart H products. The rule requires the railroad to analyze the total change in risk, then separately identify and distinguish risk changes associated with the use of the product from risk changes due to changes in operating practices (i.e., risk changes due to increased/decreased operating speed, etc.). This procedure is necessary to make an accurate comparison of the relevant risks for purposes of determining compliance with the minimum performance standard in § 236.909(a)

Changes in railroad operations, especially increases in traffic speeds and/or densities from those defined in the PSP safety analysis, may render the results obtained from a risk analysis invalid. Inspectors should be aware of the method of operations, traffic speeds, densities, and



type/size/weight of the trains and their cargo. Deviations by the railroad from the assumptions for these in the PSP require the railroad to resubmit an adjusted safety analysis. Unreported changes, or changes without an approved revised PSP, are unacceptable.

## CLASSIFICATION OF DEFECTS

- 236.909.A1 Failure to make analysis or documentation available.
- 236.909.B1 Failure to determine or demonstrate that the minimum performance standard has been met.
- 236.909.C1 Failure of risk assessment to address safety risks of product.
- 236.909.D1 Abbreviated risk assessment used when not appropriate.
- 236.909.E1 Full risk assessment techniques not appropriate.

### § 236.911 Exclusions.

(a) *Does this subpart apply to existing systems?* The requirements of this subpart do not apply to products in service as of June 6, 2005. Railroads may continue to implement and use these products and components from these existing products.

(b) *How will transition cases be handled?* Products designed in accordance with subparts A through G of this part which are not in service but are developed or are in the developmental stage prior to March 7, 2005, may be excluded upon notification to FRA by June 6, 2005, if placed in service by March 7, 2008. Railroads may continue to implement and use these products and components from these existing products. A railroad may at any time elect to have products that are excluded made subject to this subpart by submitting a PSP as prescribed in § 236.913 and otherwise complying with this subpart.

(c) *How are office systems handled?* The requirements of this subpart do not apply to existing office systems and future deployments of existing office system technology. However, a subsystem or component of an office system must comply with the requirements of this subpart if it performs safety-critical functions within, or affects the safety performance of, a new or next-generation train control system. For purposes of this section, “office system” means a centralized computer-aided train-dispatching system or centralized traffic control board.

(d) *How are modifications to excluded products handled?* Changes or modifications to products otherwise excluded from the requirements of this subpart by this section are not excluded from the requirements of this subpart if they result in a degradation of safety or a material increase in safety-critical functionality.

(e) *What other rules apply to excluded products?* Products excluded by this section from the requirements of this subpart remain subject to subparts A through G of this part as applicable.

### Application:

Paragraph (a) provides that the Subpart H does not apply to products in service on the effective date of this rule. Railroads employ numerous processor-based safety-critical products in their existing signal and train control systems. These existing systems have proven to provide a very high level of safety, reliability, and functionality. The safety record of this equipment is good and does not warrant the burden necessary to essentially re-prove that it is safe. Transit systems, except those that are connected to the general railroad system, are not directly regulated by FRA

at the national level. Field inspectors should be aware of products on their territory that fall under this category, and enforce compliance with the applicable portions of Subparts A through G. Inspectors should be aware that railroads have the option to have products which are excluded made subject to Subpart H by submitting a PSP for the product. Until such a PSP is approved, inspectors should continue to enforce compliance with Subparts A through G.

Paragraph (b) addresses the products that are designed in accordance with Part 236, Subparts A through G, that were not in service on the effective date of this rule but which were in the developmental stage. These products are all now required to be in service. Field inspectors should be aware of the products in service in their territory, and be alert to the introduction of new safety-critical products. Introduction of new or novel products that do not have an approved PSP are in violation of this regulation. These products should be identified to headquarters staff, and their use discontinued until an approved PSP, or waiver to continue operations, is received and approved.

Paragraph (c) addresses the exclusion of existing and future deployments of existing office systems technology. Currently, some railroads employ these dispatch systems as part of their existing signal and train control systems. These existing systems have been implemented voluntarily to enhance productivity and have proven to provide a reasonably high level of safety, reliability, and functionality. However, a subsystem or component of an office system must comply with Subpart H if it performs safety-critical functions within a new or next-generation signal or train control system. When an inspector notes an apparent safety-critical change to an office system where the railroad does not have a waiver or an approved PSP, the use of at least that portion of the system should be discontinued, and the inspector should inform headquarters staff of the situation.

Paragraph (d) establishes requirements for modifications of excluded products. At some point, cumulative changes to excluded products will be significant enough to require the safety assurance processes of Subpart H to be followed. This point exists when a change results in degradation of safety or in a material increase in safety-critical functionality. Modifications caused by implementation details do not necessarily cause the product to become subject to Subpart H. These types of implementation modifications are minor in nature and are the result of site-specific physical constraints. Implementation modifications that will result in a degradation of safety or a material increase in safety-critical functionality, like a change in executive software, will cause the product to be subject to Subpart H and its requirements. Inspectors should be aware of system modifications to excluded systems, and advise headquarters staff to determine if the modification requires compliance with Subpart H. If advised by headquarters staff that Subpart H compliance is required, system operation should be discontinued until receipt of an approved PSP.

Paragraph (e) clarifies the application of Subparts A through G to products excluded by this section. Inspectors should be aware of what products are covered by Subpart H, and which products are still covered by Subparts A through G, enforcing as appropriate.

## CLASSIFICATION OF DEFECTS

236.911.A1 Non-excluded product or product modification implemented in violation of Subpart H.

## § 236.913 Filing and approval of PSPs.

(a) *Under what circumstances must a PSP be prepared?* A PSP must be prepared for each product covered by this subpart. A joint PSP must be prepared when:

(1) The territory on which a product covered by this subpart is normally subject to joint operations, or is operated upon by more than one railroad; and

(2) The PSP involves a change in method of operation.

(b) *Under what circumstances must a railroad submit a petition for approval for a PSP or PSP amendment, and when may a railroad submit an informational filing?* Depending on the nature of the proposed product or change, the railroad shall submit either an informational filing or a petition for approval. Submission of a petition for approval is required for PSPs or PSP amendments concerning installation of new or next-generation train control systems. All other actions that result in the creation of a PSP or PSP amendment require an informational filing and are handled according to the procedures outlined in paragraph (c) of this section. Applications for discontinuance and material modification of signal and train control systems remain governed by parts 235 and 211 of this chapter; and petitions subject to this section may be consolidated with any relevant application for administrative handling.

(c) *What are the procedures for informational filings?* The following procedures apply to PSPs and PSP amendments which do not require submission of a petition for approval, but rather require an informational filing:

(1) Not less than 180 days prior to planned use of the product in revenue service as described in the PSP or PSP amendment, the railroad shall submit an informational filing to the Associate Administrator for Safety, FRA, 1120 Vermont Avenue, N.W., Mail Stop 25, Washington, D.C. 20590. The informational filing must provide a summary description of the PSP or PSP amendment, including the intended use of the product, and specify the location where the documentation as described in § 236.917(a)(1) is maintained.

(2) Within 60 days of receipt of the informational filing, FRA:

(i) Acknowledges receipt of the filing;

(ii) Acknowledges receipt of the informational filing and requests further information; or,

(iii) Acknowledges receipt of the filing and notifies the railroad, for good cause, that the filing will be considered as a petition for approval as set forth in paragraph (d) of this section, and requests such further information as may be required to initiate action on the petition for approval. Examples of good cause, any one of which is sufficient, include: the PSP describes a product with unique architectural concepts; the PSP describes a product that uses design or safety assurance concepts considered outside existing accepted practices (see Appendix C); and the PSP describes a locomotive-borne product that commingles safety-critical train control processing functions with locomotive operational functions. In addition, good cause includes any instance where the PSP or PSP amendment does not appear to support its safety claim of satisfaction of the performance standard, after FRA has requested further information as provided in paragraph (c)(2)(ii) of this section.

(d) *What procedures apply to petitions for approval?* The following procedures apply to PSPs and PSP amendments which require submission of a petition for approval:

(1) *Petitions for approval involving prior FRA consultation.* (i) The railroad may file a Notice of Product Development with the Associate Administrator for Safety not less than 30 days prior to the end of the system design review phase of product development and 180 days prior to planned implementation, inviting FRA to participate in the design review process and receive periodic briefings and updates as needed to follow the course of product development. At a minimum, the Notice of Product Development must contain a summary description of the product to be developed and a brief description of goals for improved safety.

(ii) Within 15 days of receipt of the Notice of Product Development, the Associate Administrator for Safety either acknowledges receipt or acknowledges receipt and requests more information.

(iii) If FRA concludes that the Notice of Product Development contains sufficient information, the Associate Administrator for Safety determines the extent and nature of the assessment and review necessary for final product approval. FRA may convene a technical consultation as necessary to discuss issues related to the design and planned development of the product.

(iv) Within 60 days of receiving the Notice of Product Development, the Associate Administrator for Safety provides a letter of preliminary review with detailed findings, including whether the design concepts of the proposed product comply with the requirements of this subpart, whether design modifications are necessary to meet the requirements of this subpart, and the extent and nature of the safety analysis necessary to comply with this subpart.

(v) Not less than 60 days prior to use of the product in revenue service, the railroad shall file with the Associate Administrator for Safety a petition for final approval.

(vi) Within 30 days of receipt of the petition for final approval, the Associate Administrator for Safety either acknowledges receipt or acknowledges receipt and requests more information. Whenever possible, FRA acts on the petition for final approval within 60 days of its filing by either granting it or denying it. If FRA neither grants nor denies the petition for approval within 60 days, FRA advises the petitioner of the projected time for decision and conducts any further consultations or inquiries necessary to decide the matter.

(2) *Other petitions for approval.* The following procedures apply to petitions for approval of PSPs which do not involve prior FRA consultation as described in paragraph (d)(1) of this section.

(i) Not less than 180 days prior to use of a product in revenue service, the railroad shall file with the Associate Administrator for Safety a petition for approval.

(ii) Within 60 days of receipt of the petition for approval, FRA either acknowledges receipt, or acknowledges receipt and requests more information.

(iii) Whenever possible, considering the scope, complexity, and novelty of the product or change, FRA acts on the petition for approval within 180 days of its filing by either granting it or denying it. If FRA neither grants nor denies the petition for approval within 180 days, it remains pending, and FRA provides the petitioner with a statement of reasons why the petition has not yet been approved.

(e) *What role do product users play in the process of safety review?* (1) FRA will publish in the FEDERAL REGISTER periodically a topic list including docket numbers for informational filings and a petition summary including docket numbers for petitions for approval.

(2) Interested parties may submit to FRA information and views pertinent to FRA's consideration of an informational filing or petition for approval. FRA considers comments to the extent practicable within the periods set forth in this section. In a proceeding consolidated with a proceeding under part 235 of this chapter, FRA considers all comments received.

(f) *Is it necessary to complete field testing prior to filing the petition for approval?* A railroad may file a petition for approval prior to completion of field testing of the product. The petition for approval should additionally include information sufficient for FRA to arrange monitoring of the tests. The Associate Administrator for Safety may approve a petition for approval contingent upon successful completion of the test program contained in the PSP or hold the petition for approval pending completion of the tests.

(g) *How are PSPs approved?* (1) The Associate Administrator for Safety grants approval of a PSP when:

(i) The petition for approval has been properly filed and contains the information required in § 236.907;

(ii) FRA has determined that the PSP complies with the railroad's approved RSPP and applicable requirements of this subpart; and

(iii) The risk assessment supporting the PSP demonstrates that the proposed product satisfies the minimum performance standard stated in § 236.909.

(2) The Associate Administrator for Safety considers the following applicable factors when evaluating the risk assessment:

(i) The extent to which recognized standards have been utilized in product design and in the relevant safety analysis;

(ii) The availability of quantitative data, including calculations of statistical confidence levels using accepted methods, associated with risk estimates;

(iii) The complexity of the product and the extent to which it will incorporate or deviate from design practices associated with previously established histories of safe operation;

(iv) The degree of rigor and precision associated with the safety analyses, including the comprehensiveness of the qualitative analyses, and the extent to which any quantitative results realistically reflect appropriate sensitivity cases;

(v) The extent to which validation of the product has included experiments and tests to identify uncovered faults in the operation of the product;

(vi) The extent to which identified faults are effectively addressed;

(vii) Whether the risk assessment for the previous condition was conducted using the same methodology as that for operation under the proposed condition; and

(viii) If an independent third-party assessment is required or is performed at the election of the supplier or railroad, the extent to which the results of the assessment are favorable.

(3) The Associate Administrator for Safety also considers when assessing PSPs the safety requirements for the product within the context of the proposed method of operations, including:

(i) The degree to which the product is relied upon as the primary safety system for train operations; and

(ii) The degree to which the product is overlaid upon and its operation is demonstrated to be independent of safety-relevant rules, practices and systems that will remain in place following the change under review.

(4) As necessary to ensure compliance with this subpart and with the RSPP, FRA may attach special conditions to the approval of the petition.

(5) Following the approval of a petition, FRA may reopen consideration of the petition for cause. Cause for reopening a petition includes such circumstances as a credible allegation of error or fraud, assumptions determined to be invalid as a result of in-service experience, or one or more unsafe events calling into question the safety analysis underlying the approval.

(h) *Under what circumstances may a third-party assessment be required, and by whom may it be conducted?* (1) The PSP must be supported by an independent third party assessment of the product when FRA concludes it is necessary based upon consideration of the following factors:

(i) Those factors listed in paragraphs (g)(2)(i) through (g)(2)(vii) of this section;

(ii) The sufficiency of the assessment or audit previously conducted at the election of a supplier or railroad; and

(iii) Whether applicable requirements of subparts A through G of this part are satisfied.

(2) As used in this section, "independent third party" means a technically competent entity responsible to and compensated by the railroad (or an association on behalf of one or more railroads) that is independent of the supplier of the product. An entity that is owned or controlled by the supplier, that is under common ownership or control with the supplier, or that is otherwise involved in the development of the product is not considered "independent" within the meaning of this section. FRA may maintain a roster of recognized technically competent entities as a service to railroads selecting reviewers under this section; however, a railroad is not limited to entities currently listed on any such roster.

(3) The third-party assessment must, at a minimum, consist of the activities and result in production of documentation meeting the requirements of Appendix D to this part. However, when requiring an assessment pursuant to this section, FRA specifies any requirements in Appendix D to this part which the agency has determined are not relevant to its concerns and, therefore, need not be included in the assessment. The railroad shall make the final assessment report available to FRA upon request.

(i) *How may a PSP be amended?* A railroad may submit an amendment to a PSP at any time in the same manner as the initial PSP. Notwithstanding the otherwise applicable requirements found in this section and § 236.915, changes affecting the safety-critical functionality of a product may be made prior to the submission and approval of the PSP amendment as necessary in order to mitigate risk.

(j) *How may field testing be conducted prior to PSP approval?* (1) Field testing of a product may be conducted prior to the approval of a PSP by the submission of an informational filing by a railroad. The FRA will arrange to monitor the tests based on the information provided in the filing, which must include:

- (i) A complete description of the product;
- (ii) An operational concepts document;
- (iii) A complete description of the specific test procedures, including the measures that will be taken to protect trains and on-track equipment;
- (iv) An analysis of the applicability of the requirements of subparts A through G of this part to the product that will not apply during testing;
- (v) The date testing will begin;
- (vi) The location of the testing; and
- (vii) A description of any effect the testing will have on the current method of operation.

(2) FRA may impose such additional conditions on this testing as may be necessary for the safety of train operations. Exemptions from regulations other than those contained in this part must be requested through waiver procedures in part 211 of this chapter.

#### Application:

With the exception of subsections (a), (f), and (j), the majority of this section is not applicable to field inspectors. The regulations in this section describe the railroad's requirements for notifying FRA of its preparation of a PSP to ensure compliance with procedures established in their RSPP, and the requirements of this subpart.

Paragraph (a) establishes a requirement for preparation of a PSP for each product covered by this subpart, and discusses the circumstances under which a joint PSP must be prepared. A joint PSP must be prepared when (1) the territory on which a product covered by the subpart is normally subject to joint operations, or is operated upon by more than one railroad; and (2) the PSP involves a change in the method of operations. Inspectors must be aware of the conditions that apply to the PSP. Unless specifically approved in the PSP, joint operations, or changes in the method of operation are not permitted. These are considered violations. Inspectors discovering these should disallow operations and advise headquarters staff.

Paragraph (f) allows railroads to file petitions for approval prior to field-testing and validation of the product. (See also paragraph (j) below.) If FRA approves the petition, the railroad may conduct testing operations using the system in question. These operations are considered temporary (pending submission and approval of the railroad's PSP). Inspectors should verify that the railroad is not operating revenue trains under such an approval condition. If this is the case, then a violation has occurred.



FRA approval is necessary where the railroad seeks to test any product for which it would otherwise be required to seek a waiver for exemption of specific Part 236 regulations. For instance, when field-testing of the product will involve direct interface with train crewmembers, there may be a requirement for some control mechanisms to be in place. In addition, railroads will likely need to test products for operational concepts and safety-critical consideration of the product prior to implementation.

Paragraph (j) identifies procedures for obtaining FRA approval to field test a Subpart H product. The information required for this filing, as described in paragraphs (j)(1)(i)–(j)(1)(vii), are necessary in order for FRA to make informed decisions regarding the safety of testing operations. This provides a simplified mechanism for exemptions of necessary portions of Part 236. Exemptions from regulations other than those contained in Part 236 must be sought under waiver procedures contained in Part 211, FRA’s Rules of Practice.

This rule states that FRA may impose conditions on field tests to assure safety of train operations. Such testing may implicate other safety issues, including adequacy of warning at highway-rail grade crossings (including Part 234 compliance), qualification of passenger equipment (Part 238), sufficiency of the track structure to support higher speeds or unbalance, and a variety of other safety issues, not all of which can be anticipated in any special approval procedure. “Clearing the railroad” for the test train answers only a portion of these issues.

Inspectors may be asked to participate in this pre-implementation testing. If not, they should be aware of this testing and any temporary relief from the regulations granted to the railroad. If particular regulatory relief has not been granted, then the inspector should take action (as appropriate) in the instance of noncompliance being found. Similarly, if the railroad is found to be conducting test operations, and cannot demonstrate receipt of FRA approval, testing should be halted until FRA approval is obtained.

## CLASSIFICATION OF DEFECTS

236.913.A1 Failure to prepare a PSP or PSP amendment as required.

236.913.B1 Failure to submit a PSP or PSP amendment as required.

236.913.C1 Failure to submit an informational filing as required.

236.913.J1 Field testing without authorization or approval as required.

### **§ 236.915 Implementation and operation.**

*(a) When may a product be placed or retained in service?* (1) Except as stated in paragraphs (a)(2) and (a)(3) of this section, a railroad may operate in revenue service any product 180 days after filing with FRA the informational filing for that product. The FRA filing date can be found in FRA’s acknowledgment letter referred to in § 236.913(c)(2).

(2) Except as stated in paragraph (a)(3) of this section, if FRA approval is required for a product, the railroad shall not operate the product in revenue service until after the Associate Administrator for Safety has approved the petition for approval for that product pursuant to § 236.913.

(3) If after product implementation FRA elects, for cause, to treat the informational filing for the product as a petition for approval, the product may remain in use if otherwise consistent with the applicable law and regulations. FRA may impose special conditions for use of the product during the period of review for cause.

(b) *How does the PSP relate to operation of the product?* Each railroad shall comply with all provisions in the PSP for each product it uses and shall operate within the scope of initial operational assumptions and predefined changes identified by the PSP. Railroads may at any time submit an amended PSP according to the procedures outlined in § 236.913.

(c) *What precautions must be taken prior to interference with the normal functioning of a product?* The normal functioning of any safety-critical product must not be interfered with in testing or otherwise without first taking measures to provide for safe movement of trains, locomotives, roadway workers and on-track equipment that depend on normal functioning of such product.

(d) *What actions must be taken immediately upon failure of a safety-critical component?* When any safety-critical product component fails to perform its intended function, the cause must be determined and the faulty component adjusted, repaired, or replaced without undue delay. Until repair of such essential components are completed, a railroad shall take appropriate action as specified in the PSP. See also §§ 236.907(d) and 236.917(b).

#### Application:

Paragraph (a) establishes requirements relating to when products may be implemented and used in revenue service. Paragraph (a)(1) discusses the standard for products which do not require FRA approval, but rather an informational filing. Paragraph (a)(2) addresses the standard for products which require that a petition for approval be submitted to FRA for approval. Such products shall not be used in revenue service prior to FRA approval.

Paragraph (a)(3) excepts from the requirements of paragraphs (a)(1) and (a)(2) those products for which an informational filing had been filed initially, then FRA elected after implementation to treat the filing as a petition for approval. In the case where FRA chooses to treat an informational filing as a petition for approval after implementation, “for cause” is not intended to be restricted to the same interpretation given in § 236.913(c) for “good cause.” FRA envisions that cause for review after implementation will more likely be related to actual in-service performance than initial design safety considerations.

Paragraph (b) establishes a requirement that railroads will not exceed maximum volumes, speeds, or any other parameter limit provided for in the PSP. On the other hand, a PSP could be based upon speed/volume parameters that are broader than the intended initial application, so long as the full range of sensitivity analyses are included in the supporting risk assessment. FRA feels this requirement will help ensure that comprehensive product risk assessments are performed before products are implemented. This paragraph also makes allowance for amendment of PSPs even after implementation. Railroads indicated they will need the ability to amend PSPs to correct initial assumptions after implementation. Furthermore, railroads feel that if operating conditions for which a product was designed are no longer applicable and safety levels have not been reduced, the necessary corresponding PSP amendments should be allowed. FRA agrees that a mechanism must be available to handle this kind of circumstance, but of course the degree of scrutiny afforded the amendment would depend upon the specific risk profile of the proposed change.



Paragraph (c) requires that each railroad ensure the integrity of a processor-based system not be compromised, by prohibiting the normal functioning of such system to be interfered with by testing or otherwise without first taking measures to provide for the safety of train movements, roadway workers, and on-track equipment that depend on the normal functioning of the system. This provision parallels current § 236.4, which applies to all devices. By requiring this paragraph, FRA merely intends to clarify that the standard in current § 236.4 applies to Subpart H products.

Paragraph (d) requires, in the event of the failure of a component essential to the safety of a processor-based system to perform as intended, that the cause be identified and corrective action taken without undue delay. The paragraph also requires that, until repair is completed, the railroad be required to take appropriate measures to assure the safety of train movements, roadway workers, and on-track equipment. This requirement mirrors current requirement § 236.11, which applies to all signal system components.

#### CLASSIFICATION OF DEFECTS

- 236.915.A1    Operation of a product without authorization or approval as required.
- 236.915.B1    Failure to comply with the PSP as required.
- 236.915.C1    Interference with the normal functioning of a safety-critical product without first taking necessary safety measures as required.
- 236.915.D1    Failure to determine the cause of any safety-critical product component failure, and to adjust, repair, or replace the faulty component without undue delay.
- 236.915D2    Until repair of faulty component is completed, failure to appropriate action as specified in the PSP.

#### **§ 236.917 Retention of records.**

(a) *What life-cycle and maintenance records must be maintained?* (1) The railroad shall maintain at a designated office on the railroad:

(i) For the life-cycle of the product, adequate documentation to demonstrate that the PSP meets the safety requirements of the railroad's RSPP and applicable standards in this subpart, including the risk assessment;

(ii) An Operations and Maintenance Manual, pursuant to § 236.919; and

(iii) Training records pursuant to § 236.923(b).

(2) Results of inspections and tests specified in the PSP must be recorded as prescribed in § 236.110.

(3) Contractors of the railroad shall maintain at a designated office training records pursuant to § 236.923(b).

(b) *What actions must the railroad take in the event of occurrence of a safety-relevant hazard?* After the product is placed in service, the railroad shall maintain a database of all safety-relevant hazards as set forth in the PSP and those that had not been previously identified in the PSP. If the frequency of the safety-relevant hazards exceeds the threshold set forth in the PSP (see § 236.907(a)(6)), then the railroad shall:

(1) Report the inconsistency in writing (by mail, facsimile, e-mail, or hand delivery to the Director, Office of Safety Assurance and Compliance, FRA, 1120 Vermont Ave., N.W., Mail Stop 25, Washington, D.C. 20590, within 15 days of discovery. Documents that are hand delivered must not be enclosed in an envelope.

(2) Take prompt countermeasures to reduce the frequency of the safety-relevant hazard(s) below the threshold set forth in the PSP; and

(3) Provide a final report to the FRA Director, Office of Safety Assurance and Compliance, on the results of the analysis and countermeasures taken to reduce the frequency of the safety-relevant hazard(s) below the threshold set forth in the PSP when the problem is resolved.

#### Application:

The railroad is required to maintain adequate documentation to demonstrate that the PSP meets the safety requirements of the RSPP and applicable standards in this subpart, including the risk assessment, and that the product conforms to the PSP.

All the documents and records required by this section must be maintained at a designated office on the railroad. All documents and records must be available for FRA inspection and copying during normal business hours. The following records are required to be maintained:

- The product Operations and Maintenance Manual, as described in § 236.919 for the product life-cycle (i.e., the point where the product has been permanently and completely removed from operational service anywhere on the railroad).
- Railroad training records which designate persons who are qualified under § 236.923(b) until new designations are recorded or for at least one year after such persons leave applicable service.
- Implementation, maintenance, inspection, and testing records (as described in § 236.907(a)(18)(ii)) be recorded as prescribed in § 236.110.
- Contractors training records at a designated office which designate persons who are qualified under § 236.923. Contractors training records are subject to the same provisions as those for railroads.

Inspectors should have access to these documents. If the railroad asserts that they are not available locally to the inspector, the inspector should contact the supervisory specialist in the region where the documents are held, or headquarters staff. The same criteria used for document inspection associated with Subparts A through G are applicable.

After the product is placed in service, railroads must maintain a database of safety-relevant hazards as described in § 236.907(a)(6), which occur or are discovered on the product. This database information shall also be available for inspection and replication by FRA and FRA certified State inspectors, during normal business hours.

Inspectors should also have access to these documents. If the railroad asserts that they are not available locally to the inspector, the inspector should contact the supervisory specialist in the region where the documents are held, or headquarters staff. The same criteria used for document inspection associated with Subparts A through G are applicable.

If an inspector discovers the frequency of occurrence for a safety-relevant hazard exceeds the threshold value provided in its PSP, prompt countermeasures are required to have been made by the railroad to reduce the frequency of the safety-relevant hazards or eliminate the hazard. There may be situations where reducing the severity of such hazards will suffice for an equivalent reduction in risk. For example, reducing operating speed may not reduce the frequency of certain hazards involving safety-critical products, but it would in most cases reduce the severity of such hazards.

Upon discovery of a hazard exceeding the PSP threshold, inspectors should verify that the railroad has reported the hazard occurrence to FRA within 15 days. FRA currently allows faxing or emailing of reports required by §§ 233.7 and 234.9, involving signal failure and grade crossing signal system failure, respectively. This is extended to include products covered by Subpart H. The failure reports may be in writing by mail, facsimile, email, messenger, or hand delivery. Documents that are hand delivered to FRA must not be enclosed in an envelope, as all envelopes are required to be routed through the DOT mailroom.

Inspectors should also verify that the railroad has provided a final report on how a safety-relevant hazard was corrected or mitigated.

The scope and difficulty of undertaking these actions could vary dramatically. In some cases, an adequate response could be completed within days. In other cases the total response could take years, even with prompt, deliberate action. If the actions were to take a significant time, FRA would expect the railroad to make progress reports to FRA. The reporting requirement of § 236.917(b) is not intended to excuse lack of compliance with current reporting requirements of Part 233. In the case of a false proceed signal failure, FRA would not expect the railroad to wait for the frequency of such occurrences to exceed the threshold reporting level assigned in the hazard log. Rather, current § 233.7 requires all such instances to be reported.

## CLASSIFICATION OF DEFECTS

- 236.917.A1 Failure to maintain records as required.
- 236.917.B1 Failure to maintain a database of all safety-relevant hazards as required.
- 236.917.B2 Failure to report to the FRA the frequency of safety-relevant hazards exceeding the threshold set forth in the PSP.
- 236.917.B3 Failure to take prompt countermeasures to reduce the frequency of safety-relevant hazards below the threshold set forth in the PSP.
- 236.917.B4 Failure to provide final report to the FRA on the results of the analysis and countermeasures taken when the problem is resolved.

### **§ 236.919 Operations and Maintenance Manual.**

(a) The railroad shall catalog and maintain all documents as specified in the PSP for the installation, maintenance, repair, modification, inspection, and testing of the product and have them in one Operations and Maintenance Manual, readily available to persons required to perform such tasks and for inspection by FRA and FRA-certified State inspectors.

