Motive Power and Equipment Compliance Manual

April 2026

U.S. Department of Transportation

Federal Railroad Administration

Prepared By: FRA Office of Railroad Safety, Motive Power and Equipment Division
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This manual is subject to change, including modification or revocation, at any time by FRA, without prior notice, in light of future regulatory and other FRA actions. After such actions occur, the corresponding information in this manual may be outdated until the manual is updated to reflect those changes.

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Chapter 1 – General Information

Introduction

Note: See the Disclaimer on page i regarding this Compliance Manual.

The Motive Power and Equipment Compliance Manual (Compliance Manual or manual) provides information to Federal and State Motive Power & Equipment (MP&E) inspectors that help ensure compliance with Federal railroad safety requirements.[1] Findings of noncompliance with Federal railroad safety requirements may result in enforcement action including civil penalty assessment. Discussions of the Federal railroad safety requirements in this manual provide explanations related to specific regulatory sections. The information contained in this manual does not modify, alter, or revise the Federal railroad safety requirements. This manual is the property of FRA and is intended to be used by FRA and participating State personnel.

This manual is a complement to the *Office of Railroad Safety's General Manual* (General Manual). The General Manual provides detailed information regarding FRA's overall operations, history, statutory authority, rulemaking process, and inspection and investigation procedures. Both manuals are specifically intended for use by the safety inspectors and technical specialists throughout the country who monitor compliance with Federal railroad safety requirements. Using both manuals will achieve uniformity and consistency, as well as enable FRA's front-line representatives to promote the agency's safety mission successfully.

Inspectors should use the Compliance Manual as an aid to help gain a better understanding of the Federal railroad safety requirements governing the safety of railroad rolling equipment. However, having thorough knowledge and understanding of these requirements alone is not enough to be a good inspector. The success and effectiveness of FRA's safety assurance and compliance programs hinge on the ability of the inspector to use good judgment and strategies with the railroad industry, so that compliance is achieved. Inspectors have considerable enforcement discretion, and this manual should be used to provide the individual with information on how to exercise that discretion. If the manual does not provide adequate information for a particular situation, or if there is any doubt as to the meaning of any of the information provided in this manual, the inspector should seek the assistance of the regional MP&E specialist.

Compliance with the information in this manual will assist with the uniform application and enforcement of Federal railroad safety requirements throughout the Nation. This uniformity is necessary for effective program management and is mandated by the Federal Railroad Safety Act of 1970 (Pub. L. No. 91-458). This information will also help to achieve maximum effective use of the limited available resources.

[1] Generally, the Compliance Manual's organization reflects the MP&E regulations. Meaning there is a chapter for each of the main MP&E regulations, but other Federal railroad safety requirements are referenced throughout the document where relevant. Generally, Federal railroad safety regulatory text is included only for convenience in instances where corresponding information is provided. Therefore, the Compliance Manual does not include a comprehensive copy of the Federal railroad safety requirements. To carry out inspection duties, inspectors must separately be familiar with the Federal railroad safety requirements.

All activities shall be conducted in accordance with FRA's goal of improving railroad safety contained in the **General Inspection Principles** in Chapter 3 of the General Manual.

Questions from inspectors about information contained in this manual should be referred to the MP&E Headquarters Staff (RRS-41) for a prompt response. Inspectors' suggestions regarding improvements or corrections to the manual should also be submitted to regional MP&E specialists, who will then forward them to RRS-41.

Program Goals

The goal of the MP&E inspection program is to administer an effective safety program and to achieve safe operating and mechanical practices in the railroad industry, through compliance with all Federal railroad safety requirements that are designed to promote railroad safety. The MP&E inspection program is responsible primarily for monitoring compliance with the following railroad safety regulations, found in Title 49 Code of Federal Regulations (CFR):

Part 210 - Railroad Noise Emission Compliance Regulations

Part 215 - Railroad Freight Car Safety Standards

Part 218 - Railroad Operating Practices
Subpart B - Blue Signal Protection of Workers
Subpart D - Prohibition Against Tampering with Safety Devices

Part 221 - Rear End Marking Device - Passenger, Commuter and Freight Trains

Part 223 - Safety Glazing Standards - Locomotives, Passenger Cars, and Cabooses

Part 224 - Reflectorization of Rail Freight Rolling Stock

Part 229 - Railroad Locomotive Safety Standards

Part 230 - Steam Locomotive Inspection and Maintenance Standards

Part 231 - Railroad Safety Appliance Standards

Part 232 - Brake System Safety Standards for Freight and Other Non-Passenger Trains and Equipment: End-of-Train Devices

Part 238 - Passenger Equipment Safety Standards

Part 239 - Passenger Train Emergency Preparedness
§ 239.101(6) On-board Emergency Equipment
§ 239.107 Emergency Exits

Basis for Regulation and Inspection

The statutory authority permitting Federal regulations and inspections conducted by the MP&E inspectors comes from various Acts of the U.S. Congress. For a detailed discussion on this authority please see the **Brief History and Organization of the Federal Railroad Administration** in Chapter 1 of the General Manual.

Definitions and Roles

Specialist: As used hereafter in this manual, refers specifically to regional MP&E railroad safety specialists. The specialist is responsible for technical evaluation and oversight of all motive power and equipment inspections, analyses, and activities within the region and provides technical information, training, and advice in the MP&E areas. Headquarters specialists are subject to the same information provided in this manual.

Inspector: As used hereafter in this manual, refers to a Federal MP&E inspector or a qualified State equipment inspector. Inspectors are the front-line representatives of the agency and must be thorough while conducting themselves in a safe, professional, ethical, and courteous manner.

State Equipment Inspector: As used hereafter in this manual refers to either a qualified State car inspector, qualified State locomotive inspector, or qualified State MP&E inspector who has been certified by FRA to conduct equipment inspections in a participating State.

Stakeholders: Includes those the agency regulates as well as those it serves. Some partner with FRA to develop safety initiatives and technology, while others help review, develop, and/or enforce FRA's safety regulations. **All stakeholders** depend on FRA to fulfill its mission to *promote safe and successful railroad transportation to meet current and future needs.*

Credentials

Inspectors must have their credentials on their person while on duty. Any request to provide identification should be complied with in a prompt and courteous manner. Inspectors should not permit their credentials to be photocopied. Additionally, inspectors are encouraged to obtain and provide business cards to stakeholders, as conditions warrant. Inspectors should consult with their supervisors on procedures for procuring the cards, as conditional reimbursement is permitted.

Personal Safety

The inspector's first concern is for his or her own safety and that of any accompanying personnel. Inspectors should always remain alert to the dangers of moving equipment and third rail/electrified equipment.

Inspectors must comply with any railroad's request to use safety equipment, such as hard hats, safety shoes, safety glasses, etc. Inspectors should also comply with all of the railroad's safety rules, to the extent that it would not materially interfere with FRA's capability to conduct inspections. FRA inspectors are **not** required to establish blue signal protection while conducting inspection activities.

Inspectors should be familiar with the Federal Railroad Administration Safety Policy, Procedures, and Recommendations. Copies of this pamphlet are available either from regional or headquarters managers, or from an FRA industrial hygienist.

Recommended Safe Work Procedures

Each inspector is encouraged to refer to a booklet published by FRA called *Recommended Safe Work Procedures*. By adhering to the information contained in the booklet, staying alert, and never taking the work environment for granted, inspectors will reduce the likelihood of injury to themselves and others. Work procedures and practices are defined as the suggested safe way to perform a job. The potential for injuries increases when prescribed procedures are not properly followed.

If the information in the booklet is not clear, or if it does not provide enough material to make a sound decision, the inspector should contact the Collateral Duty Officer or a supervisor for additional information. Remember, no job is so important, and no service is so urgent that we cannot take time to perform all work safely.

Technical Bulletins

The Office of Railroad Safety periodically issues Technical Bulletins (TB) to provide instructions and guidance on a variety of general and discipline-oriented issues.

MP&E inspectors must maintain a current file of all general and MP&E-related TBs, which must be readily available to them. Inspectors may review the Compliance Manual and all TBs on FRA's website by going to the tab for "Railroad Safety," then "Divisions," then "Motive Power and Equipment," then scroll down to the "eLibrary" and select the tab for "Technical Bulletins."

Contacts with News Media

Inspectors are not authorized to grant interviews or respond to representatives of the news media regarding FRA activities. If approached by news media personnel, inspectors should refer such personnel to FRA's Office of Public Affairs (202-493-6024) for handling. This applies to all news organizations including television and radio news stations, as well as newspapers, magazines, Web-based news outlets, as well as academic organizations and industry trade publications. ***Inspectors must not provide the news media with information or opinions as to a probable cause of an accident or incident.***

Any requests for information, made under the Freedom of Information Act, should be forwarded to the FRA Office of the Chief Counsel.

See **Contacts with News Media under Communication Guideline** in Chapter 4 of the General Manual for more information regarding requests for information. For a public report or further information, contact FRA's Office of Public Affairs at 202-493-6024.

Cooperation of FRA Personnel with Industry, Labor, and Other Agencies

Inspectors should maintain a cordial relationship with the railroads, manufacturers of railroad equipment, labor union personnel, and other public or governmental agencies. Inspectors must obtain authority from their regional supervisors or their representative before cooperation or participation in any project with any of these groups or individuals is conducted.

Subpoenas

Responding to Subpoenas and Other Requests for Information or Testimony in Chapter 2 of the General Manual provides important information regarding responding to requests and demands to testify or produce documents to outside parties.

If subpoenaed or otherwise notified to appear as a witness in any court proceeding, inspectors must immediately notify their regional specialist and provide information as to the date, place and time of the subpoena served; title of case; party by whom subpoenaed; name and address of that party's attorney; name of court; place, date and time of trial or other court proceeding, and circumstances of the incident for which subpoenaed. This also applies to railroad disciplinary investigations. The inspector **must not** respond to any of these requests independently.

Operating Equipment

An inspector may not operate any piece of railroad equipment. ***There is no exception to this rule!*** However, an inspector may request that a railroad representative move or operate a piece of equipment or perform a test for inspection purposes.

Delaying Trains

Inspectors have no authority to prohibit the departure or movement of any train, locomotive, car, *etc*. Inspectors can issue a Special Notice for Repairs and should point out any hazardous conditions that could result in an accident should the defective train, locomotive, or car depart without appropriate attention. If a railroad elects to move equipment without taking appropriate action, the inspector should notify their regional specialist immediately and develop information to pursue civil penalties or other enforcement action against the railroad and/or initiate enforcement action against an individual, especially if a Special Notice for Repairs has been issued and ignored.

See **Intervening When Railroad Employees Perform Unsafe Acts** in Chapter 2 of the General Manual.

Unusual Occurrences

See **Handling Deterrents to Inspections** in Chapter 2 of the General Manual.

National Transportation Safety Board

See the **National Transportation Safety Board (NTSB)** section in Chapter 4 of the General Manual for guidance.

The "Independent Safety Board Act of 1974" established the NTSB as an independent agency. The NTSB is authorized to investigate railroad accidents and make recommendations based upon the findings of their investigations. If NTSB Investigators arrive on the scene during an accident investigation, FRA inspectors should introduce themselves and promptly contact the regional specialist to advise of the NTSB's presence. However, unless instructed otherwise, FRA investigation activities should continue independently.

It is the Office of Railroad Safety's policy to extend full cooperation to the NTSB in all matters related to railroad safety and accident investigation. If an inspector is assigned to assist in an NTSB accident investigation, the inspector must keep the MP&E Staff Director informed about the progress of the NTSB's investigation.

Chapter 2 – Inspection and Compliance Program

Introduction

The General Manual provides detailed information regarding general inspection and investigative procedures, along with a discussion about the rulemaking process. However, some policies and procedures specific to the MP&E discipline warrant inclusion in this manual.

Allocation of Resources

MP&E specialists are responsible for coordinating *special* MP&E assignments and activities within the region using national and regional safety data to allocate inspector resources. Regional supervisors, through the MP&E specialist, shall establish priorities appropriate to the urgency and seriousness of any alleged complaint, violation, or incident.

Inspectors are responsible for coordinating daily inspection activities to ensure adequate coverage of their territory. The inspector should plan to visit all assigned inspection points within their territories as circumstances warrant, unless directed otherwise by regional management.

Regular Inspection Point

Inspectors will prepare and maintain an accurate Regular Inspection Point (RIP) list of inspection points for railroads within their assigned territories. The RIP list, and any subsequent changes to the list, shall be forwarded to the regional specialist. The specialist is responsible for reviewing region RIP lists for accuracy.

Inspection/Activities Priorities

The allocation of resources will often deviate from the desired goal because of unforeseen events. When these events occur, the Deputy Staff Director, specialists, and inspectors will base their decisions on the following priorities:

1. Accident investigations
2. Congressional complaint investigations
3. Waiver petition investigations
4. One-time movement (OTM) investigations (receives higher priority if the OTM is for clearing major accident site)
5. Regular complaint investigations
6. Focused enforcement inspections

7. Sample locomotive/car inspections
8. Steam locomotive - Boiler inspections
9. Site-specific (routine) inspections
10. Operation Life Saver presentations

Accident Investigations

Refer to the **Accident Investigation Guidelines** in Chapter 4 of the General Manual, for agency policies and procedures. The following resources are available for assessing commodity hazards and rail equipment damage and can be provided to the On-Scene Coordinator:

Emergency Assistance:

Chemtrec	800-424-9300
Chlorep	703-527-3887
EPA National Agriculture Compliance Assistance Center (NACA)	
Pesticide Safety	888-663-2155
Bureau of Explosives	202-639-2910
Poison Control Center	800-222-1222
National Response Center	800-424-8802
FEMA	202-646-2044
Nuclear Regulatory Commission	301-951-0550
Transportation Crisis Mgt Center	202-366-5270
FRA Public Affairs Office	202-493-6024

Congressional Complaint Inspections

Refer to **Compliant Investigations** in Chapter 5 of the General Manual. Inspectors have **45 days** to complete the investigation and submit a written report of the findings to the regional specialist.

Waiver Petition Investigations

All MP&E waiver petitions must be processed through the Washington, DC, Headquarters Office. Headquarters will assign a Docket Number and publish the request in the *Federal Register* and transmit the request to the region for investigation. The region will then assign the waiver petition to an inspector for investigation. Waiver petitions are handled pursuant to 49 CFR Part 211, which states that waiver decisions must be made not later than 9 months after receipt of the request. Therefore, the waiver investigation must be conducted in a timely manner.

The inspector will prepare an Inspector Report Form for MP&E Petitions and submit it to the regional office within 30 days. If the waiver petition investigation requires more than 30 days to complete, the inspector will submit a memorandum or e-mail to the regional office detailing the reason for the delay. All recommendations from the inspector and region must be supported with *factual* evidence, proof, and/or data, ***not opinions***. CAUTION: Inspectors should never disclose to the petitioner what the recommendation will be, as the Railroad Safety Board has the final say.

Refer to **Waiver Investigations including Signal Applications** in Chapter 5 of the General Manual for more details on the waiver process.

Inspectors shall use the Form "Inspector Report Form for MP&E Petitions" shown below to report the findings of their investigations.

DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION

Inspector Report Form for MP&E Petitions

Petition No. **Date Petition Filed**

Date of Report

Inspector

Railroad/Co. Filing Petition

Inspection/Investigation Date **Location**

Railroad/Co. Representative Name & Title

Synopsis of Petition and Inspector Recommendation
Furnish the Following Information - ***(choose one only with X for (a))***

(a)		**Description of proposed changes or relief sought, locations with respect to place and distance between designated points is correctly stated in Public Notice, or should be changed to read as follows.**

(b)	**Name of any other railroads affected by proposed changes not shown in Public Notice and manner in which affected.**
(c)	**1) Description of motive power or equipment involved.**
	2) Describe condition of motive power or equipment involved relative to compliance with 49 CFR Part(s) 215, 223, 229, 230, 231, 232, or 238.
	3) Description of operations for which waiver is sought.
	4) Information relative to the proposed relief not fully described in the Public Notice.
	5) Present method of operation, number of trains or other movements per day, and speed authorizations and restrictions.
	6) Summary of accidents/incident reports reviewed relative to proposed relief.
	7) Other pertinent facts or remarks.
(d)	**List of any prints, bulletins, orders, timetables, *etc*., obtained during investigation.**

(e)	**List the specific sections from which relief are sought (*e.g.*, 49 CFR Part 223, 229)**.
	1) Reason(s) proposed relief from compliance with the regulations is necessary.
	2) If any of the proposed changes have been placed in service, give description of such changes, date such changes were placed in service and the reasons for making the changes before approval of the petition.
(f)	**Inspector analysis - The proposed relief will *(choose one only with X for (f))***
	Reduce protection and safety.
	Provide adequate protection for existing and operating conditions without materially reducing safety.
	Maintain existing protection and safety.
	Increase protection and safety.
	State Reasons:
(g)	**Inspector recommendations regarding disposition of this application, (explain and state reasons).**

One-Time Movement (OTM) Inspections

From time to time, railroads or equipment owners will request that FRA issue a "one-time movement authority" to allow noncomplying cars or locomotives to be moved for a specific purpose under specified conditions ensuring for safety of the movement. FRA considers an OTM to be an exercise of its enforcement discretion in a limited number of specialized circumstances, and the granting of such authority does not relieve a party from any statutory liability applicable to such movements.

This authority is not necessary for equipment that can be moved under 49 CFR §§ 215.9, 229.9, 238.15, or 238.17. FRA will *consider* granting OTM movement authority on the following basis:

- Positioning - For example, an over-aged car or noncomplying locomotive being moved to a railroad museum for permanent display, or noncomplying equipment moved to ports for shipment outside the U.S.
- Dismantling - A wreck-damaged car or locomotive that is deemed to be not economically repairable, or an over-aged or retired car or locomotive that needs to be moved to a scrap yard for dismantling.
- Repair - Movement for repair requests are the most common, and the most often denied of the four categories. For FRA to consider issuing authority for movement of noncomplying equipment for repair, the circumstances related to the movement must be unique and/or the necessary repairs must require specialized facilities or personnel skills. For example, the nearest facility may not be equipped to effect the necessary repairs fully, such as heavily wreck-damaged locomotives or tank cars.
- Prototypes - Special demonstrations and testing of prototype equipment.

To obtain OTM authority from FRA, the requestor must submit a letter, via e-mail, on company letterhead to:

Staff Director
Motive Power & Equipment Division
Federal Railroad Administration
1200 New Jersey Avenue, SE
Washington, DC 20590
FRARRSMPE@dot.gov

An option for requesting the movement of a locomotive is the Association of American Railroads (AAR) automated OTM application system. Also, AAR has developed a similar web portal for the OTM movement for freight cars. AAR's RailINC manages both systems. When a railroad or car owner requests an OTM, FRA is automatically notified through the system.All request letters must contain the following information:

- The reporting mark/number and the type of equipment (*e.g.*, locomotive, covered hopper car, passenger car) for which the OTM is requested, along with the corresponding Federal railroad safety law or regulation (*e.g.*, 49 CFR § 215.203(a)(1) - *Restricted Cars*).