(b) Plans required for proper maintenance, repair, inspection, and testing of safety-critical products must be adequate in detail and must be made available for inspection by FRA and FRA-certified State inspectors where such products are deployed or maintained. They must identify all software versions, revisions, and revision dates. Plans must be legible and correct

(c) Hardware, software, and firmware revisions must be documented in the Operations and Maintenance Manual according to the railroad's configuration management control plan and any additional configuration/revision control measures specified in the PSP.

(d) Safety-critical components, including spare equipment, must be positively identified, handled, replaced, and repaired in accordance with the procedures specified in the PSP

#### Application:

This section works with §§ 236.815, 236.905, and 236.907 that require all specified documentation contained in the PSP necessary for the installation, repair, modification, and testing of a product be placed in an Operations and Maintenance Manual for that product and be made available to both persons required to perform such tasks and to FRA.

The Operations and Maintenance Manual includes the requirement that plans necessary for proper maintenance and testing of products be correct, legible, and available where such systems are deployed or maintained, and that they identify the hardware, software, and firmware revisions in accordance with the configuration management requirements specified in the PSP.

This manual should be available to the inspector at all times.

The railroad should be able to demonstrate to the inspector that safety-critical components contained in processor-based systems, including spare equipment, be identified, replaced, handled, and repaired in accordance with the configuration management requirements specified in the PSP.

An electronic format is an appropriate medium for such a manual. Electronic copies of the manual should be maintained in the same manner as other electronic records, and the manual is required to be included in the railroad's configuration management plan (with the master copy and dated amendments carefully maintained so that the status of instructions to the field, as of any given date, can be readily determined).

### CLASSIFICATION OF DEFECTS

236.919.A1 Failure to catalog and maintain all documents specified in the PSP in one operations and maintenance manual.

236.919.A2 Operations and maintenance manual not readily available to those performing the tasks.

236.919.A3 Operations and maintenance manual not readily available for inspection by FRA or FRA-certified State inspectors.

#### **§ 236.921 Training and qualification program, general.**

(a) *When is training necessary and who must be trained?* Employers shall establish and implement training and qualification programs for products subject to this subpart. These

programs must meet the minimum requirements set forth in the PSP and in §§ 236.923 through 236.929 as appropriate, for the following personnel:

(1) Persons whose duties include installing, maintaining, repairing, modifying, inspecting, and testing safety-critical elements of the railroad's products, including central office, wayside, or onboard subsystems;

(2) Persons who dispatch train operations (issue or communicate any mandatory directive that is executed or enforced, or is intended to be executed or enforced, by a train control system subject to this subpart);

(3) Persons who operate trains or serve as a train or engine crewmember subject to instruction and testing under part 217 of this chapter, on a train operating in territory where a train control system subject to this subpart is in use;

(4) Roadway workers whose duties require them to know and understand how a train control system affects their safety and how to avoid interfering with its proper functioning; and

(5) The direct supervisors of persons listed in paragraphs (a)(1) through (a)(4) of this section.

(b) *What competencies are required?* The employer's program must provide training for persons who perform the functions described in paragraph (a) of this section to ensure that they have the necessary knowledge and skills to effectively complete their duties related to processor-based signal and train control equipment.

#### Application:

This section sets forth the general requirements of an employer's training and qualification programs related to safety-critical processor-based signal and train control products. The term "employer" means a railroad, a contractor, or a supplier whose employees are performing the duties described in Paragraphs (a)(1) through (a)(5). Training programs must meet the minimum requirements listed in §§ 236.923 through 236.929, as appropriate, and any more stringent requirements identified within the PSP for the product. Persons cited in paragraph (a) must be trained to the appropriate degree to ensure that they have the necessary knowledge and skills to effectively complete their duties related to operation and maintenance of products. The program will provide training for persons whose duties include inspecting, testing, maintaining, or repairing elements of a railroad's safety-critical processor-based signal and train control systems, including central office, wayside, or onboard subsystems. In addition, it will include training required for personnel dispatching and operating trains in territory where advanced train control is in use, and for roadway workers whose duties require knowledge and understanding of the operating rules within the system. Finally, it will include supervisors of the foregoing persons.

Railroads are responsible for training their own employees. Contractors, including suppliers whose employees are performing the duties described in this section, are also responsible for training their own employees. In short, employers are responsible for having their employees who perform work covered by this section trained and qualified.

If FRA finds untrained contractors performing work that requires training, both the contractor and railroad may potentially be subject to civil penalty enforcement activity. Railroads should provide proof that contractors have training programs that comply with this section and that the contractors are using trained and qualified personnel to perform work on a railroad's processor-based safety-critical signal and train control products. If FRA finds untrained contractor employees conducting work which requires training, FRA can take enforcement action against both the contractor and the railroad. If the railroad has placed a clear contractual responsibility on the provider of services to train personnel and maintain appropriate records, FRA would

normally proceed first against the contractor. In any event, FRA will expect to see prompt corrective action.

## CLASSIFICATION OF DEFECTS

- 236.921.A1 Failure to establish and implement training and qualification programs for products subject to subpart H, meeting minimum requirements for required personnel.
- 236.921.B1 Failure to provide training to employees to ensure they have the necessary knowledge and skills to effectively complete their duties related to processor-based signal and train control equipment.

### § 236.923 Task analysis and basic requirements.

(a) *How must training be structured and delivered?* As part of the program required by § 236.921, the employer shall, at a minimum:

(1) Identify the specific goals of the training program with regard to the target population (craft, experience level, scope of work, etc.), task(s), and desired success rate;

(2) Based on a formal task analysis, identify the installation, maintenance, repair, modification, inspection, testing, and operating tasks that must be performed on a railroad's products. This includes the development of failure scenarios and the actions expected under such scenarios;

(3) Develop written procedures for the performance of the tasks identified;

(4) Identify the additional knowledge, skills, and abilities above those required for basic job performance necessary to perform each task;

(5) Develop a training curriculum that includes classroom, simulator, computer-based, hands-on, or other formally structured training designed to impart the knowledge, skills, and abilities identified as necessary to perform each task;

(6) Prior to assignment of related tasks, require all persons mentioned in § 236.921(a) to successfully complete a training curriculum and pass an examination that covers the product and appropriate rules and tasks for which they are responsible (however, such persons may perform such tasks under the direct onsite supervision of a qualified person prior to completing such training and passing the examination);

(7) Require periodic refresher training at intervals specified in the PSP that includes classroom, simulator, computer-based, hands-on, or other formally structured training and testing, except with respect to basic skills for which proficiency is known to remain high as a result of frequent repetition of the task; and

(8) Conduct regular and periodic evaluations of the effectiveness of the training program specified in § 236.923(a)(1) verifying the adequacy of the training material and its validity with respect to current railroads products and operations

(b) *What training records are required?* Employers shall retain records which designate persons who are qualified under this section until new designations are recorded or for at least one year after such persons leave applicable service. These records shall be kept in a designated location and be available for inspection and replication by FRA and FRA-certified State inspector.

### Application:

This section amplifies on the requirements of § 236.921 of what the inspector should expect to observe when examining a railroad's training program. While an inspector may find a variety of curriculum which includes either classroom, hands-on, or other formally structured training designed to impart the knowledge and skills necessary to perform each task, the required task analysis will tailor each program to the needs of the particular system to which it applies. The training program will identify inspection, testing, maintenance, repairing, dispatching, and operating tasks for signal and train control equipment and develop written procedures for performance of those tasks.

The target population is identified in § 236.921(a)(1) through (a)(5). Training programs must be specifically tailored to each category of employee required to be trained and must meet the minimum requirements listed in §§ 236.923 through 236.929, as appropriate, and any more stringent requirements in the PSP for the product.

Managers and supervisors must be trained to carry out the functions their duties require. If a direct supervisor is in a position where he or she may have to fulfill the responsibilities or duties of a subordinate, he or she must have the requisite knowledge and training to do so. If, however, a manager or supervisor will likely never need to fulfill the duties of a subordinate, and that person is not expected to provide technical oversight for certain functions, he or she may not need to be trained on those functions.

All persons subject to training requirements and their direct supervisors must successfully complete the training curriculum and pass an examination for the tasks for which they are responsible. For example, a person who operates a train would not require training on how to inspect, test, or maintain the equipment unless the person was also assigned to perform those tasks. Generally, appropriate training must be given to each of these employees prior to task assignment. However, an employee may be allowed to perform a task for which that person has not received the appropriate training only if the employee does so under the direct, onsite supervision of a qualified person. Direct supervisor is intended to mean the immediate, first-level supervisor to whom the employee reports.

Periodic refresher training is to be conducted at intervals specified in the PSP. This periodic training must include either classroom, hands-on, computer-based training, or other formally structured training in order that railroad employees and contractor employees maintain the knowledge and skills.

There is a requirement to compare actual and desired success rates for the examination. The objective of this requirement is twofold. The first is to determine if the training program materials and curriculum are imparting the specific knowledge, skills, and abilities to accomplish the stated goals of the training program. The second is to determine if the stated goals of the training program reflect the correct and current products and operations.

Ongoing regular verification of the results of the training process is required to ensure that the training program materials and curriculum are relevant, the learning objectives are being met, and the necessary knowledge, skills, and abilities are actually being imparted. Without regular feedback, verification and validation (and if necessary, adjustments, to ensure the necessary relevancy and effectiveness) cannot occur.



Railroads will maintain railroad employee training records. Contractors, including suppliers, must maintain records on contractor employees who perform work covered by this section. FRA expects to have access to the training records of contractor and supplier employees whose work functions are covered by the training requirements of this section. If FRA cannot attain access to such records, the railroad, and the contractor or supplier, may be subject to civil penalty enforcement activity.

These records must be kept until new designations are recorded or for at least 1 year after such persons leave applicable service, and must be available for FRA inspection and copying.

## CLASSIFICATION OF DEFECTS

236.923.A1 Failure to develop an acceptable training program as required.

236.923.A2 Failure to train persons as required.

236.923.A3 Failure to conduct evaluation of training program as required.

236.923.B1 Failure to maintain training program records as required.

### **§ 236.925 Training specific to control office personnel.**

Any person responsible for issuing or communicating mandatory directives in territory where products are or will be in use must be trained in the following areas, as applicable:

(a) Instructions concerning the interface between the computer-aided dispatching system and the train control system, with respect to the safe movement of trains and other on-track equipment;

(b) Railroad operating rules applicable to the train control system, including provision for movement and protection of roadway workers, unequipped trains, trains with failed or cut-out train control onboard systems, and other on-track equipment; and

(c) Instructions concerning control of trains and other on-track equipment in case the train control system fails, including periodic practical exercises or simulations, and operational testing under part 217 of this chapter to ensure the continued capability of the personnel to provide for safe operations under the alternative method of operation

#### Application:

This section identifies to the inspector additional specialized training that must be provided to employees responsible for issuing or communicating mandatory directives. The training must include instructions concerning the interface between computer-aided dispatching systems and processor-based train control systems as applicable to the safe movement of trains and other on-track equipment.

The training must also include operating rules that pertain to the train control system, including the provision for moving unequipped trains and trains on which the train control system has failed or been cut-out en route, rules and procedures for the protection of roadway workers and equipment, and instructions when a train control system fails. This rule also requires periodic



practical exercises or simulations and operational testing under Part 217 to assure that personnel are capable of providing for safe operations under alternative operating methods.

## CLASSIFICATION OF DEFECTS

236.925.A1 Failure to provide training specific to control office personnel as required.

### § 236.927 Training specific to locomotive engineers and other operating personnel.

(a) *What elements apply to operating personnel?* Training provided under this subpart for any locomotive engineer or other person who participates in the operation of a train in train control territory must be defined in the PSP and the following elements must be addressed:

(1) Familiarization with train control equipment onboard the locomotive and the functioning of that equipment as part of the system and in relation to other onboard systems under that person's control;

(2) Any actions required of the onboard personnel to enable, or enter data to, the system, such as consist data, and the role of that function in the safe operation of the train;

(3) Sequencing of interventions by the system, including pre-enforcement notification, enforcement notification, penalty application initiation and post-penalty application procedures;

(4) Railroad operating rules applicable to the train control system, including provisions for movement and protection of any unequipped trains, or trains with failed or cut-out train control onboard systems and other on-track equipment;

(5) Means to detect deviations from proper functioning of onboard train control equipment and instructions regarding the actions to be taken with respect to control of the train and notification of designated railroad personnel; and

(6) Information needed to prevent unintentional interference with the proper functioning of onboard train control equipment.

(b) *How must locomotive engineer training be conducted?* Training required under this subpart for a locomotive engineer, together with required records, must be integrated into the program of training required by part 240 of this chapter.

(c) *What requirements apply to full automatic operation?* The following special requirements apply in the event a train control system is used to effect full automatic operation of the train:

(1) The PSP must identify all safety hazards to be mitigated by the locomotive engineer.

(2) The PSP must address and describe the training required with provisions for the maintenance of skills proficiency. As a minimum, the training program must:

(i) As described in § 236.923(a)(2), develop failure scenarios which incorporate the safety hazards identified in the PSP, including the return of train operations to a fully manual mode;

(ii) Provide training, consistent with § 236.923(a), for safe train operations under all failure scenarios and identified safety hazards that affect train operations;

(iii) Provide training, consistent with § 236.923(a), for safe train operations under manual control; and

(iv) Consistent with § 236.923(a), ensure maintenance of manual train operating skills by requiring manual starting and stopping of the train for an appropriate number of trips and by one or more of the following methods:

(A) Manual operation of a train for a 4-hour work period;

(B) Simulated manual operation of a train for a minimum of 4 hours in a Type I simulator as required; or

(C) Other means as determined following consultation between the railroad and designated

representatives of the affected employees and approved by the FRA. The PSP must designate the appropriate frequency when manual operation, starting, and stopping must be conducted, and the appropriate frequency of simulated manual operation.

#### Application:

This section identifies to the inspector additional specialized training that must be provided to locomotive engineers and other operating personnel who interact with processor-based train control systems. “Other operating personnel” means onboard train and engine crewmembers (i.e., conductors, brakemen, and assistant engineers). With respect to certified locomotive engineers, the training requirements of this section must be integrated into the training requirements of 49 CFR Part 240.

The training must contain familiarization with the onboard processor-based equipment and the functioning of that equipment as part of a train control system and its relationship to other onboard systems under that person’s control. The program must, at a minimum, address all the topics identified in paragraphs (a)(1) through (a)(6). The training program must also cover all notifications by the system (i.e., onboard displays) and actions or responses to such notifications required by onboard personnel, safety hazards to be mitigated by the locomotive engineer, as well as how each action or response ensures proper operation of the system and safe operation of the train.

Each railroad has the flexibility to develop its locomotive engineer training program to be applicable to the particular system being installed by that railroad. FRA recognizes that there is no one curriculum across the board that will generally satisfy the locomotive engineer training requirements. As with the general training requirements, the requisite task analysis will be specific to the functions of the system or systems of each railroad. The training requirements can be worked out individually among the railroad and its labor representatives, subject to approval of the FRA. In all cases, the PSP must define the appropriate training intervals for these tasks.

### CLASSIFICATION OF DEFECTS

236.927.A1 Failure to provide training specific to locomotive engineers and other operating personnel as required.

#### **§ 236.929 Training specific to roadway workers.**

*(a) How is training for roadway workers to be coordinated with part 214?* Training required under this subpart for a roadway worker must be integrated into the program of instruction required under part 214, subpart C of this chapter (“Roadway Worker Protection”), consistent with task analysis requirements of § 236.923. This training must provide instruction for roadway workers who provide protection for themselves or roadway work groups.

*(b) What subject areas must roadway worker training include?* (1) Instruction for roadway workers must ensure an understanding of the role of processor-based signal and train control equipment in establishing protection for roadway workers and their equipment.

(2) Instruction for roadway workers must ensure recognition of processor-based signal and train control equipment on the wayside and an understanding of how to avoid interference with its proper functioning.

(3) Instructions concerning the recognition of system failures and the provision of alternative methods of on-track safety in case the train control system fails, including periodic practical

exercises or simulations and operational testing under part 217 of this chapter to ensure the continued capability of roadway workers to be free from the danger of being struck by a moving train or other on-track equipment.

Application:

This section identifies to the inspector additional specialized training that must be provided to roadway workers and other maintenance-of-way personnel and as it associates with the program of instruction required under Part 214, Subpart C, Roadway Worker Protection. This training is designed to provide instruction for workers who obtain protection for roadway work groups or themselves.

The training must include instruction to ensure (1) an understanding of the role of a processor-based train control system in establishing protection for workers and their equipment (whether at a work zone or while moving on-track between work locations), (2) recognition of processor-based signal and train control equipment on the wayside, and (3) an understanding of how to avoid interference with its proper functioning. This section also requires training on procedures during abnormal operations such as system failures, the operation of unequipped trains, or the operation of a train with failed or cut-out onboard equipment. Roadway workers, uniquely situated out on the right-of-way, are at risk of being struck by trains and on-track equipment. Given the potential for exposure to extreme peril, specific and periodic drills on that training is required.

#### CLASSIFICATION OF DEFECTS

236.929.A1 Failure to provide training specific to roadway workers as required.

### **Subpart I – Positive Train Control Systems**

#### **§ 236.1001 Purpose and scope.**

(a) This subpart prescribes minimum, performance-based safety standards for PTC systems required by 49 U.S.C. 20157, this subpart, or an FRA order, including requirements to ensure that the development, functionality, architecture, installation, implementation, inspection, testing, operation, maintenance, repair, and modification of those PTC systems will achieve and maintain an acceptable level of safety. This subpart also prescribes standards to ensure that personnel working with, and affected by, safety-critical PTC system related products receive appropriate training and testing.

(b) Each railroad may prescribe additional or more stringent rules, and other special instructions, that are not inconsistent with this subpart.

(c) This subpart does not exempt a railroad from compliance with any requirement of subparts A through H of this part or parts 233, 234, and 235 of this chapter, unless:

(1) It is otherwise explicitly excepted by this subpart; or

(2) The applicable PTCSP, as defined under § 236.1003 and approved by FRA under § 236.1015, provides for such an exception per § 236.1013.

## Application:

This section describes both the purpose and the scope of Subpart I. Subpart I provides performance-based regulations for the development, test, installation, and maintenance of PTC systems, and the associated personnel training requirements, that are mandated for installation by FRA. This subpart details the process and identifies the documents that railroads and operators of passenger trains are to use and incorporate in their PTC implementation plans. This subpart also details the process and procedure for obtaining FRA approval of such plans.

## CLASSIFICATION OF DEFECTS

§ 236.1001.B1 Railroad prescribed more stringent rules that are inconsistent with this subpart.

§ 236.1001.B2 Railroad prescribed more stringent special instructions that are inconsistent with this subpart.

### **§ 236.1003 Definitions.**

(a) Definitions contained in subparts G and H of this part apply equally to this subpart.

(b) The following definitions apply to terms used only in this subpart unless otherwise stated:

*After-arrival mandatory directive* means an authority to occupy a track which is issued to a train that is not effective and not to be acted upon until after the arrival and passing of a train, or trains, specifically identified in the authority.

*Associate Administrator* means the FRA Associate Administrator for Railroad Safety/Chief Safety Officer.

*Class I railroad* means a railroad which in the last year for which revenues were reported exceeded the threshold established under regulations of the Surface Transportation Board (49 CFR part 1201.1-1 (2008)).

*Cleartext* means the un-encrypted text in its original, human readable, form. It is the input of an encryption or encipher process, and the output of an decryption or decipher process.

*Controlling locomotive* means Locomotive, controlling, as defined in § 232.5 of this chapter.

*Host railroad* means a railroad that has effective operating control over a segment of track.

*Interoperability* means the ability of a controlling locomotive to communicate with and respond to the PTC railroad's positive train control system, including uninterrupted movements over property boundaries.

*Limited operations* means operations on main line track that have limited or no freight operations and are approved to be excluded from this subpart's PTC system implementation and operation requirements in accordance with § 236.1019(c);

*Main line* means, except as provided in § 236.1019 or where all trains are limited to restricted speed within a yard or terminal area or on auxiliary or industry tracks, a segment or route of railroad tracks:

(1) Of a Class I railroad, as documented in current timetables filed by the Class I railroad with the FRA under § 217.7 of this title, over which 5,000,000 or more gross tons of railroad traffic is transported annually; or

(2) Used for regularly scheduled intercity or commuter rail passenger service, as defined in 49 U.S.C. 24102, or both. Tourist, scenic, historic, or excursion operations as defined in part 238 of this chapter are not considered intercity or commuter passenger service for purposes of this part.

*Main line track exclusion addendum* (“MTEA”) means the document submitted under § 236.1011 and § 236.1019 requesting to designate track as other than main line.

*Medium speed* means, Speed, medium, as defined in subpart G of this part.

*NPI* means a Notice of Product Intent (“NPI”) as further described in § 236.1013.

*PTC* means positive train control as further described in § 236.1005.

*PTCDP* means a PTC Development Plan as further described in § 236.1013.

*PTCIP* means a PTC Implementation Plan as required under 49 U.S.C. 20157 and further described in § 236.1011.

*PTCPVL* means a PTC Product Vendor List as further described in § 236.1023.

*PTCSP* means a PTC Safety Plan as further described in § 236.1015.

*PTC railroad* means each Class I railroad and each entity providing regularly scheduled intercity or commuter rail passenger transportation required to implement or operate a PTC system.

*PTC System Certification* means certification as required under 49 U.S.C. 20157 and further described in §§ 236.1009 and 236.1015.

*Request for Amendment* (“RFA”) means a request for an amendment of a plan or system made by a PTC railroad in accordance with § 236.1021.

*Request for Expedited Certification* (“REC”) means, as further described in § 236.1031, a request by a railroad to receive expedited consideration for PTC System Certification.

*Restricted speed* means, Speed, restricted, as defined in subpart G of this part.

*Safe State* means a system state that, when the system fails, cannot cause death, injury, occupational illness, or damage to or loss of equipment or property, or damage to the environment.

*Segment of track* means any part of the railroad where a train operates.

*Temporal separation* means that passenger and freight operations do not operate on any segment of shared track during the same period and as further defined under § 236.1019 process or processes in place to assure that result.

*Tenant railroad* means a railroad, other than a host railroad, operating on track upon which a PTC system is required.

*Track segment* means segment of track.

*Type Approval* means a number assigned to a particular PTC system indicating FRA agreement that the PTC system could fulfill the requirements of this subpart.

*Train* means one or more locomotives, coupled with or without cars.

### Application:

Where possible and practicable, FRA prefers to provide explicit definitions for terms and concepts rather than rely solely on a shared understanding of a term through use.

## **§ 236.1005 Requirements for Positive Train Control systems.**

(a) *PTC system requirements.* Each PTC system required to be installed under this subpart shall:

(1) Reliably and functionally prevent:

(i) Train-to-train collisions—including collisions between trains operating over rail-to-rail at-grade crossings in accordance with the following risk-based table or alternative arrangements providing an equivalent level of safety as specified in an FRA approved PTCSP:

<b>Crossing Type</b>	<b>Max Speed</b>	<b>Protection Required</b>
(A) Interlocking – one or more PTC routes intersecting with one or more non-PTC routes	≤ 40 miles per hour.....	Interlocking signal arrangement in accordance with the requirements of subparts A-G of this part and PTC enforced stop on PTC routes.
(B) Interlocking – one or more PTC routes intersecting with one or more non-PTC routes	> 40 miles per hour.....	Interlocking signal arrangement in accordance with the requirements of subparts A-G of this part, PTC enforced stop on all PTC routes, and either the use of other than full PTC technology that provides positive stop enforcement or a split-point derail incorporated into the signal system accompanied by 20 miles per hour maximum allowable speed on the approach of any intersecting non-PTC route.
(C) Interlocking – all PTC routes intersecting	Any speed.....	Interlocking signal arrangements in accordance with the requirements of subparts A-G of this part, and PTC enforced stop on all routes.

(ii) Overspeed derailments, including derailments related to railroad civil engineering speed restrictions, slow orders, and excessive speeds over switches and through turnouts;

(iii) Incursions into established work zone limits without first receiving appropriate authority and verification from the dispatcher or roadway worker in charge, as applicable and in accordance with part 214 of this chapter; and

(iv) The movement of a train through a main line switch in the improper position as further described in paragraph (e) of this section.

(2) Include safety-critical integration of all authorities and indications of a wayside or cab signal system, or other similar appliance, method, device, or system of equivalent safety, in a manner by which the PTC system shall provide associated warning and enforcement to the extent, and except as, described and justified in the FRA approved PTCDP or PTCSP, as applicable;

(3) As applicable, perform the additional functions specified in this subpart;

(4) Provide an appropriate warning or enforcement when:

(i) A derail or switch protecting access to the main line required by § 236.1007, or otherwise provided for in the applicable PTCSP, is not in its derailing or protecting position, respectively;

(ii) A mandatory directive is issued associated with a highway-rail grade crossing warning system malfunction as required by §§ 234.105, 234.106, or 234.107;

(iii) An after-arrival mandatory directive has been issued and the train or trains to be waited on has not yet passed the location of the receiving train;

(iv) Any movable bridge within the route ahead is not in a position to allow permissive indication for a train movement pursuant to § 236.312; and



(v) A hazard detector integrated into the PTC system that is required by paragraph (c) of this section, or otherwise provided for in the applicable PTCSP, detects an unsafe condition or transmits an alarm; and

(5) Limit the speed of passenger and freight trains to 59 miles per hour and 49 miles per hour, respectively, in areas without broken rail detection or equivalent safeguards.

(b) *PTC system installation.* (1) *Lines required to be equipped.* Except as otherwise provided in this subpart, each Class I railroad and each railroad providing or hosting intercity or commuter passenger service shall progressively equip its lines as provided in its approved PTCIP such that, on and after December 31, 2015, a PTC system certified under § 236.1015 is installed and operated by the host railroad on each:

(i) Main line over which is transported any quantity of material poisonous by inhalation (PIH), including anhydrous ammonia, as defined in §§ 171.8, 173.115 and 173.132 of this title;

(ii) Main line used for regularly provided intercity or commuter passenger service, except as provided in § 236.1019; and

(iii) Additional line of railroad as required by the applicable FRA approved PTCIP, this subpart, or an FRA order requiring installation of a PTC system by that date.

(2) *Initial baseline identification of lines.* For the purposes of paragraph (b)(1)(i) of this section, the baseline information necessary to determine whether a Class I railroad's track segment shall be equipped with a PTC system shall be determined and reported as follows:

(i) The traffic density threshold of 5 million gross tons shall be based upon calendar year 2008 gross tonnage, except to the extent that traffic may fall below 5 million gross tons for two consecutive calendar years and a PTCIP or an RFA reflecting this change is filed and approved under paragraph (b)(4) of this section and, if applicable, § 236.1021.

(ii) The presence or absence of any quantity of PIH hazardous materials shall be determined by whether one or more cars containing such product(s) was transported over the track segment in calendar year 2008 or prior to the filing of the PTCIP, except to the extent that the PTCIP or RFA justifies, under paragraph (b)(4) of this section, removal of the subject track segment from the PTCIP listing of lines to be equipped.

(3) *Addition of track segments.* To the extent increases in freight rail traffic occur subsequent to calendar year 2008 that might affect the requirement to install a PTC system on any line not yet equipped, the railroad shall seek to amend its PTCIP by promptly filing an RFA in accordance with § 236.1021. The following criteria apply:

(i) If rail traffic exceeds 5 million gross tons in any year after 2008, the tonnage shall be calculated for the preceding two calendar years and if the total tonnage for those two calendar years exceeds 10 million gross tons, a PTCIP or its amendment is required.

(ii) If PIH traffic is carried on a track segment as a result of a request for rail service or rerouting warranted under part 172 of this title, and if the line carries in excess of 5 million gross tons of rail traffic as determined under this paragraph, a PTCIP or its amendment is required. This does not apply when temporary rerouting is authorized in accordance with paragraph (g) of this section.

(iii) Once a railroad is notified by FRA that its RFA filed in accordance with this paragraph has been approved, the railroad shall equip the line with the applicable PTC system by December 31, 2015, or within 24 months, whichever is later.

(4) *Exclusion or removal of track segments from PTC baseline.* (i) *Routing changes.* In a PTCIP or an RFA, a railroad may request review of the requirement to install PTC on a track segment where a PTC system is otherwise required by this section, but has not yet been installed, based upon changes in rail traffic such as reductions in total traffic volume or cessation of passenger or PIH service. Any such request shall be accompanied by estimated traffic projections for the next 5 years (e.g., as a result of planned rerouting, coordinations, or location of new business on the line). Where the request involves prior or planned rerouting of PIH

traffic, the railroad must provide a supporting analysis that takes into consideration the requirements of subpart I, part 172 of this title, assuming the subject route and each practicable alternative route to be PTC-equipped, and including any interline routing impacts.

(A) FRA will approve the exclusion if, based upon data in the docket of the proceeding, FRA finds that it would be consistent with safety as further provided in this paragraph.