- The status of the equipment, to include all noncomplying components. State the cause of any damage (*e.g.*, collision/sideswipe, grade crossing collision, derailment). Also, address any precautions taken to ensure the safety of railroad personnel during the move, such as removal of sharp edges, lose or crushed components, addition of temporary safety appliances and/or caution tape, roped-off stairway, *etc*.

- The point of origin and final destination of the equipment, including the specific route, to include any stops or layovers (such as for unloading and cleaning of tank cars) and all railroads that will be involved with the movement, with the approximate distance of the movement.

- The rationale for the request (why the repairs cannot be made at the current or nearest repair location).

- Any restrictions the railroad or car owner believes should be applied to the movement.

- The point of contact (name, address, telephone, e-mail address, and (as applicable) fax number) where the subject equipment is located, so that an FRA inspector can schedule an inspection.

- Name, title, address, telephone, e-mail address, and (as applicable) fax number of the person requesting the OTM.

How to Expedite:

In order to expedite the process, the OTM request may be emailed or faxed to FRA's headquarters in Washington, DC, at (202) 493-6309. The fax cover sheet should be addressed to the attention of the Staff Director, Motive Power & Equipment Division. OTMs that come through headquarters will be handled by headquarters staff. Headquarters staff will contact the appropriate region for an inspection of the equipment. The region will develop a report of findings, along with any recommendations regarding safety conditions or concerns. Headquarters or the regional MP&E specialist will draft the final response letter and provide a copy of the letter to the relevant region(s) prior to the movement taking place.

Regular Complaint Investigations

Refer to **Complaint Investigations** in Chapter 5 of the General Manual for detailed procedures.

Complaints are generally filed by railroad employees, labor organizations, or the public. The complaint may be submitted by either formal letter, e-mail, telephonic, or verbal format. Complaints may be referred by other State or Federal agencies. The inspector assigned to a complaint investigation normally knows the identity of the complainant and the names of potentially helpful contacts.

Attention: The complaint investigation must be conducted without revealing to anybody that a complaint is or was under investigation. An inspector may not, under any circumstances, reveal the identity of the complainant to anyone not employed by FRA, unless:

- The complainant authorizes such disclosure in writing; or
- FRA refers the matter to the Attorney General (AG) for enforcement. In such instances, discussion is limited to persons within the AG's office. *See* 49 U.S.C. § 20109.

The region will assign the complaint to an inspector, who will complete the investigation within 60 days. If a complaint investigation cannot be completed in 60 days, the inspector will write a memorandum or e-mail to the regional office explaining the reason(s) for the delay. Each five days thereafter, until completion of the complaint, the inspector will submit a memorandum or e-mail to the regional office explaining the status of the complaint.

Focused Enforcement Inspections

Focused enforcement entails concentrating enforcement efforts primarily on the types of violations most likely to cause an actual train accident or injury. FRA's accident/injury database provides a wealth of information on the leading causes of accidents and injuries. The basic principle here is allocating our finite enforcement resources to those areas where improvements in compliance are most likely to produce maximum safety benefits. The principle is the same regarding allocating inspection resources; as discussed in a separate document on inspections, FRA needs to use available information on safety risk criteria to better guide selection of inspection priorities.

FRA inspectors shall utilize FRA's accident, injury, and inspection data to gain better insight into the types of violations that are actually causing large numbers of accidents and injuries. While much of the information is already available to the field, FRA will distribute to the field data summaries showing the leading causes of train accidents and injuries by safety discipline, cause code, and regulatory section. The data will be industry-wide and broken down by railroad. With this information, inspectors will be better equipped to weigh the discretion criteria concerning the inherent seriousness of violations and the level of risk posed in specific circumstances. This is not to suggest that enforcement decisions are to become entirely driven by data. Direct observations and experience will always be necessary elements of these decisions. However, because the agency has adopted certain performance goals linked directly to reducing the rate of certain unsafe events, FRA needs to use the data collected to help achieve those goals.

In-depth accident analyses are conducted to determine if any Federal railroad safety laws or regulations have been violated and what remedial action should be taken. In addition, inspectors must study accident trends in their inspection territory, especially those attributed to human factors and mechanical practices, to include inspections, tests, and repairs. Information is available for each railroad in the inspector's territory and will be helpful in outlining inspection plans and setting safety priorities. Site-specific inspections should be performed on the basis of each inspector's knowledge of enforcement areas requiring more attention to ensure safety. An inspector's knowledge of each railroad within the inspection territory should determine the types of inspections that must be performed. For example, if a recent human factors-caused accident was related to an improper air brake inspection, concentrated inspections of the railroad's air brake inspections should be conducted at various times throughout a 24-hour period, to include weekends. Where inspectors are focusing on leading causes of accidents and injuries, their violation reports should summarize the factors underlying their decision.

In the meantime, inspectors are encouraged to make use of data already at their disposal, including accident data, inspection data, and their own experience about the most important safety hazards. Inspectors should give this information great weight and strongly consider enforcement action whenever these especially unsafe conditions occur, with a goal of maximizing the safety return on enforcement efforts. While some enforcement actions will continue to be necessary on matters that are not likely to actually cause accidents or injuries but violate regulations that are important underpinnings of an effective regulatory program (*e.g.*, recordkeeping), matters that are serious safety concerns are more likely to be the prime candidates for enforcement actions. Reporting, recordkeeping, and inspection violations become more important to the extent they are widespread and/or bear directly on compliance with substantive requirements.

This careful focus on how enforcement discretion is exercised should significantly improve FRA's utilization of limited resources regarding compliance oversight. FRA may also decide to adopt a "zero tolerance" (i.e., always enforce) policy for the most egregious and flagrant violations. The goal is not to achieve a particular volume of enforcement actions on the high or low side. The goal is a compliance program in which enforcement discretion is routinely exercised in a commonsense way to address important problems that more cooperative enforcement methods have not resolved.

Sample Locomotive/Car Inspections

Inspectors should review any material that was disseminated to them prior to conducting the sample car inspection for detailed information and procedures.

Sample car/locomotive inspections are performed as a courtesy to the manufacturers, to ensure that the equipment is built in accordance with **all** applicable Federal railroad safety laws. Car builders that desire to have the FRA review their equipment for compliance with safety appliance standards are to submit their safety appliance arrangement drawings, prints, *etc.*, to the FRA Office of Railroad Infrastructure and Mechanical Equipment for review, at least 60 days prior to construction. All requests and drawings should be submitted to the following address:

Staff Director
Motive Power & Equipment Division
Federal Railroad Administration
1200 New Jersey Avenue, SE, Mail Stop 25
Washington, DC 20590

FRA will review the documents submitted and advise the builder as to the status. The builder should then notify the Office of Railroad Infrastructure and Mechanical Equipment at least 30 days in advance of when the sample equipment will be ready for inspection. Once the request is received, headquarters will coordinate with the appropriate Regional personnel as to the date and location of a scheduled sample car/locomotive inspection. The Regional MP&E Safety

Specialist will appoint an experienced inspector to conduct the inspection. If the location of the sample car/locomotive inspection is in Canada, the Region shall coordinate the inspection activity with representatives from Transport Canada so that a joint inspection can be conducted.

The individual assigned to perform the sample car/locomotive inspection shall review in advance the current MP&E Sample Car/Locomotive Inspection Procedure Guidelines, pertinent regulations covering the type of car or locomotive to be inspected, and (if possible) the current Association of American Railroads (AAR) Manual of Standards and Recommended Practices (Safety Appliance Requirements for Freight Cars Standard S-2044) or the American Public Transportation Association (APTA) Standards applicable to the car or locomotive to be inspected. Inspectors should have the necessary equipment to perform the inspection (i.e., appropriate regulations and standards, gauges, camera, ruler, measuring devices, and the checklist which is provided in an appendix).

The equipment inspected must strictly comply with the applicable sections of:

49 CFR Part 215	Freight Car Safety Standards
49 CFR Part 223	Safety Glazing Standards
49 CFR Part 224	Reflectorization
49 CFR Part 229	Locomotive Safety Standards
49 CFR Part 231	Safety Appliance Standards (or S-2044 for builds after January 2015)
49 CFR Part 232	Power Brake Systems
49 CFR Part 238	Passenger Equipment Safety Standards
49 CFR Part 239	Passenger Train Emergency Preparedness

In addition to regulatory requirements, the equipment should be examined from the standpoint of overall operational safety. Conditions not covered by regulations should be addressed in the assessment of the equipment. Photograph and describe in detail any condition detrimental to safety, or that has the potential to become a detriment to safety.

While performing a brake system inspection, it is important to examine the location of pertinent brake components, which must be observed during the performance of required brake inspections by railroad inspectors. The brake must be designed so that a railroad inspector can observe from a safe position, either the piston travel, an accurate indicator which shows piston travel, or any other means by which the brake system is actuated. The design shall not require the railroad inspector to place himself or herself on, under, or between components of the equipment to observe the brake actuation or release during a required train air brake inspection.

Unsafe and questionable conditions must be identified and reported to the car/locomotive manufacturer during the inspection.

FRA Form F6180.4, *Special Inspection of Safety Appliance Equipment*, will be completed for each type of equipment inspected. Normally, a sample car inspection does not require an FRA F6180.96 report. A computerized version of the F6180.4 report, in Word format, has been developed for use.

Each block of the F6180.4 shall be completed. Enter "N/A" in spaces that do not apply. If an appliance deviates from the standards, enter the dimensions or description in the appropriate space on the front of the form. Any deviation from FRA regulations must be documented on the F6180.4 report and reported to the builder's representative for corrective action. If necessary, a memorandum may be used to supplement the F6180.4.

The Hand Brake entry should include the manufacturer and model number.

The Handhold and Ladder Tread entries should show clear, usable length.

The Power Brake block should show the type of brake applied, such as WABCO - ABDWXL, or NYAB - ABDW, or an ECP brake system. Additional information may be included describing the brake system (i.e., 12-inch cylinder, empty-load sensing equipped, stand-alone or overlay ECP system, *etc*.).

A minimum of six photographs must be supplied that clearly show the safety appliance arrangements and any noncomplying conditions, to include each corner of the car and both ends of the car. Also, any defect noted should have a photo to support it.

The inspector should use the "sample car inspection checklist" when performing the sample car inspection and submit a copy of the checklist with the F6180.4 report in the package to headquarters. The inspector should also try to obtain a copy of the golden shoe test report, along with any other brake test reports, slewing reports, *etc*., and include the copies in the package that will be forwarded to headquarters.

At the conclusion of the inspection, the inspector should inform the car builder of the findings. However, the inspector **is not to advise the builder that the "sample car" meets all Federal railroad safety law requirements.** Headquarters will advise the builder and the Region on the car's status of compliance or noncompliance. The Office of Railroad Infrastructure and Mechanical Equipment will provide the car builder, in writing, the results of the sample car inspection.

MP&E Safety Concern & Recommendation Report F6180.4A

During regular inspection of railroad rolling stock equipment, the inspector may or may not be sure compliance has been achieved when encountering a potential safety concern or systemic safety condition. Conditions where compliance is in question and that warrant further investigation without removal of equipment from service should be reported by using this form. Answers to questions such as "Has previous relief been provided by waiver, sample car inspection, or other regulatory process?" when performing field inspections usually are not readily available. Inspectors are encouraged to complete this form by filling out any potential unsafe condition(s) that he/she believes there is no clear information for inspectors regarding compliance.

The inspector shall contact his/her MP&E specialist to determine if there may be a valid safety concern. The Regional MP&E inspector and MP&E specialist will contact MP&E headquarters to discuss the safety concern. If warranted, headquarters will provide an FRA control number to identify the safety concern.

Once the Regional specialist and headquarters determine that the condition is a safety concern and assign a control number, a Form F6180.4A will be completed. The Form F6180.4A, *MP&E Safety Concern & Recommendation Report*, will be completed for each potentially unsafe condition for tracking of each reportable defect. Form F6180.4A is located at the end of this section. Each field on the form must be completed and is expandable to assist the inspector in including additional information.

Photographs of a safety concern, along with other tools necessary to help determine the condition, should be included by attaching text or photography to the report.

Once the F6180.4A has been received at headquarters, the Specialist will contact the appropriate parties to discuss the issue and make recommendations to bring the equipment into compliance or discuss other regulatory processes for resolution. In the event relief has been provided, a response will be sent to the MP&E Specialist, and the matter will be considered closed.

F6180.4A reports submitted will be entered into the headquarters database and will be placed on the FRA secure site to monitor progress of each reported incident.

OMB No. 2130-0565

<table>
<tr><td colspan="4">U.S. Department of Transportation
Federal Railroad Administration</td><td colspan="5">MP&E SAFETY CONCERN & RECOMMENDATION REPORT</td></tr>
<tr><td colspan="4">Inspector(s) Name:</td><td colspan="2">Inspector ID:</td><td>Date:</td><td>Region:</td><td>FRA Control No.:</td></tr>
<tr><td colspan="4"></td><td colspan="2"></td><td></td><td></td><td></td></tr>
<tr><td colspan="4">Built Date:</td><td colspan="5">Type: (e.g. B, CH, AC, etc. use code from F6180.96 / RISPC table)</td></tr>
<tr><td colspan="4"></td><td colspan="5"></td></tr>
<tr><td colspan="4">Name of Builder and/or Owner:</td><td colspan="5">Location of Builder and/or Owner: (City & State)</td></tr>
<tr><td colspan="4"></td><td colspan="5"></td></tr>
<tr><td rowspan="2">Initial:</td><td rowspan="2"></td><td rowspan="2">Number:</td><td rowspan="2"></td><td colspan="4">Were Concern(s) Recorded On F6180.96:</td><td>☐ Yes
☐ No</td></tr>
<tr><td colspan="4">If Yes, Indicate Inspector Initials Followed by Inspection Report No.(s):</td><td></td></tr>
<tr><td colspan="3">Approximate Number Of Units With</td><td>0</td><td>Reporting Marks:</td><td></td><td colspan="3"></td></tr>
<tr><td colspan="9">If Known, Approximate Number Of Units In Service With The Concern(s) Described Below:</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">CFR Section And Text Reference: (Cite Complete CFR Section, TB, and Corresponding Text Description)</td></tr>
</table>

Description Of Concern(s):
Cite Any Safety Concerns, Known History of Injuries/Fatalities/Derailments, etc. Associated With This Issue: (Names, Dates, Location, etc.)
Inspector Recommendation(s):

FRA F 6180.4a (Current Date)

Public reporting burden for this information collection is estimated to average 60 minutes per response. This estimate includes the time for completing the inspection and filling-out this form. According to the paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this collection of information is 2130-0565.

Site-Specific (Routine) Inspections

Refer to the General Manual, Chapter 3, for detailed information regarding regular inspection activities.

MP&E inspectors are **not** required to announce their presence on railroad property, nor are they required to provide advance notice of an inspection, investigation, follow-up, or surveillance activity. However, advance notice may be necessary to ensure the availability of records, equipment, carrier representatives, and/or persons to be interviewed.

Upon completion of an inspection, the inspectors shall confer with a railroad representative to advise them of any noncomplying conditions or practices discovered by the inspection. The inspector should cite the defective conditions and the applicable regulation that is in noncompliance. If time permits, a written report will be given to a railroad representative before the inspector leaves the railroad's property. If the railroad representative is not present or the inspector does not have sufficient time to complete a written report, then one shall be completed during the next work period and delivered or forwarded via e-mail to the railroad representative.

When conducting an inspection at a remote location where no railroad representative is available, a railroad official shall be contacted at the completion of the inspection and advised of the results.

The RISPC Program, F6180.96: Form F6180.96 inspection report preparation ***is mandatory*** for all inspections where civil penalty action (a violation report) is recommended. Title 49 CFR § 209.405(a)) requires railroads to submit a Report of Remedial Action to FRA for all violations 30 days after the end of the calendar month in which notice of violation occurred. To complete the regulatory cycle, inspectors should complete the Remedial Action portion of the inspection report as soon as the report (railroad copy) is received from the railroad. Inspectors are required to update all inspection reports containing violations as soon as possible. This helps better ensure the integrity of FRA's inspection report database and the regulatory requirements.

All defective conditions must be listed on FRA Form 6180.96. Inspectors must ***not*** create a separate F6180.96 report for each violation taken during an inspection activity. The F6180.96 report is designed so that the inspector can list all of the defects taken for an inspection activity and identify which defect is being recommended for civil penalty by checking the appropriate box. When the violation box is checked "Yes" on the F6180.96 inspection report line item, some of the information is automatically transferred from the F6180.96 inspection report to the FRA Form F6180.109 violation report.

FRA Form F6180.109: This report replaces all other MP&E violation reports previously used in connection with violation reporting of MP&E type violations, ***except*** for those associated with Parts 218 and 221. FRA Form F6180.109 is a component of the RISPC program and can be accessed from within RISPC or via a shortcut icon. FRA Form F6180.109 will be used for the following violations:

- Part 209 - Railroad Safety Enforcement Procedures
- Part 210 - Railroad Noise Emission Compliance Regulations
- Part 215 - Railroad Freight Car Safety Standards
- Part 223 - Safety Glazing Standards - Locomotives, Passenger Cars and Cabooses
- Part 224 - Reflectorization of Rail Freight Rolling Stock
- Part 229 - Railroad Locomotive Safety Standards
- Part 230 - Steam Locomotive Inspection and Maintenance Standards
- Part 231 - Railroad Safety Appliance Standards
- Part 232 - Brake System Safety Standards for Freight and Other Non-passenger Trains and Equipment; End-of-Train Devices
- Part 238 - Passenger Equipment Safety Standards
- Part 201 - 40 CFR - Certain Noise Violations
- Statutory Violations - 49 U.S.C. Subtitle V, Chapters 203 & 207

Note: A narrative section is still required and must be inserted in Item 44 (Violation Narrative) of the form. In most cases, the narrative will require the use of attachments. It is recommended that in Item 44 (Violation Narrative) the word "Attachments" be included at the bottom of the page, followed by a Table of Contents page, then followed by all subsequent pages of attachments.

FRA Form F6180.67: The Violation of Federal Railroad Safety Regulations form is used to submit violation reports in connection with 49 CFR Part 218 - Subpart B, Blue Signal Protection of Workers, and 49 CFR Part 221 - Rear End Marker Devices. FRA Form F6180.67 is also used for other operating practices violations. Detailed instructions similar to these are also embedded in the RISPC program. Refer to those instructions for completing FRA Form F6180.67. This form behaves in the same manner as FRA Form F6180.109 and resides within the RISPC program.

Submission of Photographs as Evidence: Digital photographs provide strong evidence in support of a violation. If photographs are included in the violation, the inspector will attach and explain what each photograph shows *(be certain that the photo clearly depicts the defect(s) and location of the defect(s) in question)*. If photographs are part of the evidence, both the original and second copy of each violation report must have the photographs when they are submitted to FRA's Office of the Chief Counsel. This is required so that when one copy is furnished to the respondent, the respondent will have the same evidence that the FRA has in its possession. Digital photographs are acceptable. The inspector must make a statement in his/her violation report indicating that the digital photographs have not been altered in any way. Photographs that have been altered in any way must not be included as evidence.

Note: Refer to MP&E Technical Bulletin MP&E 05-01, *Guidelines for Preparing New MP&E Violation Report - FRA F 6180.109*, for Item and Field descriptions and required information.