(1) In the case of a requested exclusion based on cessation of passenger service or a decline in gross tonnage below 5 million gross tons as computed over a 2-year period, the removal will be approved absent special circumstances as set forth in writing (e.g., because of anticipated traffic growth in the near future).

(2) In the case of current or planned cessation of PIH materials traffic over a track segment, FRA will approve an exclusion of a line from the PTCIP if the railroad satisfies the requirements of § 236.1020.

(B) [Reserved]

(ii) *Lines with de minimis PIH risk.* (A) In a PTCIP or RFA, a railroad may request review of the requirement to install PTC on a low density track segment where a PTC system is otherwise required by this section, but has not yet been installed, based upon the presence of a minimal quantity of PIH hazardous materials (less than 100 cars per year, loaded and residue). Any such request shall be accompanied by estimated traffic projections for the next 5 years (e.g., as a result of planned rerouting, coordinations, or location of new business on the line). Where the request involves prior or planned rerouting of PIH traffic, the railroad must provide the information and analysis identified in paragraph (b)(4)(i) of this section. The submission shall also include a full description of potential safety hazards on the segment of track and fully describe train operations over the line. This provision is not applicable to lines segments used by intercity or commuter passenger service.

(B) Absent special circumstances related to specific hazards presented by operations on the line segment, FRA will approve a request for relief under this paragraph for a rail line segment:

(1) Consisting exclusively of Class 1 or 2 track as described in part 213 of this title;

(2) That carries less than 15 million gross tons annually;

(3) Has a ruling grade of less than 1 percent; and

(4) On which any train transporting a car containing PIH materials (including a residue car) is operated under conditions of temporal separation from other trains using the line segment as documented by a temporal separation plan accompanying the request. As used in this paragraph, “temporal separation” has the same meaning given by § 236.1019(e), except that the separation addressed is the separation of a train carrying any number of cars containing PIH materials from other freight trains.

(C) FRA will also consider, and may approve, requests for relief under this paragraph for additional line segments where each such segment carries less than 15 million gross tons annually and where it is established to the satisfaction of the Associate Administrator that risk mitigations will be applied that will ensure that risk of a release of PIH materials is negligible.

(D) Failure to submit sufficient information will result in the denial of any request under this paragraph (b)(4)(ii). If the request is granted, on and after the date the line would have otherwise been required to be equipped under the schedule contained in the PTCIP and approved by FRA, operations on the line shall be conducted in accordance with any conditions attached to the grant, including implementation of proposed mitigations as applicable.

(5) *Line sales.* FRA does not approve removal of a line from the PTCIP exclusively based upon a representation that a track segment will be abandoned or sold to another railroad. In the event a track segment is approved for abandonment or transfer by the Surface Transportation Board, FRA will review at the request of the transferring and acquiring railroads whether the requirement to install PTC on the line should be removed given all of the circumstances, including expected traffic and hazardous materials levels, reservation of trackage or haulage



rights by the transferring railroad, routing analysis under part 172 of this chapter, commercial and real property arrangements affecting the transferring and acquiring railroads post-transfer, and such other factors as may be relevant to continue safe operations on the line. If FRA denies the request, the acquiring railroad shall install the PTC system on the schedule provided in the transferring railroad's PTCIP, without regard to whether it is a Class I railroad.

(6) *New rail passenger service.* No new intercity or commuter rail passenger service shall commence after December 31, 2015, until a PTC system certified under this subpart has been installed and made operative.

(c) *Hazard detectors.* (1) All hazard detectors integrated into a signal or train control system on or after October 16, 2008, shall be integrated into PTC systems required by this subpart; and their warnings shall be appropriately and timely enforced as described in the applicable PTCSP.

(2) The applicable PTCSP must provide for receipt and presentation to the locomotive engineer and other train crew members of warnings from any additional hazard detectors using the PTC data network, onboard displays, and audible alerts. If the PTCSP so provides, the action to be taken by the system and by the crew members shall be specified.

(3) The PTCDP (as applicable) and PTCSP for any new service described in § 236.1007 to be conducted above 90 miles per hour shall include a hazard analysis describing the hazards relevant to the specific route(s) in question (e.g., potential for track obstruction due to events such as falling rock or undermining of the track structure due to high water or displacement of a bridge over navigable waters), the basis for decisions concerning hazard detectors provided, and the manner in which such additional hazard detectors will be interfaced with the PTC system.

(d) *Event recorders.* (1) Each lead locomotive, as defined in part 229, of a train equipped and operating with a PTC system required by this subpart must be equipped with an operative event recorder, which shall:

(i) Record safety-critical train control data routed to the locomotive engineer's display that the engineer is required to comply with;

(ii) Specifically include text messages conveying mandatory directives, maximum authorized speeds, PTC system brake warnings, PTC system brake enforcements, and the state of the PTC system (e.g., cut in, cut out, active, or failed); and

(iii) Include examples of how the captured data will be displayed during playback along with the format, content, and data retention duration requirements specified in the PTCSP submitted and approved pursuant to this paragraph. If such train control data can be calibrated against other data required by this part, it may, at the election of the railroad, be retained in a separate memory module.

(2) Each lead locomotive, as defined in part 229, manufactured and in service after October 1, 2009, that is equipped and operating with a PTC system required by this subpart, shall be equipped with an event recorder memory module meeting the crash hardening requirements of § 229.135 of this chapter.

(3) Nothing in this subpart excepts compliance with any of the event recorder requirements contained in § 229.135 of this chapter.

(e) *Switch position.* The following requirements apply with respect to determining proper switch position under this section. When a main line switch position is unknown or improperly aligned for a train's route in advance of the train's movement, the PTC system will provide warning of the condition associated with the following enforcement:

(1) A PTC system shall enforce restricted speed over any switch:

(i) Where train movements are made with the benefit of the indications of a wayside or cab signal system or other similar appliance, method, device, or system of equivalent safety proposed to FRA and approved by the Associate Administrator in accordance with this part; and

(ii) Where wayside or cab signal system or other similar appliance, method, device, or system of equivalent safety, requires the train to be operated at restricted speed.

(2) A PTC system shall enforce a positive stop short of any main line switch, and any switch on a siding where the allowable speed is in excess of 20 miles per hour, if movement of the train over the switch:

(i) Is made without the benefit of the indications of a wayside or cab signal system or other similar appliance, method, device, or system of equivalent safety proposed to FRA and approved by the Associate Administrator in accordance with this part; or

(ii) Would create an unacceptable risk. Unacceptable risk includes conditions when traversing the switch, even at low speeds, could result in direct conflict with the movement of another train (including a hand-operated crossover between main tracks, a hand-operated crossover between a main track and an adjoining siding or auxiliary track, or a hand-operated switch providing access to another subdivision or branch line, etc.).

(3) A PTC system required by this subpart shall be designed, installed, and maintained to perform the switch position detection and enforcement described in paragraphs (e)(1) and (e)(2) of this section, except as provided for and justified in the applicable, FRA approved PTCDP or PTCSF.

(4) The control circuit or electronic equivalent for all movement authorities over any switches, movable-point frogs, or derails shall be selected through circuit controller or functionally equivalent device operated directly by the switch points, derail, or by switch locking mechanism, or through relay or electronic device controlled by such circuit controller or functionally equivalent device, for each switch, movable-point frog, or derail in the route governed. Circuits or electronic equivalent shall be arranged so that any movement authorities less restrictive than those prescribed in paragraphs (e)(1) and (e)(2) of this section can only be provided when each switch, movable-point frog, or derail in the route governed is in proper position, and shall be in accordance with subparts A through G of this part, unless it is otherwise provided in a PTCSF approved under this subpart.

(f) *Train-to-train collision.* A PTC system shall be considered to be configured to prevent train-to-train collisions within the meaning of paragraph (a) of this section if trains are required to be operated at restricted speed and if the onboard PTC equipment enforces the upper limits of the railroad's restricted speed rule (15 or 20 miles per hour). This application applies to:

(1) Operating conditions under which trains are required by signal indication or operating rule to:

(i) Stop before continuing; or

(ii) Reduce speed to restricted speed and continue at restricted speed until encountering a more favorable indication or as provided by operating rule.

(2) Operation of trains within the limits of a joint mandatory directive.

(g) *Temporary rerouting.* A train equipped with a PTC system as required by this subpart may be temporarily rerouted onto a track not equipped with a PTC system and a train not equipped with a PTC system may be temporarily rerouted onto a track equipped with a PTC system as required by this subpart in the following circumstances:

(1) *Emergencies.* In the event of an emergency—including conditions such as derailment, flood, fire, tornado, hurricane, earthquake, or other similar circumstance outside of the railroad's control—that would prevent usage of the regularly used track if:

(i) The rerouting is applicable only until the emergency condition ceases to exist and for no more than 14 consecutive calendar days, unless otherwise extended by approval of the Associate Administrator;

(ii) The railroad provides written or telephonic notification to the applicable Regional Administrator of the information listed in paragraph (i) of this section within one business day of the beginning of the rerouting made in accordance with this paragraph; and

(iii) The conditions contained in paragraph (j) of this section are followed.

(2) *Planned maintenance.* In the event of planned maintenance that would prevent usage of the regularly used track if:

(i) The maintenance period does not exceed 30 days;

(ii) A request is filed with the applicable Regional Administrator in accordance with paragraph (i) of this section no less than 10 business days prior to the planned rerouting; and

(iii) The conditions contained in paragraph (j) of this section are followed.

(h) *Rerouting requests.* (1) For the purposes of paragraph (g)(2) of this section, the rerouting request shall be self-executing unless the applicable Regional Administrator responds with a notice disapproving of the rerouting or providing instructions to allow rerouting. Such instructions may include providing additional information to the Regional Administrator or Associate Administrator prior to the commencement of rerouting. Once the Regional Administrator responds with a notice under this paragraph, no rerouting may occur until the Regional Administrator or Associate Administrator provides his or her approval.

(2) In the event the temporary rerouting described in paragraph (g)(2) of this section is to exceed 30 consecutive calendar days:

(i) The railroad shall provide a request in accordance with paragraphs (i) and (j) of this section with the Associate Administrator no less than 10 business days prior to the planned rerouting; and

(ii) The rerouting shall not commence until receipt of approval from the Associate Administrator.

(i) *Content of rerouting request.* Each notice or request referenced in paragraph (g) and (h) of this section must indicate:

(1) The dates that such temporary rerouting will occur;

(2) The number and types of trains that will be rerouted;

(3) The location of the affected tracks; and

(4) A description of the necessity for the temporary rerouting.

(j) *Rerouting conditions.* Rerouting of operations under paragraph (g) of this section may occur under the following conditions:

(1) Where a train not equipped with a PTC system is rerouted onto a track equipped with a PTC system, or a train not equipped with a PTC system that is compatible and functionally responsive to the PTC system utilized on the line to which the train is being rerouted, the train shall be operated in accordance with § 236.1029; or

(2) Where any train is rerouted onto a track not equipped with a PTC system, the train shall be operated in accordance with the operating rules applicable to the line on which the train is rerouted.

(k) *Rerouting cessation.* The applicable Regional Administrator may order a railroad to cease any rerouting provided under paragraph (g) or (h) of this section.

#### Application:

A PTC system shall prevent train-to-train collisions, overspeed derailments, incursions into work limits without permission, or the movement of a train through a main line switch in the improper position. It shall include safety-critical integration of all authorities and signal indications. It shall provide appropriate warning or enforcement when a derail or switch is in the wrong position, a highway-rail grade crossing warning system malfunction is reported, a movable bridge is not in the proper position, or a hazard detector detects an unsafe condition. It shall also limit the speed of freight trains to 49 mph and passenger trains to 59 mph in areas without broken rail protection.

A PTC system will be installed on Class I railroad main lines over which any quantity of PIH material is transported or on any railroad lines where regularly scheduled passenger service is provided. There are specific requirements for the addition, exclusion, or removal of a PTC system along any track, or the re-routing of trains. Requests must be provided in accordance with the regulations.

#### CLASSIFICATION OF DEFECTS

- § 236.1005.A1 Failure of the PTC system to reliably and functionally prevent train-to-train collisions.
- § 236.1005.A2 Alternative arrangements to reliably and functionally prevent train-to-train collisions not provided as specified in the PTCSP.
- § 236.1005.A3 Alternative arrangements specified in the PTCSP to reliably and functionally prevent train-to-train collisions fail provide an equivalent level of safety.
- § 236.1005.A4 Interlocking signal arrangement in accordance with the requirements of Subparts a – g not provided at a rail-to-rail at-grade crossing with at least one PTC route.
- § 236.1005.A5 PTC enforced stop not provided on PTC routes at a rail-to-rail at-grade crossing.
- § 236.1005.A6 Technology, other than full PTC, providing positive stop enforcement or a split-point derail incorporated into the signal system, not provided for a non-PTC route intersecting a PTC route with speed limit greater than 40 miles per hour at a rail-to-rail at-grade crossing.
- § 236.1005.A7 Speed not limited to 20 mph on non-PTC route approaching a rail-to-rail at-grade crossing with at least one intersecting PTC route where the maximum speed is greater than 40 mph.
- § 236.1005.A8 Split-point derail not incorporated into the signal system on non-PTC route approaching a rail-to-rail at-grade crossing with at least one intersecting PTC route where the maximum speed is greater than 40 mph.
- § 236.1005.A9 Positive stop not enforced by other than full PTC technology used on non-PTC intersecting route approaching a rail-to-rail at-grade crossing with at least one PTC route where the maximum speed is greater than 40 mph.
- § 236.1005.A10 Failure of the PTC system to reliably and functionally prevent overspeed derailments.
- § 236.1005.A11 Failure of the PTC system to reliably and functionally enforce railroad civil engineering speed restrictions.
- § 236.1005.A12 Failure of the PTC system to reliably and functionally enforce temporary speed restrictions.

- § 236.1005.A13 Failure of the PTC system to reliably and functionally enforce the most restrictive speed restriction within a track segment.
- § 236.1005.A14 Failure of the PTC system to reliably and functionally prevent incursions into established work zone limits where appropriate authority and/or verification has not been received.
- § 236.1005.A15 Failure of the PTC system to integrate, within the system, electronic authority and/or verification to enter established work zone limits.
- § 236.1005.A16 Failure of the PTC system to enforce speed restrictions within established work zone limits.
- § 236.1005.A17 Failure of the PTC system to reliably and functionally prevent the movement of a train through a main line switch in the improper position.
- § 236.1005.A18 Failure of the PTC system to include safety-critical integration of all authorities and/or indications of a wayside signal system, cab signal system, other similar appliance, method, device, or system of equivalent safety.
- § 236.1005.A19 Failure of the PTC system to provide warning and/or enforcement of all authorities and indications of a wayside signal system, cab signal system, other similar appliance, method, device, or system of equivalent safety.
- § 236.1005.A20 Failure of the PTC system to provide warning and/or enforcement when a switch or derail protecting access to the main line is not in its protecting or derauling position.
- § 236.1005.A21 Failure of the PTC system to provide warning and/or enforcement when a mandatory directive is issued associated with a malfunctioning highway-rail grade crossing warning system.
- § 236.1005.A22 Failure of the PTC system to provide warning and/or enforcement when an after-arrival mandatory directive has been issued and the train or trains to be waited on have not passed the location of the receiving train.
- § 236.1005.A23 Failure of the PTC system to provide warning and/or enforcement when any movable bridge within the route ahead is not in a position to allow permissive indication for train movements.
- § 236.1005.A24 Failure of the PTC system to provide warning and/or enforcement when a hazard detector, integrated into the PTC system, detects an unsafe condition or transmits an alarm.
- § 236.1005.A25 Failure of the PTC system to limit the speed of passenger trains to 59 mph in areas without broken rail protection or equivalent safeguards.
- § 236.1005.A26 Failure of the PTC system to limit the speed of freight trains to 49 mph in areas without broken rail protection or equivalent safeguards.

- § 236.1005.B1 Failure to implement a PTC system on a track segment where PTC is required prior to December 31, 2015.
- § 236.1005.B2 Commencement of revenue service of a PTC system prior to obtaining system certification.
- § 236.1005.B3 Failure to install PTC on a track segment on which freight rail traffic subsequent to calendar year 2008 has increased to levels requiring the implementation of PTC.
- § 236.1005.B4 Failure to amend a PTCIP, by promptly filing an RFA, to include implementing PTC on a track segment on which freight rail traffic subsequent to calendar year 2008 has increased to levels requiring the implementation of PTC.
- § 236.1005.B5 Failure to implement PTC on a track segment included in an FRA approved RFA by December 31, 2015 or within 24 months, whichever is later.
- § 236.1005.B6 Failure to obtain FRA approval, by an RFA and amended PTCIP, to exclude a track segment from PTC implementation due to routing changes.
- § 236.1005.B7 Failure to obtain FRA approval, by an RFA and amended PTCIP, to exclude a track segment from PTC implementation due to decreased freight traffic.
- § 236.1005.B8 Failure to obtain FRA approval, by an RFA and amended PTCIP, to exclude a track segment from PTC implementation due to line sales.
- § 236.1005.B9 Failure to install an FRA certified PTC system prior to commencing a new intercity or commuter rail passenger service after December 31, 2015.
- § 236.1005.C1 Failure to integrate a hazard detector into a PTC system that was integrated into a signal or train control system on or after October 16, 2008.
- § 236.1005.C2 Failure of a PTC system integrated hazard detector to timely and/or appropriately enforce warnings as described in the PTCSP.
- § 236.1005.D1 Lead locomotive of a train required to be PTC equipped not equipped with an operative event recorder.
- § 236.1005.D2 Failure of the event recorder in the lead locomotive of a train required to be PTC equipped to record the locomotive engineer's safety-critical train control data that the engineer is required to comply with.
- § 236.1005.D3 Failure of the event recorder in the lead locomotive of a train required to be PTC equipped to record text messages conveying mandatory directives, maximum authorized speeds, PTC system brake warnings, PTC system brake enforcements, or the state of the PTC system.

- § 236.1005.D4 Failure of the event recorder in the lead locomotive of a train required to be PTC equipped, manufactured and in service after October 1, 2009, not equipped with a crash hardened memory module.
- § 236.1005.E1 Failure to design, install, and/or maintain a required PTC system to perform switch point detection and enforcement except as provided for in an FRA approved PTCDP or PTCSP.
- § 236.1005.E2 Failure of the PTC system, supplemented by indications of a wayside or cab signal system, or similar appliance, method, device, or system of equivalent safety, to provide warning and/or enforce restricted speed over any main line switch when the switch position is unknown or improperly lined for a train's route in advance of the train's movement.
- § 236.1005.E3 Failure of the PTC system to provide warning and/or enforce restricted speed over any switch where indications of a wayside or cab signal system, or similar appliance, method, device, or system of equivalent safety, requires the train to be operated at restricted speed.
- § 236.1005.E4 Failure of the PTC system, without the indications of a wayside or cab signal system, or similar appliance, method, device, or system of equivalent safety, to provide warning and/or enforce a positive stop short of any mainline switch, or any switch on a siding where the allowable speed is in excess of 20 mph when the switch position is unknown or improperly lined for a train's route in advance of the train's movement.
- § 236.1005.E5 Failure of the PTC system to provide warning and/or enforce a positive stop short of any mainline switch, or any switch on a siding where the allowable speed is in excess of 20 mph and would create an unacceptable risk.
- § 236.1005.G1 PTC required equipped trains rerouted to a non-PTC equipped track without approval or just cause.
- § 236.1005.G2 Non-PTC equipped trains rerouted to a PTC required track without approval or just cause.
- § 236.1005.G3 Emergency rerouting of PTC required equipped trains to a non-PTC equipped track in excess of 14 consecutive calendar days without FRA approval.
- § 236.1005.G4 Emergency rerouting of non-PTC equipped trains to a PTC required track in excess of 14 consecutive calendar days without FRA approval.
- § 236.1005.G5 Emergency rerouting of PTC required equipped trains to a non-PTC equipped track after the emergency condition ceases.
- § 236.1005.G6 Emergency rerouting of non-PTC equipped trains to a PTC required track after the emergency condition ceases.
- § 236.1005.G7 Failure of the railroad to provide written or telephonic notification to the applicable FRA regional administrator within one business day after commencing emergency rerouting operations.

- § 236.1005.G8 Failure to provide the required information in the written or telephonic temporary rerouting request.
- § 236.1005.G9 Planned maintenance rerouting of PTC required equipped trains to a non-PTC equipped track in excess of 30 consecutive calendar days without approval.
- § 236.1005.G10 Planned maintenance rerouting of non-PTC equipped trains to a PTC required track in excess of 30 consecutive calendar days without approval.
- § 236.1005.G11 Failure to provide written or telephonic notification to the applicable FRA regional administrator at least 10 business days prior to the planned maintenance rerouting operations beginning.
- § 236.1005.G12 Commencing planned maintenance rerouting operations without FRA approval.
- § 236.1005.G13 Failure to operate non-PTC equipped trains temporarily rerouted to a PTC required track in accordance with § 236.1029.
- § 236.1005.G14 Failure to cease temporary rerouting operations per FRA order.

**§ 236.1006 Equipping locomotives operating in PTC territory.**

(a) Except as provided in paragraph (b) of this section, each train operating on any track segment equipped with a PTC system shall be controlled by a locomotive equipped with an onboard PTC apparatus that is fully operative and functioning in accordance with the applicable PTCSP approved under this subpart.

(b) *Exceptions.* (1) Prior to December 31, 2015, each railroad required to install PTC shall include in its PTCIP specific goals for progressive implementation of onboard systems and deployment of PTC-equipped locomotives such that the safety benefits of PTC are achieved through incremental growth in the percentage of controlling locomotives operating on PTC lines that are equipped with operative PTC onboard equipment. The PTCIP shall include a brief but sufficient explanation of how those goals will be achieved, including assignment of responsibilities within the organization. The goals shall be expressed as the percentage of trains operating on PTC-equipped lines that are equipped with operative onboard PTC apparatus responsive to the wayside, expressed as an annualized (calendar year) percentage for the railroad as a whole.

(2) Each railroad shall adhere to its PTCIP and shall report, on April 16, of 2011, 2012, 2013, and 2014, its progress toward achieving the goals set under paragraph (b)(1) of this section. In the event any annual goal is not achieved, the railroad shall further report the actions it is taking to ensure achievement of subsequent annual goals.

(3) On and after December 31, 2015, a train controlled by a locomotive with an onboard PTC apparatus that has failed en route is permitted to operate in accordance with § 236.1029.

(4) A train operated by a Class II or Class III railroad, including a tourist or excursion railroad, and controlled by a locomotive not equipped with an onboard PTC apparatus is permitted to operate on a PTC-operated track segment:

(i) That either:

(A) Has no regularly scheduled intercity or commuter passenger rail traffic; or

(B) Has regularly scheduled intercity or commuter passenger rail traffic and the applicable PTCIP permits the operation of a train operated by a Class II or III railroad and controlled by a



locomotive not equipped with an onboard PTC apparatus;

(ii) Where operations are restricted to four or less such unequipped trains per day, whereas a train conducting a “turn” operation (e.g., moving to a point of interchange to drop off or pick up cars and returning to the track owned by a Class II or III railroad) is considered two trains for this purpose; and

(iii) Where each movement shall either:

(A) Not exceed 20 miles in length; or

(B) To the extent any movement exceeds 20 miles in length, such movement is not permitted without the controlling locomotive being equipped with an onboard PTC system after December 31, 2020, and each applicable Class II or III railroad shall report to FRA its progress in equipping each necessary locomotive with an onboard PTC apparatus to facilitate continuation of the movement. The progress reports shall be filed not later than December 31, 2017 and, if all necessary locomotives are not yet equipped, on December 31, 2019.

(c) When a train movement is conducted under the exceptions described in paragraph (b)(4) of this section, that movement shall be made in accordance with § 236.1029.

#### Application:

Each train operating on any track segment equipped with a PTC system shall be controlled by a

locomotive equipped with an onboard PTC apparatus. There are certain exceptions which are as defined in this subsection.

### CLASSIFICATION OF DEFECTS

§ 236.1006.A1 Operating a controlling locomotive in PTC territory without a required and operative PTC onboard apparatus on and/or after December 31, 2015.

§ 236.1006.B1 Failure of a railroad required to implement PTC to adhere to its PTCIP.

§ 236.1006.B2 Failure to report as prescribed by this section.

§ 236.1006.B3 Failure of a railroad required to implement PTC to report actions taken to ensure achievement of subsequent annual goals after failing a previous annual goal.

§ 236.1006.B4 Trains of a Class II, Class III, tourist, and/or excursion railroad, controlled by a locomotives not equipped with an onboard PTC apparatus, operating on PTC-equipped track with regularly scheduled intercity or commuter passenger traffic when the applicable PTCIP does not permit such operations.

§ 236.1006.B5 Trains of a Class II, Class III, tourist, and/or excursion railroad, controlled by locomotives not equipped with an onboard PTC apparatus, operating on PTC-equipped track in excess of four trains per day.

§ 236.1006.B6 Trains of a Class II, Class III, tourist, and/or excursion railroad, controlled by locomotives not equipped with an onboard PTC apparatus, operating more than 20 miles on PTC equipped track after December 31, 2020.

## **§ 236.1007 Additional requirements for high-speed service.**

(a) A PTC railroad that conducts a passenger operation at or greater than 60 miles per hour or a freight operation at or greater than 50 miles per hour shall have installed a PTC system including or working in concert with technology that includes all of the safety-critical functional attributes of a block signal system meeting the requirements of this part, including appropriate fouling circuits and broken rail detection (or equivalent safeguards).

(b) In addition to the requirements of paragraph (a) of this section, a host railroad that conducts a freight or passenger operation at more than 90 miles per hour shall:

(1) Have an approved PTCSP establishing that the system was designed and will be operated to meet the fail-safe operation criteria described in Appendix C to this part; and

(2) Prevent unauthorized or unintended entry onto the main line from any track not equipped with a PTC system compliant with this subpart by placement of split-point derails or equivalent means integrated into the PTC system; and

(3) Comply with § 236.1029(c).

(c) In addition to the requirements of paragraphs (a) and (b) of this section, a host railroad that conducts a freight or passenger operation at more than 125 miles per hour shall have an approved PTCSP accompanied by a document (“HSR-125”) establishing that the system:

(1) Will be operated at a level of safety comparable to that achieved over the 5 year period prior to the submission of the PTCSP by other train control systems that perform PTC functions required by this subpart, and which have been utilized on high-speed rail systems with similar technical and operational characteristics in the United States or in foreign service, provided that the use of foreign service data must be approved by the Associate Administrator before submittal of the PTCSP; and

(2) Has been designed to detect incursions into the right-of-way, including incidents involving motor vehicles diverting from adjacent roads and bridges, where conditions warrant.

(d) In addition to the requirements of paragraphs (a) through (c) of this section, a host railroad that conducts a freight or passenger operation at more than 150 miles per hour, which is governed by a Rule of Particular Applicability, shall have an approved PTCSP accompanied by a HSR-125 developed as part of an overall system safety plan approved by the Associate Administrator.

(e) A railroad providing existing high-speed passenger service may request in its PTCSP that the Associate Administrator excuse compliance with one or more requirements of this section upon a showing that the subject service has been conducted with a high level of safety.

### **Application:**

A PTC railroad that conducts a passenger operation at or greater than 60 mph or a freight operation at or greater than 50 mph shall have a block signal system installed in addition to a PTC system. If a railroad operates at more than 90 mph it will include the above mentioned system in addition to providing intrusion detection and a means to prevent unauthorized entry along with other requirements as defined in this subpart. There are further requirements for railroads operating at over 150 mph.

### **CLASSIFICATION OF DEFECTS**

§ 236.1007.A1 Operation of passenger trains on non-PTC equipped territory at speeds equal to or greater than 60 mph.

§ 236.1007.A2 Operation of passenger trains at speed equal to or greater than 60 mph on PTC

system not integrated with technology that includes all the safety-critical functional attributes of a block signal system meeting the requirements of this part.

- § 236.1007.A3 Operation of freight trains on non-PTC equipped territory at speeds equal to or greater than 50 mph.
- § 236.1007.A4 Operation of freight trains at speed equal to or greater than 50 mph on PTC system not integrated with technology that includes all the safety-critical functional attributes of a block signal system meeting the requirements of this part.
- § 236.1007.B1 Failure to fully implement incursion protection where required.
- § 236.1007.B2 Operation of trains at speeds greater than 90 mph on PTC system not designed per appendix C.
- § 236.1007.C1 Operation of trains at speeds greater than 125 mph without an approved PTCSPP accompanied by an HSR-125 document.
- § 236.1007.C2 Operation of trains at speeds greater than 125 mph at a level of safety less than that achieved over the 5 year period prior to the submission of the PTCSPP by other train control systems that perform PTC functions required by this subpart.
- § 236.1007.C3 Operation of trains at speeds greater than 125 mph at a level of safety less than that achieved over the 5 year period prior to the submission of the PTCSPP by other train control systems that perform PTC functions that have been utilized on high-speed rail systems with similar technical and operational characteristics in the united states or in foreign service.
- § 236.1007.C4 Operation of trains at speeds greater than 125 mph on PTC system without incursion detection.
- § 236.1007.D1 Operation of trains at speeds greater than 150 mph not in accordance with the rule of particular applicability.

#### **§ 236.1009 Procedural requirements.**

(a) *PTC Implementation Plan (PTCIP)*. (1) By April 16, 2010, each host railroad that is required to implement and operate a PTC system in accordance with § 236.1005(b) shall develop and submit in accordance with § 236.1011(a) a PTCIP for implementing a PTC system required under § 236.1005. Filing of the PTCIP shall not exempt the required filings of an NPI, PTCSPP, PTCDP, or Type Approval.

(2) After April 16, 2010, a host railroad shall file:

(i) A PTCIP if it becomes a host railroad of a main line track segment for which it is required to implement and operate a PTC system in accordance with § 236.1005(b); or

(ii) A request for amendment (“RFA”) of its current and approved PTCIP in accordance with § 236.1021 if it intends to:

(A) Initiate a new category of service (i.e., passenger or freight); or

(B) Add, subtract, or otherwise materially modify one or more lines of railroad for which

installation of a PTC system is required.

(3) The host and tenant railroad(s) shall jointly file a PTCIP that addresses shared track:

(i) If the host railroad is required to install and operate a PTC system on a segment of its track; and

(ii) If the tenant railroad that shares the same track segment would have been required to install a PTC system if the host railroad had not otherwise been required to do so.

(4) If railroads required to file a joint PTCIP are unable to jointly file a PTCIP in accordance with paragraphs (a)(1) and (a)(3) of this section, then each railroad shall:

(i) Separately file a PTCIP in accordance with paragraph (a)(1);

(ii) Notify the Associate Administrator that the subject railroads were unable to agree on a PTCIP to be jointly filed;

(iii) Provide the Associate Administrator with a comprehensive list of all issues not in agreement between the railroads that would prevent the subject railroads from jointly filing the PTCIP; and

(iv) Confer with the Associate Administrator to develop and submit a PTCIP mutually acceptable to all subject railroads.

(b) *Type Approval*. Each host railroad, individually or jointly with others such as a tenant railroad or system supplier, shall file prior to or simultaneously with the filing made in accordance with paragraph (a) of this section:

(1) An unmodified Type Approval previously issued by the Associate Administrator in accordance with § 236.1013 or § 236.1031(b) with its associated docket number;

(2) A PTCDP requesting a Type Approval for:

(i) A PTC system that does not have a Type Approval; or

(ii) A PTC system with a previously issued Type Approval that requires one or more variances;

(3) A PTCSP subject to the conditions set forth in paragraph (c) of this section, with or without a Type Approval; or

(4) A document attesting that a Type Approval is not necessary since the host railroad has no territory for which a PTC system is required under this subpart.

(c) *Notice of Product Intent (NPI)*. A railroad may, in lieu of submitting a PTCDP, or referencing an already issued Type Approval, submit an NPI describing the functions of the proposed PTC system. If a railroad elects to file an NPI in lieu of a PTCDP or referencing an existing Type Approval with the PTCIP, and the PTCIP is otherwise acceptable to the Associate Administrator, the Associate Administrator may grant provisional approval of the PTCIP.

(1) A provisional approval of a PTCIP, unless otherwise extended by the Associate Administrator, is valid for a period of 270 days from the date of approval by the Associate Administrator.

(2) The railroad must submit an updated PTCIP with either a complete PTCDP as defined in §236.1013(a), an updated PTCIP referencing an already approved Type Approval, or a full PTCSP within 270 days after the “Provisional Approval.”

(i) Within 90 days of receipt of an updated PTCIP that was submitted with an NPI, the Associate Administrator will approve or disapprove of the updated PTCIP and notify in writing the affected railroad. If the updated PTCIP is not approved, the notification will include the plan’s deficiencies. Within 30 days of receipt of that notification, the railroad or other entity that submitted the plan shall correct all deficiencies and resubmit the plan in accordance with this section and § 236.1011, as applicable.

(ii) If an update to a “Provisionally Approved” PTCIP is not received by the Associate Administrator by the end of the period indicated in this paragraph, the “Provisional Approval” given to the PTCIP is automatically revoked. The revocation is retroactive to the date the original PTCIP and NPI were first submitted to the Associate Administrator.

(d) *PTCSP and PTC System Certification.* The following apply to each PTCSP and PTC System Certification.

(1) A PTC System Certification for a PTC system may be obtained by submitting an acceptable PTCSP. If the PTC system is the subject of a Type Approval, the safety case elements contained in the PTCDP may be incorporated by reference into the PTCSP, subject to finalization of the human factors analysis contained in the PTCDP.

(2) Each PTCSP requirement under § 236.1015 shall be supported by information and analysis sufficient to establish that the requirements of this subpart have been satisfied.

(3) If the Associate Administrator finds that the PTCSP and supporting documentation support a finding that the system complies with this part, the Associate Administrator may approve the PTCSP. If the Associate Administrator approves the PTCSP, the railroad shall receive PTC System Certification for the subject PTC system and shall implement the PTC system according to the PTCSP.

(4) A required PTC system shall not:

(i) Be used in service until it receives from FRA a PTC System Certification; and (ii) Receive a PTC System Certification unless FRA receives and approves an applicable:

(A) PTCSP; or

(B) Request for Expedited Certification (REC) as defined by § 236.1031(a).

(e) *Plan contents.* (1) No PTCIP shall receive approval unless it complies with § 236.1011. No railroad shall receive a Type Approval or PTC System Certification unless the applicable PTCDP or PTCSP, respectively, comply with §§ 236.1013 and 236.1015, respectively.

(2) All materials filed in accordance with this subpart must be in the English language, or have been translated into English and attested as true and correct.

(3) Each filing referenced in this section may include a request for full or partial confidentiality in accordance with § 209.11 of this chapter. If confidentiality is requested as to a portion of any applicable document, then in addition to the filing requirements under § 209.11 of this chapter, the person filing the document shall also file a copy of the original unredacted document, marked to indicate which portions are redacted in the document's confidential version without obscuring the original document's contents.

(f) *Supporting documentation and information.* (1) Issuance of a Type Approval or PTC System Certification is contingent upon FRA's confidence in the implementation and operation of the subject PTC system. This confidence may be based on FRA-monitored field testing or an independent assessment performed in accordance with § 236.1035 or § 236.1017, respectively.

(2) Upon request by FRA, the railroad requesting a Type Approval or PTC System Certification must engage in field testing or independent assessment performed in accordance with § 236.1035 or § 236.1017, respectively, to support the assertions made in any of the plans submitted under this subpart. These assertions include any of the plans' content requirements under this subpart.

(g) *FRA conditions, reconsiderations, and modifications.* (1) As necessary to ensure safety, FRA may attach special conditions to approving a PTCIP or issuing a Type Approval or PTC System Certification.

(2) After granting a Type Approval or PTC System Certification, FRA may reconsider the Type Approval or PTC System Certification upon revelation of any of the following factors concerning the contents of the PTCDP or PTCSP:

(i) Potential error or fraud;

(ii) Potentially invalidated assumptions determined as a result of in-service experience or one or more unsafe events calling into question the safety analysis supporting the approval.

(3) During FRA's reconsideration in accordance with this paragraph, the PTC system may remain in use if otherwise consistent with the applicable law and regulations and FRA may

impose special conditions for use of the PTC system.

(4) After FRA's reconsideration in accordance with this paragraph, FRA may:

(i) Dismiss its reconsideration and continue to recognize the existing FRA approved Type Approval or PTC System Certification;

(ii) Allow continued operations under such conditions the Associate Administrator deems necessary to ensure safety; or

(iii) Revoke the Type Approval or PTC System Certification and direct the railroad to cease operations where PTC systems are required under this subpart.

(h) *FRA access.* The Associate Administrator, or that person's designated representatives, shall be afforded reasonable access to monitor, test, and inspect processes, procedures, facilities, documents, records, design and testing materials, artifacts, training materials and programs, and any other information used in the design, development, manufacture, test, implementation, and operation of the system, as well as interview any personnel:

(1) Associated with a PTC system for which a Type Approval or PTC System Certification has been requested or provided; or

(2) To determine whether a railroad has been in compliance with this subpart.

(i) *Foreign regulatory entity verification.* Information that has been certified under the auspices of a foreign regulatory entity recognized by the Associate Administrator may, at the Associate Administrator's sole discretion, be accepted as independently Verified and Validated and used to support each railroad's development of the PTCSP.

(j) *Processing times for PTCDP and PTCSP.* (1) Within 30 days of receipt of a PTCDP or PTCSP, the Associate Administrator will either acknowledge receipt or acknowledge receipt and request more information.

(2) To the extent practicable, considering the scope, complexity, and novelty of the product or change:

(i) FRA will approve, approve with conditions, or deny the PTCDP within 60 days of the date on which the PTCDP was filed;

(ii) FRA will approve, approve with conditions, or deny the PTCSP within 180 days of the date on which the PTCSP was filed;

(iii) If FRA has not approved, approved with conditions, or denied the PTCDP or PTCSP within the 60-day or 180-day window, as applicable, FRA will provide the submitting party with a statement of reasons as to why the submission has not yet been acted upon and a projected deadline by which an approval or denial will be issued and any further consultations or inquiries will be resolved.

#### Application:

This section defines the procedural requirements for a railroad to file the required documentation necessary to install a PTC system. It lists the necessary documents along with the timelines associated with their filing. It also lists the various options that a railroad has as it pertains to what type of system they intend to install.

### CLASSIFICATION OF DEFECTS

§ 236.1009.A1 Failure to develop and/or submit a PTC implementation plan within the required time frame.

§ 236.1009.A2 Failure to amend PTCIP when required.

- § 236.1009.A3 Failure of the host and tenant railroad(s) to file a joint PTCIP when required.
- § 236.1009.A4 Failure of the host and/or tenant railroad(s) to file separate PTCIPs when unable to file a joint PTCIP.
- § 236.1009.A5 Failure of the host and/or tenant railroad(s) to notify the Associate Administrator for Railroad Safety/Chief Safety Officer when unable to file a required joint PTCIP.
- § 236.1009.A6 Failure of the host and/or tenant railroad(s), unable to file a joint PTCIP, to provide the Associate Administrator a comprehensive list of issues preventing the filing of a joint PTCIP.
- § 236.1009.A7 Failure of the host and/or tenant railroad(s), unable to file a joint PTCIP, to confer with the Associate Administrator to develop and submit a PTCIP acceptable to all subject railroads.
- § 236.1009.B1 Failure to file prior to or simultaneously with the PTCIP either a PTCDP or reference to an already issued Type Approval.
- § 236.1009.B2 Failure to obtain Type Approval when required.
- § 236.1009.C1 Failure to submit prior to or simultaneously with the PTCIP a NPI in lieu of either a PTCP or reference to an already issued Type Approval.
- § 236.1009.C2 Failure to submit to FRA an updated PTCIP with a PTCDP, referenced Type Approval, or PTCSP within 270 days of being granted a Provisional Approval of a PTCIP.
- § 236.1009.C3 Failure to update NPI.
- § 236.1009.D1 Operation of PTC system prior to system certification.
- § 236.1009.D2 Failure to implement PTC system in accordance to the PTCSP.
- § 236.1009.E1 Failure to submit to FRA a PTCIP, NPI, PTCDP, or PTCSP, referencing a Type Approval, or filing a document attesting a Type Approval is not necessary, in the English language.
- § 236.1009.F1 Failure to engage in field testing or conduct an independent assessment as requested by FRA.
- § 236.1009.G1 Failure to abide to FRA special conditions attached to a PTCIP, Type Approval, or PTC system certification.
- § 236.1009.H1 Failure to grant FRA reasonable access to monitor, test, inspect, and/or interview.
- § 236.1009.I1 Information provided by a foreign regulatory entity, not recognized by FRA, used to support the development of a PTCSP.



## **§ 236.1011 PTC Implementation Plan content requirements.**

(a) *Contents.* A PTCIP filed pursuant to this subpart shall, at a minimum, describe:

(1) The functional requirements that the proposed system must meet;

(2) How the PTC railroad intends to comply with §§ 236.1009(c) and (d);

(3) How the PTC system will provide for interoperability of the system between the host and all tenant railroads on the track segments required to be equipped with PTC systems under this subpart and:

(i) Include relevant provisions of agreements, executed by all applicable railroads, in place to achieve interoperability;

(ii) List all methods used to obtain interoperability; and

(iii) Identify any railroads with respect to which interoperability agreements have not been achieved as of the time the plan is filed, the practical obstacles that were encountered that prevented resolution, and the further steps planned to overcome those obstacles;

(4) How, to the extent practical, the PTC system will be implemented to address areas of greater risk to the public and railroad employees before areas of lesser risk;

(5) The sequence and schedule in which track segments will be equipped and the basis for those decisions, and shall at a minimum address the following risk factors by track segment:

(i) Segment traffic characteristics such as typical annual passenger and freight train volume and volume of poison- or toxic-by-inhalation (PIH or TIH) shipments (loads, residue);

(ii) Segment operational characteristics such as current method of operation (including presence or absence of a block signal system), number of tracks, and maximum allowable train speeds, including planned modifications; and

(iii) Route attributes bearing on risk, including ruling grades and extreme curvature;

(6) The following information relating to rolling stock:

(i) What rolling stock will be equipped with PTC technology;

(ii) The schedule to equip that rolling stock by December 31, 2015;

(iii) All documents and information required by § 236.1006; and

(iv) Unless the tenant railroad is filing its own PTCIP, the host railroad's PTCIP shall:

(A) Attest that the host railroad has made a formal written request to each tenant railroad requesting identification of each item of rolling stock to be PTC system equipped and the date each will be equipped; and

(B) Include each tenant railroad's response to the host railroad's written request made in accordance with paragraph (a)(6)(iv)(A) of this section;

(7) The number of wayside devices required for each track segment and the installation schedule to complete wayside equipment installation by December 31, 2015;

(8) Identification of each track segment on the railroad as mainline or non-mainline track. If the PTCIP includes an MTEA, as defined by § 236.1019, the PTCIP should identify the tracks included in the MTEA as main line track with a reference to the MTEA;

(9) To the extent the railroad determines that risk-based prioritization required by paragraph (a)(4) of this section is not practical, the basis for this determination; and

(10) The dates the associated PTCDP and PTCSP, as applicable, will be submitted to FRA in accordance with § 236.1009.

(b) *Additional Class I railroad PTCIP requirements.* Each Class I railroad shall include:

(1) In its PTCIP a strategy for full deployment of its PTC system, describing the criteria that it will apply in identifying additional rail lines on its own network, and rail lines of entities that it controls or engages in joint operations with, for which full or partial deployment of PTC technologies is appropriate, beyond those required to be equipped under this subpart. Such criteria shall include consideration of the policies established by 49 U.S.C. 20156 (railroad safety



risk reduction program), and regulations issued there under, as well as non-safety business benefits that may accrue.

(2) In the Technology Implementation Plan of its Risk Reduction Program, when first required to be filed in accordance with 49 U.S.C. 20156 and any regulation promulgated there under, a specification of rail lines selected for full or partial deployment of PTC under the criteria identified in its PTCIP.

(3) Nothing in this paragraph shall be construed to create an expectation or requirement that additional rail lines beyond those required to be equipped by this subpart must be equipped or that such lines will be equipped during the period of primary implementation ending December 31, 2015.

(4) As used in this paragraph, “partial implementation” of a PTC system refers to use, pursuant to subpart H of this part, of technology embedded in PTC systems that does not employ all of the functionalities required by this subpart.

(c) *FRA review.* Within 90 days of receipt of a PTCIP, the Associate Administrator will approve or disapprove of the plan and notify in writing the affected railroad or other entity. If the PTCIP is not approved, the notification will include the plan’s deficiencies. Within 30 days of receipt of that notification, the railroad or other entity that submitted the plan shall correct all deficiencies and resubmit the plan in accordance with § 236.1009 and paragraph (a) of this section, as applicable.

(d) *Subpart H.* A railroad that elects to install a PTC system when not required to do so may elect to proceed under this subpart or under subpart H of this part.

(e) Upon receipt of a PTCIP, NPI, PTCDP, or PTCSP, FRA posts on its public web site notice of receipt and reference to the public docket in which a copy of the filing has been placed. FRA may consider any public comment on each document to the extent practicable within the time allowed by law and without delaying implementation of PTC systems.

(f) The PTCIP shall be maintained to reflect the railroad’s most recent PTC deployment plans until all PTC system deployments required under this subpart are complete.

#### Application:

This section describes the contents required within a railroad’s PTCIP. It includes the functional requirements, interoperability, the sequence and schedule in which track segments will be equipped, along with rolling stock information. It also lists any MTEA’s risk based prioritization, and other specific information as defined within the section.

### CLASSIFICATION OF DEFECTS

§ 236.1011.A1 Failure to provide the required information in a PTCIP.

§ 236.1011.B1 Failure of a class 1 railroad to include a strategy for full deployment of a PTC system within the PTCIP.

§ 236.1011.C1 Failure to correct a deficient PTCIP within 30 days of notification by FRA.

§ 236.1011.F1 Failure to maintain a PTCIP reflecting the most recent PTC deployment plans.

§ 236.1011.F2 Failure to install a PTC system in accordance with Subpart I when so required.

### **§ 236.1013 PTC Development Plan and Notice of Product Intent content requirements and**

## **Type Approval.**

(a) For a PTC system to obtain a Type Approval from FRA, the PTCDP shall be filed in accordance with § 236.1009 and shall include:

(1) A complete description of the PTC system, including a list of all PTC system components and their physical relationships in the subsystem or system;

(2) A description of the railroad operation or categories of operations on which the PTC system is designed to be used, including train movement density (passenger, freight), operating speeds (including a thorough explanation of intended compliance with § 236.1007), track characteristics, and railroad operating rules;

(3) An operational concepts document, including a list with complete descriptions of all functions which the PTC system will perform to enhance or preserve safety;

(4) A document describing the manner in which the PTC system architecture satisfies safety requirements;

(5) A preliminary human factors analysis, including a complete description of all human-machine interfaces and the impact of interoperability requirements on the same;

(6) An analysis of the applicability to the PTC system of the requirements of subparts A through G of this part that may no longer apply or are satisfied by the PTC system using an alternative method, and a complete explanation of the manner in which those requirements are otherwise fulfilled;

(7) A prioritized service restoration and mitigation plan and a description of the necessary security measures for the system;

(8) A description of target safety levels (e.g., MTTHE for major subsystems as defined in subpart H of this part), including requirements for system availability and a description of all backup methods of operation and any critical assumptions associated with the target levels;

(9) A complete description of how the PTC system will enforce authorities and signal indications;

(10) A description of the deviation which may be proposed under § 236.1029(c), if applicable; and

(11) A complete description of how the PTC system will appropriately and timely enforce all integrated hazard detectors in accordance with § 236.1005(c)(3), if applicable.

(b) If the Associate Administrator finds that the system described in the PTCDP would satisfy the requirements for PTC systems under this subpart and that the applicant has made a reasonable showing that a system built to the stated requirements would achieve the level of safety mandated for such a system under § 236.1015, the Associate Administrator may grant a numbered Type Approval for the system.

(c) Each Type Approval shall be valid for a period of 5 years, subject to automatic and indefinite extension provided that at least one PTC System Certification using the subject PTC system has been issued within that period and not revoked.

(d) The Associate Administrator may prescribe special conditions, amendments, and restrictions to any Type Approval as necessary for safety.

(e) If submitted, an NPI must contain the following information:

(1) A description of the railroad operation or categories of operations on which the proposed PTC system is designed to be used, including train movement density (passenger, freight), operating speeds (including a thorough explanation of intended compliance with § 236.1007), track characteristics, and railroad operating rules;

(2) An operational concepts document, including a list with complete descriptions of all functions that the proposed PTC system will perform to enhance or preserve safety;

(3) A description of target safety levels (e.g., MTTHE for major subsystems as defined in

subpart H of this part), including requirements for system availability and a description of all backup methods of operation and any critical assumptions associated with the target levels;

(4) A complete description of how the proposed PTC system will enforce authorities and signal indications; and

(5) A complete description of how the proposed PTC system will appropriately and timely enforce all integrated hazard detectors in accordance with § 236.1005(c)(3), if applicable.

#### Application:

This section describes the requirements for a railroad's PTC system to obtain a Type Approval from FRA, and the content requirements for their PTCDP, which shall be filed in accordance with § 236.1009 and shall include: a complete description of the PTC system, a description of the railroad operation, an operational concepts document, a system architecture document, and various other requirements as defined within this section. If the Associate Administrator finds that the system described in the PTCDP would satisfy the requirements for PTC systems under this subpart and that the applicant has made a reasonable showing that a system built to the stated requirements would achieve the level of safety mandated for such a system under § 236.1015, the Associate Administrator may grant a numbered Type Approval for the system.

#### CLASSIFICATION OF DEFECTS

§ 236.1013.A1 Failure to submit a PTCDP to FRA by the date stated in the current PTCIP.

§ 236.1013.A2 Failure to provide the required information in a PTCDP.

§ 236.1013.D1 Inappropriate use of Type Approval.

§ 236.1013.D2 Failure to maintain a quality control system.

§ 236.1013.E1 Failure to develop and/or submit a NPI to FRA in lieu of submitting a PTCDP or PTCSP, referencing a Type Approval, or filing a document attesting a Type Approval is not necessary.

§ 236.1013.E2 Failure to provide the required information in an NPI.

#### **§ 236.1015 PTC Safety Plan content requirements and PTC System Certification.**

(a) Before placing a PTC system required under this part in service, the host railroad must submit to FRA a PTCSP and receive a PTC System Certification. If the Associate Administrator finds that the PTCSP and supporting documentation support a finding that the system complies with this part, the Associate Administrator approves the PTCSP and issues a PTC System Certification. Receipt of a PTC System Certification affirms that the PTC system has been reviewed and approved by FRA in accordance with, and meets the requirements of, this part.

(b) A PTCSP submitted under this subpart may reference and utilize in accordance with this subpart any Type Approval previously issued by the Associate Administrator to any railroad, provided that the railroad:

(1) Maintains a continually updated PTCPVL pursuant to § 236.1023; and

(2) Shows that the supplier from which they are procuring the PTC system has established and can maintain a quality control system for PTC system design and manufacturing acceptable

to the Associate

Administrator. The quality control system must include the process for the product supplier or vendor to promptly and thoroughly report any safety-relevant failure and previously unidentified hazards to each railroad using the product; and

(3) Provides the applicable licensing information.

(c) A PTCSP submitted in accordance with this subpart shall:

(1) Include the FRA approved PTCDP or, if applicable, the FRA issued Type Approval;

(2)(i) Specifically and rigorously document each variance, including the significance of each variance between the PTC system and its applicable operating conditions as described in the applicable PTCDP from that as described in the PTCSP, and attest that there are no other such variances; or

(ii) Attest that there are no variances between the PTC system and its applicable operating conditions as described in the applicable PTCDP from that as described in the PTCSP; and

(3) Attest that the system was otherwise built in accordance with the applicable PTCDP and PTCSP and achieves the level of safety represented therein.

(d) A PTCSP shall include the same information required for a PTCDP under § 236.1013(a). If a PTCDP has been filed and approved prior to filing of the PTCSP, the PTCSP may incorporate the PTCDP by reference, with the exception that a final human factors analysis shall be provided. The PTCSP shall contain the following additional elements:

(1) A hazard log consisting of a comprehensive description of all safety-relevant hazards not previously addressed by the vendor or supplier to be addressed during the life-cycle of the PTC system, including maximum threshold limits for each hazard (for unidentified hazards, the threshold shall be exceeded at one occurrence);

(2) A description of the safety assurance concepts that are to be used for system development, including an explanation of the design principles and assumptions;

(3) A risk assessment of the as-built PTC system described;

(4) A hazard mitigation analysis, including a complete and comprehensive description of each hazard and the mitigation techniques used;

(5) A complete description of the safety assessment and Verification and Validation processes applied to the PTC system, their results, and whether these processes address the safety principles described in Appendix C to this part directly, using other safety criteria, or not at all;

(6) A complete description of the railroad's training plan for railroad and contractor employees and supervisors necessary to ensure safe and proper installation, implementation, operation, maintenance, repair, inspection, testing, and modification of the PTC system;

(7) A complete description of the specific procedures and test equipment necessary to ensure the safe and proper installation, implementation, operation, maintenance, repair, inspection, testing, and modification of the PTC system on the railroad and establish safety-critical hazards are appropriately mitigated. These procedures, including calibration requirements, shall be consistent with or explain deviations from the equipment manufacturer's recommendations;

(8) A complete description of any additional warning to be placed in the Operations and Maintenance Manual in the same manner specified in § 236.919 and all warning labels to be placed on equipment as necessary to ensure safety;

(9) A complete description of the configuration or revision control measures designed to ensure that the railroad or its contractor does not adversely affect the safety-functional requirements and that safety-critical hazard mitigation processes are not compromised as a result of any such change;

(10) A complete description of all initial implementation testing procedures necessary to establish that safety-functional requirements are met and safety-critical hazards are appropriately mitigated;

(11) A complete description of all post-implementation testing (validation) and monitoring procedures, including the intervals necessary to establish that safety-functional requirements, safety-critical hazard mitigation processes, and safety-critical tolerances are not compromised over time, through use, or after maintenance (adjustment, repair, or replacement) is performed;

(12) A complete description of each record necessary to ensure the safety of the system that is associated with periodic maintenance, inspections, tests, adjustments, repairs, or replacements, and the system's resulting conditions, including records of component failures resulting in safety-relevant hazards (see § 236.1037);

(13) A safety analysis to determine whether, when the system is in operation, any risk remains of an unintended incursion into a roadway work zone due to human error. If the analysis reveals any such risk, the PTCDP and PTCSP shall describe how that risk will be mitigated;

(14) A more detailed description of any alternative arrangements as already provided under § 236.1005(a)(1)(i).

(15) A complete description of how the PTC system will enforce authorities and signal indications, unless already completely provided for in the PTCDP;

(16) A description of how the PTCSP complies with § 236.1019(f), if applicable;

(17) A description of any deviation in operational requirements for en route failures as specified under § 236.1029(c), if applicable and unless already completely provided for in the PTCDP;

(18) A complete description of how the PTC system will appropriately and timely enforce all integrated hazard detectors in accordance with § 236.1005;

(19) An emergency and planned maintenance temporary rerouting plan indicating how operations on the subject PTC system will take advantage of the benefits provided under § 236.1005(g) through (k); and

(20) The documents and information required under § 236.1007 and § 236.1033.

(e) The following additional requirements apply to:

(1) *Non-vital overlay*. A PTC system proposed as an overlay on the existing method of operation and not built in accordance with the safety assurance principles set forth in Appendix C of this part must, to the satisfaction of the Associate Administrator, be shown to:

(i) Reliably execute the functions set forth in § 236.1005;

(ii) Obtain at least 80 percent reduction of the risk associated with accidents preventable by the functions set forth in § 236.1005, when all effects of the change associated with the PTC system are taken into account. The supporting risk assessment shall evaluate all intended changes in railroad operations coincident with the introduction of the new system; and (iii) Maintain a level of safety for each subsequent system modification that is equal to or greater than the level of safety for the previous PTC systems.

(2) *Vital overlay*. A PTC system proposed on a newly constructed track or as an overlay on the existing method of operation and built in accordance with the safety assurance principles set forth in Appendix C of this part must, to the satisfaction of the Associate Administrator, be shown to:

(i) Reliably execute the functions set forth in § 236.1005; and

(ii) Have sufficient documentation to demonstrate that the PTC system, as built, fulfills the safety assurance principles set forth in Appendix C of this part. The supporting risk assessment may be abbreviated as that term is used in subpart H of this part.

(3) *Stand-alone*. A PTC system proposed on a newly constructed track, an existing track for which no signal system exists, as a replacement for an existing signal or train control system, or otherwise to replace or materially modify the existing method of operation, shall:

(i) Reliably execute the functions required by § 236.1005 and be demonstrated to do so to FRA's satisfaction; and

(ii) Have a PTCSP establishing, with a high degree of confidence, that the system will not

introduce new hazards that have not been mitigated. The supporting risk assessment shall evaluate all intended changes in railroad operations in relation to the introduction of the new system and shall examine in detail the direct and indirect effects of all changes in the method of operations.

(4) *Mixed systems.* If a PTC system combining overlay, stand-alone, vital, or non-vital characteristics is proposed, the railroad shall confer with the Associate Administrator regarding appropriate structuring of the safety case and analysis.