Statements of Witness or Reports of Interview: Unless a violation is substantiated by an inspector's personal knowledge or by records FRA requires railroads to maintain, the violation report should be accompanied by statements of witness reports obtained from railroad employees, railroad officials, or other persons who know the circumstances surrounding the noncomplying act or condition. If a statement is the only proof of noncompliance, the use of a witness statement is required.

Copies of Railroads' Records: When applicable, the violation report must be accompanied by legible copies of the railroad's applicable records, containing information that will provide the FRA Office of the Chief Counsel with substantiating documentation and a clear understanding of the violation of Federal safety regulations.

This information may be submitted in the form of duplicated copies of the railroad's records or through comprehensive, word-for-word extracts taken from the railroad's records.

Operation Life Saver Presentations

Refer to the General Manual, Chapter 6, for certification requirements and presentation guidelines.

FRA's Jurisdiction Over Tourist and Excursion Railroads

Please refer to the "Safety Jurisdiction over Tourist Railroads" section on Pages 30 and 31 of the General Manual for additional information.

As with many agencies of the Federal government, FRA does not extend the "full reach" of most of its regulations as far as the statute permits for resource and/or policy reasons. To identify the agency's current policy regarding the scope of regulatory enforcement for certain types of railroads, FRA developed a set of informational guidelines. These guidelines are meant to clarify the extent of and proper application for the jurisdiction that the agency chooses to exercise. The purpose for this section is to provide enforcement information for tourist and excursion railroads.

Information

FRA will exercise jurisdiction over tourist operations, whether or not they operate over the general railroad system, except those that are (1) less than 24 inches in gage and/or (2) insular. FRA considers an operation insular if it is limited to a separate enclave in such a way that there is no reasonable expectation that the safety of any member of the public, except for a business guest, a licensee of a tourist operation, or an affiliated entity, or a trespasser, would be affected by the operation. Therefore, an operation will not be considered insular if one or more of the following exists on its line:

- A public highway-rail crossing that is in use;
- An at-grade rail crossing that is in use;
- A bridge over a public road or waters used for commercial navigation; or
- A common corridor with a railroad, i.e., its operations are within 30 feet of those of any railroad.

Thus, the mere fact that a tourist operation is not connected to the general railroad system would not make it insular under these criteria. While these criteria will tend to sort out the insular theme parks and museums, there will still be a need to do case-by-case analysis in some close situations.

Regulation

Tourist railroads are generally not required to comply with the requirements of 49 CFR Parts 238 or 239. However, tourist railroads that operate on the general system must comply with all Federal railroad safety laws, unless and until any appropriate waiver has been applied for and granted. Of course, FRA generally lacks authority to waive statutory requirements.

Some tourist railroads are neither insular nor part of the general system (i.e., stand-alone lines with no freight traffic). In these instances, only the following statutes apply:

- 49 U.S.C. §§ 20102, 20301, 20302, 20303, 20502, 20503, 20504, 20505, 20701, 20902, 21302, 21304 (formerly 45 U.S.C. §§ 1, 2, 4, 9, 11, 13, of the Safety Appliance Act and 45 U.S.C. 22 *et seq.* of the Locomotive Inspection Act)

However, FRA's emergency order authority permits the agency to address a true safety emergency arising from specific conditions. Thus, even "off-the-system" tourist railroads should understand that FRA has the jurisdiction to inspect their operations, and to take emergency action if those operations pose an imminent hazard of death or injury.

The chart below provides general information regarding the scope of compliance.

Tourist Railroads
FRA's Exercise-of-Jurisdiction
Decision Tree

Is the track gage less than 24 inches?

YES
FRA will not exercise jurisdiction. End of inquiry.

NO
Does railroad operate over the general railroad system, or own track that is part of the general railroad system?

YES
All regulations[1] (except 49 CFR parts 227, 238, 239, 270, 272) and safety statutes apply. FRA entertains petitions for waivers of regulations and the hours of service laws. End of inquiry.

NO
Is the railroad carrier INSULAR or NON-INSULAR?
- Rail-rail grade crossing that is in use? Non-insular
- Public highway-rail grade crossing that is in use? Non-insular
- Bridge over public road or waters used for commercial navigation? Non-insular
- Operation within 30 feet of another railroad? Non-insular

INSULAR
FRA does not exercise jurisdiction.[7] End of inquiry.

NON-INSULAR
FRA's exercise of jurisdiction is limited to the following:
- 49 CFR parts 171-179, 209, 210, 211, 215, 216, 222[2], 224[3], 225, 228[4], 230, 234, 237[5]
- 49 U.S.C. ch. 203, 205, 207, 209, 211[6]
- FRA's subpoena authority, civil penalty authority, disqualification authority, emergency order authority.

Note: This chart is intended to provide general guidance in broad terms. It is not intended to serve as a complete explanation of FRA's policy or as a substitute for an application of that policy to specific facts.

[1] Please see the Applicability sections of Part 219 (drugs and alcohol), Part 221 (rear end markers), Part 223 (glazing), Part 225 (accident reporting), and Part 232, Subpart E (end-of-train devices), for certain nuances relating to the application of those Parts to general system tourist railroads.

[2] Part 222 (train horn) does not apply to passenger railroads that operate entirely off the general system and at speeds of 15 miles per hour or less over public highway-rail grade crossings.

[3] Part 224 (reflectorization) only applies to those railroad freight cars and locomotives that cross a public or private highway-rail grade crossing, are used for revenue or work train service, and are not being used exclusively in passenger service.

[4] Part 228 (passenger train hours of service requirements), Subpart F, and 49 C.F.R. §§ 228.11(c)(1)-(2) and 228.19(c)(5)-(8) apply to train employees of non-insular tourist railroads.

[5] Part 237 (bridge safety standards) applies to both insular and non-insular tourist railroads.

[6] Hours of service restrictions on duty hours apply to dispatcher and signal employees of non-insular tourist railroads.

[7] See footnote 5 above.

Source Codes

The source codes listed below are the only source codes to be used by MP&E inspectors. When applying the appropriate source code on inspection reports, the inspectors should remember that FRA must, at all times, focus on the quality of inspection efforts. For many years, our estimates have indicated that we have the ability to actively monitor about two-tenths of one percent (i.e., 0.2 percent) of railroad operations. Current data shows a similar relationship between railroad operations and FRA inspection capacity.

Please note that according to Technical Bulletin G-07-03, the selectable Source Codes have been reduced in the RISPC. Five codes have been eliminated and will generate error messages in the inspection reports if they are used. Those codes are:

F – Federal Assistance Investigation
G – Other
K – Inspection from Train
W – Focused Inspection
Y – Inbound Extended Haul Trains

In place of codes F, G, and W, please use Source Code D, Special Investigation. Source Code D requires that the File Number box be filled in. The previously used Source Code W for Focused Inspections or for Audits will now need to use Source Code D along with unique File Number. The File Number should be descriptive and mean something to you. The File Number box has 18 characters to work with.

MP&E Source Codes

A: Regular inspection – A periodic inspection activity conducted by Federal or State railroad safety inspectors, in accordance with established procedures, to determine railroad, shipper, consignee, contractor, or manufacturing facility compliance with Federal railroad safety laws within FRA's jurisdiction.

B: Complaint Investigation – Any inspection initiated for the purpose of performing a complaint investigation. A complaint file number must be assigned and indicated on the inspection report when this code is used.

C: Accident Investigation – Any inspection resulting from an accident/incident investigation. An accident file number must be assigned and indicated on the inspection report when this code is used.

D: Special Inspections or Investigations – Inspections initiated for a specific reason or purpose not otherwise identified. A file number must be assigned and indicated on the inspection report when this code is used.

E: Waiver Investigation – Inspections resulting from investigating requests for temporary relief from Federal regulations. A waiver investigation file number must be assigned and indicated on the inspection report when this code is used.

F: ECP Brake-Equipped Trains (MP&E) – Inspectors must complete a separate inspection report using Source Code G, along with all related inspection activity associated with the ECP brake-equipped trains (*e.g.*, Parts 215, 231, 232, *etc*.). Source Code **G** must also be used when inspection activities, such as Parts 218, 223, 229, *etc*., involve ECP brake-equipped trains and equipment.

H: Nuclear Route Shipment – Inspections of nuclear routes or shipments as specified in the Safety Compliance Oversight Program (SCOP) Plan.

R: Re-inspection – Inspection activity carried out to examine, monitor, or further develop previously conducted work. Inspectors must use good judgment when deciding the appropriate interval for the re-inspection, taking into consideration factors such as the inherent seriousness of the noncompliance and the railroad's general level of current compliance as revealed by the original inspection as a whole. Signal and Train Control inspectors and Track inspectors must also be governed by discipline-specific guidelines. The File Number field must contain the Inspector ID and previous Inspection Report Number.

V: Inspection of or at Manufacturer's Facility – Inspection activities for the purpose of conducting a sample car or sample locomotive inspection at the manufacturing facility, in accordance with established procedures, to ensure that the equipment is built in accordance with all applicable Federal statues, regulations, and requirements.

Z: Outbound Extended Haul Trains – Any inspection activity conducted on an extended haul train at the designated outbound inspection point by Federal or State railroad safety inspectors, in accordance with established procedures, to determine railroad and/or contractor's compliance with Federal regulations as prescribed in 49 CFR § 232.213(a)(2)–(5). This code shall also be used for any inspection activity at locations where cars are added en route to an extended haul train.

Activity Codes

The Office of Railroad Safety's "Multi-discipline Code Table of Definitions" is shown at the end of this section. MP&E inspectors can find activity codes specific to MP&E discipline by the Code "M" under the heading "Discipline" in the Table.

When applying the appropriate activity code on inspection reports, inspectors should remember that the quality of the inspections and how the information regarding the inspections is captured are paramount to the inspection process. The information obtained from FRA's inspections is used to support rulemakings, waiver decisions, deployment of inspectors, trend analysis, research and development projects, accident/incident analyses, and the overall condition of our Nation's railroads. To ensure that the data used for compiling statistics or for any analysis work is precise and consistent, inspectors need to adhere to the following guidelines when reporting the results of any inspections.

When conducting inspections for compliance with the following parts, inspectors are required to inspect the entire car/locomotive/train in order to count that activity as a unit for the unit count of the inspection report:

Part 215 Freight Cars
Part 224 Reflectorization
Part 229 Locomotives
Part 230 Steam Locomotives
Part 231 Safety Appliances
Part 232 Power Brakes
Part 238 Passenger Equipment

However, there will be times when only one side of the car, locomotive, or train can be inspected. This constitutes a partial inspection, which is the exception, not the normal inspection practice. If an inspector is unable to inspect the entire car, locomotive, or train, the inspector must describe why only a partial inspection was performed in the line-item description field (narrative) and the letter **P** must be entered in the class box of the line item. When the letter **P** is placed in the class box, every activity code used on the report will be captured as a partial inspection. Therefore, if the inspector performs an entire inspection of the locomotives on a train, but only inspects one side of the train such as for Parts 215, 224, 231, or 232, two inspection reports need to be made; one report for activity that received a complete inspection and one report for all activity that only received a partial inspection. Two inspection reports should be generated when activity codes for Part 218, *Blue Signal Protection*, Part 221, *Rear Markers*, and Part 223, *Glazing,* are used in conjunction with partial inspections.

Multi-discipline Code Table of Definitions

Activity	Discipline	Definition	Comments
174A	H, M	**General Requirements** – The purpose of this inspection is to determine compliance with 49 CFR §§ 174.3, 174.5, 174.9, 174.14, 174.16, and 174.50. Record one unit for the inspection of each car transporting hazardous materials.	

Activity	Discipline	Definition	Comments
174B	H, O	**General Operating Requirements** – The purpose of this inspection is to review a train crew's documentation for each railcar containing hazardous material, including any changes in placement of the car. The inspection should include determining compliance with the basic hazardous materials shipping paper descriptions as required in 49 CFR § 174.26. Record one unit for each train consist inspected, and one subunit for each inspection of the basic shipping paper description of each car containing hazardous materials. **Note 1:** Inspectors must use activity code TPLH to record inspections associated with train placement requirements. **Note 2:** Inspectors must use this code instead of code 172C when inspecting shipping papers specific to a particular train.	
209	ALL	**Remedial Action** – The purpose of this inspection is to report a railroad that has not complied with a requirement to provide a remedial action as noted in a previous inspection report. Record one unit for each remedial action not in compliance. (See General Manual for additional guidance).	
215D	H, O, S, T	**Freight Car Mechanical Inspection** – The purpose of this inspection is for any inspector **other than an MPE inspector** to determine compliance with 49 CFR Part 215, including Appendix D. The inspection includes those performed by an FRA inspector or when an FRA inspector observes railroad employees performing this inspection. MPE inspectors should reference activity code 215. Record one unit for each freight car inspected or observed inspected for compliance with 49 CFR Part 215. For articulated cars, count each platform as one unit. **Note 1:** HM and OP inspectors should use this activity code HM for ALL of their Part 215 inspections. **Note 2:** Properly stenciled maintenance-of-way equipment is exempt from 49 CFR § 215.305(b).	
217E	ALL	**Emergency Order** – The purpose of this inspection is to determine compliance with a current Emergency Order. Record each unit and subunit as directed by the unique instructions issued by FRA HQ regarding each specific Emergency Order. Inspectors must thoroughly explain the inspection in the inspection report's narrative.	

Activity	Discipline	Definition	Comments
217O	ALL	**Other Operations Observations** – The purpose of this inspection is to observe railroad employees of any craft performing duties regarding railroad operating rules (ROR), and railroad safety rules (RSR). It will include all related RORs, RSRs, railroad bulletins, and any written railroad policy not otherwise covered in Federal regulations. Noncompliance will be recorded as a Non-FRA defect under this activity code. Record one unit for an entire yard or equivalent facility monitored, and one subunit for each crewmember, yardmaster, contractor, track employee, mechanical employee, signal maintainer, *etc*., that the inspector continually observed a sufficient amount of time to determine compliance or noncompliance. **Note:** Unlike noncompliance with Federal regulations, it is FRA policy that inspectors provide information recorded under this activity code regarding noncompliance of an ROR/RSR <u>**without identifying the noncompliant employee by name**</u> in the Federal inspection report. See the General Manual for a further explanation. **Example 1**: An FRA Track Inspector observes a 20-person section gang working for approximately 45 minutes when the inspector observes a track employee sitting on the rail. The FRA inspector intervenes by addressing the employee's noncompliance with an RSR, and then discusses the noncompliance with the employee's supervisor. The inspection report will include the recording of one occurrence of a Non-FRA defect for a track employee's failure to comply with the specific RSR that prohibits employees from sitting on a rail. The inspector will record the inspection as one unit and <u>20</u> subunits **Example 2:** An FRA MP&E Inspector observes <u>four</u> persons working on a railroad car with proper Blue Signal protection for approximately 10 minutes when the inspector observes one of the workers perform a task while not wearing the required protective equipment. The FRA inspector intervenes by addressing the employee's noncompliance with an RSR by discussing it with the employee's supervisor. The inspection report will include the recording of a Non-FRA defect for a car shop employee's failure to comply with the specific RSR that prohibits performing the task without the proper protective equipment. The inspector will record the inspection as one unit and <u>four</u> subunits.	

Activity	Discipline	Definition	Comments
218C	O, S,T	**Camp Car Protection** ─ The purpose of this inspection is to determine compliance with camp car protection. Record one unit for each track inspected that requires camp car protection.	
218M	M, O	**Blue Signal Protection on Main or Other than Main Track** – The purpose of this inspection is to determine if the protection provided railroad employees requiring Blue Signal protection is in accordance with 49 CFR §§ 218.25, 218.27, and 218.30. Record one unit for each track that requires Blue Signal protection. If the track requiring Blue Signal protection has more than one train or cut of cars requiring protection record one unit for the entire track. Regarding inspecting compliance with Blue Signal regulations involving a remotely controlled switch: Record one unit for all associated recordkeeping requirements at that location, and one subunit for each track associated with those records. **Note 1:** Except for stub tracks, both ends of the track must be inspected for compliance with the Blue Signal regulations. **Note 2:** There is a drop-down FRA observation code inspectors may use in lieu of writing a comment when there are no exceptions noted.	

218O	ALL	**Part 218, Subpart F** – The purpose of this inspection is to determine a railroad's compliance with Part 218 Subpart F, including the requirement for a railroad to have complying railroad operating rules as indicated in the regulation. Record one unit for each day, or partial day, spent reviewing relevant railroad rules or for each yard or equivalent facility monitored. Record one subunit for each crewmember, yardmaster, contractor, track employee, mechanical employee, signal maintainer, *etc*., that the inspector continually observed a sufficient amount of time to determine compliance or noncompliance. **Note:** It is FRA policy that inspectors provide information regarding incidents recorded under this activity code as noncompliance of a federal regulation. It will include **<u>identifying the noncompliant individual by name</u>** in the inspection report. See the General Manual for a further explanation. **Example 1:** An FRA Track Inspector observes a 12-person section gang working for approximately 45 minutes when the inspector observes a track employee throwing a switch with equipment in the foul of the switch. The FRA inspector intervenes by addressing the employee's noncompliance with Part 218, Subpart F, and then discusses the noncompliance with the employee's supervisor. The inspection report will include the recording of the noncompliance for the track employee's failure to comply with Part 218, Subpart F, and the name of the employee in noncompliance. The inspector will record the inspection as one unit and <u>12</u> subunits. **Example 2:** An FRA MP&E Inspector observes <u>six</u> persons switching railcars in a car shop for approximately 10 minutes when the inspector observes one of the workers fail to properly protect a shoving movement. The FRA inspector intervenes by addressing the employee's noncompliance with Part 218, Subpart F, and then discusses the noncompliance with the employee's supervisor. The inspection report will include the recording of the noncompliance for the car shop employee's failure to comply with Part 218, Subpart F, and the name of the employee in noncompliance. The inspector will record the inspection as one unit and <u>six</u> subunits. **Example 3:** An inspector reviews a railroad's rules to determine if they are in compliance with the requirements	

Activity	Discipline	Definition	Comments
		regarding railroad equipment in the foul and operating switches. The inspection report will include the recording of one unit for this inspection and will also reference the precise railroad rule(s), or lack thereof, in the inspection report's narrative.	
218S	M, O	**Blue Signal Protection Locomotive or Car Shops** – The purpose of this inspection is to determine compliance with regulations requiring Blue Signal protection in a locomotive servicing track area, a car shop repair track area, or a track that has been designated as a repair track or expedite track. Record one unit for each area inspected. If 49 CFR § 218.29(c), *Alternative methods of protection,* is applied in a car shop repair track area or a locomotive servicing track area, one unit is recorded for the entire area, regardless of the number of tracks in the area or the number of cars or locomotives on those tracks. **Note 1:** Except for stub tracks, both ends of the track, or each entrance to the area must be inspected for compliance with the regulation. Workers must be on, under, or between equipment, inspecting, testing, repairing, or servicing before recording a unit for this activity. **Note 2:** There is a drop-down FRA observation code inspectors may use in lieu of writing a comment when there are not any exceptions noted.	
221	M, O	**Rear End Markers** – The purpose of this inspection is to monitor compliance with Part 221. This activity code **<u>should not be used</u>** when inspecting an End of Train (EOT) device under Part 232. Record one unit for each train, locomotive (including DPUs), or caboose inspected for compliance. The inspection of each rear end marking device in rooms or locations where rear end marking devices are stored and/or recharged and maintained is one unit. Each rear end marker ID must be recorded in the line item along with the appropriate observation. Individual marking devices that are not attached to trains or in storage areas not subject to service are not recorded as a unit. **Note:** There is a drop-down FRA observation code inspectors may use in lieu of writing a comment when there are not any exceptions noted.	