(f) When determining whether the PTCSP fulfills the requirements under paragraph (d) of this section, the Associate Administrator may consider all available evidence concerning the reliability and availability of the proposed system and any and all safety consequences of the proposed changes. In any case where the PTCSP lacks adequate data regarding safety impacts of the proposed changes, the Associate Administrator may request the necessary data from the applicant. If the requested data is not provided, the Associate Administrator may find that potential hazards could or will arise.

(g) If a PTCSP applies to a system designed to replace an existing certified PTC system, the PTCSP will be approved provided that the PTCSP establishes with a high degree of confidence that the new system will provide a level of safety not less than the level of safety provided by the system to be replaced.

(h) When reviewing the issue of the potential data errors (for example, errors arising from data supplied from other business systems needed to execute the braking algorithm, survey data needed for location determination, or mandatory directives issued through the computer aided dispatching system), the PTCSP must include a careful identification of each of the risks and a discussion of each applicable mitigation. In an appropriate case, such as a case in which the residual risk after mitigation is substantial or the underlying method of operation will be significantly altered, the Associate Administrator may require submission of a quantitative risk assessment addressing these potential errors.

#### Application:

This section describes the requirements before placing a PTC system required under this part in service. The host railroad must submit to FRA a PTCSP and receive a PTC System Certification. A PTCSP shall include the same information required for a PTCDP under § 236.1013(a). If a PTCDP has been filed and approved prior to filing of the PTCSP, the PTCSP may incorporate the PTCDP by reference, with the exception that a final human factors analysis shall be provided. The PTCSP shall also contain additional elements as defined within this section. When determining whether the PTCSP fulfills the requirements of this section, the Associate Administrator may consider all available evidence concerning the reliability and availability of the proposed system and any and all safety consequences of the proposed changes.

#### CLASSIFICATION OF DEFECTS

- § 236.1015.A1 Failure to submit a PTCSP to FRA by the date stated in the current PTCIP.
- § 236.1015.A2 Failure to implement PTC system in accordance with the associated PTCSP and resultant system certification.
- § 236.1015.A3 Failure to maintain PTC system in accordance with the associated PTCSP and resultant system certification.

- § 236.1015.B1 Use of, and/or reference to, a Type Approval without updating and/or maintaining a PTCPL.
- § 236.1015.B2 Use of, and/or reference to, a Type Approval without providing information pertaining to the PTC system supplier quality control system.
- § 236.1015.B3 Use of, and/or reference to, a Type Approval without providing applicable licensing information.
- § 236.1015.C1 Failure to include an FRA approved PTCDP or FRA issued Type Approval with a PTCSP.
- § 236.1015.C2 Failure to document each variance between the PTC system and its applicable operating conditions as described in the PTCDP from that as described in the PTCSP.
- § 236.1015.C3 Failure to attest to no other variances, after documenting the variances, between the PTC system and its applicable operating conditions as described in the PTCDP from that as described in the PTCSP.
- § 236.1015.C4 Failure to attest to no variances between the PTC system and its applicable operating conditions as described in the PTCDP from that as described in the PTCSP.
- § 236.1015.D1 Failure to provide a final human factor analysis with a PTCSP incorporating a previously FRA approved PTCDP.
- § 236.1015.D2 Failure to provide the required information in a PTCSP.
- § 236.1015.D3 Failure to maintain required supporting documentation.
- § 236.1015.E1 Failure to provide non-vital overlay PTC system documentation demonstrating at least an 80-percent reduction of risk associated with PTC preventable accidents.
- § 236.1015.E2 Failure of a non-vital overlay PTC system to provide an 80-percent reduction of risk associated with PTC preventable accidents.
- § 236.1015.E3 Failure of a non-vital overlay PTC system to maintain a level of safety for each subsequent system modification that is equal to or greater than the level of safety for the previous PTC systems.
- § 236.1015.E4 Failure to provide vital overlay system documentation demonstrating the PTC system, as built, fulfills the safety assurance principles in Appendix C.
- § 236.1015.E5 Failure of a vital overlay PTC system to fulfill the safety assurance principles in Appendix C.
- § 236.1015.E6 Failure to provide stand-alone PTC system documentation demonstrating the system will not introduce new hazards that have not been mitigated.



- § 236.1015.E7 New hazards introduced by a stand-alone PTC system that have not been mitigated.
- § 236.1015.E8 Failure to confer with the FRA Associate Administrator regarding the structuring of the safety case and analysis for the proposed implementation of a mixed PTC system.
- § 236.1015.G1 Failure of a PTCSP for a new system, designed to replace an existing system, to document a level of safety for the new PTC system that is equal to or greater than the level of safety of the previous PTC system.

**§ 236.1017 Independent Third-Party Verification and Validation.**

(a) The PTCSP must be supported by an independent third-party assessment when the Associate Administrator concludes that it is necessary based upon the criteria set forth in § 236.913, with the exception that consideration of the methodology used in the risk assessment (§ 236.913(g)(2)(vii)) shall apply only to the extent that a comparative risk assessment was required. To the extent practicable, FRA makes this determination not later than review of the PTCIP and the accompanying PTCDP or PTCSP. If an independent assessment is required, the assessment may apply to the entire system or a designated portion of the system.

(b) If a PTC system is to undergo an independent assessment in accordance with this section, the host railroad may submit to the Associate Administrator a written request that FRA confirm whether a particular entity would be considered an independent third party pursuant to this section. The request should include supporting information identified in paragraph (c) of this section. FRA may request further information to make a determination or provide its determination in writing.

(c) As used in this section, “independent third party” means a technically competent entity responsible to and compensated by the railroad (or an association on behalf of one or more railroads) that is independent of the PTC system supplier and vendor. An entity that is owned or controlled by the supplier or vendor, that is under common ownership or control with the supplier or vendor, or that is otherwise involved in the development of the PTC system is not considered “independent” within the meaning of this section.

(d) The independent third-party assessment shall, at a minimum, consist of the activities and result in the production of documentation meeting the requirements of Appendix F to this part, unless excepted by this part or by FRA order or waiver.

(e) Information provided that has been certified under the auspices of a foreign railroad regulatory entity recognized by the Associate Administrator may, at the Associate Administrator’s discretion, be accepted as having been independently verified.

Application:

This rule requires that the PTCSP be supported by an independent third-party assessment when the Associate Administrator concludes that it is necessary based upon the criteria set forth in § 236.913, with the exception that consideration of the methodology used in the risk assessment (§ 236.913(g)(2)(vii)) shall apply only to the extent that a comparative risk assessment was required. If an independent assessment is required, the assessment may apply to the entire system or a designated portion of the system. It further lists the railroads rights and responsibilities as they pertain to this section.



- § 236.1017.A1 Failure to conduct independent third-party verification and validation when ordered.
- § 236.1017.A2 PTCSP not supported by an independent third-party assessment based upon the criteria set forth in § 236.913.
- § 236.1017.A3 Mandatory third-party assessment not per minimum requirements contained in Appendix F to Part 236.
- § 236.1017.C1 Required independent third-party assessment not conducted by a technically competent entity.
- § 236.1017.C2 Independent third party is owned or controlled by the supplier or vendor involved in the development of the PTC system.

**§ 236.1019 Main line track exceptions.**

(a) *Scope and procedure.* This section pertains exclusively to exceptions from the rule that trackage over which scheduled intercity and commuter passenger service is provided is considered main line track requiring installation of a PTC system. One or more intercity or commuter passenger railroads, or freight railroads conducting joint passenger and freight operation over the same segment of track may file a main line track exclusion addendum (“MTEA”) to its PTCIP requesting to designate track as not main line subject to the conditions set forth in paragraphs (b) or (c) of this section. No track shall be designated as yard or terminal unless it is identified in an MTEA that is part of an FRA approved PTCIP.

(b) *Passenger terminal exception.* FRA will consider an exception in the case of trackage used exclusively as yard or terminal tracks by or in support of regularly scheduled intercity or commuter passenger service where the MTEA describes in detail the physical boundaries of the trackage in question, its use and characteristics (including track and signal charts) and all of the following apply:

(1) The maximum authorized speed for all movements is not greater than 20 miles per hour, and that maximum is enforced by any available onboard PTC equipment within the confines of the yard or terminal;

(2) Interlocking rules are in effect prohibiting reverse movements other than on signal indications without dispatcher permission; and

(3) Either of the following conditions exists:

(i) No freight operations are permitted; or

(ii) Freight operations are permitted but no passengers will be aboard passenger trains within the defined limits.

(c) *Limited operations exception.* FRA will consider an exception in the case of a track segment used

for limited operations (operating in accordance with § 236.0 of this part) under one of the following sets of conditions:

(1) The trackage is used for limited operations by at least one passenger railroad subject to at least one of the following conditions:

(i) All trains are limited to restricted speed;

(ii) Temporal separation of passenger and other trains is maintained as provided in paragraph

(e) of this section; or

(iii) Passenger service is operated under a risk mitigation plan submitted by all railroads

involved in the joint operation and approved by FRA. The risk mitigation plan must be supported by a risk assessment establishing that the proposed mitigations will achieve a level of safety not less than the level of safety that would obtain if the operations were conducted under paragraph (c)(1) or (c)(2) of this section.

(2) Passenger service is operated on a segment of track of a freight railroad that is not a Class I railroad on which less than 15 million gross tons of freight traffic is transported annually and on which one of the following conditions applies:

(i) If the segment is unsignaled and no more than four regularly scheduled passenger trains are operated during a calendar day, or

(ii) If the segment is signaled (e.g., equipped with a traffic control system, automatic block signal system, or cab signal system) and no more than 12 regularly scheduled passenger trains are operated during a calendar day.

(3) Not more than four passenger trains per day are operated on a segment of track of a Class I freight railroad on which less than 15 million gross tons of freight traffic is transported annually.

(d) A limited operations exception under paragraph (c) is subject to FRA review and approval. FRA may require a collision hazard analysis to identify hazards and may require that specific mitigations be undertaken. Operations under any such exception shall be conducted subject to the terms and conditions of the approval. Any main line track exclusion is subject to periodic review.

(e) *Temporal separation.* As used in this section, temporal separation means that limited passenger and freight operations do not operate on any segment of shared track during the same period and also refers to the processes or physical arrangements, or both, in place to ensure that temporal separation is established and maintained at all times. The use of exclusive authorities under mandatory directives is not, by itself, sufficient to establish that temporal separation is achieved. Procedures to ensure temporal separation shall include verification checks between passenger and freight operations and effective physical means to positively ensure segregation of passenger and freight operations in accordance with this paragraph.

(f) *PTCSP requirement.* No PTCSP—filed after the approval of a PTCIP with an MTEA—shall be approved by FRA unless it attests that no changes, except for those included in an FRA approved RFA, have been made to the information in the PTCIP and MTEA required by paragraph (b) or (c) of this section.

(g) *Designation modifications.* If subsequent to approval of its PTCIP or PTCSP the railroad seeks to modify which track or tracks should be designated as main line or not main line, it shall request modification of its PTCIP or PTCSP, as applicable, in accordance with § 236.1021.

#### Application:

This rule identifies the conditions under which a railroad may request relief from installing a PTC system on a required line. They include passenger terminal exceptions, limited operations exceptions, and temporal separation. Each of these conditions has specific guidelines which must be met as defined within this section.

### CLASSIFICATION OF DEFECTS

§ 236.1019.A1 Track designated as yard or terminal is not identified in a MTEA that is part of an FRA approved PTCIP.

§ 236.1019.B1 Revenue operations conducted in noncompliance with the Passenger Terminal Exception.

- § 236.1019.B2 Physical boundaries of trackage used exclusively as yard or terminal not described in detail in an approved PTCIP.
- § 236.1019.B3 Use and characteristics of trackage used exclusively as yard or terminal not described in detail in an approved PTCIP.
- § 236.1019.B4 Maximum authorized speed for any movement exceeds 20 mph for tracks identified in MTEA Passenger Terminal Exception as yard or terminal.
- § 236.1019.B5 Maximum authorized speed is not enforced by any available onboard PTC equipment for tracks identified in MTEA Passenger Terminal Exception as yard or terminal.
- § 236.1019.B6 Tracks identified in a MTEA for Passenger Terminal Exception do not have interlocking rules in effect prohibiting reverse movements other than on signal indication without dispatcher permission.
- § 236.1019.B7 Tracks identified in a MTEA for Passenger Terminal Exception has freight operation and permit passengers aboard passenger trains within the defined limits.
- § 236.1019.C1 Revenue operations conducted in noncompliance with the Limited Operations Exception.
- § 236.1019.C2 Trackage used for limited operations trains not limited to restricted speed, temporal separation, or under an approved risk mitigation plan submitted by all railroads involved.
- § 236.1019.C3 Passenger service operated under the Limited Operations Exception on a Class 1 railroad segment of track on which more than 15 million gross tons of freight traffic is transported annually.
- § 236.1019.C4 More than four regularly scheduled passenger trains are operated under the Limited Operations Exception during a calendar day on a nonsignaled segment of track.
- § 236.1019.C5 More than 12 regularly scheduled passenger trains are operated under the Limited Operations Exception during a calendar day on a signaled segment of track.
- § 236.1019.C6 More than four passenger trains per day are operated under the Limited Operations Exception on a Class 1 railroad segment of track on which less than 15 million gross tons of freight traffic is transported annually.
- § 236.1019.D1 Limited operations not conducted subject to terms and conditions of an approved Limited Operations Exception.
- § 236.1019.E1 Passenger and freight operations permitted during the same period on a segment of track operating under a Temporal Separation Exception.

- § 236.1019.E2 Exclusive authorities under mandatory directives used as only method to establish temporal separation.
- § 236.1019.E3 Verification checks between passenger and freight operations not used to ensure temporal separation of trains.
- § 236.1019.E4 Effective physical means to positively ensure segregation of passenger and freight operations not available.
- § 236.1019.G1 Designation of tracks as main line or not main line modified without request for modification of the PTCIP or PTCSP in accordance with § 236.1021.

**§ 236.1020 Exclusion of track segments for implementation due to cessation of PIH materials service or rerouting.**

(a) *Purpose and scope.* This section sets forth the conditions under which track segments identified in the 2008 baseline described in § 236.1005(b)(2) may be removed from the PTCIP. A track segment qualified for removal under this section may be removed after FRA approves a request contained in the PTCIP or an RFA filed prior to the required and scheduled PTC installation date for the subject track segment.

(b) *Cessation of PIH materials service.* Except as provided in paragraph (c) of this section, the following three conditions must all be satisfied in order to justify removal of a track segment from the PTCIP:

(1) *Local service.* The railroad must affirm that there is no remaining local PIH materials traffic expected on the track segment, or that service is expected to cease as of a date certain prior to December 31, 2015. In the case of future cessation of local service, the expectation may be documented by statements from all current PIH materials shippers and/or consignees. The railroad is not required to anticipate future requests for service not in keeping with prior service patterns. (See § 236.1005(b)(3)).

(2) *Overhead traffic.* (i) To the extent that the track segment carried PIH materials traffic other than local traffic in 2008, the railroad must establish that current or prospective rerouting to one or more alternate track segments is justified. In making this showing, the railroad must assume, for purposes of analysis only, that both the subject track segment and the alternative route(s) will be equipped and operated with PTC. Rerouting will be justified if the analysis is conducted in accordance with the same procedures and using the same methodology as required for safety and security route analysis under 49 CFR 172.820, with appropriate quantitative weight given to risk reduction effected by installation of a PTC system. If the track segment in question is not clearly the route posing the least overall safety and security risks, then removal of the line from the PTCIP may be granted.

(ii) However, unlike analysis under part 172, FRA will consider the case for rerouting and removal of the line from the PTCIP to be made if the alternative(s) to the track segment sought to be removed has substantially the same overall safety and security risks as the subject routes under the stipulated conditions for analysis. In determining whether risk is substantially the same, FRA will consider the volume of traffic diverted, and such other factors as safety may require.

(3) *Residual risk.* In the case of a track segment for which cessation of local service is established under paragraph (b)(1) of this section and for which analysis shows any overhead PIH materials traffic could properly be rerouted under paragraph (b)(2) of this section, the railroad shall also establish that the remaining risk arising from rail operations on the track

segment— pertaining to events that can be prevented or mitigated in severity by a PTC system— is less than the average equivalent risk per route mile on track segments required to be equipped with PTC because of annual gross tonnage and the presence of PIH materials traffic (excluding track segments also carrying passenger traffic). Such average equivalent risk shall be determined as of a time prior to installation of PTC on the line segments. This provision of the rule requires a future rulemaking to finalize and implement a risk evaluation methodology. Lines identified for removal subject to this provision will not be required to be equipped with PTC prior to the issuance of a final rule detailing the methodology.

(i) FRA will develop a risk evaluation methodology for the purpose of conducting the analysis required pursuant to paragraph (b)(3) of this section. The risk evaluation methodology will be finalized through a separate rulemaking proceeding that will permit all interested parties to provide input on the specific methodology and, whether that methodology should be employed. If in the rulemaking proceeding FRA determines that a risk methodology should not be employed, then FRA will amend this final rule to eliminate the residual risk provisions.

(ii) Any track segment qualifying for consideration under paragraph (b)(3) of this section and identified by the railroad for requested removal from the PTCIP shall be considered to be “pending for decision” until such time as FRA has published the risk evaluation methodology identified in paragraph (b)(3)(i) of this section. If a final risk evaluation methodology is employed, the railroad may be requested to provide supplemental information related to its request for removal of specific lines. The railroad is not required to commence installation of PTC on any track segment “pending for decision” under this paragraph, until a final FRA determination is made.

(c) If a track segment qualifies for removal from the PTCIP under paragraphs (b)(1) and (b)(2) of this section but does not meet the test of paragraph (b)(3) of this section, the railroad may nevertheless request that the PTCIP be amended to remove the track segment based upon compensating reductions in the risk related to PTC preventable accidents based on installation of PTC technology on one or more track segments not otherwise required to be equipped. Upon a proper showing that the increment of risk reduction is at least as great on the substitute line as it would be on the line sought to be excluded from the PTCIP, FRA may approve the substitution.

#### Application:

This section sets forth the conditions under which track segments identified in the 2008 baseline described in § 236.1005(b)(2) may be removed from the PTCIP. It defines the requirements that a railroad must meet to be approved for the exception of installing a PTC system.

#### CLASSIFICATION OF DEFECTS

§ 236.1020.A1 Removal of a track segment from a PTCIP without FRA approval.

§ 236.1020.B1 Failure to affirm there is no remaining local PIH traffic, or PIH traffic will cease by December 31, 2015, on a track segment requested to be removed from a PTCIP.

§ 236.1020.B2 Failure to provide documentation from shippers and/or consignees attesting to cessation of current PIH traffic by December 31, 2015.

§ 236.1020.B3 Failure to provide significant justification for the rerouting of overhead PIH

traffic to one or more alternate track segments.

- § 236.1020.B4 Failure to show residual risk of remaining rail operations on a track segment requested to be removed from a PTCIP is less than average equivalent risk on track segments required to PTC equipped.
- § 236.1020.B5 Failure to provide additional requested information for track segments requested to be removed from a PTCIP.
- § 236.1020.C1 Failure to provide significant documentation in support of implementing PTC on a substitute track segment in lieu of one listed in a PTCIP.

### **§ 236.1021 Discontinuances, material modifications, and amendments.**

(a) No changes, as defined by this section, to a PTC system, PTCIP, PTCDP, or PTCSP, shall be made unless:

(1) The railroad files a request for amendment (“RFA”) to the applicable PTCIP, PTCDP, or PTCSP with the Associate Administrator; and

(2) The Associate Administrator approves the RFA.

(b) After approval of an RFA in accordance with paragraph (a) of this section, the railroad shall immediately adopt and comply with the amendment.

(c) In lieu of a separate filing under part 235 of this chapter, a railroad may request approval of a discontinuance or material modification of a signal or train control system by filing an RFA to its PTCIP, PTCDP, or PTCSP with the Associate Administrator.

(d) An RFA made in accordance with this section will not be approved by FRA unless the request includes:

(1) The information listed in § 235.10 of this chapter and the railroad provides FRA upon request any additional information necessary to evaluate the RFA (see § 235.12), including:

(2) The proposed modifications;

(3) The reasons for each modification;

(4) The changes to the PTCIP, PTCDP, or PTCSP, as applicable;

(5) Each modification’s effect on PTC system safety;

(6) An approximate timetable for filing of the PTCDP, PTCSP, or both, if the amendment pertains to a PTCIP; and

(7) An explanation of whether each change to the PTCSP is planned or unplanned.

(i) Unplanned changes that affect the Type Approval’s PTCDP require submission and approval in accordance with § 236.1013 of a new PTCDP, followed by submission and approval in accordance with § 236.1015 of a new PTCSP for the PTC system.

(ii) Unplanned changes that do not affect the Type Approval’s PTCDP require submission and approval of a new PTCSP.

(iii) Unplanned changes are changes affecting system safety that have not been documented in the PTCSP. The impact of unplanned changes on PTC system safety has not yet been determined.

(iv) Planned changes may be implemented after they have undergone suitable regression testing to demonstrate, to the satisfaction of the Associate Administrator, they have been correctly implemented and their implementation does not degrade safety.

(v) Planned changes are changes affecting system safety in the PTCSP and have been included in all required analysis under § 236.1015. The impact of these changes on the PTC

system's safety has been incorporated as an integral part of the approved PTCSP safety analysis.

(e) If the RFA includes a request for approval of a discontinuance or material modification of a signal or train control system, FRA will publish a notice in the Federal Register of the application and will invite public comment in accordance with part 211 of this chapter.

(f) When considering the RFA, FRA will review the issue of the discontinuance or material modification and determine whether granting the request is in the public interest and consistent with railroad safety, taking into consideration all changes in the method of operation and system functionalities, both within normal PTC system availability and in the case of a system failed state (unavailable), contemplated in conjunction with installation of the PTC system. The railroad submitting the RFA must, at FRA's request, perform field testing in accordance with § 236.1035 or engage in Verification and Validation in accordance with § 236.1017.

(g) FRA may issue at its discretion a new Type Approval number for a PTC system modified under this section.

(h) *Changes requiring filing of an RFA.* Except as provided by paragraph (i), an RFA shall be filed to request the following:

- (1) Discontinuance of a PTC system, or other similar appliance or device;
- (2) Decrease of the PTC system's limits (e.g., exclusion or removal of a PTC system on a track segment);
- (3) Modification of a safety critical element of a PTC system; or
- (4) Modification of a PTC system that affects the safety critical functionality of any other PTC system with which it interoperates.

(i) *Discontinuances not requiring the filing of an RFA.* It is not necessary to file an RFA for the following discontinuances:

- (1) Removal of a PTC system from track approved for abandonment by formal proceeding;
- (2) Removal of PTC devices used to provide protection against unusual contingencies such as landslide, burned bridge, high water, high and wide load, or tunnel protection when the unusual contingency no longer exists;
- (3) Removal of the PTC devices that are used on a movable bridge that has been permanently closed by the formal approval of another government agency and is mechanically secured in the closed position for rail traffic; or
- (4) Removal of the PTC system from service for a period not to exceed 6 months that is necessitated by catastrophic occurrence such as derailment, flood, fire, or hurricane, or earthquake.

(j) *Changes not requiring the filing of an RFA.* When the resultant change to the PTC system will comply with an approved PTCSP of this part, it is not necessary to file for approval to decrease the limits of a system when it involves the:

- (1) Decrease of the limits of a PTC system when interlocked switches, derails, or movable-point frogs are not involved;
- (2) Removal of an electric or mechanical lock, or signal used in lieu thereof, from hand-operated switch in a PTC system where train speed over such switch does not exceed 20 miles per hour, and use of those devices has not been part of the considerations for approval of a PTCSP; or
- (3) Removal of an electric or mechanical lock, or signal used in lieu thereof, from a hand-operated switch in a PTC system where trains are not permitted to clear the main track at such switch and use of those devices has not been a part of the considerations for approval of a PTCSP.

(k) *Modifications not requiring the filing of an RFA.* When the resultant arrangement will comply with an approved PTCSP of this part, it is not necessary to file an application for approval of the following modifications:



- (1) A modification that is required to comply with an order of the Federal Railroad Administration or any section of part 236 of this title;
- (2) Installation of devices used to provide protection against unusual contingencies such as landslide, burned bridges, high water, high and wide loads, or dragging equipment;
- (3) Elimination of existing track other than a second main track;
- (4) Extension or shortening of a passing siding; or
- (5) The temporary or permanent arrangement of existing systems necessitated by highway-rail grade separation construction. Temporary arrangements shall be removed within six months following completion of construction.

Application:

This section describes the procedures and circumstances in which a railroad can request discontinuances, material modifications, and amendments. A railroad must file a Request for Amendment (RFA) unless otherwise defined within this section. There is specific information required within the RFA which must be present and specific criteria which must be met before approval can be granted.

#### CLASSIFICATION OF DEFECTS

- § 236.1021.A1 Changes made to a PTC system, PTCIP, PTCDP, or PTCSP without first filing an RFA.
- § 236.1021.A2 Changes made to a PTC system, PTCIP, PTCDP, or PTCSP without approval of an RFA.
- § 236.1021.B1 Failure to immediately adopt and comply with approved RFA for an amendment to a PTC System, PTCIP, PTCDP, or PTCSP.
- § 236.1021.C1 Failure to request approval of a discontinuance or material modification of a signal or train control system by filing an RFA in lieu of a separate filing under Part 235.
- § 236.1021.D1 Information listed in § 235.10 not included in an RFA for a material modification or discontinuance of a signal or train control system.
- § 236.1021.D2 Failure to provide other information requested for evaluation of an RFA.
- § 236.1021.D3 Failure to submit a new PTCDP and/or PTCSP for approval when unplanned changes affect the original Type Approval's PTCDP.
- § 236.1021.D4 Failure to submit a new PTCSP for approval due to unplanned changes affecting PTC system safety.
- § 236.1021.D5 Planned changes implemented prior to suitable regression testing.
- § 236.1021.D6 Planned changes incorrectly implemented.
- § 236.1021.D7 Implementation of planned changes degrades safety.



- § 236.1021.F1 Failure to perform requested field testing of an approved RFA.
- § 236.1021.H1 Discontinuance or material modification of a PTC system without approval when required.
- § 236.1021.H2 RFA not filed for the discontinuance of a PTC system, or other similar appliance or device.
- § 236.1021.H3 RFA not filed for approval of decreasing a PTC system's limits.
- § 236.1021.H4 RFA not filed for approval of modification to a safety-critical element of a PTC system.
- § 236.1021.H5 RFA not filed for approval of modification to a PTC system that affects the safety-critical functionality of any other PTC system with which it interoperates.

### **§ 236.1023 Errors and Malfunctions.**

(a) Each railroad implementing a PTC system on its property shall establish and continually update a PTC Product Vendor List (PTCPVL) that includes all vendors and suppliers of each PTC system, subsystem, component, and associated product, and process in use system wide. The PTCPVL shall be made available to FRA upon request.

(b)(1) The railroad shall specify within its PTCSP all contractual arrangements with hardware and software suppliers or vendors for immediate notification between the parties of any and all safety-critical software failures, upgrades, patches, or revisions, as well as any hardware repairs, replacements, or modifications for their PTC system, subsystems, or components.

(2) A vendor or supplier, on receipt of a report of any safety-critical failure to their product, shall promptly notify all other railroads that are using that product, whether or not the other railroads have experienced the reported failure of that safety-critical system, subsystem, or component.

(3) The notification from a supplier to any railroad shall include explanation from the supplier of the reasons for such notification, the circumstances associated with the failure, and any recommended mitigation actions to be taken pending determination of the root cause and final corrective actions.

(c) The railroad shall:

(1) Specify the railroad's process and procedures in its PTCSP for action upon their receipt of notification of safety-critical failure, as well as receipt of a safety-critical upgrade, patch, revision, repair, replacement, or modification.

(2) Identify configuration/revision control measures in its PTCSP that are designed to ensure the safety-functional requirements and the safety-critical hazard mitigation processes are not compromised as a result of any change and that such a change can be audited.

(d) The railroad shall provide to the applicable vendor or supplier the railroad's procedures for action upon notification of a safety-critical failure, upgrade, patch, or revision for the PTC system, subsystem, component, product, or process, and actions to be taken until the faulty system, subsystem, or component has been adjusted, repaired or replaced.

(e) After the product is placed in service, the railroad shall maintain a database of all safety-

relevant hazards as set forth in the PTCSP and those that had not previously been identified in the PTCSP. If the frequency of the safety-relevant hazard exceeds the thresholds set forth in the PTCSP, or has not been previously identified in the appropriate risk analysis, the railroad shall:

(1) Notify the applicable vendor or supplier and FRA of the failure, malfunction, or defective condition that decreased or eliminated the safety functionality;

(2) Keep the applicable vendor or supplier and FRA apprised on a continual basis of the status of any and all subsequent failures; and

(3) Take prompt counter measures to reduce or eliminate the frequency of the safety relevant hazards below the threshold identified in the PTCSP.

(f) Each notification to FRA required by this section shall:

(1) Be made within 15 days after the vendor, supplier, or railroad discovers the failure, malfunction, or defective condition. However, a report that is due on a Saturday or a Sunday may be delivered on the following Monday and one that is due on a holiday may be delivered on the next business day;

(2) Be transmitted in a manner and form acceptable to the Associate Administrator and by the most expeditious method available; and

(3) Include as much available and applicable information as possible, including:

(i) PTC system name and model;

(ii) Identification of the part, component, or system involved, including the part number as applicable;

(iii) Nature of the failure, malfunctions, or defective condition;

(iv) Mitigation taken to ensure the safety of train operation, railroad employees, and the public; and

(v) The estimated time to correct the failure.

(4) In the event that all information required by paragraph (f)(3) of this section is not immediately available, the non-available information shall be forwarded to the Associate Administrator as soon as practicable in supplemental reports.

(g) Whenever any investigation of an accident or service difficulty report shows that a PTC system or product is unsafe because of a manufacturing or design defect, the railroad and its vendor or supplier shall, upon request of the Associate Administrator, report to the Associate Administrator the results of its investigation and any action taken or proposed to correct that defect.

(h) PTC system and product suppliers and vendors shall:

(1) Promptly report any safety-relevant failures or defective conditions, previously unidentified hazards, and recommended mitigation actions in their PTC system, subsystem, or component to each railroad using the product; and

(2) Notify FRA of any safety-relevant failure, defective condition, or previously unidentified hazard discovered by the vendor or supplier and the identity of each affected and notified railroad.

(i) The requirements of this section do not apply to failures, malfunctions, or defective conditions that:

(1) Are caused by improper maintenance or improper usage; or

(2) Have been previously identified to the FRA, vendor or supplier, and applicable user railroads.

(j) When any safety-critical PTC system, subsystem, or component fails to perform its intended function, the cause shall be determined and the faulty product adjusted, repaired, or replaced without undue delay. Until corrective action is completed, a railroad shall take appropriate action to ensure safety and reliability as specified within its PTCSP.

(k) Any railroad experiencing a failure of a system resulting in a more favorable aspect than intended or other condition hazardous to the movement of a train shall comply with the reporting

requirements, including the making of a telephonic report of an accident or incident involving such failure, under part 233 of this chapter. Filing of one or more reports under part 233 of this chapter does not exempt a railroad, vendor, or supplier from the reporting requirements contained in this section.

Application:

The requirements of this section provide the process and procedures for tracking, reporting, and correction of errors and malfunctions. Included in this section are the procedures for the railroads responsibilities to maintain and make available to the FRA a PTCVPL along with the procedures for reporting a safety-critical incident.

CLASSIFICATION OF DEFECTS

- § 236.1023.A1 PTCVPL not established.
- § 236.1023.A2 Failure to maintain PTCVPL.
- § 236.1023.A3 PTCVPL not available to FRA upon request.
- § 236.1023.B1 Contractual arrangements with hardware suppliers, software suppliers, and/or vendors not specified in the PTCSP.
- § 236.1023.B2 Failure of a supplier to promptly provide proper notification of identified PTC system safety-critical failure to all railroads using that product.
- § 236.1023.B3 Notification of a safety-critical failure does not include reasons for such notification, circumstances associated with the failure, and/or recommended mitigation actions.
- § 236.1023.C1 Failure to provide processes and procedures in the PTCSP for actions upon notification of safety-critical failures, safety-critical upgrades, patch revisions, repair, replacement, or modification.
- § 236.1023.C2 Failure to identify configuration/revision control measures in the PTCSP.
- § 236.1023.D1 Failure to provide vendor and/or supplier the railroad procedures for action upon notification of a safety-critical failure, upgrade, patch, or revision of PTC system, subsystem, component, product, or process.
- § 236.1023.D2 Failure to provide vendor and/or supplier the railroad procedures for action to be taken until faulty PTC system, subsystem, or component has been adjusted, repaired, or replaced.
- § 236.1023.E1 Failure to maintain a database of all safety-relevant hazards of a PTC system in service.
- § 236.1023.E2 Failure to notify FRA, vendor, and/or supplier if the frequency of a safety-relevant hazard exceeds the threshold set forth in the PTCSP.

- § 236.1023.E3 Failure to notify FRA, vendor, and/or supplier of a safety-relevant hazard not previously identified.
- § 236.1023.E4 Failure to update FRA, the vendor, and/or supplier of any and all subsequent failures related to a safety-relevant hazardous event.
- § 236.1023.E5 Failure to take counter measures to reduce or eliminate the frequency of any safety-relevant hazard above the threshold identified in the PTCSP.
- § 236.1023.F1 Failure to provide notification to FRA of a failure, malfunction, or defective condition within 15 business days.
- § 236.1023.F2 Notification to FRA of a failure, malfunction, or defective condition not transmitted expeditiously.
- § 236.1023.F3 Notification to FRA of a failure, malfunction, or defective condition not transmitted in an acceptable manner and form.
- § 236.1023.F4 Failure to provide FRA all available and applicable required information when reporting failure, malfunction, or defective condition.
- § 236.1023.F5 Failure to provide FRA supplemental reports as required information of the failure, malfunction, or defective condition becomes available.
- § 236.1023.G1 Failure to respond to an FRA request to report results of an investigation of an accident or service difficulty revealing a PTC system or product is unsafe because of a manufacturing or design defect.
- § 236.1023.G2 Failure to respond to an FRA request to report any action taken or proposed as the result of an investigation of an accident or service difficulty revealing a PTC system or product is unsafe.
- § 236.1023.H1 Failure of a PTC supplier and/or vendor to promptly report to each affected railroad any safety-relevant failures or defective conditions, previously unidentified hazards, and/or recommended mitigation actions of a PTC system, subsystem, or component.
- § 236.1023.H2 Failure of a PTC supplier and/or vendor to notify FRA of any safety-relevant failure, defective condition, or previously unidentified hazard.
- § 236.1023.H3 Notification to FRA of any safety-relevant failure, defective condition, or previously unidentified hazard does not include the identity of each affected and notified railroad.
- § 236.1023.J1 Safety-critical PTC system, subsystem, and/or component, essential to the safety of train operation, failing to perform its intended function not adjusted without undue delay.

- § 236.1023.J2 Safety-critical PTC system, subsystem, and/or component, essential to the safety of train operation, failing to perform its intended function not repaired without undue delay.
- § 236.1023.J3 Safety-critical PTC system, subsystem, and/or component, essential to the safety of train operation, failing to perform its intended function not replaced without undue delay.
- § 236.1023.J4 Cause not determined for any safety-critical PTC system, subsystem, and/or component out of correspondence with known operating conditions.
- § 236.1023.J5 Failure to take appropriate action prior to completion of corrective action, as specified within the carrier's PTCSP, to ensure safety and reliability when any safety-critical PTC system, subsystem or component fails to perform its intended function.
- § 236.1023.K1 Report not made of the failure of a system resulting in a more favorable aspect than intended or other condition hazardous to the movement of a train, per Part 233.

## **§ 236.1025 [RESERVED]**

## **§236.1027 PTC system exclusions.**

(a) The requirements of this subpart apply to each office automation system that performs safety-critical functions within, or affects the safety performance of, the PTC system. For purposes of this section, "office automation system" means any centralized or distributed computer-based system that directly or indirectly controls the active movement of trains in a rail network.

(b) Changes or modifications to PTC systems otherwise excluded from the requirements of this subpart by this section do not exclude those PTC systems from the requirements of this subpart if the changes or modifications result in a degradation of safety or a material decrease in safety-critical functionality.

(c) Primary train control systems cannot be integrated with locomotive electronic systems unless the complete integrated systems:

- (1) Have been shown to be designed on fail-safe principles;
- (2) Have demonstrated to operate in a fail-safe mode;
- (3) Have a manual fail-safe fallback and override to allow the locomotive to be brought to a safe stop in the event of any loss of electronic control; and
- (4) Are included in the approved and applicable PTCDP and PTCSP.

(d) PTC systems excluded by this section from the requirements of this subpart remain subject to subparts A through H of this part as applicable.

### Application:

The requirements of this subpart apply to each office automation system that performs safety-critical functions within, or affects the safety performance of, the PTC system. For purposes of this section "office automation system" means any centralized or distributed computer-based system that directly or indirectly controls the active movement of trains in a rail network.

PTC systems excluded by this section from the requirements of this subpart remain subject to Subparts A through H of this part as applicable.

## CLASSIFICATION OF DEFECTS

- § 236.1027.B1 PTC office automated system changes or modification resulted in a degradation of safety or a material decrease in safety-critical functionality.
- § 236.1027.C1 Integration of primary train control system with locomotive not designed on fail-safe principle.
- § 236.1027.C2 Integration of primary train control system with locomotive electronic system without demonstration of operation in a fail-safe mode.
- § 236.1027.C3 Primary train control system integrated with locomotive failed to operate in a fail-safe mode.
- § 236.1027.C4 Primary train control system integrated with a locomotive electronic system does not have a manual fail-safe fallback and override to allow the locomotive to be brought to a safe stop in the event of any loss of electronic control.
- § 236.1027.C5 Primary train control system integrated with a locomotive electronic system is not included in an approved and applicable PTCDP and PTCSF.

### **§ 236.1029 PTC system use and en route failures.**

(a) When any safety-critical PTC system component fails to perform its intended function, the cause must be determined and the faulty component adjusted, repaired, or replaced without undue delay. Until repair of such essential components are completed, a railroad shall take appropriate action as specified in its PTCSF.

(b) Where a PTC onboard apparatus on a controlling locomotive that is operating in or is to be operated within a PTC system fails or is otherwise cut-out while en route (i.e., after the train has departed its initial terminal), the train may only continue in accordance with the following:

(1) The train may proceed at restricted speed, or if a block signal system is in operation according to signal indication at medium speed, to the next available point where communication of a report can be made to a designated railroad officer of the host railroad;

(2) Upon completion and communication of the report required in paragraph (b)(1) of this section, or where immediate electronic report of said condition is appropriately provided by the PTC system itself, a train may continue to a point where an absolute block can be established in advance of the train in accordance with the following:

(i) Where no block signal system is in use, the train may proceed at restricted speed, or

(ii) Where a block signal system is in operation according to signal indication, the train may proceed at a speed not to exceed medium speed.

(3) Upon reaching the location where an absolute block has been established in advance of the train, as referenced in paragraph (b)(2) of this section, the train may proceed in accordance with the following:

(i) Where no block signal system is in use, the train may proceed at medium speed; however, if the involved train is a passenger train or a train hauling any amount of PIH material, it may only proceed at a speed not to exceed 30 miles per hour.

(ii) Where a block signal system is in use, a passenger train may proceed at a speed not to

exceed 59 miles per hour and a freight train may proceed at a speed not to exceed 49 miles per hour.

(iii) Except as provided in paragraph (c), where a cab signal system with an automatic train control system is in operation, the train may proceed at a speed not to exceed 79 miles per hour.

(c) In order for a train equipped with PTC traversing a track segment equipped with PTC to deviate from the operating limitations contained in paragraph (b) of this section, the deviation must be described and justified in the FRA approved PTCDP or PTCSP, or the Order of Particular Applicability, as applicable.

(d) Each railroad shall comply with all provisions in the applicable PTCDP and PTCSP for each PTC system it uses and shall operate within the scope of initial operational assumptions and predefined changes identified.

(e) The normal functioning of any safety-critical PTC system must not be interfered with in testing or otherwise without first taking measures to provide for the safe movement of trains, locomotives, roadway workers, and on-track equipment that depend on the normal functioning of the system.

(f) The PTC system's onboard apparatus shall be so arranged that each member of the crew assigned to perform duties in the locomotive can receive the same PTC information displayed in the same manner and execute any functions necessary to that crew member's duties. The locomotive engineer shall not be required to perform functions related to the PTC system while the train is moving that have the potential to distract the locomotive engineer from performance of other safety-critical duties.

#### Application:

This section defines the responsibilities and procedures that a railroad must take when an en route PTC failure occurs. Depending on the underlying signal system in place, it also describes the maximum permissible speed for a train in the event of an equipment failure. It also describes the placement of the onboard apparatus.

### CLASSIFICATION OF DEFECTS

§ 236.1029.A1 Cause not determined without undue delay for safety-critical PTC system component failing to perform its intended function.

§ 236.1029.A2 PTC system component, essential to the safety of train operation, failing to perform its intended function not adjusted without undue delay.

§ 236.1029.A3 PTC system component, essential to the safety of train operation, failing to perform its intended function not repaired without undue delay.

§ 236.1029.A4 PTC system component, essential to the safety of train operation, failing to perform its intended function not replaced without undue delay.

§ 236.1029.A5 Failure to take appropriate action prior to completion of corrective action, as specified within the carrier's PTCSP, to ensure safety and reliability when any essential PTC component fails to perform its intended function.

- § 236.1029.B1 Train initially permitted to proceed at greater than restricted speed in non-signalized territory when PTC device fails and/or is cut out en route.
- § 236.1029.B2 Train initially permitted to proceed at greater than medium speed in signalized territory when PTC device fails and/or is cut out en route.
- § 236.1029.B3 Report not made to designated officer at the next available point of communication after PTC device fails and/or is cut out en route.
- § 236.1029.B4 Train permitted to proceed at greater than medium speed within an absolute block in non-signalized territory when PTC device fails and/or is cut out en route.
- § 236.1029.B5 PIH train permitted to proceed at greater than 30 mph within an absolute block in non-signalized territory when PTC device fails and/or is cut out en route.
- § 236.1029.B6 Freight train permitted to proceed at greater than 49 mph within an absolute block in signalized territory when PTC device fails and/or is cut out en route.
- § 236.1029.B7 Passenger train permitted to proceed at greater than 59 mph within an absolute block in signalized territory when PTC device fails and/or is cut out en route.
- § 236.1029.B8 Train permitted to proceed at greater than 79 mph within an absolute block in ATC territory when PTC device fails and/or is cut out en route.
- § 236.1029.C1 Train permitted to deviate from operational limitations when PTC device fails and/or is cut out en route without such deviation described and justified in an FRA approved PTCDP, PTCSP, and/or the Order of Particular Applicability.
- § 236.1029.D1 Railroad operations not within the scope of initial operational assumptions and predefined changes identified in applicable PTCDP and PTCSP for each PTC system in use.
- § 236.1029.E1 Interference with the normal functioning of a PTC system or its components without first taking measures to provide for the safe movement of trains, locomotives, roadway workers, and/or on-track equipment that depend on the normal functioning of the system.
- § 236.1029.F1 PTC system onboard apparatus not arranged so that each member of the train crew can receive the same PTC information.
- § 236.1029.F2 PTC system onboard apparatus not arranged so that each member of the train crew can execute any functions necessary for that crewmember's duties.
- § 236.1029.F3 Locomotive engineer required to perform functions related to the PTC system while the train is moving that have the potential to distract him or her from the performance of other safety-critical duties.

**§ 236.1031 Previously approved PTC systems.**

- (a) Any PTC system fully implemented and operational prior to March 16, 2010, may receive



PTC System Certification if the applicable PTC railroad, or one or more system suppliers and one or more PTC railroads, submits a Request for Expedited Certification (REC) letter to the Associate Administrator. The REC letter must do one of the following:

(1) Reference a product safety plan (PSP) approved by FRA under subpart H of this part and include a document fulfilling the requirements under §§ 236.1011 and 236.1013 not already included in the PSP;

(2) Attest that the PTC system has been approved by FRA and in operation for at least 5 years and has already received an assessment of Verification and Validation from an independent third party under part 236 or a waiver supporting such operation; or

(3) Attest that the PTC system is recognized under an Order issued prior to March 16, 2010.

(b) If an REC letter conforms to paragraph (a)(1) of this section, the Associate Administrator, at his or her sole discretion, may also issue a new Type Approval for the PTC system.

(c) In order to receive a Type Approval or PTC System Certification under paragraph (a) or (b) of this section, the PTC system must be shown to reliably execute the functionalities required by §§ 236.1005 and 236.1007 and otherwise conform to this subpart.

(d) Previous approval or recognition of a train control system, together with an established service history, may, at the request of the PTC railroad, and consistent with available safety data, be credited toward satisfaction of the safety case requirements set forth in this part for the PTCSP with respect to all functionalities and implementations contemplated by the approval or recognition.

(e) To the extent that the PTC system proposed for implementation under this subpart is different in significant detail from the system previously approved or recognized, the changes shall be fully analyzed in the PTCDP or PTCSP as would be the case absent prior approval or recognition.

(f) As used in this section—

(1) *Approved* refers to approval of a Product Safety Plan under subpart H of this part.

(2) *Recognized* refers to official action permitting a system to be implemented for control of train operations under an FRA order or waiver, after review of safety case documentation for the implementation.

(g) Upon receipt of an REC, FRA will consider all safety case information to the extent feasible and appropriate, given the specific facts before the agency. Nothing in this section limits re-use of any applicable safety case information by a party other than the party receiving:

(1) A prior approval or recognition referred to in this section; or

(2) A Type Approval or PTC System Certification under this subpart.

#### Application:

This rule prescribes an expedited certification process in order to facilitate the ability of the railroads to leverage the results of PTC design, development, and implementation efforts that have been previously approved or recognized by FRA prior to the adoption of this subpart.

Any PTC system fully implemented and operational prior to March 16, 2010, may receive PTC System Certification if the applicable PTC railroad, or one or more system suppliers and one or more PTC railroads, submits a Request for Expedited Certification (REC) letter to the Associate Administrator.

#### CLASSIFICATION OF DEFECTS

§ 236.1031.A1 Failure to provide the required information within an REC.

- § 236.1031.C1 Failure to show all required PTC system functionalities within the proposed system are executed reliably within an REC.
- § 236.1031.E1 Failure to fully analyze within the PTCDP and/or PTCSP all significant changes for a proposed system for which an REC is requested.

**§ 236.1033 Communications and security requirements.**

- (a) All wireless communications between the office, wayside, and onboard components in a PTC system shall provide cryptographic message integrity and authentication.
- (b) Cryptographic keys required under paragraph (a) of this section shall:
- (1) Use an algorithm approved by the National Institute of Standards (NIST) or a similarly recognized and FRA approved standards body;
  - (2) Be distributed using manual or automated methods, or a combination of both; and
  - (3) Be revoked:
    - (i) If compromised by unauthorized disclosure of the cleartext key; or
    - (ii) When the key algorithm reaches its lifespan as defined by the standards body responsible for approval of the algorithm.
- (c) The cleartext form of the cryptographic keys shall be protected from unauthorized disclosure, modification, or substitution, except during key entry when the cleartext keys and key components may be temporarily displayed to allow visual verification. When encrypted keys or key components are entered, the cryptographically protected cleartext key or key components shall not be displayed.
- (d) Access to cleartext keys shall be protected by a tamper resistant mechanism.
- (e) Each railroad electing to also provide cryptographic message confidentiality shall:
- (1) Comply with the same requirements for message integrity and authentication under this section; and
  - (2) Only use keys meeting or exceeding the security strength required to protect the data as defined in the railroad's PTCSP and required under § 236.1013(a)(7).
- (f) Each railroad, or its vendor or supplier, shall have a prioritized service restoration and mitigation plan for scheduled and unscheduled interruptions of service. This plan shall be included in the PTCDP or PTCSP as required by §§ 236.1013 or 236.1015, as applicable, and made available to FRA upon request, without undue delay, for restoration of communication services that support PTC system services.
- (g) Each railroad may elect to impose more restrictive requirements than those in this section, consistent with interoperability requirements specified in the PTCSP for the system.

**Application:**

This rule provides specific communications security requirements for PTC system messages.

All wireless communications between the office, wayside, and onboard components in a PTC system shall provide cryptographic message integrity and authentication.

**CLASSIFICATION OF DEFECTS**

- § 236.1033.A1 Wireless communications between office, wayside, and/or onboard components of PTC system do not provide cryptographic message integrity and authentication.

- § 236.1033.B1 Cryptographic key does not use an algorithm approved by the NIST or a similarly recognized and FRA approved standards body.
- § 236.1033.B2 Failure to revoke a cryptographic key after the unauthorized disclosure of cleartext key.
- § 236.1033.B3 Failure to revoke a cryptographic upon reaching its lifespan as defined by the standards body responsible for the approval of the algorithm.
- § 236.1033.C1 Cleartext form of cryptographic keys not protected against unauthorized disclosure, modification, and/or substitution.
- § 236.1033.C2 Cryptographically protected, cleartext key or key component displayed when encrypted keys or key components are entered.
- § 236.1033.D1 Access to cleartext keys not protected by tamper resistant mechanism.
- § 236.1033.E1 Cryptographic message confidentiality does not comply with the message integrity and/or authentication protocols.
- § 236.1033.E2 Failure to use keys for cryptographic message confidentiality defined by railroad's PTCSP/PTCDP.
- § 236.1033.F1 Failure of a railroad, vendor, or supplier to develop a prioritized service and mitigation plan for scheduled or unscheduled interruption of service.
- § 236.1033.F2 Prioritized service and mitigation plan for scheduled or unscheduled interruption of service not included in the PTCDP or PTCSP as required.
- § 236.1033.F3 Railroad, vendor, or supplier prioritized service and mitigation plan for scheduled or unscheduled interruption of service not made available to FRA upon request.
- § 236.1033.F4 Prioritized service and mitigation plan for scheduled or unscheduled interruption of service not made available to FRA upon request without undue delay for restoration of communication services supporting PTC system.

**§ 236.1035 Field testing requirements.**

(a) Before any field testing of an uncertified PTC system, or a product of an uncertified PTC system, or any regression testing of a certified PTC system is conducted on the general rail system, the railroad requesting the testing must provide:

- (1) A complete description of the PTC system;
- (2) An operational concepts document;
- (3) A complete description of the specific test procedures, including the measures that will be taken to protect trains and on-track equipment;
- (4) An analysis of the applicability of the requirements of subparts A through G of this part to the PTC system that will not apply during testing;
- (5) The date the proposed testing shall begin;
- (6) The test locations; and

(7) The effect on the current method of operation the PTC system will or may have under test.

(b) FRA may impose additional testing conditions that it believes may be necessary for the safety of train operations.

(c) Relief from regulations other than from subparts A through G of this part that the railroad believes are necessary to support the field testing, must be requested in accordance with part 211 of this title.

#### Application:

This section prescribes the requirements for initial field testing of an uncertified PTC system or a product of an uncertified PTC system, or any regression testing of a certified PTC system on the general rail system.

### CLASSIFICATION OF DEFECTS

- § 236.1035.A1 Failure to provide a complete description of PTC system to FRA prior to field testing of uncertified PTC system, product of uncertified PTC system, or regression testing of certified PTC system conducted on the general rail system.
- § 236.1035.A2 Failure to provide an Operational Concepts document to FRA prior to field testing of uncertified PTC system, product of uncertified PTC system, or regression testing of certified PTC system conducted on the general rail system.
- § 236.1035.A3 Failure to provide a complete description of specific test procedures, including measures to be taken to protect trains and on-track equipment, to FRA prior to field testing of uncertified PTC system, product of uncertified PTC system, or regression testing of certified PTC system conducted on the general rail system.
- § 236.1035.A4 Failure to provide an analysis of the applicability of the requirements of Subparts A thru G of this Part to the PTC system not applying during testing prior to field testing of uncertified PTC system, product of uncertified PTC system, or regression testing of certified PTC system conducted on the general rail system.
- § 236.1035.A5 Failure to provide the date of proposed testing, test locations, and/or effect on current Method of Operation PTC system will or may have under test prior to field testing of uncertified PTC system, product of uncertified PTC system, or regression testing of certified PTC system conducted on the general rail system.
- § 236.1035.B1 Failure to adhere to FRA imposed additional requirements for field testing of uncertified PTC system, product of uncertified PTC system, or regression testing of certified PTC system conducted on the general rail system.
- § 236.1035.C1 Regulations not adhered to while field testing of uncertified PTC system, product of uncertified PTC system, or regression testing of certified PTC system conducted on the general rail system without prior FRA approval.

#### **§ 236.1037 Records retention.**

- (a) Each railroad with a PTC system required to be installed under this subpart shall maintain

at a designated office on the railroad:

(1) A current copy of each FRA approved Type Approval, if any, PTCDP, and PTCSP that it holds;

(2) Adequate documentation to demonstrate that the PTCSP and PTCDP meet the safety requirements of this subpart, including the risk assessment;

(3) An Operations and Maintenance Manual, pursuant to § 236.1039; and

(4) Training and testing records pursuant to § 236.1043(b).

(b) Results of inspections and tests specified in the PTCSP and PTCDP must be recorded pursuant to § 236.110.

(c) Each contractor providing services relating to the testing, maintenance, or operation of a PTC system required to be installed under this subpart shall maintain at a designated office training records required under § 236.1039(b).

(d) After the PTC system is placed in service, the railroad shall maintain a database of all safety-relevant hazards as set forth in the PTCSP and PTCDP and those that had not been previously identified in either document. If the frequency of the safety-relevant hazards exceeds the threshold set forth in either of these documents, then the railroad shall:

(1) Report the inconsistency in writing by mail, facsimile, e-mail, or hand delivery to the Director, Office of Safety Assurance and Compliance, FRA, 1200 New Jersey Ave, SE, Mail Stop 25, Washington, DC 20590, within 15 days of discovery. Documents that are hand delivered must not be enclosed in an envelope;

(2) Take prompt countermeasures to reduce the frequency of each safety-relevant hazard to below the threshold set forth in the PTCSP and PTCDP; and

(3) Provide a final report when the inconsistency is resolved to the FRA Director, Office of Safety Assurance and Compliance, on the results of the analysis and countermeasures taken to reduce the frequency of the safety-relevant hazard(s) below the threshold set forth in the PTCSP and PTCDP.

#### Application:

This section identifies reporting requirements and describes mandatory record maintenance for any railroad required to install a PTC system, or contractor providing services relating to the testing, maintenance, or operation of the required system.

§ 236.1037.A1 Current copy of FRA approved Type Approval, PTCDP, and/or PTCSP not maintained at the designated railroad office.

§ 236.1037.A2 Failure to maintain documentation demonstrating the PTCDP and/or PTCSP meet all the applicable safety requirements.

§ 236.1037.A3 Failure to maintain documentation demonstrating the PTCDP and/or PTCSP meet all the applicable safety requirements at the designated railroad office.

§ 236.1037.A4 PTC system operations and maintenance manual not maintained at the designated railroad office.

§ 236.1037.A5 Training and test records not maintained at the designated railroad office.

§ 236.1037.B1 PTCDP and/or PTCSP specified inspections and/or tests results not recorded.

- § 236.1037.C1 Training records for contractor providing services relating to testing, maintenance, or operation of PTC system not maintained at a designated office.
- § 236.1037.D1 Failure to maintain, at the designated railroad office, a database of all safety-relevant hazards, to include those identified in the PTCDP, PTCSP, and/or those not previously identified.
- § 236.1037.D2 Failure to report to FRA any inconsistency pertaining to frequency of safety-relevant hazards exceeding threshold established in PTCDP and/or PTCSP within 15 days of discovery.
- § 236.1037.D3 Failure to report to FRA by an approved means, any inconsistency pertaining to frequency of safety-relevant hazards exceeding threshold established in PTCDP and/or PTCSP.
- § 236.1037.D4 Failure to take prompt countermeasures to reduce the frequency of each safety-relevant hazard above the threshold established in PTCDP and/or PTCSP.
- § 236.1037.D5 Failure to provide a final report to FRA of results of analysis and countermeasures taken to reduce the frequency of safety-relevant hazards set forth in PTCDP and/or PTCSP.

#### **§ 236.1039 Operations and Maintenance Manual.**

(a) The railroad shall catalog and maintain all documents as specified in the PTCDP and PTCSP for the installation, maintenance, repair, modification, inspection, and testing of the PTC system and have them in one Operations and Maintenance Manual, readily available to persons required to perform such tasks and for inspection by FRA and FRA-certified state inspectors.

(b) Plans required for proper maintenance, repair, inspection, and testing of safety critical PTC systems must be adequate in detail and must be made available for inspection by FRA and FRA-certified state inspectors where such PTC systems are deployed or maintained. They must identify all software versions, revisions, and revision dates. Plans must be legible and correct.

(c) Hardware, software, and firmware revisions must be documented in the Operations and Maintenance Manual according to the railroad's configuration management control plan and any additional configuration/revision control measures specified in the PTCDP and PTCSP.

(d) Safety-critical components, including spare equipment, must be positively identified, handled, replaced, and repaired in accordance with the procedures specified in the PTCDP and PTCSP.

(e) Each railroad shall designate in its Operations and Maintenance Manual an appropriate railroad officer responsible for issues relating to scheduled interruptions of service contemplated by § 236.1029.

#### **Application:**

This section requires that each railroad develop a manual covering the requirements for the installation, maintenance, repair, modification, inspection, and testing of the PTC system and have them in one Operations and Maintenance Manual, readily available to persons required to perform such tasks, and for inspection by FRA and FRA-certified state inspectors. The railroad shall catalog and maintain these documents as specified in the PTCDP and PTCSP.