Activity	Discipline	Definition	Comments
227N	IH	**227N - Occupational Noise Exposure** – The purpose of this inspection is to determine compliance with Part 227 regarding occupational noise exposure in the **locomotive cab**. It will include reviewing audiometric test records, employee noise exposure monitoring plan and monitoring records, cab noise monitoring records, postings of monitoring results, training plans and records, or interviewing persons regarding noise exposure. Record one unit for each day or partial day of an inspection and one subunit for each Part 227 record reviewed. **Note:** This activity may only be claimed when accompanied by a member of the Industrial Hygiene staff.	
228	O, S	**Hours of Service Records Inspection** – The purpose of this inspection is to determine if Hours of Service (HOS) records are in compliance with Part 228. Record one unit for each day or partial day of inspection, and one subunit for each HOS record reviewed. This activity code includes any examination of HOS logs, HOS report forms, HOS documents, interviewing employees regarding HOS, and any other HOS records review activity. This activity code is not used to document an employee exceeding the HOS. **Note:** Reports ***taking exception to*** an employee exceeding the hours of service should **not** be recorded under this activity code; please reference the proper activity code associated with the employee's type of work or discipline. Example: Activity Code 228P, 211, or HSL.	
228C	O,S	**Construction of Employee Sleeping Quarters** – The purpose of this inspection is to determine compliance with Part 228, Subpart C. Record one unit for each day, or partial day, spent reviewing relevant facilities regarding Part 228, Subpart C.	
229X	H, O	**Locomotive Inspection in Operations** – The purpose of this inspection is for any inspector, other **than an MP&E inspector**, to determine a railroad's compliance with Part 229. Record one unit for any locomotive inspected. The inspection may include, but is not limited to, the locomotive daily inspection, any passageway tripping hazards, cab sanitation, cab lighting, speed indicator check, *etc*.	

Activity	Discipline	Definition	Comments
232E	M, O	**End of Train Device** – The purpose of this inspection is to inspect an End of Train (EOT) device for compliance with Part 232. The inspection must include verifying that the information on the calibration sticker is legible, and that it contains the date, name of person, and location of the last calibration. This activity also includes comparing the quantitative values between the front and rear unit, and the ability of the rear unit to achieve an emergency application in response to an emergency application initiated from the front unit. Record one unit for each EOT inspected or observed for compliance. **Note:** This activity code will be used when citing defects on the Head End Device (HED) associated with the End of Train device (EOT).	
232O	H, O, S, T	**Freight Train Brake Test Observation** – The purpose of this inspection is for any inspector, **other than an MP&E inspector**, to determine compliance with Part 232 not covered in activity code 232E or 232X. It includes any airbrake test required by Part 232. Airbrake test inspections should include in the narrative of the inspection report if the inspector was observing or accompanying a railroad employee or contractor employee performing the airbrake test. Record one unit for each observation or inspection, and one subunit for each railcar involved.	

Activity	Discipline	Definition	Comments
232X	M, O	**Securement of Locomotive and Cars** – The purpose of this inspection is to determine if railroad equipment is in compliance with 49 CFR § 232.103(n). Record units as follows: 1. Record one unit for an inspection of unattended equipment that consists of a single locomotive or locomotive consist, either attached to cars or not. This inspection includes determining compliance with the requirements for throttle position, status of the reverse lever, position of the generator field switch, status of the independent brakes, position of the isolation switch, handbrake, and position of the automatic brake valve. 2. Record one unit for an inspection of unattended equipment **NOT** attached to locomotives that are required to be secured under this regulation. This unit includes inspections for bottled air. **Note 1:** If a train is separated to avoid blocking any type of crossing it should have each section of the equipment recorded as a separate unit. **Note 2:** The inspection report that records a defect or recommended violation identified should clearly state the number of handbrakes found to be applied, the number of handbrakes required to be applied, and the current operating rule in place that indicates the precise number of handbrakes required to be applied. **Note 3:** This inspection also includes an inspector reviewing railroad rules for compliance with this Part. **Example:** If 30 unattended railcars are found on a track that is required to have seven hand brakes applied but the inspection reveals that only one handbrake is applied, it will be recorded as one unit with one occurrence for the failure to have the other six handbrakes applied.	
238O	H,O, S, T	**Passenger Equipment Inspection (Partial)** – The purpose of this inspection is for any inspector, **other than an MP&E inspector**, to determine compliance with Part 238 that is not covered in activity codes 232X or 238T. Record one unit for each inspection and a subunit for each passenger car inspected.	

Activity	Discipline	Definition	Comments
238T	M, O	**Passenger Train Brake Test Observation** – The purpose of this inspection is to document an observation of a passenger train airbrake test, excluding tourist equipment. Record one unit for each entire brake test observed for compliance with Part 238, and one subunit for each railroad record associated with the Class I airbrake test. **Note:** There is a drop-down FRA observation code inspectors may use in lieu of writing a comment when there are not any exceptions noted.	
238X	M, O	**Passenger Equipment Securement** – The purpose of this inspection is to determine if passenger or commuter equipment is properly secured (excluding tourist equipment). Record one unit for each train, whether or not a locomotive is attached.	
BWS	S,T	**Bridge Worker Safety** – An inspection concerning Part 214, Subpart B, Bridge Worker Safety Standards. Record one unit for each bridge gang or work group, and one subunit for each member of the gang or work group.	
FC	H, M	**Inspection of Freight Containers, General Handling and Loading Requirements** – The purpose of the inspection includes inspecting the railcar for markings, placards, structural integrity, and securement. Record one unit for each exterior inspection of a container, and one subunit for each comprehensive inspection of a package. In addition to the above inspection criteria, a comprehensive inspection includes the inspection of the interior of the container for blocking & bracing and loading segregation requirements. This activity code may only be used when assessing compliance with 49 CFR §§ 174.55, 174.61, 174.81, and 177.834. **Note 1:** Use BP codes to record intermodal tank inspections.	

Activity	Discipline	Definition	Comments
NOIR	ALL	**Noise Test Records** – The purpose of this inspection is to document a review of a locomotive's noise testing session, or a locomotive's noise testing record. Record one unit for each locomotive's noise testing session monitored and/or all noise testing records associated with the locomotive tested. **Example 1:** A short line railroad has three records on file documenting a locomotive horn test performed on locomotive SP 1234. Record one unit for the examination of all three records. **Example 2:** A short line railroad has three records on file documenting a locomotive horn test performed on locomotive SP 1234, and two records on SP 2345. Record two units for the inspection of the noise testing records for two locomotives. **Example 3:** An inspector monitors three noise testing sessions on SP 4567, and then reviews three noise testing records regarding that same locomotive. Record one unit for the locomotive and testing records involved. **Note 1:** This activity code should only be used by inspectors who have been trained to inspect locomotive horn testing records. **Note 2:** This activity code should not be used with Part 227 Occupational Noise Exposure inspections, (activity code 227N), or when performing a noise test (activity code NOIS).	
NOIS	ALL	**Noise Tests** – The purpose of this inspection is to perform a noise test in accordance with Federal regulations. This activity code should only be used by inspectors who have attended the FRA training course regarding the equipment used to conduct these inspections. Record one unit for each day or partial day of an inspection. This activity code should not be used with Part 227 Occupational Noise Exposure inspections, (activity code 227N), or when reviewing noise records (activity code NOIR).	

Activity	Discipline	Definition	Comments
RADX	H, O, T	**Radar Speed Monitoring** – The purpose of this inspection is to monitor and/or accurately validate the speed of trains and railroad equipment for compliance with Federal regulations and/or railroad operating rules. Record one unit for each speed monitoring session and one subunit for each locomotive, train, or railroad equipment on the rail monitored. Non-compliance with railroad operating rules should be recorded under activity code 217O. **Note 1:** When entering this code, the inspector must indicate the initials and number of the lead locomotive, or a locomotive within the consist, in the Train # / Site Field. This Field permits the entry of 15 characters. Each train or piece of equipment monitored will require a new line item. **Note 2:** FRA and participating State inspectors must not perform radar monitoring sessions unless they received a certificate of qualification from an FRA employee who holds a current certificate as a stationary radar trainer. See Chapter 3 of the General Manual for a complete discussion of FRA policy.	Revised 2-26/2011
RMM	T, S	**Roadway Maintenance Machine & Hi-Rail** – The purpose of this inspection is to document an observation or inspection concerning Part 214, Subpart D, On-Track Roadway Maintenance Machines and Hi-Rail Vehicles. Record one unit for each Roadway Maintenance Machine or Hi-Rail Vehicle inspected. **Example:** If a large-scale tie unit consisting of 20 roadway maintenance machines and one Hi-Rail vehicle is operating on the tracks, and only five of those machines are inspected, then record five units. **Note:** If a machine operator fails to comply with railroad rules not covered by Part 214 or any Federal regulation the inspector must note the non-compliance by recording it using a Non-FRA defect under activity code 217O, as provided in the guidelines of that activity code.	

Activity	Discipline	Definition	Comments
RULE	ALL	**Rulebook Review** – The purpose of this inspection is to record an inspector's review or formal discussion with a railroad manager, regarding railroad rules that will determine if they accurately correlate with current FRA regulations. Record one unit for each day, or partial day, spent reviewing a railroad rule(s) for compliance with Federal regulations. Record a subunit for each CFR section involved. Only comments should be recorded under this activity code. Any defects should be recorded under the proper corresponding activity code. **Note:** Inspections regarding reviewing railroad rules to ensure compliance regarding 49 CFR § 232.103(n) and Part 218, Subpart F should not be recorded under this activity code. Inspectors should reference activity code 232X and 218O respectively for those railroad rule inspections. **Example 1:** An inspection of NEBR railroad's rulebook determined that railroad rules regarding signal systems (Part 234 and Part 236) comply with Federal regulations. Record one unit and two subunits. **Example 2:** An inspection that included discussions with railroad managers regarding NEBR railroad's rulebook and bulletins determined that the railroad's rules regarding Part 217 and Part 220, Subpart C, correlated with FRA regulations. Record one unit and two subunits.	

Activity	Discipline	Definition	Comments
RWP	O, S, T	**Roadway Worker Protection** – The purpose of this inspection is to determine compliance with Part 214, Subpart C, Roadway Worker Protection (RWP). Record one unit for an individual worker or group of employees (with a roadway worker in charge) at a specific location. This will include attending a job briefing with a group of RWP employees. Record each train required to provide an audible warning signal as a separate unit, and each employee requiring RWP as a subunit. **Note:** When performing multi-point inspection work with the same employee (or group of employees), record only one unit for determining compliance, and one subunit for each employee of the workgroup per day. **Example 1:** When observing or inspecting a large production crew, record a separate unit for each different location where an employee (or group of employees) is monitored for compliance. *E.g.*, large projects may have multiple teams or workgroups at various locations along the right of way; record each worker, team, or workgroup at each different location as a separate unit. **Example 2:** You observe an RWP crew consisting of one employee-in-charge and 20 track employees together at a single location. Record one unit for the location and 21 subunits for the entire RWP work group.	
TC	H, M	**Tank Car Inspection** – The purpose of this inspection includes inspecting for markings, placards, and structural integrity. Record one unit for each ground-level inspection that did not include a top-level inspection. Record one subunit for each comprehensive inspection of a tank car. In addition to the above inspection criteria, a comprehensive inspection includes a ground-level inspection of both sides and a top-level inspection as well. This activity code may only be used when assessing compliance with 49 CFR §§ 172.302(a)(1), 172.304, 172.502(a)(1)(i), 172.516(c)(2) & (6), 173.31, and 174.50, and Parts 179 & 180.	
TPLH	H, M, O	**In-Train Placement of Placarded Rail Cars, Transport Vehicles, and Freight Containers** – The purpose of this activity is to determine compliance with positioning in-train of placarded cars, 49 CFR §§ 174.84 & 174.85. Record one unit for each train inspected.	

Chapter 3 - Enforcement Actions

General

An MP&E inspector is not required to initiate or recommend formal enforcement action each time a non-complying condition is discovered. To help achieve compliance, the inspector may pursue the following actions:

- **Exception.** The inspector may take an exception by documenting the non-complying condition or defect on the proper inspection form so that the condition is corrected before use of the equipment.

- **Violation.** The inspector may recommend a civil monetary penalty violation for issuance against the railroad, after documenting the recommendation on the proper inspection form.

- **Special Notice for Repairs.** The inspector may issue a special notice for repairs, requiring that equipment not in compliance with 49 CFR Parts 215, 229, 230, or 238 be removed from service until brought into compliance. (*See* 49 CFR Part 216).

- **Individual Liability.** The inspector may recommend an individual liability action against an individual for reckless or willful actions. An individual liability action may be recommended *with or without* recommending or taking any enforcement action against the railroad.

Determining When and What Enforcement Action Is Necessary

For information regarding when and what enforcement action is necessary, please read the General Manual: Chapter 3 – **Inspections and Civil Penalty Recommendations** and the **Improvements in Civil Penalty Enforcement Memo** in the *General Technical Bulletins and Other Guidance Documents*.

Chapter 4 - Railroad Freight Car Safety Standards, Part 215

Introduction

In accordance with the provisions of the Federal Railroad Safety Act of 1970, FRA issued Freight Car Safety Standards (49 CFR Part 215). The standards became effective on January 1, 1974. Since 1974, there have been several amendments to Part 215. The railroad industry is constantly changing, and FRA recognizes additional amendments will be needed to stay current with the changes. Advances in new technology, high-speed rail, the increasing number of articulated cars in service, new concepts in freight car construction, and the changing railroad environment will lead to changes to the Federal railroad safety laws. On the following pages, you will find information related to the freight car safety standards that will aid inspectors in the performance of freight car safety standards inspections. For convenience the information is organized in numerical order by section.

In addition to Federal railroad safety laws, inspectors should be familiar with the Association of American Railroads (AAR) Interchange Rules and the AAR Manual of Standards and Recommended Practices. FRA does not have authority to enforce the AAR Interchange Rules or the AAR Manual of Standards and Recommended Practices. AAR establishes industry standards with the revisions to the Field Manual of Interchange Rules, typically published annually. AAR requirements provide valuable insight into railroad equipment and operations as they exist in the industry.

Federal and State inspectors must be able to assess an ever-increasing variety of conditions and ascertain the necessity and type of corrective procedures to be initiated. Although 49 CFR § 215.7, Prohibited Acts, provides for strict liability, inspectors should always be governed by the seven factors listed in Part 209, Appendix A.

MP&E inspectors must determine whether conditions observed acutely impact the safe operation of the freight equipment. When freight equipment is inspected and deficiencies exist, the inspector must decide whether the defect:

- Is a Part 215 defect;
- Should be documented on the F6180.96 - Inspection Report;
- Warrants the issuance of a violation;
- Warrants the issuance of a Special Notice for Repairs; and/or
- Should be reported to the railroad as an unsafe condition that is not encompassed in Federal railroad safety laws. (This could be either the railroad's standards or AAR standards.)

Note: In many instances, AAR requirements are more restrictive than Federal requirements.

The following discussion summarizes guidelines to be used by Federal and State inspectors conducting field inspections for compliance or enforcement activity. Enforcement policies must be adhered to by each inspector conducting inspections of freight cars. It is the inspector's responsibility to determine whether each unit is inspected, tested, maintained, or operated by railroad personnel complies with Federal railroad safety laws and is safe to operate over the general railroad system.

Determining Noncompliance

When an inspection reveals a noncomplying condition, the inspector must examine and determine the particular details of the condition in order to assess whether it conforms with the current explanations and guidelines issued by FRA. Before recording the condition as a defect, the inspector must weigh each essential factor to determine whether the condition meets, exceeds, or is noncompliant with Federal railroad safety laws. If the inspector determines that a condition is unsafe or creates an imminent hazard and is not covered by Federal railroad safety laws, he or she should inform a responsible railroad official of the need for corrective action. This could be based on the railroad's standard or an AAR requirement.

When a measurement is required to determine compliance or noncompliance and such measurement cannot be accurately stated as meeting or exceeding those measurements contained in the applicable regulation, then that condition must not be reported as a defect.

When the inspector determines and documents that a freight car is noncompliant with Federal railroad safety laws, he or she should consider filing appropriate reports (based on the situation). To determine what enforcement action to employ, the inspector should consider the compliance history at the location and whether or not the railroad immediately initiates corrective action. If the inspector concludes a violation is warranted, then only one written violation report can be issued per car. The violation report can contain multiple counts for defective conditions, **but do not issue multiple violation reports for an individual car**. If the noncomplying condition for a violation can be proven to have existed for multiple days, then the one violation report should indicate how many days the car was in violation. Do not issue a separate violation report for each day the car is determined to be in noncompliance.

Additionally, if the inspector determines that a freight car is noncompliant with Federal railroad safety laws, is unsafe, and presents an imminent safety hazard, and if the inspector has reason to believe that the railroad will not take immediate corrective action, a **Special Notice for Repairs** should be issued to the railroad. *See* 49 CFR Part 216. Remember**, inspectors generally have no authority to prohibit movement of any railroad equipment (train, locomotive, car, *etc*.**). However, when a Special Notice for Repairs is issued, the railroad shall remove the car from service until it is restored to serviceable condition. The inspector should enumerate each serious condition in the notice. ***When FRA issues a Special Notice for Repairs, a violation report must also be submitted***.

Inspection of freight cars that have been **repaired and released** by car repair facilities should be done on a regular basis. These freight cars should be suitable for service and free of **all** defects.

If defects are found, violations should be submitted. This inspection must take place after the car is moved from the shop or repair track area.

An individual who willfully authorizes movement or operation of noncomplying or unsafe equipment, with knowledge of the circumstances, can be held personally liable for such action. Inspectors should carefully weigh all pertinent facts before considering a willful violation of Federal railroad safety laws and/or an individual liability action. The inspector must communicate with the FRA MP&E Regional specialist prior to advising a railroad employee that he or she will be cited with an individual liability violation.

Freight Car Safety Standards Inspection Procedures

Upon arrival at an inspection point, inspectors should notify the local railroad representative of their presence and intentions, determine what equipment will be inspected, and ask the railroad representatives if they plan to accompany the inspection. However, it is not always advantageous to be accompanied on inspections or to notify the railroad of FRA presence, especially if an inspection is related to a complaint or investigation.

Generally, inspectors should focus Part 215 inspection activities on cars after the railroad's personnel or agents have had an opportunity to perform their inspection of the cars. However, performing inspections on inbound trains can be advantageous to determine the quality of inspections at previous locations where cars are placed in trains. Inspections should also be performed at any location where cars are routinely picked up and placed in trains.

Inspectors must be properly attired and comply with the railroad's safety requirements (*e.g.*, safety glasses, hard hat, safety shoes, *etc*.). Inspectors should also have in their possession the necessary gauges, flashlight, ruler and/or tape measure, camera, and a current copy of the Federal railroad safety laws. Do not use the railroad's gauges for enforcement activities.