## CLASSIFICATION OF DEFECTS

- § 236.1039.A1 Failure to maintain and catalog all documentation pertaining installation, maintenance, repair, modification, inspection, and testing of PTC system in one operations and maintenance manual.
- § 236.1039.A2 Failure to make the operations and maintenance manual available to persons required to perform PTC installation, maintenance, repair, modification, inspection, and testing tasks.
- § 236.1039.A3 Operations and maintenance manual not made available to FRA and/or FRA-certified State inspectors during normal business hours.
- § 236.1039.B1 Plans required for maintenance, repair, inspection, and/or testing of safety-critical PTC systems not developed.
- § 236.1039.B2 Plans required for maintenance, repair, inspection, and/or testing of safety-critical PTC systems not of sufficient detail.
- § 236.1039.B3 Plans required for maintenance, repair, inspection, and/or testing of safety-critical PTC systems not made available for inspection by FRA and/or FRA-certified State inspectors during normal business hours.
- § 236.1039.B4 Plans required for maintenance, repair, inspection, and/or testing of safety-critical PTC systems do not identify software versions, revisions, and/or revision dates.
- § 236.1039.B5 Plans required for maintenance, repair, inspection, and/or testing of safety-critical PTC systems not legible and/or correct.
- § 236.1039.C1 Hardware, software, and/or firmware revisions not documented in PTC system operations and maintenance manual according to the railroad's Configuration Management Control Plan and/or any additional configuration/revision control measures specified in the system PTCDP and/or PTCSP.
- § 236.1039.D1 Safety-critical components of PTC system, including spare equipment, not positively identified, handled, replaced, or repaired in accordance with procedures specified in PTCDP and/or PTCSP.
- § 236.1039.E1 Failure to designate a railroad officer responsible for issues relating to scheduled interruptions of service of PTC system in the PTC system operations and maintenance manual.

### **§ 236.1041 Training and qualification program, general.**

(a) *Training program for PTC personnel.* Employers shall establish and implement training and qualification programs for PTC systems subject to this subpart. These programs must meet the minimum requirements set forth in the PTCDP and PTCSP in §§ 236.1039 through 236.1045, as appropriate, for the following personnel:

- (1) Persons whose duties include installing, maintaining, repairing, modifying, inspecting,



and testing safety-critical elements of the railroad's PTC systems, including central office, wayside, or onboard subsystems;

(2) Persons who dispatch train operations (issue or communicate any mandatory directive that is executed or enforced, or is intended to be executed or enforced, by a train control system subject to this subpart);

(3) Persons who operate trains or serve as a train or engine crew member subject to instruction and testing under part 217 of this chapter, on a train operating in territory where a train control system subject to this subpart is in use;

(4) Roadway workers whose duties require them to know and understand how a train control system affects their safety and how to avoid interfering with its proper functioning; and

(5) The direct supervisors of persons listed in paragraphs (a)(1) through (a)(4) of this section.

(b) *Competencies*. The employer's program must provide training for persons who perform the functions described in paragraph (a) of this section to ensure that they have the necessary knowledge and skills to effectively complete their duties related to operation and maintenance of the PTC system.

#### Application:

This section sets forth the general/minimal requirements of an employer's training and qualification programs for PTC systems subject to this subpart. These programs shall provide a description of the specific training necessary to ensure the safe installation, implementation, operation, maintenance, repair, inspection, testing, and modification of the PTC system, including central office, wayside, or onboard subsystems. This section does not restrict the employer from adopting additional and more stringent training requirements.

#### CLASSIFICATION OF DEFECTS

- § 236.1041.A1 Training and/or qualification program not established and/or implemented.
- § 236.1041.A2 Training and/or qualification program does not meet minimum requirements set forth in a PTCDP and/or PTCSP for persons whose duties include installing, maintaining, repairing, modifying, inspecting, and testing safety-critical elements of the railroad's PTC systems, including central office, wayside, or onboard subsystems.
- § 236.1041.A3 Training and/or qualification program does not meet minimum requirements set forth in a PTCDP and/or PTCSP for persons who dispatch train operations (issue or communicate any mandatory directive that is executed or enforced, or is intended to be executed or enforced, by a train control system subject to this subpart).
- § 236.1041.A4 Training and qualification program does not meet minimum requirements set forth in a PTCDP and/or PTCSP for persons who operate trains or serve as a train or engine crewmember subject to instruction and testing under Part 217 of this chapter, on a train operating in territory where a train control system subject to this subpart is in use.
- § 236.1041.A5 Training and/or qualification program does not meet minimum requirements set forth in a PTCDP and/or PTCSP for roadway workers whose duties require them to know and understand how a train control system affects their safety and how to avoid interfering with its proper functioning.



§ 236.1041.A6 Training and/or qualification program does not meet minimum requirements set forth in a PTCDP and/or PTCSP for the direct supervisors of persons listed in this section.

§ 236.1041.B1 Training and/or qualification program is not adequate to ensure personnel have necessary knowledge and skills to effectively complete required duties related to operation and maintenance of the PTC system.

### **§ 236.1043 Task analysis and basic requirements.**

(a) *Training structure and delivery.* As part of the program required by § 236.1041, the employer shall, at a minimum:

(1) Identify the specific goals of the training program with regard to the target population (craft, experience level, scope of work, etc.), task(s), and desired success rate;

(2) Based on a formal task analysis, identify the installation, maintenance, repair, modification, inspection, testing, and operating tasks that must be performed on a railroad's PTC systems. This includes the development of failure scenarios and the actions expected under such scenarios;

(3) Develop written procedures for the performance of the tasks identified;

(4) Identify the additional knowledge, skills, and abilities above those required for basic job performance necessary to perform each task;

(5) Develop a training and evaluation curriculum that includes classroom, simulator, computer-based, hands-on, or other formally structured training designed to impart the knowledge, skills, and abilities identified as necessary to perform each task;

(6) Prior to assignment of related tasks, require all persons mentioned in § 236.1041(a) to successfully complete a training curriculum and pass an examination that covers the PTC system and appropriate rules

and tasks for which they are responsible (however, such persons may perform such tasks under the direct onsite supervision of a qualified person prior to completing such training and passing the examination);

(7) Require periodic refresher training and evaluation at intervals specified in the PTCDP and PTCSP that includes classroom, simulator, computer-based, hands-on, or other formally structured training and testing, except with respect to basic skills for which proficiency is known to remain high as a result of frequent repetition of the task; and

(8) Conduct regular and periodic evaluations of the effectiveness of the training program specified in § 236.1041(a)(1) verifying the adequacy of the training material and its validity with respect to current railroads PTC systems and operations.

(b) *Training records.* Employers shall retain records which designate persons who are qualified under this section until new designations are recorded or for at least one year after such persons leave applicable service. These records shall be kept in a designated location and be available for inspection and replication by FRA and FRA-certified State inspectors.

#### **Application:**

This section defines the requirements for a railroad's training program training structure and delivery. As part of the program required by § 236.1041, the employer shall follow the directions within this section to include formal task analysis, written procedures for the performance, additional knowledge, skills, and abilities, along with refresher training and record retention.

## CLASSIFICATION OF DEFECTS

- § 236.1043.A1 Failure to identify specific goals of a PTC training program.
- § 236.1043.A2 PTC training program is not based on a formal task analysis, identifying installation, maintenance, repair, modification, inspection, testing, and/or operating tasks that must be performed on the PTC systems.
- § 236.1043.A3 PTC training program does not identify installation, maintenance, repair, modification, inspection, testing, and/or operating tasks that must be performed on the PTC systems, including failure scenarios and resulting expected actions.
- § 236.1043.A4 Failure to develop written procedures for the performance of identified tasks.
- § 236.1043.A5 Training program does not identify additional knowledge, skills, and/or abilities above those required for basic job performance necessary to perform each task.
- § 236.1043.A6 Training and/or evaluation curriculum not developed.
- § 236.1043.A7 Training and/or evaluation curriculum not sufficiently designed to impart the knowledge, skills, and/or abilities identified as necessary to perform each task.
- § 236.1043.A8 PTC personnel assigned unsupervised related tasks without successfully completing a training curriculum and/or passing an examination.
- § 236.1043.A9 Periodic refresher training and/or evaluation not provided as specified in a PTCDP and/or PTCSP.
- § 236.1043.A10 Regular and/or periodic evaluations of the effectiveness of the training program not conducted.
- § 236.1043.B1 Training records which designate persons qualified on PTC system not retained until new designation recorded or at least one year after such persons leave applicable service.
- § 236.1043.B2 Training records not kept at designated location.
- § 236.1043.B3 Training records not made available for inspection and/or replication by FRA and/or FRA-certified State inspectors during normal business hours.

### **§ 236.1045 Training specific to office control personnel.**

(a) Any person responsible for issuing or communicating mandatory directives in territory where PTC systems are or will be in use shall be trained in the following areas, as applicable:

(1) Instructions concerning the interface between the computer-aided dispatching system and the train control system, with respect to the safe movement of trains and other on-track equipment;

(2) Railroad operating rules applicable to the train control system, including provision for movement and protection of roadway workers, unequipped trains, trains with failed or cut-out

train control onboard systems, and other on-track equipment; and

(3) Instructions concerning control of trains and other on-track equipment in case the train control system fails, including periodic practical exercises or simulations, and operational testing under part 217 of this chapter to ensure the continued capability of the personnel to provide for safe operations under the alternative method of operation.

(b) [Reserved]

#### Application:

This section explains the training that must be provided to employees responsible for issuing or communicating mandatory directives. This training must include instructions concerning the interface between computer-aided dispatching systems and PTC systems as applicable to the safe movement of trains and other on-track equipment. In addition, the training must include operating rules that pertain to the train control system, including the provision for moving unequipped trains and trains on which the train control system has failed or been cut out en route. Additionally, it also includes periodic practical exercises or simulations and operational testing under Part 217 to assure that personnel are capable of providing for safe operations under alternative operation methods.

### CLASSIFICATION OF DEFECTS

§ 236.1045.A1 Failure to train any person responsible for issuing and/or communicating mandatory directives in territory where PTC systems are or will be in use concerning the interface between the computer-aided dispatching system and the train control system, with respect to the safe movement of trains and other on-track equipment.

§ 236.1045.A2 Failure to train any person responsible for issuing and/or communicating mandatory directives in territory where PTC systems are or will be in use on railroad operating rules applicable to the train control system, including provision for movement and protection of roadway workers, unequipped trains, trains with failed or cut-out train control onboard systems, and other on-track equipment.

§ 236.1045.A3 Failure to train any person responsible for issuing and/or communicating mandatory directives in territory where PTC systems are or will be in use concerning control of trains and other on-track equipment in case the train control system fails, including periodic practical exercises or simulations, and operational testing under Part 217 of this chapter to ensure the continued capability of the personnel to provide for safe operations under the alternative method of operation.

#### **§ 236.1047 Training specific to locomotive engineers and other operating personnel.**

(a) *Operating personnel.* Training provided under this subpart for any locomotive engineer or other person who participates in the operation of a train in train control territory shall be defined in the PTCDP as well as the PTCSP. The following elements shall be addressed:

(1) Familiarization with train control equipment onboard the locomotive and the functioning of that equipment as part of the system and in relation to other onboard systems under that person's control;

(2) Any actions required of the onboard personnel to enable, or enter data to, the system, such as consist data, and the role of that function in the safe operation of the train;

(3) Sequencing of interventions by the system, including pre-enforcement notification, enforcement notification, penalty application initiation and post-penalty application procedures;

(4) Railroad operating rules and testing (part 217) applicable to the train control system, including provisions for movement and protection of any unequipped trains, or trains with failed or cut-out train control onboard systems and other on-track equipment;

(5) Means to detect deviations from proper functioning of onboard train control equipment and instructions regarding the actions to be taken with respect to control of the train and notification of designated railroad personnel; and

(6) Information needed to prevent unintentional interference with the proper functioning of onboard train control equipment.

(b) *Locomotive engineer training.* Training required under this subpart for a locomotive engineer, together with required records, shall be integrated into the program of training required by part 240 of this chapter.

(c) *Full automatic operation.* The following special requirements apply in the event a train control system is used to effect full automatic operation of the train:

(1) The PTCDP and PTCSP shall identify all safety hazards to be mitigated by the locomotive engineer.

(2) The PTCDP and PTCSP shall address and describe the training required with provisions for the maintenance of skills proficiency. As a minimum, the training program must:

(i) As described in § 236.1043(a)(2), develop failure scenarios which incorporate the safety hazards identified in the PTCDP and PTCSP including the return of train operations to a fully manual mode;

(ii) Provide training, consistent with § 236.1047(a), for safe train operations under all failure scenarios and identified safety hazards that affect train operations;

(iii) Provide training, consistent with § 236.1047(a), for safe train operations under manual control; and

(iv) Consistent with § 236.1047(a), ensure maintenance of manual train operating skills by requiring manual starting and stopping of the train for an appropriate number of trips and by one or more of the following methods:

(A) Manual operation of a train for a 4-hour work period;

(B) Simulated manual operation of a train for a minimum of 4 hours in a Type I simulator as required; or

(C) Other means as determined following consultation between the railroad and designated representatives of the affected employees and approved by FRA. The PTCDP and PTCSP shall designate the appropriate frequency when manual operation, starting, and stopping must be conducted, and the appropriate frequency of simulated manual operation.

(d) *Conductor training.* Training required under this subpart for a conductor, together with required records, shall be integrated into the program of training required under this chapter.

### Application:

This section specifies minimum training requirements for locomotive engineers and other operating personnel who interact with PTC systems onboard the locomotive. This includes onboard train and engine crew members (i.e., conductors, brakemen, and assistant engineers). Training should include familiarization with the onboard PTC equipment and the functioning of that equipment as part of a train control system and its relationship to other onboard systems under that person's control. The training program must cover all notifications by the system (i.e., onboard displays) and actions or responses to such notifications required by onboard

personnel, as well as how each action or response ensures proper operation of the system and safe operation of the train. The training requirements of this section must be fully integrated into the training requirements of 49 CFR Part 240.

#### CLASSIFICATION OF DEFECTS

- § 236.1047.A1 Training specific to locomotive engineers, and/or other persons participating in the operation of a train in train control territory, not conducted in accordance with training program as set forth in PTCDP and/or PTCSP.
- § 236.1047.A2 Failure to train any locomotive engineer, and/or other person who participates in the operation of a train in train control territory, with the train control equipment onboard the locomotive and/or the functioning of that equipment as part of the system and in relation to other onboard systems under that person's control.
- § 236.1047.A3 Failure to train any locomotive engineer, and/or other person who participates in the operation of a train in train control territory, on all actions required of the onboard personnel to enable, and/or enter data to, the system, such as consist data, and the role of that function in the safe operation of the train.
- § 236.1047.A4 Failure to train any locomotive engineer, and/or other person who participates in the operation of a train in train control territory, the sequencing of interventions by the system, including pre-enforcement notification, enforcement notification, penalty application initiation, and/or post-penalty application procedures.
- § 236.1047.A5 Failure to train any locomotive engineer, and/or other person who participates in the operation of a train in train control territory, on the railroad operating rules and/or testing (Part 217) applicable to the train control system, including provisions for movement and protection of any unequipped trains, or trains with failed or cut-out train control onboard systems and other on-track equipment.
- § 236.1047.A6 Failure to train any locomotive engineer, and/or other person who participates in the operation of a train in train control territory, on the means to detect deviations from proper functioning of onboard train control equipment and/or instructions regarding the actions to be taken with respect to control of the train and notification of designated railroad personnel.
- § 236.1047.A7 Failure to train any locomotive engineer, and/or other person who participates in the operation of a train in train control territory, on the information needed to prevent unintentional interference with the proper functioning of onboard train control equipment.
- § 236.1047.B1 Failure to integrate the locomotive engineer PTC training into the Part 240 locomotive engineer training.
- § 236.1047.C1 The PTCDP and/or PTCSP do not identify all safety hazards to be mitigated by the locomotive engineer in the event a train control system is used to effect the full automatic operation of the train.
- § 236.1047.C2 The PTCDP and/or PTCSP do not address and/or describe the training required to include provisions for the maintenance of skill proficiency in the event a train

control system is used to effect the full automatic operation of the train.

- § 236.1047.C3 Failure to develop training to address failure scenarios, which incorporate the safety hazards identified in the PTCDP and/or PTCSP, in the event a train control system is used to effect the full automatic operation of the train.
- § 236.1047.C4 Failure to develop training to address returning of train operations to a fully manual mode in the event of a failure of the automatic operation of the train.
- § 236.1047.C5 Failure to provide training to address all failure scenarios and/or identified safety hazards that affect train operations.
- § 236.1047.C6 Failure to provide training for safe train operations under manual control.
- § 236.1047.C7 Failure to provide training to ensure maintenance of manual train operating skills.
- § 236.1047.C8 The PTCDP and/or PTCSP do not designate the appropriate frequency of manual and/or simulated manual operations.
- § 236.1047.D1 Training and/or required training records specific to conductors participating in the operation of a train in train control territory not integrated into the PTC training program.

#### **§ 236.1049 Training specific to roadway workers.**

(a) *Roadway worker training.* Training required under this subpart for a roadway worker shall be integrated into the program of instruction required under part 214, subpart C of this chapter (“Roadway Worker Protection”), consistent with task analysis requirements of § 236.1043. This training shall provide instruction for roadway workers who provide protection for themselves or roadway work groups.

(b) *Training subject areas.* (1) Instruction for roadway workers shall ensure an understanding of the role of processor-based signal and train control equipment in establishing protection for roadway workers and their equipment.

(2) Instruction for all roadway workers working in territories where PTC is required under this subpart shall ensure recognition of processor-based signal and train control equipment on the wayside and an understanding of how to avoid interference with its proper functioning.

(3) Instructions concerning the recognition of system failures and the provision of alternative methods of on-track safety in case the train control system fails, including periodic practical exercises or simulations and operational testing under part 217 of this chapter to ensure the continued capability of roadway workers to be free from the danger of being struck by a moving train or other on-track equipment.

#### **Application:**

This section specifies minimum training requirements for roadway workers. This training is designed to provide instructions for workers who obtain protection for roadway work groups or themselves and will specifically include instruction to ensure an understanding of the role of a PTC system in establishing protection for workers and their equipment, whether at a work zone

or while moving on-track equipment between work locations. Also, this section requires that training include recognition of PTC equipment on the wayside and how to avoid interference with its proper function. It also requires the railroad to incorporate appropriate training in the program of instruction under Part 214, Subpart C, Roadway Worker Protection.

#### CLASSIFICATION OF DEFECTS

- § 236.1049.A1 Failure to integrate the roadway worker PTC training into the program of instruction required under Part 214 (Roadway Worker Protection).
- § 236.1049.B1 PTC training for roadway workers does not address the role of processor-based signal and train control equipment in establishing protection for roadway workers and their equipment.
- § 236.1049.B2 PTC training for roadway workers does not address the recognition of processor-based signal and train control equipment on the wayside and/or an understanding of how to avoid interference with its proper functioning.
- § 236.1049.B3 PTC training for roadway workers does not address the recognition of system failures and/or the provision of alternative methods of on-track safety in case the train control system fails.
- § 236.1049.B4 PTC training for roadway workers does not address periodic practical exercises or simulations and/or operational testing under Part 217 of this chapter to ensure the continued capability of roadway workers to be free from the danger of being struck by a moving train or other on-track equipment.

#### **Appendix A to Part 236—Civil Penalty Schedule**

Refer to the latest edition of 49 CFR Part 236 – CIVIL PENALTIES

#### **Appendix B to Part 236—Risk Assessment Criteria**

The safety-critical performance of each product for which risk assessment is required under this part must be assessed in accordance with the following criteria or other criteria if demonstrated to the Associate Administrator for Safety to be equally suitable:

(a) *How are risk metrics to be expressed?* The risk metric for the proposed product must describe with a high degree of confidence the accumulated risk of a train system that operates over a life-cycle of 25 years or greater. Each risk metric for the proposed product must be expressed with an upper bound, as estimated with a sensitivity analysis, and the risk value selected must be demonstrated to have a high degree of confidence.

(b) *How does the risk assessment handle interaction risks for interconnected subsystems/components?* The safety-critical assessment of each product must include all of its interconnected subsystems and components and, where applicable, the interaction between such subsystems.

(c) *How is the previous condition computed?* Each subsystem or component of the previous condition must be analyzed with a Mean Time To Hazardous Event (MTTHE) as specified subject to a high degree of confidence.

(d) *What major risk characteristics must be included when relevant to assessment?* Each risk



calculation must consider the total signaling and train control system and method of operation, as subjected to a list of hazards to be mitigated by the signaling and train control system. The methodology requirements must include the following major characteristics, when they are relevant to the product being considered:

- (1) Track plan infrastructure;
  - (2) Total number of trains and movement density;
  - (3) Train movement operational rules, as enforced by the dispatcher and train crew behaviors;
  - (4) Wayside subsystems and components; and
  - (5) Onboard subsystems and components.
- (e) *What other relevant parameters must be determined for the subsystems and components?*

The failure modes of each subsystem or component, or both, must be determined for the integrated hardware/software (where applicable) as a function of the Mean Time To Failure (MTTF) failure restoration rates, and the integrated hardware/software coverage of all processor-based subsystems or

components, or both. Train operating and movement rules, along with components that are layered in order to enhance safety-critical behavior, must also be considered.

(f) *How are processor-based subsystems/components assessed?* (1) An MTTHE value must be calculated for each processor-based subsystem or component, or both, indicating the safety-critical behavior of the integrated hardware/software subsystem or component, or both. The human factor impact must be included in the assessment, whenever applicable, to provide an integrated MTTHE value. The MTTHE calculation must consider the rates of failures caused by permanent, transient, and intermittent faults accounting for the fault coverage of the integrated hardware/software subsystem or component, phased-interval maintenance, and restoration of the detected failures.

(2) MTTHE compliance verification and validation must be based on the assessment of the design for verification and validation process, historical performance data, analytical methods and experimental safety-critical performance testing performed on the subsystem or component. The compliance process must be demonstrated to be compliant and consistent with the MTTHE metric and demonstrated to have a high degree of confidence.

(g) *How are non-processor-based subsystems/components assessed?* (1) The safety-critical behavior of all non-processor-based components, which are part of a processor-based system or subsystem, must be quantified with an MTTHE metric. The MTTHE assessment methodology must consider failures caused by permanent, transient, and intermittent faults, phase-interval maintenance and restoration of failures and the effect of fault coverage of each non-processor-based subsystem or component.

(2) MTTHE compliance verification and validation must be based on the assessment of the design for verification and validation process, historical performance data, analytical methods and experimental safety-critical performance testing performed on the subsystem or component. The non-processor-based quantification compliance must be demonstrated to have a high degree of confidence.

(h) *What assumptions must be documented?* (1) The railroad shall document any assumptions regarding the reliability or availability of mechanical, electric, or electronic components. Such assumptions must include MTTF projections, as well as Mean Time To Repair (MTTR) projections, unless the risk assessment specifically explains why these assumptions are not relevant to the risk assessment. The railroad shall document these assumptions in such a form as to permit later automated comparisons with in-service experience (e.g., a spreadsheet).

(2) The railroad shall document any assumptions regarding human performance. The



documentation shall be in such a form as to facilitate later comparisons with in-service experience.

(3) The railroad shall document any assumptions regarding software defects. These assumptions shall be in a form which permits the railroad to project the likelihood of detecting an in-service software defect. These assumptions shall be documented in such a form as to permit later automated comparisons with in-service experience.

(4) The railroad shall document all of the identified safety-critical fault paths. The documentation shall be in such a form as to facilitate later comparisons with in-service faults.

[70 FR 11052, March 07, 2005]

## **Appendix C to Part 236—Safety Assurance Criteria and Processes**

(a) *What is the purpose of this appendix?* This appendix seeks to promote full disclosure of safety risk to facilitate minimizing or eliminating elements of risk where practicable by providing minimum criteria and processes for safety analyses conducted in support of PSPs. The analysis required by this appendix is intended to minimize the probability of failure to an acceptable level, helping to optimize the safety of the product within the limitations of the available engineering science, cost, and other constraints. FRA uses the criteria and processes set forth in this appendix to evaluate analyses, assumptions, and conclusions provided in RSPP and PSP documents. An analysis performed under this appendix must:

1) Address each area of paragraph (b) of this appendix, explaining how such objectives are addressed or why they are not relevant, and

(2) Employ a validation and verification process pursuant to paragraph (c) of this appendix.

(b) *What categories of safety elements must be addressed?* The designer shall address each of the following safety considerations when designing and demonstrating the safety of products covered by Subpart H of this part. In the event that any of these principles are not followed, the PSP shall state both the reason(s) for departure and the alternative(s) utilized to mitigate or eliminate the hazards associated with the design principle not followed.

(1) *Normal operation.* The system (including all hardware and software) must demonstrate safe operation with no hardware failures under normal anticipated operating conditions with proper inputs and within the expected range of environmental conditions. All safety-critical functions must be performed properly under these normal conditions. Absence of specific operator actions or procedures will not prevent the system from operating safely. There must be no hazards that are categorized as unacceptable or undesirable. Hazards categorized as unacceptable must be eliminated by design.

(2) *Systematic failure.* It must be shown how the product is designed to mitigate or eliminate unsafe systematic failures—those conditions which can be attributed to human error that could occur at various stages throughout product development. This includes unsafe errors in the software due to human error in the software specification, design or coding phases, or both; human errors that could impact hardware design; unsafe conditions that could occur because of an improperly designed human-machine interface; installation and maintenance errors; and errors associated with making modifications.

(3) *Random failure.* (i) The product must be shown to operate safely under conditions of random hardware failure. This includes single as well as multiple hardware failures, particularly in instances where one or more failures could occur, remain undetected (latent) and react in combination with a subsequent failure at a later time to cause an unsafe operating situation. In instances involving a latent failure, a subsequent failure is similar to there being a single failure. In the event of a transient failure, and if so designed, the system should restart itself if it is safe to do so. Frequency of attempted restarts must be considered in the hazard analysis required by

§ 236.907(a)(8).

(ii) There shall be no single point failures in the product that can result in hazards categorized as unacceptable or undesirable. Occurrence of credible single point failures that can result in hazards must be detected and the product must achieve a known safe state before falsely activating any physical appliance.

(iii) If one non-self-revealing failure combined with a second failure can cause a hazard that is categorized as unacceptable or undesirable, then the second failure must be detected and the product must achieve a known safe state before falsely activating any physical appliance.

(4) *Common Mode failure.* Another concern of multiple failures involves common mode failures in which two or more subsystems or components intended to compensate one another to perform the same function all fail by the same mode and result in unsafe conditions. This is of particular concern in instances in which two or more elements (hardware or software, or both) are used in combination to ensure safety. If a common mode failure exists, then any analysis performed under this appendix cannot rely on the assumption that failures are independent. Examples include: the use of redundancy in which two or more elements perform a given function in parallel and when one (hardware or software) element checks/monitors another element (of hardware or software) to help ensure its safe operation. Common mode failure relates to independence, which must be ensured in these instances. When dealing with the effects of hardware failure, the designer shall address the effects of the failure not only on other hardware, but also on the execution of the software, since hardware failures can greatly affect how the software operates.

(5) *External influences.* The product must be shown to operate safely when subjected to different external influences, including:

(i) Electrical influences such as power supply anomalies/transients, abnormal/improper input conditions (e.g., outside of normal range inputs relative to amplitude and frequency, unusual combinations of inputs), including those related to a human operator, and others such as electromagnetic interference or electrostatic discharges, or both;

(ii) Mechanical influences such as vibration and shock; and

(iii) Climatic conditions such as temperature and humidity.

(6) *Modifications.* Safety must be ensured following modifications to the hardware or software, or both. All or some of the concerns identified in this paragraph may be applicable depending upon the nature and extent of the modifications.

(7) *Software.* Software faults must not cause hazards categorized as unacceptable or undesirable.

(8) *Closed Loop Principle.* The product design must require positive action to be taken in a prescribed manner to either begin product operation or continue product operation.

(9) *Human Factors Engineering.* The product design must sufficiently incorporate human factors engineering that is appropriate to the complexity of the product; the educational, mental, and physical capabilities of the intended operators and maintainers; the degree of required human interaction with the component; and the environment in which the product will be used.

(c) *What standards are acceptable for verification and validation?* (1) The standards employed for verification or validation, or both, of products subject to this subpart must be sufficient to support achievement of the applicable requirements of subpart H of this part.

(2) U.S. Department of Defense Military Standard (MIL-STD) 882C, "System Safety Program Requirements" (January 19, 1993), is recognized as providing appropriate risk analysis processes for incorporation into verification and validation standards.

(3) The following standards designed for application to processor-based signal and train control systems are recognized as acceptable with respect to applicable elements of safety analysis required by Subpart H of this part. The latest versions of the standards listed below

should be used unless otherwise provided.

(i) IEEE 1483-2000, Standard for the Verification of Vital Functions in Processor-Based Systems Used in Rail Transit Control.

(ii) CENELEC Standards as follows:

(A) EN50126: 1999, Railway Applications: Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS);

(B) EN50128 (May 2001), Railway Applications: Software for Railway Control and Protection Systems;

(C) EN50129: 2003, Railway Applications: Communications, Signaling, and Processing Systems-Safety Related Electronic Systems for Signaling; and

(D) EN50155:2001/A1:2002, Railway Applications: Electronic Equipment Used in Rolling Stock.

(iii) ATCS Specification 140, Recommended Practices for Safety and Systems Assurance.

(iv) ATCS Specification 130, Software Quality Assurance.

(v) AAR-AREMA 2005 Communications and Signal Manual of Recommended Practices, Part 17.

(vi) Safety of High Speed Ground Transportation Systems. Analytical Methodology for Safety Validation of Computer Controlled Subsystems. Volume II: Development of a Safety Validation Methodology. Final Report September 1995. Author: Jonathan F. Luedeke, Battelle. DOT/FRA/ORD-95/10.2.

(vii) IEC 61508 (International Electrotechnical Commission), Functional Safety of Electrical/Electronic/Programmable/Electronic Safety (E/E/P/ES) Related Systems, Parts 1-7 as follows:

(A) IEC 61508-1 (1998-12) Part 1: General requirements and IEC 61508-1 Corr. (1999-05) Corrigendum 1-Part 1:General Requirements.

(B) IEC 61508-2 (2000-05) Part 2: Requirements for electrical/electronic/ programmable electronic safety-related systems.

(C) IEC 61508-3 (1998-12) Part 3: Software requirements and IEC 61508-3 Corr.1 (1999-04) Corrigendum 1-Part3: Software requirements.

(D) IEC 61508-4 (1998-12) Part 4: Definitions and abbreviations and IEC 61508-4 Corr.1 (1999-04) Corrigendum 1-Part 4: Definitions and abbreviations.

(E) IEC 61508-5 (1998-12) Part 5: Examples of methods for the determination of safety integrity levels and IEC 61508-5 Corr.1 (1999-04) Corrigendum 1 Part 5: Examples of methods for determination of safety integrity levels.

(F) IEC 61508-6 (2000-04) Part 6: Guidelines on the applications of IEC 61508-2 and -3.

(G) IEC 61508-7 (2000-03) Part 7: Overview of techniques and measures.

(4) Use of unpublished standards, including proprietary standards, is authorized to the extent that such standards are shown to achieve the requirements of this part. However, any such standards shall be available for inspection and replication by FRA and for public examination in any public proceeding before the FRA to which they are relevant.

[70 FR 11052, March 07, 2005]

## **Appendix D to Part 236—Independent Review of Verification and Validation**

(a) *What is the purpose of this appendix?* This appendix provides minimum requirements for independent third-party assessment of product safety verification and validation pursuant to subpart H of this part. The goal of this assessment is to provide an independent evaluation of the

product manufacturer's utilization of safety design practices during the product's development and testing phases, as required by the applicable railroad's RSPP, the product PSP, the requirements of subpart H of this part, and any other previously agreed-upon controlling documents or standards.

(b) *What general requirements apply to the conduct of third party assessments?* (1) The supplier may request advice and assistance of the reviewer concerning the actions identified in paragraphs (c) through

(g) of this appendix. However, the reviewer should not engage in design efforts, in order to preserve the reviewer's independence and maintain the supplier's proprietary right to the product.

(2) The supplier shall provide the reviewer access to any and all documentation that the reviewer requests and attendance at any design review or walkthrough that the reviewer determines as necessary to complete and accomplish the third party assessment. The reviewer may be accompanied by representatives of FRA as necessary, in FRA's judgment, for FRA to monitor the assessment.

(c) *What must be done at the preliminary level?* The reviewer shall evaluate with respect to safety and comment on the adequacy of the processes which the supplier applies to the design and development of the product. At a minimum, the reviewer shall compare the supplier processes with acceptable methodology and employ any other such tests or comparisons if they have been agreed to previously with FRA. Based on these analyses, the reviewer shall identify and document any significant safety vulnerabilities which are not adequately mitigated by the supplier's (or user's) processes. Finally, the reviewer shall evaluate the adequacy of the railroad's RSPP, the PSP, and any other documents pertinent to the product being assessed.

(d) *What must be done at the functional level?* (1) The reviewer shall analyze the Preliminary Hazard Analysis (PHA) for comprehensiveness and compliance with the railroad's RSPP.

(2) The reviewer shall analyze all Fault Tree Analyses (FTA), Failure Mode and Effects Criticality Analysis (FMECA), and other hazard analyses for completeness, correctness, and compliance with the railroad's RSPP.

(e) *What must be done at the implementation level?* The reviewer shall randomly select various safety-critical software modules for audit to verify whether the requirements of the RSPP were followed. The number of modules audited must be determined as a representative number sufficient to provide confidence that all unaudited modules were developed in compliance with the RSPP.

(f) *What must be done at closure?* (1) The reviewer shall evaluate and comment on the plan for installation and test procedures of the product for revenue service.

(2) The reviewer shall prepare a final report of the assessment. The report shall be submitted to the railroad prior to the commencement of installation testing and contain at least the following information:

(i) Reviewer's evaluation of the adequacy of the PSP, including the supplier's MTTF and risk estimates for the product, and the supplier's confidence interval in these estimates;

(ii) Product vulnerabilities which the reviewer felt were not adequately mitigated, including the method by which the railroad would assure product safety in the event of a hardware or software failure (i.e., how does the railroad assure that all potentially hazardous failure modes are identified?) and the method by which the railroad addresses comprehensiveness of the product design for the requirements of the operations it will govern (i.e., how does the railroad assure that all potentially hazardous operating circumstances are identified? Who records any deficiencies identified in the design process? Who tracks the correction of these deficiencies and confirms that they are corrected?);

(iii) A clear statement of position for all parties involved for each product vulnerability cited by the reviewer;

- (iv) Identification of any documentation or information sought by the reviewer that was denied, incomplete, or inadequate;
- (v) A listing of each RSPP procedure or process which was not properly followed;
- (vi) Identification of the software verification and validation procedures for the product's safety-critical applications, and the reviewer's evaluation of the adequacy of these procedures;
- (vii) Methods employed by the product manufacturer to develop safety-critical software, such as use of structured language, code checks, modularity, or other similar generally acceptable techniques; and
- (viii) Method by which the supplier or railroad addresses comprehensiveness of the product design which considers the safety elements listed in paragraph (b) of Appendix C to this part.

[70 FR 11052, March 07, 2005]

## **Appendix E to Part 236—Human-Machine Interface (HMI) Design**

(a) *What is the purpose of this appendix?* The purpose of this appendix is to provide HMI design criteria which will minimize negative safety effects by causing designers to consider human factors in the development of HMIs.

(b) *What is meant by “designer” and “operator”?* As used in this section, “designer” means anyone who specifies requirements for-or designs a system or subsystem, or both, for-a product subject to subpart H of this part, and “operator” means any human who is intended to receive information from, provide information to, or perform repairs or maintenance on a signal or train control product subject to Subpart H of this part.

(c) *What kinds of human factors issues must designers consider with regard to the general function of a system?* (1) *Reduced situational awareness and over-reliance.* HMI design must give an operator active functions to perform, feedback on the results of the operator's actions, and information on the automatic functions of the system as well as its performance. The operator must be “in-the-loop.” Designers shall consider at minimum the following methods of maintaining an active role for human operators:

- (i) The system must require an operator to initiate action to operate the train and require an operator to remain “in the loop” for at least 30 minutes at a time;
- (ii) The system must provide timely feedback to an operator regarding the system's automated actions, the reasons for such actions, and the effects of the operator's manual actions on the system;
- (iii) The system must warn operators in advance when they require an operator to take action; and
- (iv) HMI design must equalize an operator's workload.

(2) *Expectation of predictability and consistency in product behavior and communications.* HMI design must accommodate an operator's expectation of logical and consistent relationships between actions and results. Similar objects must behave consistently when an operator performs the same action upon them.

(3) *Limited memory and ability to process information.* (i) HMI design must minimize an operator's information processing load. To minimize information processing load, the designer shall:

- (A) Present integrated information that directly supports the variety and types of decisions that an operator makes;
- (B) Provide information in a format or representation that minimizes the time required to understand and act; and
- (C) Conduct utility tests of decision aids to establish clear benefits such as processing time saved or improved quality of decisions.

(ii) HMI design must minimize the load on an operator's memory.

(A) To minimize short-term memory load, the designer shall integrate data or information from multiple sources into a single format or representation ("chunking") and design so that three or fewer "chunks" of information need to be remembered at any one time.

(B) To minimize long-term memory load, the designer shall design to support recognition memory, design memory aids to minimize the amount of information that must be recalled from unaided memory when making critical decisions, and promote active processing of the information.

(4) *Miscellaneous Human Factors Concerns*. System designers shall:

(i) Design systems that anticipate possible user errors and include capabilities to catch errors before they propagate through the system;

(ii) Conduct cognitive task analyses prior to designing the system to better understand the information processing requirements of operators when making critical decisions; and

(iii) Present information that accurately represents or predicts system states.

(d) *What kinds of HMI design elements must a designer incorporate in the development of on-board train displays and controls?* (1) *Location of displays and controls*. Designers shall:

(i) Locate displays as close as possible to the controls that affect them;

(ii) Locate displays and controls based on an operator's position;

(iii) Arrange controls to minimize the need for the operator to change position;

(iv) Arrange controls according to their expected order of use;

(v) Group similar controls together;

(vi) Design for high stimulus-response compatibility (geometric and conceptual);

(vii) Design safety-critical controls to require more than one positive action to activate (e.g., auto stick shift requires two movements to go into reverse); and

(viii) Design controls to allow easy recovery from error.

(2) *Information management*. HMI design must:

(i) Display information in a manner which emphasizes its relative importance;

(ii) Comply with the ANSI/HFS 100-1988 standard;

(iii) Design for display luminance of the foreground or background of at least 35 cd/m<sup>2</sup> (the displays should be capable of a minimum contrast 3:1 with 7:1 preferred, and controls should be provided to adjust the brightness level and contrast level);

(iv) Design the interface to display only the information necessary to the user;

(v) Where text is needed, using short, simple sentences or phrases with wording that an operator will understand;

(vi) Use complete words where possible. Where abbreviations are necessary, choose a commonly accepted abbreviation or consistent method and select commonly used terms and words that the operator will understand;

(vii) Adopt a consistent format for all display screens by placing each design element in a consistent and specified location;

(viii) Display critical information in the center of the operator's field of view by placing items that need to be found quickly in the upper left hand corner and items which are not time-critical in the lower right hand corner of the field of view;

(ix) Group items that belong together;

(x) Design all visual displays to meet human performance criteria under monochrome conditions and add color only if it will help the user in performing a task, and use color coding as a redundant coding technique;

(xi) Limit the number of colors over a group of displays to no more than seven;

(xii) Design warnings to match the level of risk or danger with the alerting nature of the signal;

(xiii) With respect to information entry, avoid full QWERTY keyboards for data entry; and  
(xiv) Use digital communications for safety-critical messages between the locomotive engineer and the dispatcher.

(e) *What kinds of HMI design elements must a designer consider with respect to problem management?* (1) HMI design must enhance an operator's situation awareness. An operator must have access to:

- (i) Knowledge of the operator's train location relative to relevant entities;
- (ii) Knowledge of the type and importance of relevant entities;
- (iii) Understanding of the evolution of the situation over time;
- (iv) Knowledge of the roles and responsibilities of relevant entities; and
- (v) Knowledge of expected actions of relevant entities.

(2) HMI design must support response selection and scheduling.

(3) HMI design must support contingency planning.

[70 FR 11052, March 7, 2005]



# **Reference A**

## **Fouling Section Clearance Point Measurement Diagram**



## Determining Minimum Fouling Section Clearance

The following is the preferred method of determining if an existing effective insulated joint of a fouling section provides the absolute minimal clearance in accordance with § 236.58. The insulated joint you must test is the joint at which the fouling section ends and which is located closest to the frog. Proper minimal clearance can be determined in all cases by taking the minimum clearance for parallel tracks and adding the extra clearance required for curved track(s).

The minimum clearance for parallel tracks (outside of near rail to outside of near rail) is calculated by using the widest normal cars (3'-3" for outside of rail to car side) and adding the overhang of normal cars (11' for the center of front axle to front edge of car) which may be standing at the effective joint but not shunting the fouling section. This minimum distance equals 6'-6". As a "rule of thumb", if this distance measures less than 7', the fouling section may be deemed to not extend to the point of clearance.

If one or both of the adjacent tracks are curved, and you wish to determine the extra clearance required due to that curvature and the resultant "skewing" of the near front corner of a car toward the other track, use the drawing below in the following manner:

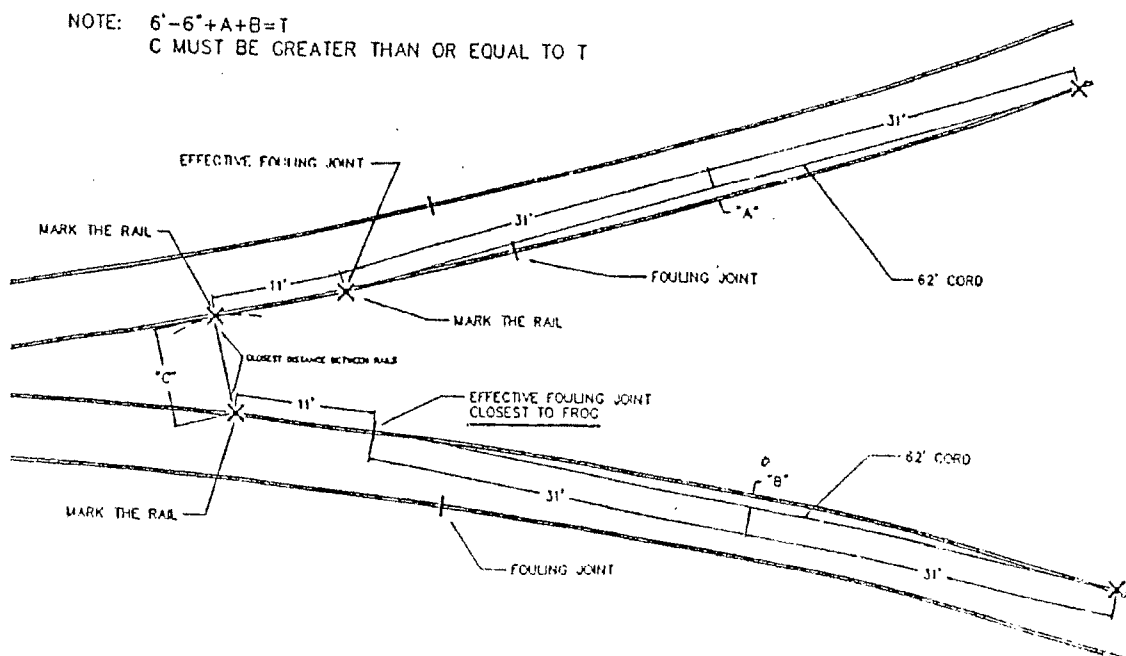
1. Make a cord 62' in length and mark the midpoint on the cord (31').
2. Stretch one end of the cord from the gauge point at the effective insulated joint and the other end of the cord to the gauge point on the same rail in the direction away from the frog. The cord must be stretched tight so it is in a straight line.
3. Measure the distance from the midpoint of the cord to the gauge point of the rail. This is the "A" measurement and it represents the additional distance required for car corner clearance. If the track is straight, A will be 0".
4. Measure from the effective insulated joint in the direction toward the frog and mark the near rail at the 11' point.
5. Using a tape measure, measure the shortest distance to the near rail of the adjacent track from the 11' mark. Mark the rail at the closest point and call this measurement "C".
6. Measure from that mark (determined in step 5) in the direction away from the frog and mark the rail at the 11' point.
7. Stretch one end of the cord from the gauge point at that mark and the other end to the gauge point on the same rail in the direction away from the frog. Again the cord must be stretched tight so it is in a straight line.
8. Measure the distance from the midpoint of the cord to the gauge point of the rail. This is the "B" measurement and it represents the additional distance required in the same manner as in step 3.

At this time, all the measurements necessary to determine if the existing effective insulated joint provides the absolute minimum clearance have been completed.

$$6'-6" + A + B = T \text{ (The total distance required for minimum clearance)}$$

Distance "C" (actual clearance distance) must not be less than "T"

If "C" is less than "T", the effective insulated joint is located improperly and the fouling section does not extend to the minimum clearance point as is required in § 236.58



# **Reference B**

**Copy of January 3, 1985**

**Himmel Letter**



U.S. Department  
of Transportation  
**Federal Railroad  
Administration**

**JAN 3 1985**

400 Seventh St., S.W.  
Washington, D.C. 20590

Mr. L. M. Himmel, Sr.  
Executive Director  
Operations and Maintenance  
Department  
Communications and Signals  
Division  
Association of American Railroads  
1920 L Street, N.W.  
Washington, D.C. 20036

Dear Mr. Himmel:

This has further reference to your letter dated October 12, 1984, and the subsequent meeting on November 27, 1984, between representatives of the Association of American Railroads (AAR), the Brotherhood of Railroad Signalmen (BRS), and the Federal Railroad Administration (FRA), concerning the enforcement of sections 236.4, 236.60, 236.102, 236.106, 236.108, 236.204, 236.309, and 236.376-381, inclusive, of the Rules, Standards and Instructions (RS&I).

The FRA has considered the contents of your letter and the comments presented during the meeting. Based on the issues raised, the following interpretations are provided:

Section 236.4 Interference with normal functioning of device.

The AAR requested that during operational tests of locomotive engineers, a signal made dark without establishing an approach aspect not be considered as interference. The AAR recommends that FRA's Technical Manual be revised to make the requirements of this rule applicable only at controlled signals and automatic interlockings.

This rule imposes on each carrier the requirement to prohibit procedures or practices which defeat or nullify the safety of its signal systems without first taking measures to provide for the safety of train operations.

The comments of the AAR clearly indicated that a dark signal is regarded as the most restrictive indication that can be given at that signal and that an engineer is required to act on the preview of the dark signal to reduce train speed or stop in compliance with the restrictive indication.

Section 236.23 requires that a yellow light, a lunar light, or a series of lights or a semaphore blade in the upper or lower quadrant at an angle of 45 degrees to the vertical be used to indicate that speed is to be restricted and stop may be required.

The FRA cannot condone a practice that is hazardous to the safety of train operation or that is contrary to its regulations. Accordingly, an aspect complying with section 236.23 is required in approach to any signal made dark for operational tests.

Section 236.60 Switch shunting circuit; use restricted.

The AAR contends that only new switches come under this rule and questioned whether or not the provisions of the rule are applicable to independently operated fouling point derails equipped with switch circuit controllers. The AAR recommended that FRA's Technical Manual be revised to exempt switches where points are relocated because of rail relay or change in size of turnout and at independently operated fouling point derails.

This rule prohibits the installation of a switch shunting circuit except where track or control circuit is also selected through the switch circuit controller. These provisions apply to all systems including signal arrangements such as tunnel protection, slide fence, or high water detector.

Installations of switch shunting circuits in service on February 27, 1984, are not affected by the requirements of this rule and may be continued in service. The repair or replacement of components in such existing circuits is also permitted.

The FRA is enforcing the provisions of this rule at switches in the following manner:

At each new switch installed in each system existing on February 27, 1984.

At all switches in each system installed after February 26, 1984.

At each switch installed in an existing system where the point of switch is relocated for reasons other than routine track maintenance (including rail relay) or the angle of the switch frog is changed as the result of a change in carrier track standards.

A new switch is considered to be:

An additional switch installed in a system existing on February 27, 1984.

All switches of each system installed after February 26, 1984.

A switch installed as the result of the shortening or lengthening of a siding or other auxiliary track.

It is the prerogative of each carrier whether switch circuit controllers are provided at independently operated derails installed in block signal systems. The FRA will consider granting relief from the requirements of this section at such installations upon an adequate showing by individual carriers.

#### Section 236.102 Semaphore or searchlight signal mechanism.

The AAR withdrew comment on the enforcement of this section.

#### Section 236.106 Relays.

The AAR contends that US&S CDP relays and GRS VTB relays are not polar relays and, therefore, are not required to be tested every two years. In addition, the AAR contends the removal of a plug-in relay and replacement with same does not require complete circuit checks.

The provisions of this section prescribes periodic testing of each relay, the functioning of which affects the safety of train operation. AC centrifugal relays must be tested at least once every 12 months; AC vane

relays, DC polar relays, and relays with soft iron magnetic structure must be tested at least once every two years; and all other relays must be tested at least once every four years.

According to the manufacturers' catalogs, the CDP relay is a magnetic stick relay and the VTB relay configured to be either a magnetic stick relay or polar biased relay. Accordingly, these relays are only required to be tested at least once every four years.

A plug-in relay may be removed from its mounting base and reinserted without requiring applicable tests prescribed by sections 236.377 to 236.381, inclusive, to be performed. However, where two or more relays are removed at the same time and subject to being reinserted in mounting bases other than that from which they were removed, applicable tests prescribed by sections 236.377 to 236.381, inclusive, must be performed since the circuits would be considered as having been disarranged.

Section 236.108 Insulation resistance tests, wires in trunking and cables.

The AAR questioned whether circuit checks must be made after insulation resistance tests where all wires of a cable are removed from a terminal board.

This section requires tests be made of insulation resistance of wires in trunking and cable when installed and at least once every ten years thereafter. The insulation resistance of each conductor in trunking or within a cable must be tested to ground and against all other wires in the trunking or cable. Each conductor having insulation resistance of less than 500,000 ohms shall be tested annually. No conductor having insulation resistance of less than 200,000 ohms may be left in service.

A major cause of false proceed failures is errors in connections. The disconnecting of several conductors at a terminal board or junction box creates conditions favorable to making errors in connection and is considered to be a disarrangement. Therefore, where all wires in trunking or cable are disconnected for performing insulation resistance tests, the applicable tests prescribed by sections 236.377 to 236.381, inclusive, must be performed.

Section 236.204 Track signaled for movements in both directions, requirements.

The AAR questioned whether the last sentence of this rule permitted a "stop, then proceed at restricted speed" aspect.

This rule is the standard by which automatic block signal systems, designed on either the overlap or absolute permissive block principle, must perform to provide proper protection for opposing trains on track signaled for movements in both directions. The last sentence applies only to absolute permissive block signaling and requires that when a train passes a head block signal, it shall cause the opposing head block signal to display an aspect with indication not more favorable than "stop".

When this rule was adopted in 1950, it required that a train cause one or more opposing signals immediately ahead of it to display an aspect requiring a stop. There were no provisions for permissive aspects such as grade or tonnage markers or "stop, then proceed at restricted speed," even though such aspects were in wide use throughout the industry. In 1966 the rule was revised to permit the use of permissive aspects except at head block signals in absolute permissive block signaling.

In overlap signaling, trains are protected ahead by one or more opposing signals displaying an aspect with indication not more favorable than "proceed at restricted speed," the approach to which is governed by an aspect indicating "approach next signal prepared to stop." Thus, opposing trains approaching each other are safely reduced to restricted speed, making the overlap system very flexible even though opposing trains may meet in a manner that would require one train to back up to the nearest auxiliary track to permit them to pass one another.

In absolute permissive block signaling, opposing protection is from siding-to-siding. When a train passes a head block signal, the opposing head block signal is required to display an aspect indicating "stop", which requires an opposing train to stop and stay at the point where the trains can pass one another.

The revision to this rule, effective February 27, 1984, further clarifies that in absolute permissive block signaling, the use of aspects at head block signals indicating "stop, then proceed at restricted speed" or "proceed at restricted speed" is prohibited.

The FRA recognizes that radio communication technology has resulted in innovative methods of train operation other than timetable and train orders that establish absolute block protection for opposing movements regardless of the design of the automatic block signal system. The FRA will consider relief from the requirements of the last sentence of this section upon adequate showing by individual carriers.

Section 236.309 Loss of shunt protection; where required.

The AAR believes that requirements for interlocking signal at an automatic interlocking to stay green for five seconds after a loss of shunt is unrealistic. The AAR requests a change in FRA's interpretation to the extent that automatic interlockings having time locking be exempted from these requirements.

This rule prescribes, among other things, that a loss of shunt of five seconds or less not permit an established route to be changed at an automatic interlocking. The FRA applies this requirement at each approach track circuit and each interlocked track circuit at automatic interlockings. The issue here concerns approach track circuits only.

At an automatic interlocking provided with time locking, a loss of shunt on an approach track circuit to an established route, i.e., a signal displaying an aspect to proceed, will cause the signal to display an aspect indicating "stop" and activate a predetermined time interval that will, among other things, prevent an aspect to proceed from being displayed for any conflicting route.

At an automatic interlocking provided with approach locking, a loss of shunt on an approach track circuit to an established route, i.e., a signal displaying an aspect to proceed, will cause the signal to display an aspect indicating "stop." No predetermined time interval will be activated, therefore, if an approach track circuit on a conflicting route is occupied at the



time of the loss of shunt, the conflicting interlocked signal will immediately display an aspect to proceed. The FRA has considered the AAR's proposal and found it reasonable. Safety of train operation will not be affected. Accordingly, the FRA will revise its Technical Manual to exempt automatic interlockings provided with time locking. However, interlockings provided with approach locking must be so arranged that a loss of shunt for five seconds or less on an approach track circuit will not permit an established route to be changed.

Section 236.376 Mechanical locking.  
Section 236.377 Approach locking.  
Section 236.378 Time locking.  
Section 236.379 Route locking.  
Section 236.380 Indication locking.  
Section 236.381 Traffic locking.

The AAR requested clarity of the term "disarranged"; questioned whether the removal of two or more wires constituted a disarrangement which required the above tests be performed; and suggested FRA's Technical Manual be revised to exempt the requirements of testing where a device is provided with plug couplers or the replacement is accomplished by removal of not more than one wire at a time.

These rules prescribe inspection and tests of the various types of locking. The rules require mechanical locking be tested when new locking is installed; electric locking be tested when placed in service; and all locking be tested thereafter when modified, disarranged, or at least once every two years, whichever shall occur first.

Major sources of false proceed failures for more than five years have been errors in connection and errors in design. The revision of these rules resulted in the requirements that tests be performed at the time such errors should be detected, before they present hazards to the safety of train operation.

Accordingly, mechanical locking is considered to be disarranged when (i) one or more pieces of locking are broken; or (ii) one or more pieces of locking are removed.

Electric locking is considered to be disarranged when (i) a relay is replaced with another; (ii) when two or more signal line wires or a cable having two or more conductors are severed; (iii) when a cable or conductor in a locking circuit is replaced with another; or (iv) when wires are removed at the same time from more than one terminal of a relay or terminal board.

The Signal Inspection Act gives the Federal Railroad Administration authority over the Nation's railroad signal and train control systems. Being burdened with the responsibility for the safety of these systems, the FRA must insist on uniform application of its regulations by all carriers, even where a carrier prefers to employ other approaches deemed by it to be equally safe.

FRA's Rules of Practice (49 CFR 211) provide for the granting of relief from any rule or regulation. However, deviations from uniformity are considered only in those cases where the applicant presents sufficient evidence to support granting relief from a specific rule. Except for section 236.309, such supporting evidence was not presented in your letter or during the meeting held on November 27, 1984.

Enclosed is a copy of the revision of FRA's Technical Manual in connection with the application of the provisions of section 236.309.

Sincerely,

J. W. Walsh

J. W. Walsh  
Associate Administrator  
for Safety

Enclosure

cc: All Directors of Railroad Safety  
All S&TC Specialists  
J. W. Hansen, BRS  
W. W. Lauer, BRS  
W. D. Pickett, BRS  
W. A. Johnston, AAR  
J. F. Derochie, MP  
R. D. Liggett, SBD  
B. J. Hutton, ATSF  
G. D. Wilson, SP  
*L. T. Bates, BRS*  
RRS-1 Rdg  
RRS-10 Rdg  
RRS-11 Rdg  
RRS-11 Subj  
SHStotts/ecc/12/28/84

# Reference C

**FRA Home Page – Web-link to Technical Bulletins;  
[http://www.fra.dot.gov/eLib/Find#p1\\_z50\\_ICT\\_s59](http://www.fra.dot.gov/eLib/Find#p1_z50_ICT_s59)**

**FRA Home Page - Web-link to Safety Advisories;  
[http://www.fra.dot.gov/eLib/Find#p1\\_z50\\_s59\\_ISA](http://www.fra.dot.gov/eLib/Find#p1_z50_s59_ISA)**