It is not necessary for FRA or State inspectors to establish blue signal protection in order to perform inspection activity. However, inspectors should never place themselves in a position where the unexpected movement of equipment subjects them to the danger of personal injury. Railroad representatives accompanying the inspector during the inspection must obtain blue signal protection in accordance with 49 CFR Part 218 (generally, when those individuals engage in activities that require them to work on, under, or between the equipment). Effective communication and situational awareness are the two most important aspects to better ensure the safe performance of your duties.

49 CFR Part 215

Subpart A – General

§ 215.5 Definitions.

As used in this part:
(a) *Break* means a fracture resulting in complete separation into parts;

(b) *Cracked* means fractured without complete separation into parts, except that castings with shrinkage cracks or hot tears that do not significantly diminish the strength of the member are not considered to be "cracked";
(c) *Railroad freight car* means a car designed to carry freight, or railroad personnel, by rail and includes a:

(1) Box car;
(2) Refrigerator car;
(3) Ventilator car;
(4) Stock car;
(5) Gondola car;
(6) Hopper car;
(7) Flat car;
(8) Special car;
(9) Caboose car;
(10) Tank car; and
(11) Yard car.

Information

A ventilator car is a car that is arranged for ventilation and suitable for the transportation of produce or other foodstuffs not requiring refrigeration. A special car includes articulated cars, scale cars, intermodal-carless equipment (RoadRailer™), and any car not listed in this section. A yard car is any car used exclusively in yard service. In intermodal-carless equipment operations, the highway trailer is treated as the car body for the purposes of Part 215 when it is attached to the bogey on the rail.

§ 215.5 Definitions (cont.).

(d) *Dedicated service* means the exclusive assignment of cars to the transportation of freight between specified points under the following conditions:

(1) The cars are operated—
(i) Primarily on track that is inside an industrial or other non-railroad installation; and
(ii) Only occasionally over track of a railroad;

(2) The cars are not operated—
(i) At speeds of more than 15 miles per hour; and
(ii) Over track of a railroad—
(A) For more than 30 miles in one direction; or
(B) On a round trip of more than 60 miles;

(3) The cars are not freely interchanged among railroads;

(4) The words "Dedicated Service" are stenciled, or otherwise displayed, in clearly legible letters on each side of the car body;

(5) The cars have been examined and found safe to operate in dedicated service; and

(6) The railroad must—
- (i) Notify the FRA in writing that the cars are to be operated in dedicated service;
- (ii) Identify in that notice—
  - (A) The railroads affected;
  - (B) The number and type of cars involved;
  - (C) The commodities being carried; and
  - (D) The territorial and speed limits within which the cars will be operated; and
- (iii) File the notice required by this paragraph not less than 30 days before the cars operate in dedicated service;

(e) *In service* when used in connection with a railroad freight car, means each railroad freight car subject to this part unless the car:
- (1) Has a "bad order" or "home shop for repairs" tag or card containing the prescribed information attached to each side of the car and is being handled in accordance with § 215.9 of this part;
- (2) Is in a repair shop or on a repair track;
- (3) Is on a storage track and is empty; or
- (4) Has been delivered in interchange but has not been accepted by the receiving carrier.

<u>Information</u>

The Federal Register Notice dated April 21, 1980 (45 FR 26709), states that "FRA has amended 215.5(e)(4) to provide that a car that has been delivered in interchange is not 'in service' until the receiving railroad accepts the car by moving it or otherwise exercising control over it. It should be noted, however, that the delivering railroad remains liable for each defective car it tenders in interchange." **(MP&E 98-34).**

§ 215.5 Definitions (cont.).

(f) *Railroad* means all forms of non-highway ground transportation that run on rails or electromagnetic guideways, including
- (1) commuter or other short-haul rail passenger service in a metropolitan or suburban area, and
- (2) high speed ground transportation systems that connect metropolitan areas, without regard to whether they use new technologies not associated with traditional railroads. Such term does not include rapid transit operations within an urban area that are not connected to the general railroad system of transportation.

(g) *State inspector* means an inspector who is participating in investigative and surveillance activities under section 206 of the Federal Railroad Safety Act of 1970 (45 U.S.C. 435).

§ 215.9 Movement of defective cars for repair.

(a) A railroad freight car which has any component described as defective in this part may be moved to another location for repair only after the railroad has complied with the following:

(1) A person designated under § 215.11 shall determine:

(i) That it is safe to move the car; and

(ii) The maximum speed and other restrictions necessary for safely conducting the movement;

(2)

(i) The person in charge of the train in which the car is to be moved shall be notified in writing and inform all other crew members of the presence of the defective car and the maximum speed and other restrictions determined under paragraph (a)(1)(ii) of this section.

(ii) A copy of the tag or card described in paragraph (a)(3) of this section may be used to provide the notification required by paragraph (a)(2)(i) of this section.

(3) A tag or card bearing the words "bad order" or "home shop for repairs" and containing the following information, shall be securely attached to each side of the car–

(i) The reporting mark and car number;

(ii) The name of the inspecting railroad;

(iii) The inspection location and date;

(iv) The nature of each defect;

(v) Movement restrictions;

(vi) The destination for shopping or repair; and

(vii) The signature of a person designated under § 215.11.

(b)

(1) The tag or card required by paragraph (a)(3) of this section may only be removed from the car by a person designated under § 215.11 of this part.

(2) A record or copy of each tag or card attached to or removed from a car shall be retained for 90 days and, upon request, shall be made available within 15 calendar days for inspection by FRA or State inspectors.

(3) Each tag or card removed from a car shall contain a notification stating the date, location, reason for its removal, and the signature of the person who removed it from the car. These recordkeeping requirements have been approved by the Office of Management and Budget in accordance with the Federal Reports Act of 1942.

(c) Movement of a freight car under paragraph (a) of this section may be made only for the purpose of effecting repairs. If the car is empty, it may not be placed for loading. If the car is loaded, it may not be placed for unloading unless unloading is consistent with determinations made and restrictions imposed under paragraph (a)(1) of this section and—

(1) The car is consigned for a destination on the line of haul between the point where the car was found to be defective and the point where repairs are made; or

(2) Unloading is necessary for the safe repair of the car.

(d) Nothing in this section authorizes the movement of a freight car subject to a Special Notice for Repairs unless the movement is made in accordance with the restrictions contained in the Special Notice.

Information

If the car is prepared as outlined under 49 CFR § 215.9, it may be moved to any location designated by the railroad for the purpose of effecting repairs. This **does not** have to be the nearest or next repair location. The car may be moved to another railroad and can be moved past repair locations. The car must be inspected, and cards applied to both sides of the car by a designated inspector, as defined in 49 CFR § 215.11, before movement can take place. Movement authority by 49 CFR § 215.9 applies only to Part 215 defects, **not** safety appliance or power brake defects. Failure to observe any condition for movement set forth in 49 CFR § 215.9(a) and (c) deprives the railroad of the benefit of the "movement-for-repair" provision and makes the railroad and any responsible individual liable for penalty under the particular regulatory sections that apply to the defective condition. For example, liability would arise if a car with a defective roller bearing adapter travels beyond the repair location designated on the "bad order" card.

Do not issue a violation for the movement of defective equipment; instead, issue the violation for the defective condition – defective roller bearing adapter. The regulation does not prevent the railroad from changing the repair location, as long as all of the conditions of 49 CFR § 215.9 are satisfied. The purpose of the defect tag is to notify the operating crews and mechanical department personnel of the defective condition, and that the car is safe to move, along with any movement restrictions. Inspectors should periodically check defect tags to verify that they are completely filled out by a person designated under 49 CFR § 215.11.

§ 215.11 Designated inspectors.

(a) Each railroad that operates railroad freight cars to which this part applies shall designate persons qualified to inspect railroad freight cars for compliance with this part and to make determinations required by § 215.9 of this part.

(b) Each person designated under this section shall have demonstrated to the railroad a knowledge and ability to inspect railroad freight cars for compliance with the requirements of this part and to make determinations required by § 215.9 of this part.

(c) With respect to designations under this section, each railroad shall maintain written records of:

(1) Each designation in effect; and
(2) The basis for each designation.

Information

The railroad must maintain a record that contains the names of the inspectors that are designated under 49 CFR § 215.11, which can be readily produced for FRA review. This includes contractors, train crew members, or any individual that has demonstrated to the railroad the knowledge and ability to perform all of the functions listed in Part 215. Only persons that are listed as designated inspectors can make the determinations required by 49 CFR § 215.9. The railroad establishes the basis for each designation in effect. A person performing an Appendix D inspection cannot make the determination for movement under 49 CFR § 215.9. However, if a train crew member is listed as a designated inspector, he or she can make the determination for movement under 49 CFR § 215.9 but would be required to perform a full inspection for compliance with Part 215, not an Appendix D inspection.

§ 215.13 Pre-departure inspection.

(a) At each location where a freight car is placed in a train, the freight car shall be inspected before the train departs. This inspection may be made before or after the car is placed in the train.

(b) At a location where an inspector designated under § 215.11 is on duty for the purpose of inspecting freight cars, the inspection required by paragraph (a) of this section shall be made by that inspector to determine whether the car is compliant with this part.

(c) At a location where a person designated under § 215.11 is not on duty for the purpose of inspecting freight cars, the inspection required by paragraph (a) shall, as a minimum, be made for those conditions set forth in Appendix D to this part.

(d) Performance of the inspection prescribed by this section does not relieve a railroad of its liability under § 215.7 for failure to comply with any other provision of this part.

Information

The language of 49 CFR § 215.13 is very explicit. FRA has consistently interpreted this language to require a pre-departure inspection each time a car is placed in a train. Moreover, although the regulations do not specify the physical actions necessary to conduct a proper inspection, a railroad may fulfill the inspection requirements only when its inspectors position themselves in a way that permits the required observations to be made. To conduct a proper freight car safety standards inspection, both sides of a car must be inspected.

Title 49 CFR § 215.13 does not permit block swapping. At some locations a common misinterpretation of the words “placed in a train” has led to the practice of allowing new outgoing trains to be built from large blocks of cars from two or more incoming trains without performing a pre-departure inspection. Within the industry, this practice is called “block swapping.” This misinterpretation of the regulation apparently assumes that a car that remains in a block of cars when it is removed from one train is not “placed in a train” when the block is added to a new train. That assumption is incorrect. Whether singly or in groups, cars that are taken from one train and placed in another are “placed in a train” and must be inspected at the location from which the new train departs. Of course, an inspection pursuant to 49 CFR § 215.13 is not required when intact trains move from railroad to railroad.

However, as with any regulatory requirement, inspectors should exercise discretion in how 49 CFR § 215.13(a) is enforced, so that FRA's limited resources can remain focused on matters likely to produce the greatest safety benefit. The general criteria for determining when enforcement action is appropriate, and which action to take, are set forth in 49 CFR Part 209, Appendix A. The railroad's history of compliance with the relevant set of regulations, especially at the specific location involved, must be considered along with the kind and degree of potential safety hazard a condition poses in light of the immediate factual situation. Where compliance with the Freight Car Safety Standards is poor and improper inspections or no inspections are being performed, the failure to inspect or improper inspection can be (along with the physical defects found on the cars) strong enforcement candidates. Conversely, if a railroad is generally doing a good job in terms of compliance with the Freight Car Safety Standards at a particular location, the one-time failure to conduct a proper inspection at that point is more likely not a condition that poses a significant safety hazard. **(MP&E 98-57).**

Title 49 CFR § 215.13(a) requires an inspection at each location where a freight car is placed in a train. However, in some circumstances the inspection may be performed by a person not qualified or designated under 49 CFR § 215.11. The law does not require that a "designated inspector" under 49 CFR § 215.11 be assigned or employed at every location where cars are added to trains. Consequently, a train crewmember who is not a designated inspector under 49 CFR § 215.11 can perform an inspection of freight cars added to a train pursuant to Part 215, Appendix D, at a location where a person designated under 49 CFR § 215.11 is not on duty for the purpose of inspecting freight cars. However, if a location does not have a person designated under 49 CFR § 215.11 on duty for the purpose of inspecting freight cars and the railroad elects to conduct such an inspection with a non-designated person pursuant to Part 215, Appendix D, and if such an inspection uncovers a condition not in compliance with Part 215 or Appendix D, then in order to move the car for repair under 49 CFR § 215.9, a designated person under 49 CFR § 215.11 must determine whether it is safe to move the car and, if so, under what conditions.

Part 215 does not dictate when and where railroads must have designated inspectors on duty for the purpose of inspecting freight cars. Section 215.13 merely requires that, where such a person is not on duty for that purpose, the railroad must conduct an Appendix D inspection. Where there is a dispute between a railroad and its employees as to which employee is on duty for what purpose, it is a collective bargaining matter. Absent such a binding resolution from a body duly authorized to render such rulings, FRA is in no position (under current law) to conclude that an employee is on duty for the purpose of inspecting freight cars, if the railroad contends that the person is not on duty for that purpose. Once a final, binding determination is obtained, it would presumably be enforceable on its own terms by those who sought it. Although Part 215 was not intended to put FRA in the position of dictating where a railroad uses its designated inspectors, it is clear that the railroad must designate qualified inspectors, keep records of the designations, and at the very least, use such inspectors to make the determinations required under 49 CFR § 215.9 before a defective car can be moved.

At locations where cars are inspected by railroad personnel who are not designated inspectors, the options for handling the defective cars are limited to: (1) setting the car out, (2) repairing the car, or (3) bringing in a designated inspector to either repair the car or prepare the car for movement to a repair facility in accordance with 49 CFR § 215.9.

The regulation states that the pre-departure inspection may be made before or after the car is placed in the train. While the requirements for this inspection can be met by performing an inbound inspection before the cars are classified and placed into a new train, it does not relieve the railroad from the duty of placing defect-free cars in a new outbound train prior to departure. It is important to ensure cars placed in an originating train are free of defects and in full compliance with this part.

§ 215.15 Periodic inspection.

Omitted from manual.

Information

This section is no longer applicable and will not be discussed further.

Subpart B – Freight Car Components

Suspension System

§ 215.103 Defective wheel.

A railroad may not place or continue in service a car, if-

(a) A wheel flange on the car is worn to a thickness of ⅞ of an inch, or less, at a point ⅜ of an inch above the tread of the wheel;

(b) The height of a wheel flange on the car, from the tread to the top of the flange, is 1½ inches, or more;

(c) The thickness of a rim of a wheel on the car is 11/16 of an inch, or less;

(d) A wheel rim, flange, plate, or hub area on the car has a crack or break;

(e) A wheel on the car has a chip or gouge in the flange that is 1½ inches in length and ½ inch in width, or more;

(f) A wheel on the car has——
   (1) A slid flat or shelled spot that is more than 2½ inches in length; or
   (2) Two adjoining flat or shelled spots each of which is more than two inches in length;

(g) A wheel on the car shows evidence of being loose such as oil seepage on the back hub or back plate;

(h) A wheel on the car shows signs of having been overheated as evidenced by a reddish-brown discoloration, to a substantially equal extent on both the front and the back face of the rim, that extends on either face more than four inches into the plate area measured from the inner edge of the front or back face of the rim; or,

(i) A wheel on the car has been welded unless the car is being moved for repair in accordance with § 215.9 of this part.

Information

The specified wheel measurements are the minimum safety requirements and are designed to prevent wheel failures and train derailments. Wheel measurements taken by inspectors must be carefully taken to assure accuracy. To determine if a locomotive or freight car wheel is in compliance, a standard application of wheel gages is equally as important as having standard gages.

To gage a wheel for thin flange, the ⅞-inch opening of the AAR 34401 gage should slip over the flange of the wheel when the gage is held with the flat surface at the top, perpendicular to the tread (*see* **Figure 1**). The unused bulk of the gage must be suspended behind the back face of the rim. Gaging in a chipped area is not acceptable.

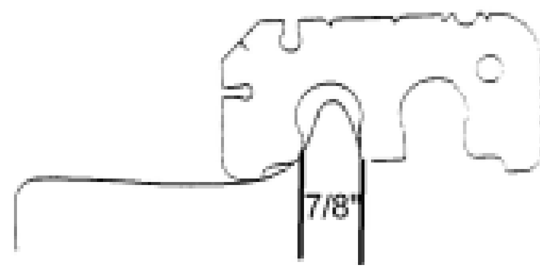


Figure 1: Gaging of wheel thin flange

A high flange wheel shall be gaged with a simplified steel wheel gage (hook gage) (*see* **Figure 2** showing correct application. Also note the wheel depicted does not have a high flange in that location, because it is not 1½" or more). The shank, or long flat portion of the gage, must be held flat against the back face of the rim and parallel to the radius of the wheel. The defective flange will contact the hook portion of the gage, and the tip of the gage will contact the tread of the wheel or be held clear from the tread. Gaging in a flat spot or shelled spot is not acceptable. For recommending a violation, there must be a total of 3 defective locations identified on the wheel, preferably at locations equally distanced around the wheel.

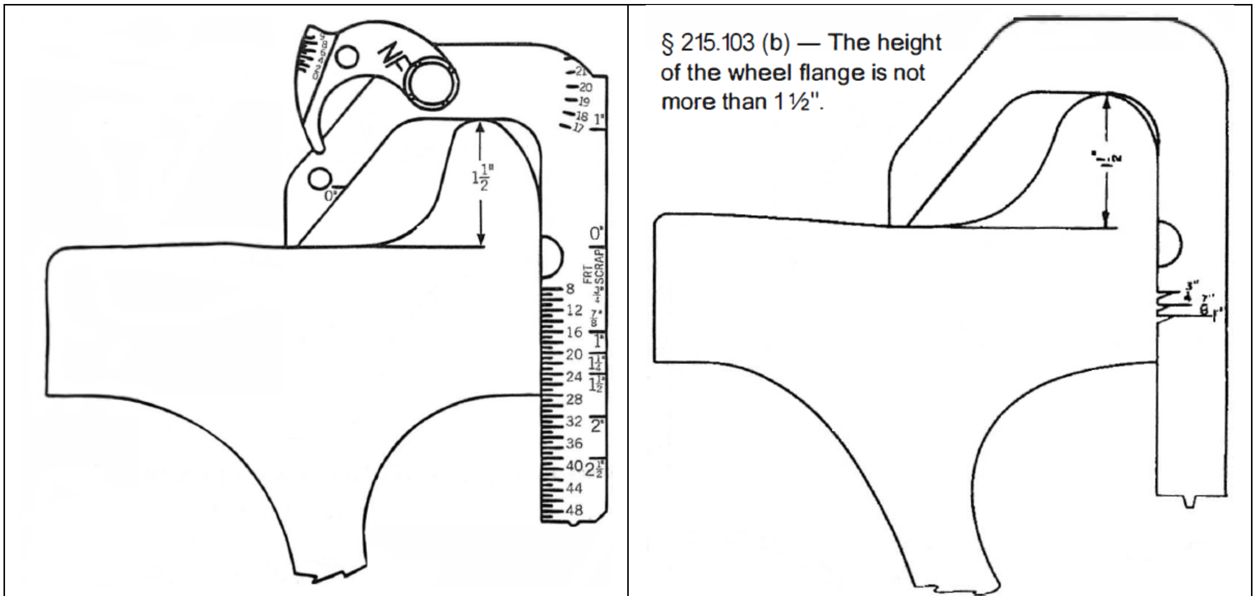


Figure 2: Gaging of wheel flange height

A thin rim wheel can be properly gaged with a W804 gage. It is suggested that if the inspector does not have a W804 gage, they should mark a simplified steel wheel gage 1/16 of an inch above the ¾-inch mark. This will allow them to make a close evaluation of an 11/16-inch rim. However, it is not recommended that a violation be submitted when using a non-calibrated gage. The gage is to be applied to the wheel in the same manner as that used for gaging a high flange, and the gaging point would be the abrupt angle at the inside of the back face of the rim. With the gage held firmly against the back face of the rim, parallel to the radius and the point resting on the tread of the wheel, the reading should be 11/16 of an inch or less for a defective condition (*see* **Figure 3**). Gaging with the tip or point of the gage in a flat spot or shelled spot is not acceptable.

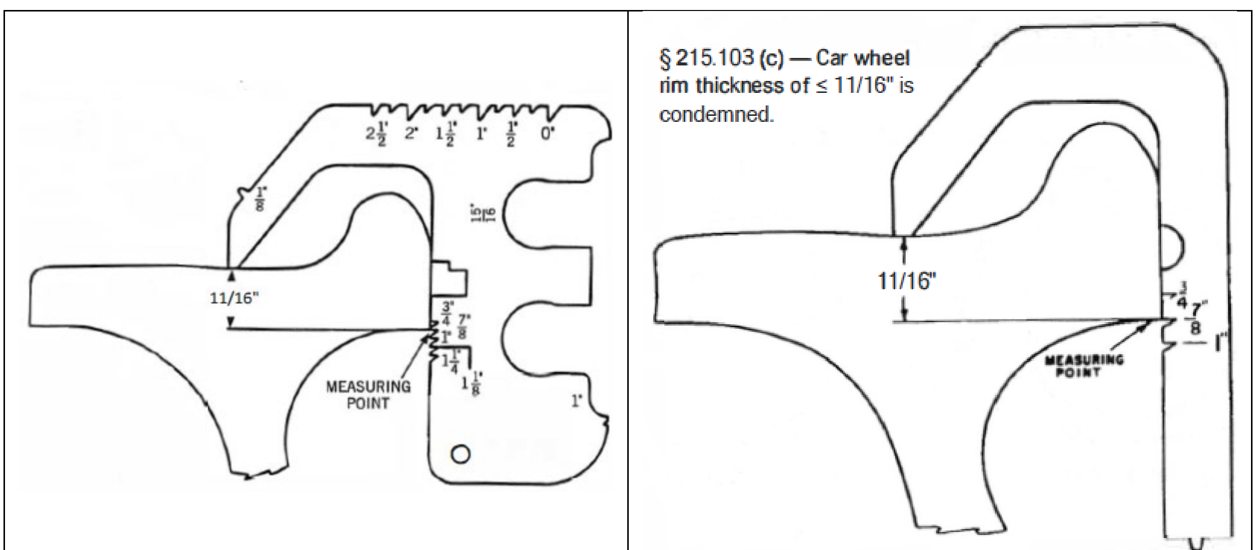


Figure 3: Gaging of wheel rim thickness.

A flat spot on a wheel may be gaged with AAR gage 34401. The flat portion of the gage is marked in such a way that a 2½-inch flat spot (which is the maximum allowable) can be easily measured. This portion of the gage must be applied to the flat spot on the wheel with absolutely no rocking motion allowable within the 2½-inch area (*see* **Figure 4**). Two adjoining flat spots, 2 or more inches in length, are measured using the same method.

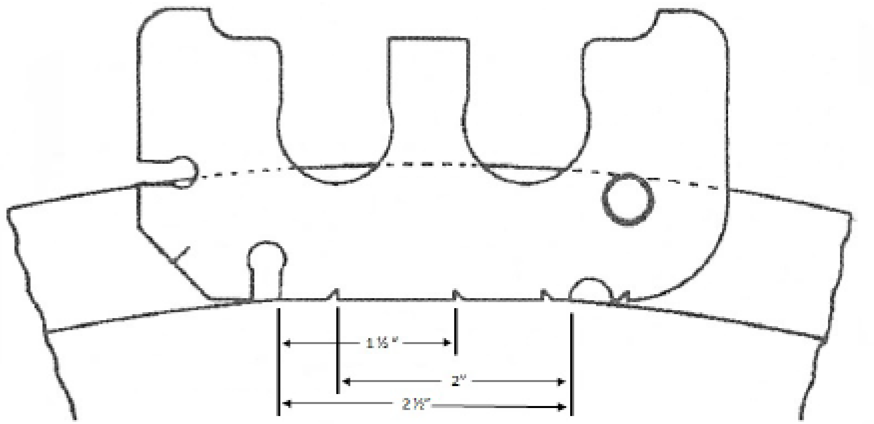


Figure 4: Gaging of wheel flat spot

The overheated wheel requires a higher degree of judgment because of the varying degrees of discoloration. A reddish-brown discoloration that extends into the wheel plate more than 4 inches on both sides of the wheel indicates an overheated condition. The discoloration should come toward the center of the wheel 4-inches inside the rim before exceptions are taken. The 4-inch measurement is to be made from the bottom of the back face of the rim. A rust condition of the wheel should not be considered as a reddish-brown discoloration.

There is currently a waiver in place that exempts "heat treated-curved plate" (HT-CP) wheels from the requirements of 49 CFR § 215.103(h), provided the HT-CP wheel is clearly identified by an "H" painted or stencilled on the outside plate of the wheel.

Welded wheels. Regulations allow the welding of wheels only as an emergency measure to enable the car to be moved to a repair facility. A welded wheel is not a prohibited defect if the car is tagged and being moved in accordance with 49 CFR § 215.9 for the purpose of replacing the wheel.

It is not acceptable to place a gage on a wheel in such a way that it takes a combination of two or more conditions to condemn it as defective (*i.e.*, gaging for high flange in a flat spot). **(MP&E 98-10).**

Regions shall ensure that their inspectors have calibrated wheel gages and know how the gages are to be applied to the wheel in order to determine if the wheel is in compliance with the regulations.

After finding a statistically elevated number of vertical split rim failures (*see* **Figure 5**) on 36-inch Southern wheels of various ages, the AAR has issued instructions that all 36-inch Southern wheels are to be pulled from service when at a wheel shop. Also, Southern CH-36 wheels made in 1995 are to be pulled from service when on a shop or repair track for any reason. Failure to follow these AAR instructions is not an FRA defect, but if observed, should be brought to the attention of the railroad.

Figure 5: Split rim wheel failure

<u>Other Wheel Failures</u>

Shattered rims (*see* **Figure 6**) occur due to subsurface defects in the wheel. They are often first observable as a crack on the side of the rim, running basically parallel to the tread, (as shown between the chalk marks in the picture on **Figure 7**). Telltale rust streaks can help to identify them. The failure is not always as benign as the one shown here, with only a small portion of the tread missing. Often, major sections of the tread break away, similar to the vertical split rim shown above. Very rarely, the plate of the wheel experiences a sudden failure and, typically, they are isolated events attributable to wheel manufacturing process error.

Figure 6: Shattered rim wheel

Figure 7: A crack on the side of the rim and running parallel to the tread could lead to shattered rim


Broken Wheel Plate

Wheel Thermal Cracks and Heat Checks

The distinction between thermal cracks and heat checks on the tread of a wheel has been a difficult one to make.

A wheel that has been severely overheated loses its residual compressive stress in the tread surface and develops cracking parallel to the axle. Since the surface has gone into tension, the cracks open and can be felt with a fingernail running over the surface. Less severe overheating can result in *heat checks*, which are visible lines on the tread surface that do not open into cracks since the wheel has *not* been overheated to the point that the residual compressive stress in the tread is lost. These lines do not feel rough when a fingernail is dragged over them. They are typically not parallel to the axle, but instead run at an angle across the tread. Heat checks may develop into shelled tread, but they are not believed to develop into cracks unless further severe overheating of the wheel occurs.

Due to disputes between at least one major railroad and car owner over the car repair billing for wheel replacements, the AAR's Wheels Axles Bearings and Lubrication (WABL) Committee conducted a thorough study resulting in the amendment/revision of Rule 41 in AAR's Interchange Rules Field Manual. More specifically, some lines which appear parallel to the axle, like thermal cracks, in fact were found to be heat checks. Wheel experts from the Transportation Technology Center determined that since there was no evidence of the surface being in tension, these lines were heat checks.

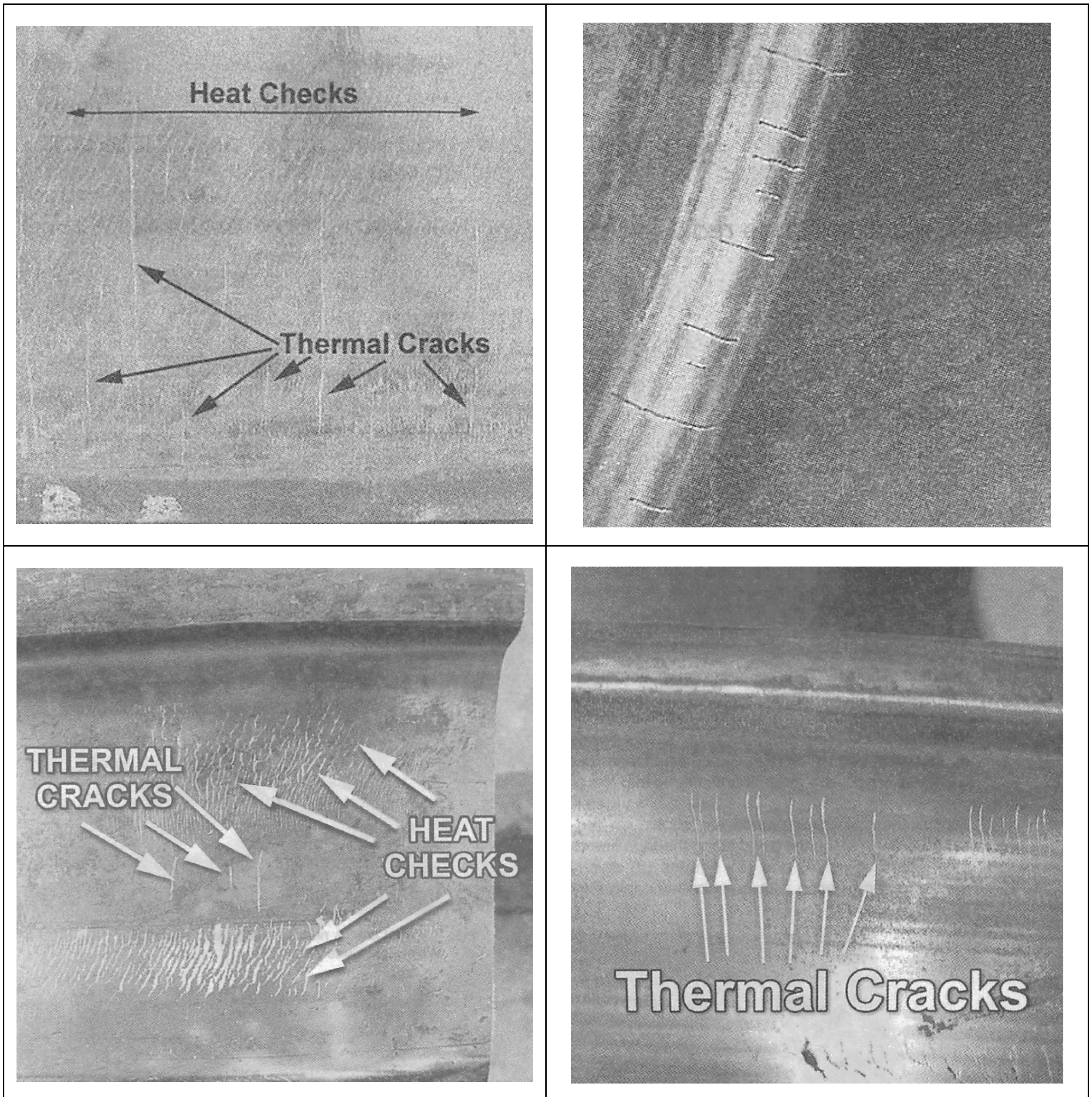


Figure: Tread/flange thermal checks (Rule 41 Field Manual of the AAR's Interchange Rules)

§ 215.105 Defective axle.

A railroad may not place or continue in service a car, if -

(a) An axle on the car has a crack or is broken;

(b) An axle on the car has a gouge in the surface that is -
- (1) Between the wheel seats; and
- (2) More than one-eighth inch in depth;

(c) An axle on the car, used in conjunction with a plain bearing, has an end collar that is broken or cracked;

(d) A journal on the car shows evidence of overheating, as evidenced by a pronounced blue-black discoloration; or
(e) The surface of the plain bearing journal on the axle, or the fillet on the axle, has-
- (1) A ridge;
- (2) A depression;
- (3) A circumferential score;
- (4) Corrugation;
- (5) A scratch;
- (6) A continuous streak;
- (7) Pitting;
- (8) Rust; or
- (9) Etching.

§ 215.107 Defective plain bearing box: General.

A railroad may not place or continue in service a car, if the car has-

- (a) A plain bearing box that does not contain visible free oil;
- (b) A plain bearing box lid that is missing, broken, or open except to receive servicing; or
- (c) A plain bearing box containing foreign matter, such as dirt, sand, or coal dust, that can be reasonably be expected to-
  - (1) Damage the bearing; or
  - (2) Have a detrimental effect on the lubrication of the journal and the bearings.

Information

A plain bearing box that contains a significant amount of water should be treated as foreign matter. The journal should be inspected with a wire feeler hook to determine if there is pitting.

§ 215.109 Defective plain bearing box: Journal lubricating system.

A railroad may not place or continue in service a car, if the car has a plain bearing box with a lubricating pad that-

(a) Has a tear extending half the length or width of the pad, or more;
(b) Shows evidence of having been scorched, burned, or glazed;
(c) Contains decaying or deteriorated fabric that impairs proper lubrication of the pad;
(d) Has-
- (1) An exposed center core (except by design); or
- (2) Metal parts contacting the journal; or

(e) Is-
- (1) Missing; or
- (2) Not in contact with the journal.

Information

Currently, AAR Interchange Rule 88 requires that all hazardous material tank cars in service must be equipped with roller bearings. Also, under AAR Interchange Rule 88 **all** freight cars offered for interchange service must be equipped with roller bearings. Although this is not a federal defect, the railroad should be made aware of the situation whenever it is detected.

§ 215.111 Defective Plain Bearing.

A railroad may not place in service or continue in service a car, if the car has a plain bearing-

(a) That is missing, cracked, or broken;
(b) On which the bearing liner-
    (1) Is loose; or
    (2) Has a broken-out piece; or
(c) That shows signs of having been overheated, as evidenced by-
    (1) Melted babbitt;
    (2) Smoke from hot oil; or
    (3) Journal surface damage.

§ 215.113 Defective Plain Bearing Wedge.

A railroad may not place or continue in service a car, if a plain bearing wedge on that car is-

(a) Missing;
(b) Cracked;
(c) Broken; or
(d) Not located in its design position.

§ 215.115 Defective Roller Bearing.

(a) A railroad may not place or continue in service a car, if the car has-

(1) A roller bearing that shows signs of having been overheated as evidenced by-
    (i) Discoloration; or
    (ii) Other telltale signs of overheating such as damage to the seal or distortion of any bearing component;

(2) A roller bearing with a-
    (i) Loose or missing cap screw; or
    (ii) Broken, missing, or improperly applied cap screw lock; or

(3) A roller bearing with a seal that is loose or damaged, or permits leakage of lubricant in clearly formed droplets.

(b)

(1) A railroad may not continue in service a car that has a roller bearing whose truck was involved in a derailment unless the bearing has been inspected and tested by:

(i) Visual examination to determine whether it shows any sign of damage; and

(ii) Spinning freely its wheel set or manually rotating the bearing to determine whether the bearing makes any unusual noise.

(2) The roller bearing shall be disassembled from the axle and inspected internally if-

(i) It shows any external sign of damage;

(ii) It makes any unusual noise when its wheel set is spun freely or the bearing is manually rotated;

(iii) Its truck was involved in a derailment at a speed of more than 10 miles per hour; or

(iv) Its truck was dragged on the ground for more than 200 feet.

(3) Each defective roller bearing shall be repaired or replaced before the car is placed back in service.

Information

Some loss of lubricant through "seepage" around a roller bearing seal may not be hazardous and should not be reported as a defect. A seal that "permits leakage of a significant amount of lubricant in clearly formed droplets" is defective. "Clearly formed droplets" means a **fresh** accumulation of grease/oil (not dirty or dried) that continually leaks out from the bearing and/or slowly forms into beads. A careful examination should be made of any roller bearing from which "fresh" or "new" lubricant is thrown onto wheels, truck components, or the car body. A seal that is "loose, damaged, or non-functioning" is considered to be defective.

A loose backing ring is **not** to be reported as a defective bearing but should be brought to the attention of the railroad, as the AAR identifies this condition as cause for removal in their Interchange Rules. Additionally, the inspector should note this condition as a comment on the F6180.96 report.

When a railroad opts to rotate the roller bearing manually, rather than rotating the wheel assembly to detect a defective condition due to a derailment, care must be exercised because the presence of lubricant and the fact that the bearing is not under load tend to reduce sounds made by small defects. When the wheel assembly is rotated, the weight on the bearing magnifies the sound.

Many shortline railroads operate over "Excepted Track" that often is the cause of derailments. Further, some shortline railroads do not have their own qualified inspectors or repair facilities to address defective conditions. Some shortlines have agreements with the interchange railroads to effect repairs to defective cars that fall under their responsibility. Due to the seriousness of a car with a defective bearing condition continuing in service and/or the possible failure of a shortline to notify the receiving railroad of a potential defective car, inspectors should review the proper handling of derailed cars and defective cars with each shortline railroad within their territory. **(MP&E 98-29).**

§ 215.117 Defective Roller Bearing Adapter.

A railroad may not place or continue in service a car, if the car has a roller bearing adapter that is-

(a) Cracked or broken;
(b) Not in its design position; or
(c) Worn on the crown of the adapter to the extent that the frame bears on the relief portion of the adapter.

Information

Appropriate enforcement action must be taken if a car has a roller bearing adapter that is out of place or has excessive wear on the crown of the adapter. Either condition can cause uneven load distribution on the bearing and result in bearing failure.

Roller bearing adapter pads designed with a square surface depression of about 5 inches and about 3/16-inch deep were at one time common on articulated equipment. They had a high failure rate and an effort was made to replace them with a specially designed adapter. The pad was designed to fit in the 5-inch square depression of the roller bearing adapter and act as the crown for proper contact with the truck side frame roof. There were at least three pad designs. The two with the highest failure rate were made to look like a square plate about 3/8-inch thick and consisted of metal plates and a plastic material which was found to crush and deteriorate. The other pad design was a rounded plate about 3/8-inch thick with squared shoulders for retention in the adapter depression. Complete failure of the pad will leave a flat surface on the top side of the adapter where the crowned surface should be in contact with the truck side frame roof. Partial failure will tend to concentrate the off-centre loading to the part of the pad that has not failed. This creates a potential roller bearing failure. Defective conditions can be easily detected by close inspection. There should be a void between the adapter and the side frame roof, except where the pad is the buffer between the two. The pad should provide enough thickness in the center to act as the crown of the adapter. If these pads are found defective, they should be reported on the appropriate inspection report using code 215.117(E)(1) “Roller bearing adapter resilient wear plate (vertical isolation pad) defective or not in its designed position.” **(MP&E 98-21).**

Adapter wear plates (roof liners) should be examined as to their condition and effectiveness. Since the regulation requires the roller bearing adapter to be in its designed position, if a problem exists, a defect should be taken. For this non-complying condition, inspectors should use RISP defect code 215.117(E)(1) Roller Bearing Adapter Resilient Wear Plate Defective or not in Position (Roof Liners).

There are cars in service that are designed to operate with a single axle wheel set at each end. The truck bearing cup filler blocks, commonly referred to as roller bearing adapter blocks, are located beneath the roller bearing rather than on top of the bearing, as found on conventional freight car equipment, and are secured in place by a single bolt or pin and cotter key (*see* **Figure-8)**. When the adapter block is missing, the adapter may become unseated from its designed location or be missing completely. When this condition is detected, take appropriate action and report the condition as set forth in 49 CFR § 215.117 (Defective roller bearing adapter).

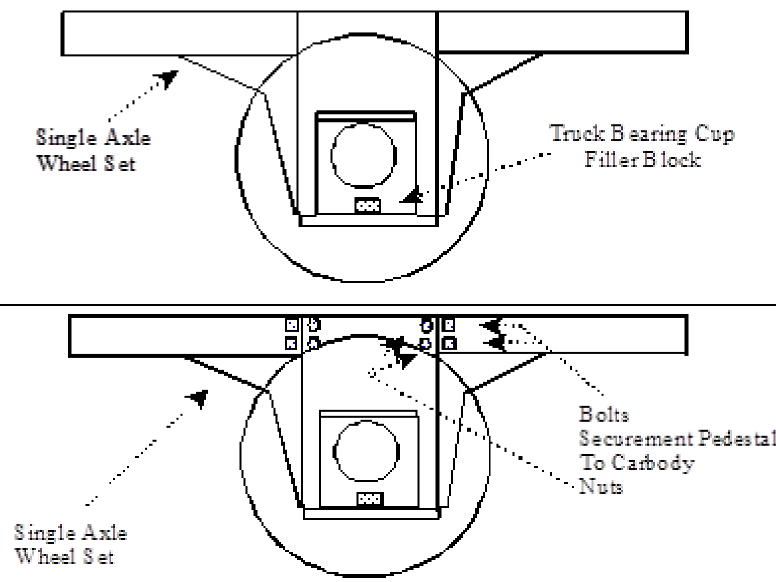


Figure 8: Single axle wheel set's carbody-pedestal securement and bearing cup filler block

Another condition that has been discovered with this type of truck is loose and missing pedestal securement bolts. Each side of the pedestal is attached to the car body (*see* **Figure 8)** by four bolts measuring 4⅞ inch each. Bolts have been found loose, broken, and missing. This noncomplying condition can be reported on Form F6180-96 using code 215.121(F)(1). **(MP&E 98-42).**

The vertical isolation pads (adapter pads) that were primarily found on articulated 125-ton double stack cars are prohibited in interchange by the AAR.

§ 215.119 Defective Freight Car Truck.

A railroad may not place or continue in service a car, if the car has-

(a) A side frame or bolster that-
- (1) Is broken; or
- (2) Has a crack of ¼ of an inch or more in the transverse direction on a tension member;

(b) A truck equipped with a snubbing device that is ineffective, as evidenced by-
- (1) A snubbing friction element that is worn beyond a wear indicator;

(2) A snubber wear plate that is loose, missing (except by design), or worn through;
(3) A broken or missing snubber activating spring; or
(4) Snubber unit that is broken, or in the case of hydraulic units, is broken or leaking clearly formed droplets of oil or other fluid.

(c) A side bearing in any of the following conditions:
(1) Part of the side bearing assembly is missing or broken;
(2) The bearings at one end of the car, on both sides, are in contact with the body bolster (except by design);
(3) The bearings at one end of the car have a total clearance from the body bolster of more than ¾ of an inch; or
(4) At diagonal opposite sides of the car, the bearings have a total clearance from the body bolsters of more than ¾ of an inch;

(d) Truck springs-
(1) That do not maintain travel or load;
(2) That are compressed solid; or
(3) More than one outer spring of which is broken, or missing, in any spring cluster;

(e) Interference between the truck bolster and the center plate that prevents proper truck rotations; or

(f) Brake beam shelf support worn so excessively that it does not support the brake beam.

Information

Truck Side Frame or Bolster

Freight car trucks side frame or truck bolster “broken” means it is separated into parts.

Extensive cracking must be reported immediately as this condition can lead to rapid failure.

A tension member (the diagonal portion of the side frame extending from the pedestal to the base of the spring pocket) must be cracked more than ¼ inch in a transverse direction (right angle) before it can be considered defective.

Snubbing Devices

The terms *snubbing units*, *attachments*, and *wear plates*, where used collectively, have been consolidated into one term: *snubbing device*. Friction-style snubbing devices with activating springs broken are defective.

“Clearly formed droplets,” means a **fresh** accumulation of grease/oil (not dirty or dried) which **continually** leaks out and forms into beads. If it is just wet looking, it is not a defect.
A car that has ineffective or broken snubbing devices will respond more violently to track irregularities and may cause a derailment. This would include the condition of a loose, missing,

or worn-through snubber wear plate. FRA has reviewed laboratory analyses on the subject of friction wedges that have added friction material, which are used on ABC-NACO Swing Motion trucks. The lab reports provided adequate evidence to conclude that there is no safety issue with composition friction material that is cracked, degraded, or missing from the wedge. Wedges that have loose composition layers provide adequate damping forces. Although new wedges generate greater damping forces than used wedges that have polished wear surfaces, a composition wedge that has all of its composition material removed still retains the damping characteristics of an all-metal wedge. Therefore, FRA will not take exception to degraded friction material condition on friction wedges used on ABC-NACO Swing Motion trucks. The wear indicator on the metal wedge is the qualifier.

Hydraulic snubbing devices equipped with a "sight gauge" or "inspection window" that visibly indicates the presence of oil or other fluid when in a normal vertical position will not be considered as defective, regardless of presence of clearly formed droplets. The effectiveness of the device should be examined for tension, compression, movement, *etc*.

Side Bearings

A missing or broken side bearing generates an uneven load distribution in the suspension system that could shift the lading. This, in turn, would cause the car to sway and derail.

All side bearing measurements should be made when the car is placed on tangent and level track. All measurements must be made from the top of the truck side bearing roller or bearing surface in the cage, to the car body side bearing surface. This measurement is taken at opposite sides of the car or at one end of the car. The sum of either of the two measurements may not exceed 3/4 inch.

Although Federal regulations do not address specific measurement standards for constant contact side bearings, measurements have been established by the industry. The industry has developed special gages for qualifying constant contact side bearings. When inspectors identify constant contact side bearings that are worn beyond the manufacturer's limits, then they are not in contact as designed and appropriate enforcement action should be taken. This is based on the language found in 49 CFR § 215.119(c)(2*) "...except by design."* All measurements must be taken on tangent level track.

Information

Constant Contact Side Bearings

Constant contact side bearings (CCSB) become condemnable when the measurements described below do not meet the specifications specified in the Field Manual of the Association American Railroads (AAR) Interchange Rules, Rule 62.

1. All side bearing height measurements must be taken:

    A. On tangent and level track

B. Vertically between side bearing mounting surface and car body wear plate surface.

C. As close to the center of the side bearing as possible.

2 CARS WITH 5 1/16 INCH SETUP HEIGHT AND 8 ½" MOUNTING HOLES (Typically found on 4 axle cars and end trucks of articulated cars)

A. Empty or loaded cars

B. Side bearing is noncompliant if the "Sum-of-the-Pairs Measurement" is:

(1). LESS than 9 ¾ inch
(2). GREATER than 10 ½ inch

C. For articulated cars Sum-of-the-Pairs refers to side bearings laterally across from each other.

D. For standalone cars, the following pairs must be summed:

(1). AL+AR

(2). BL+BR

(3). AL+BR

(4). BL+AR

E. Measure as shown in **Figure 9** below.

3. ARTICULATED CARS AT THE ARTICULATED TRUCK LOCATIONS:

A. Side bearing is noncompliant if the "Sum-of-the-Pairs Measurement" is:

Articulated Connector	Nominal Set-Up Height Or as stenciled on car	Sum-of-the-Pairs Measurement
Female	5 1/6 inch	Less than 9 ¾ inch Greater than 10 3/8 inch
Male	5 3/16 inch	Less than 9 ¾ inch Greater than 10 5/8 inch
Female / Male	Any Other	Less than 9 ¾ inch Greater than ¼ inch above 2 times the stenciled set-up height
The Sum-of-the-Pairs refers to side bearings laterally across from each other.		

B. Measure as shown in **Figure 9** below:

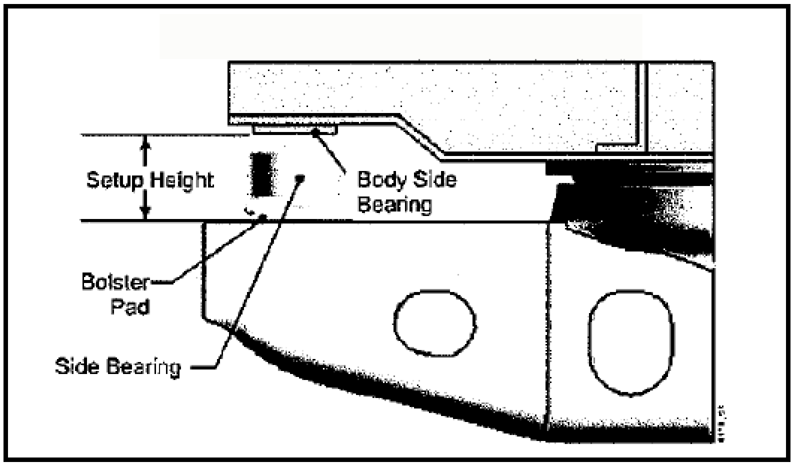


Figure 9: Measurement of constant contact side bearing typically found on 4-axle cars and end trucks of articulated cars

4. CARS WITH LOW PROFILE OR STANDARD HEIGHT SOLID BLOCK STYLE SIDE BEARING POCKETS. (Integral cast or welded on ring)

A. Side bearing is noncompliant if the "Sum-of-the-Pairs Measurement" is:

Side Bearing Manufacture	Sum-of-the-Pairs Measurement (Condemning
A. Stucki	Less than 1 inch Greater than 1 ¾ inch
Miner / Standard Truck	Less than 7/8 inch Greater than 1 5/8 inch
For standalone cars, the following pairs must be summed: AL+AR - BL+BR – AL+BR - BL+AR	

B. Measure as shown on **Figure 10** below:

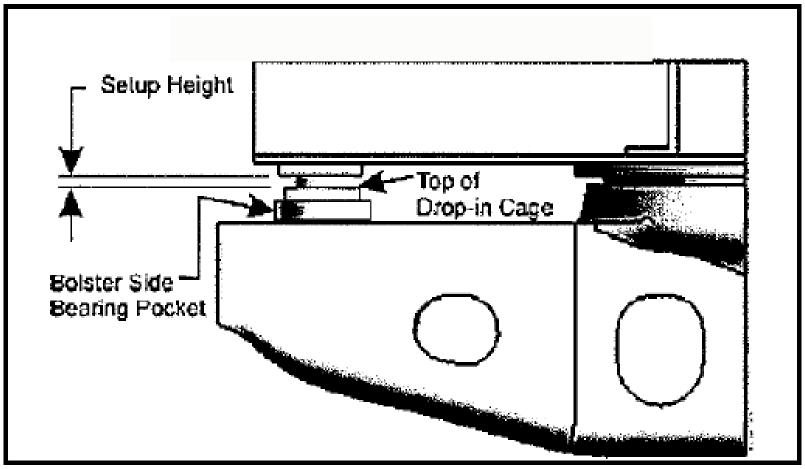


Figure 10: Measurement of constant contact side bearing on cars with low profile or standard height solid block style side bearing pocket

Truck Springs

Inner coil springs are not to be taken as a defect regardless of the number broken. One broken outer truck spring in a cluster does not create enough of an uneven load distribution to remove the car from service. Appropriate enforcement action must be taken if a car has more than one missing or broken outer truck spring within any cluster, or if the remaining truck springs are fully compressed. If the inspector detects evidence of springs oscillating in the spring nest, this is an indication that there is possible "truck hunting" problem and the inspector should make a comprehensive inspection of all truck components.

Car Bodies

§ 215.121 Defective Car Body.

A railroad may not place or continue in service a car, if:

(a) Any portion of the car body, truck, or their appurtenances (except wheels) has less than a 2½ inch clearance from the top of [the] rail;

(b) The car center sill is:
- (1) Broken;
- (2) Cracked more than 6 inches; or
- (3) Permanently bent or buckled more than 2½ inches in any six-foot length;

(c) The car has a coupler carrier that is:
- (1) Broken;
- (2) Missing;

(3) Non-resilient and the coupler has a type F head.

(d) After December 1, 1983, the car is a box car and its side doors are not equipped with operative hangers, or the equivalent, to prevent the doors from becoming disengaged.

(e) The car has a center plate:
(1) That is not properly secured;
(2) Any portion of which is missing; or
(3) That is broken; or
(4) That has two or more cracks through its cross section (thickness) at the edge of the plate that extend to the portion of the plate that is obstructed from view while the truck is in place; or

(f) The car has a broken sidesill, crossbearer, or body bolster.

Information

The requirement for maintaining car body clearance of 2½ inches is to ensure that car body items, including air hoses, are prevented from dragging on road crossings or track structures, which are safety hazards. Heavy, depressed flat cars used in hauling heavy loads should be carefully inspected.

Center Sills

A center sill is generally the central longitudinal member of the underframe of a car from striker to striker, which forms the backbone of the underframe and transmits buff and draft forces.

A center sill "broken" means a fracture resulting in complete separation into parts. A condition of this nature could result in train separation or derailment.

A center sill that is cracked more than 6 inches is defective. The integrity of the sill is compromised which can lead to total failure.

A center sill bent or buckled more than 2½ inches in any 6-foot length may undermine the integrity of the sill and result in a center sill failure.

Similarly, in "sliding sill" designs, a single hydraulic unit is installed at the center of the car and acts to control longitudinal forces received at either end of an auxiliary center sill, which is free to travel longitudinally within a fixed center sill. This type of center sill should be inspected for defects such as: cracks more than 6 inches, bent or buckled more than 2½ inches in any 6-foot length, or broken.

Coupler Carrier

The design of an "F" type coupler head requires a spring-loaded coupler carrier due to its locking characteristics.

Door Safety Hangers

FRA considers door safety hangers to be one of the most critical safety requirements. A number of personal injuries and fatalities have occurred which involved doors falling off box cars. Door safety hangers must be capable of restraining the side door when the side door is in an open position and the bottom rollers of the door are off the door tracks.

Draft System

§ 215.123 Defective Couplers

A railroad may not place or continue in service a car, if-

(a) The car is equipped with a coupler shank that is bent out of alignment to the extent that the coupler will not couple automatically with the adjacent car;

(b) The car has a coupler that has a crack in the highly stressed junction area of the shank and head as shown in the figure below (see Figure 10c below).

(c) The car has a coupler knuckle that is broken or cracked on the inside pulling face of the knuckle.

(d) The car has a knuckle pin or knuckle thrower that is:
- (1) Missing; or
- (2) Inoperative; or

(e) The car has a coupler has a retainer pin lock that is-
- (1) Missing; or
- (2) Broken; or

(f) The car has a coupler with any of the following conditions:
- (1) The locklift is inoperative;
- (2) The coupler assembly does not have anti-creep protection to prevent unintentional unlocking of the coupler lock; or
- (3) The coupler lock is-
  - (i) Missing;
  - (ii) Inoperative;
  - (iii) Bent;
  - (iv) Cracked; or
  - (v) Broken.

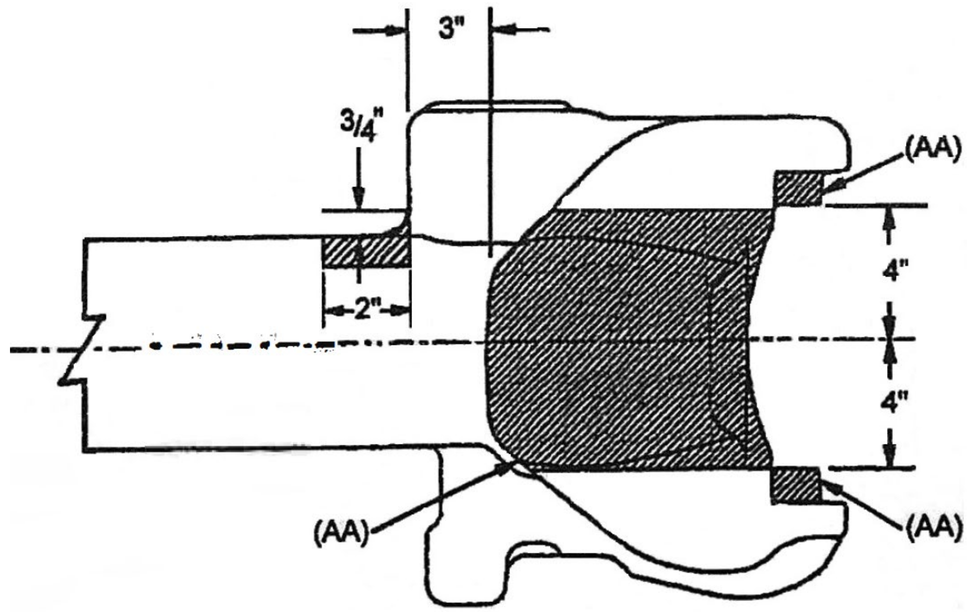
Information

Based on laboratory test results, the following clarification is provided with respect to enforcement information for the removal of cracked couplers from service:

A railroad may not place or continue in service a car that has a coupler that has a crack:

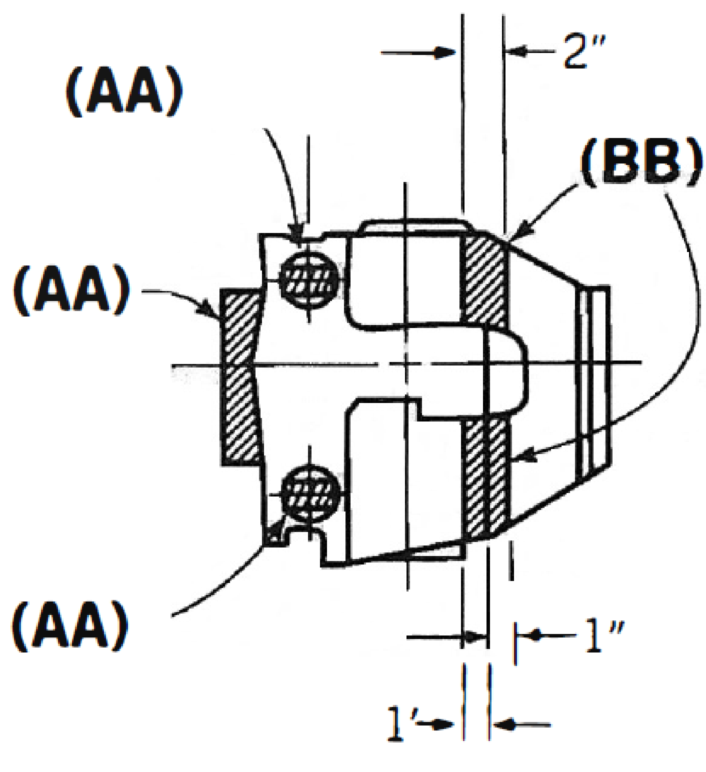
- that extends beyond the shaded areas labelled (AA) in **Figure 10a**; or
- that extends 2 inches in length, or in additive length if more than one crack is present, within a panel 2 inches wide as indicated by the shaded areas labelled (B) in **Figure 10b**; or
- that extends beyond the radius area between the horn and the shank as indicated by the shaded area labelled (CC) in **Figure 10c**; or
- that extends 2 inches in length, or in additive length if more than one crack is present, within the radius area between the horn and shank as indicated by the shaded areas labelled (CC) in **Figure 10c**; or
- that is present in the unshaded areas of **Figure 10a, 10b, and 10c**.

Additionally, inspectors who find couplers having a section broken out within the shaded areas labeled (BB) or (CC) in **Figures 10b** and **10c**, must be removed from service. If couplers have a section broken out within the other shaded areas, the inspector should bring this condition to the attention of the railroad, as the AAR identifies this condition as cause for removal in their Interchange Rules. **(MP&E 98-43).**



KNUCKLE SIDE

Figure 10a: Enforcement information for the removal of cracked couplers from service



FRONT

Figure 10b: Enforcement information for the removal of cracked couplers from service

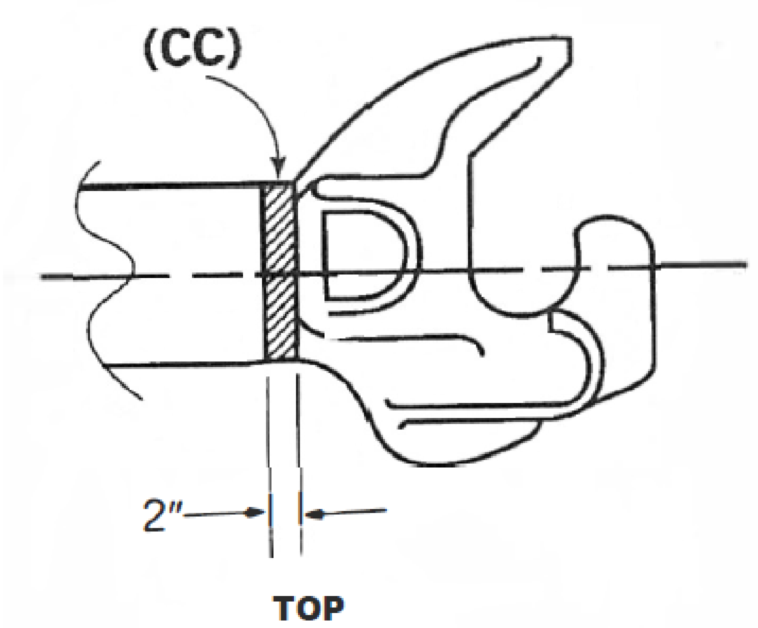


Figure 10c: Enforcement information for the removal of cracked couplers from service

The regulation is specific in that the coupler knuckle must be broken or cracked on the inside pulling face of the knuckle.

The anti-creep protection should be capable of preventing the unintentional unlocking of the coupler lock. A coupler lock lift slightly raised may raise the coupler lock and nullify the anti-creep protection of the coupler. When inspection is made for anti-creep, the car should not be in draft or buff and should be on level, tangent track. The lack of "rod-eye" clearance does not necessarily mean there is no anti-creep protection.

§ 215.125 Defective Uncoupling Device.

A railroad may not place or continue in service a car, if the car has an uncoupling device without sufficient vertical and lateral clearance to prevent-

(a) Fouling on curves; or
(b) Unintentional uncoupling.

<u>Information</u>

Toggle clearance should be closely examined.

§ 215.127 Defective Draft Arrangement.

A railroad may not place or continue in service a car, if-

(a) The car has a draft gear that is inoperative;

(b) The car has a broken yoke;

(c) An end of car cushioning unit is-
- (1) Leaking clearly formed droplets; or
- (2) Inoperative;

(d) A vertical coupler pin retainer plate-
- (1) Is missing (except by design); or
- (2) Has a missing fastener;

(e) The car has a draft key, or draft key retainer, that is-
- (1) Inoperative; or
- (2) Missing; or

(f) The car has a missing or broken follower plate.

Information

Whenever the draft gear unit is not performing its intended function of absorbing shocks and impact forces as designed, the unit is defective.

A striker casting that exhibits **fresh** "batter marks" is generally an indication of a defective draft system component.

An **end-of-car** cushioning unit is defective if it is inoperative and not performing its intended function of absorbing shocks and impacts or is leaking clearly formed droplets. A cushioning unit should not be considered defective if it is losing only a minute amount of fluid through seepage. The primary concern is an excessive loss of fluid that could render the cushioning unit inoperative. Therefore, a cushioning unit is defective if it is leaking fluid in clearly formed droplets. "Clearly formed droplets" means a **fresh** accumulation of oil (not dirty or dried) which continually forms into beads.

Based on technical data presented at an MP&E Technical Resolution Committee, FRA has determined that cushioning unit pressure indicators are **not** sufficiently reliable to determine the operating status of cushioning units. The unreliability of the indicators is due to the variable buff and draft forces exerted on cushioning devices while freight cars are in use in train yards. Therefore, FRA inspectors should not rely on cushioning unit pressure indicators to determine the operational status of a cushioning device. Thus, if clearly formed droplets are present the cushioning unit is defective and must be repaired, regardless of the indication provided by the pressure indicator. However, once a freight car is placed on a repair track, the railroad may use the pressure indicator to aid in determining the operating status of the cushioning unit. **(MP&E 00-03).**

A unit is defective if the front or rear lugs are broken or missing.

Of the three return springs, more than one defective spring constitutes a defective condition. Inspectors should be aware that some tank cars have sustained a failed stub sill assembly, resulting in the train parting and going into emergency. In one case, FRA investigations revealed that the head block, which normally is attached by welding to the tank head and stub sill, was not attached to the stub sill and was actually “floating” (only attached to the tank head). The top of the stub sill assembly showed signs of the head block rubbing. The stub sill failed at the rear of the draft gear, completely separated, including the end crossover platform. The broken stub sill remained attached to the adjacent car by the top and bottom shelf coupler, which prevented it from falling to the track structure.

There have been similar problems with fabricated stub sill dual diameter tank cars. Some cars built between 1962 and 1969 have exhibited minor crack indications in the weld connecting the cradle pad to the tank. Those cars with verified cracks revealed that the cracks always initiated in the weld attachment to the top cover plate and did not propagate through the top cover plate to the sill.

Due to the described experiences, a close inspection is to be made to **all tank cars with stub sills**. The installation should be carefully examined at the stub sill securement for any signs of stress. If the inspection of any tank car equipped with stub sills reveals any defect of the stub sill, the inspector is to notify the Regional MP&E Specialist providing the following information:

Date: ______ Railroad________ Shipper_________ Location ________
Initial & Car number_________ Built date_______ DOT Spec._______
Waybill No. and Date, Commodity_______________ Routing___________
Description of defect_______________________________________
Action taken by the railroad_________________________________
Any other information_______________________________________

The MP&E specialist should forward this information to the MP&E Staff Director.
(MP&E 98-24).

§ 215.129 Defective cushioning device.

A railroad may not place or continue in service a car if it has a cushioning device that is-

(a) Broken;

(b) Inoperative; or

(c) Missing a part-

unless its sliding components have been effectively immobilized.

Information

A **center of car** cushioning unit should not be considered defective if it is losing only a minute amount of fluid through seepage. The primary concern is an excessive loss of fluid that could render the cushioning unit inoperative. A leaking cushioning unit is defective if it is leaking fluid in clearly formed droplets. **Note:** "Clearly formed droplets" means a **fresh** accumulation of oil (not dirty or dried) which continually and/or slowly forms into beads. If the area is just wet in appearance, it should not be taken as a defective condition.

Subpart C – Restricted Equipment

§ 215.201 Scope

This subpart contains requirements restricting the use of certain railroad freight cars.

§ 215.203 Restricted cars.

(a) This section restricts the operation of any railroad freight car that is-

(1) More than 50 years old, measured from the date of original construction;

(2) Equipped with any design or type component listed in appendix A to this part; or

(3) Equipped with a Duryea underframe constructed before April 1, 1950, except for a caboose which is operated as the last car in a train.

(b) A railroad may not place or continue in service a railroad freight car described in paragraph (a) of this section, except under conditions approved by the Federal Railroad Administrator.

(c) A railroad may petition the Administrator to continue in service a car described in paragraph (a) of this section. Each petition shall be:

(1) Submitted not less than 90 days before the car is to be operated;

(2) Be submitted; and

(3) State or describe the following:

(i) The name and principal business address of the petitioning railroad.

(ii) The name and address of the entity that controls the operation and maintenance of the car involved.

(iii) The number, type, capacity, reporting marks, and car numbers of the cars, their condition, status, and age measured from the date of original construction.

(iv) The design, type component, or other item that causes the car to be restricted.

(v) The maximum load the cars would carry.

(vi) The maximum speed at which the cars would be operated.

(vii) That each car has been examined and found to be safe to operate under the conditions set forth in the petition.

(vii) The territorial limits within which the cars are to be operated and the name of each railroad that will receive the cars in interchange.

Information

The inspector should be aware that there are many approvals (some mistakenly call these waivers) in place allowing the continued operation of 50-year-old cars only in approved territorial limits with unique operating conditions. Cars operating over the 50-year limit must be stenciled with the letter **R**, as required by the next subpart.

Subpart D – Stenciling

§ 215.301 General

The railroad or private car owner reporting mark, the car number, and built date shall be stenciled, or otherwise displayed, in clearly legible letters and numbers not less than seven inches high, except those of the built date which shall not be less than one-inch high:

(a) On each side of each railroad freight car body; and
(b) In the case of a tank car, in any location that is visible to a person walking at track level beside the car.

§ 215.303 Stenciling of restricted cars.

(a) Each restricted railroad freight car that is described in § 215.205(a) of this part shall be stenciled, or marked-

(1) In clearly legible letters; and
(2) In accordance with paragraphs (b) and (c) of this section.

(b) The letter "R" shall be-

(1) Placed immediately below or to the right of the car number;
(2) The same color as the reporting mark; and
(3) The same size as the reporting mark.

(c) The following terms, to the extent needed to completely indicate the basis for the restricted operation of the car, shall be placed on the car following the symbol "R" in letters not less than one inch high:

(1) Age.
(2) Coupler.
(3) Draft.
(4) Bearings.
(5) Truck.
(6) Under-frame.
(7) Wheels.
(8) Yoke.

§ 215.305 Stenciling of maintenance-of-way equipment.

(a) Maintenance-of-way equipment (including self-propelled maintenance-of-way equipment) described in § 215.3(c)(3) shall be stenciled, or marked-

(1) In clearly legible letters; and
(2) In accordance with paragraph (b) of this section.

(b) The letters "MW" must be-

(1) At least 2 inches high; and
(2) Placed on each side of the car.

Information

Maintenance-of-way (MOW) equipment is equipment owned/operated for railroad maintenance purposes and must be stenciled with **MW**. MOW equipment cannot be used to haul commodities which will generate revenue for the railroad. Canadian MOW cars are stenciled with **RSE** (Railway Service Equipment) in lieu of the **MW**. FRA has granted a waiver to allow the **RSE** stencil instead of the **MW** stencil on MOW cars based out of Canada.

If vandals have painted graffiti on the car and obscured the identification marks, the inspector should point the defect out to the railroad for corrective action, but not issue a violation unless these actions become rampant.

Inspectors should ensure that maintenance-of-way equipment is used for maintenance-of-way activities, and not used for revenue service.

Appendix D to Part 215 – Pre-Departure Inspection Procedure

At each location where a freight car is placed in a train and a person designated under § 215.11 is not on duty for the purpose of inspecting freight cars, the freight car shall, as a minimum, be inspected for the imminently hazardous conditions listed below that are likely to cause an accident or casualty before the train arrives at its destination. These conditions are readily discoverable by a train crew member during a customary inspection.

1. Car body:

(a) Leaning or listing to side.
(b) Sagging downward.
(c) Positioned improperly on truck.
(d) Object dragging below.
(e) Object extending from side.
(f) Door insecurely attached.
(g) Broken or missing safety appliance.
(h) Lading leaking from a placarded hazardous material car.

2. Insecure coupling.

3. Overheated wheel or journal.

4. Broken or extensively cracked wheel.

5. Brake that fails to release.

6. Any other apparent safety hazard likely to cause an accident or casualty before the train arrives at its destination.

Information

There have been instances of pre-departure mechanical inspections being conducted improperly. FRA is particularly concerned about the practice of conducting pre-departure inspections pursuant to Appendix D of Part 215, while the equipment is moving (*i.e.*, a "roll by" inspection) or by conducting such inspections from locomotives on an adjacent track. While the regulations do not specify the physical actions necessary to conduct a proper inspection, FRA believes such inspections require that inspectors position themselves in such a manner that all required observations can be safely made.

Such observations cannot be safely or properly made while equipment is moving or when the inspector is positioned on a locomotive on an adjacent track. While some of the individual conditions may be observable while a train is moving, others are not, and a person cannot reasonably be expected to see all of them as a train is rolling by.

FRA inspectors should strongly consider issuing violations whenever they observe the above inspection practices being performed instead of a proper Appendix D inspection. In appropriate circumstances, the inspector may recommend assessment of a civil penalty for each car in a train that does not receive the proper pre-departure mechanical inspection. These violations should be treated as violations separate and distinct from, and in addition to, any substantive violation conditions found on individual cars. **(MP&E 98-58).**

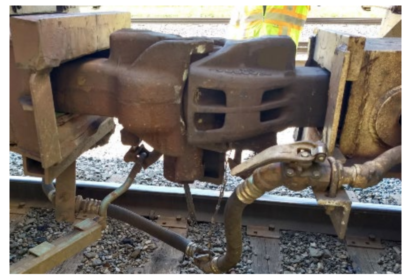
The regulations permit a car to operate to destination after properly completing an Appendix D inspection.

A person performing an Appendix D inspection cannot make the determination for movement under 49 CFR § 215.9. However, if a train crew member is listed as a designated inspector, he or she can make the determination for movement under 49 CFR § 215.9, but would be required to perform a full inspection for compliance with 49 CFR § 215.13, not an Appendix D inspection.

It is worth mentioning that the train crew members may not always possess the necessary expertise, experience, training and/or gages to identify defective conditions and determine the proper course of action. FRA reasonably expects the railroad's train crew members be fully capable to detect unsafe and abnormal car conditions during visual inspection of the train they are about to operate and, if in doubt, communicate and/or elevate the issues to appropriate railroad personnel or set the subject equipment out for further handling by the mechanical department.

Below are examples of such conditions:

Coupler Height, if not within required tolerances may lead to train separation and undesired emergency (UDE)

		
Height seems to be low	Height seems to be marginal	Height seems to be adequate

Bearing Adapters cracked or missing

	
Cracked Adapter	Missing Adapter

Wheel Defects

	
Tread Buildup	Slid Flat

Safety Appliance Defects

		
Ladder securement broken	Ladder Clearance	Handhold clearance

Box Car Door Defects

			
Boxcar doors insecure or missing			

Cross Key Retainer

Missing retainer

Chapter 5 - Blue Signal Protection of Workers, Part 218, Subpart B

Introduction

The minimum requirements for **Blue Signal Protection of Workers** are prescribed in 49 CFR Part 218, Subpart B.[2] An example of a blue signal sign is shown in **Figure 1**. This Subpart B requires railroads to take certain measures to protect their employees when engaged in inspection, testing, repair, and/or servicing of rolling equipment. It is designed to reduce the number of serious accidents resulting from human factors. A railroad may prescribe additional and/or more stringent requirements than those found in this Subpart.

On the following pages, you will find the sections of the regulation with information to aid the inspector in the performance of blue signal inspections.

Reports of blue signal inspections are to be made on the Inspection Report, F6180.96. Violations are to be submitted on Form F6180.67.

On some occasions, it may be necessary to devote a major portion of the inspection day to conducting blue signal observations; however, in most instances, inspectors should incorporate blue signal inspections with their routine inspection activities. For example, during a locomotive

[2] The information in this chapter is intended to help FRA inspectors understand and apply the requirements in 49 CFR Part 218, Subpart B, and it does not alter or expand any of those requirements.

inspection at a locomotive repair facility, observations of that facility's blue signal protection would be appropriate.

Before conducting any blue signal inspections, you will need knowledge of any permissible alternative methods of providing the required protection. For instance, using the above example, it is the railroad's option whether to use the procedures listed in 49 CFR § 218.27 or in 49 CFR § 218.29 to protect a locomotive servicing track area. Before entering a particular location, you must also be aware of any waivers of the regulations that may be applicable to that location.

Remember, it is the railroad's obligation to provide blue signal protection. Inspectors shall not order railroad personnel to stop working, nor should the inspector establish blue signal protection. It is the inspector's responsibility to monitor and determine whether blue signal protection is being applied correctly. If it is not being applied correctly, the inspector must take appropriate enforcement action to correct the situation. Noncompliance with blue signal regulations is serious and can lead to injury or death.

49 CFR Part 218

Subpart A – General

§ 218.1 Purpose.

This part prescribes minimum requirements for railroad operating rules and practices. Each railroad may prescribe additional or more stringent requirements in its operating rules, timetables, timetable special instructions, and other special instructions.

§ 218.3 Application.

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

(b) This part does not apply to -

> (1) A railroad that operates only on track inside an installation which is not part of the general railroad system of transportation, or
>
> (2) Rapid transit operations in an urban area that are not connected with the general railroad system of transportation.

Information

Blue signal regulations apply only to railroads that operate rolling equipment on standard gage track that is part of the general railroad system of transportation. It **does not** apply to a railroad that operates only on tracks inside an installation that is not part of the general railroad system, or a railroad that operates only on tracks used exclusively for urban rapid transit. However, if a

railroad employee is working on, under, or between rolling equipment on a track located inside an industry or plant served by a railroad, blue signal protection must be established.

§ 218.5 Definitions.

Absolute block means a block in which no train is permitted to enter while it is occupied by another train.

Blue signal means a clearly distinguishable blue flag or blue light by day and a blue light at night. When attached to the operating controls of a locomotive, it need not be lighted if the inside of the cab area of the locomotive is sufficiently lighted so as to make the blue signal clearly distinguishable.

Camp car means any on-track vehicle, including outfit, camp, or bunk cars or modular homes mounted on flat cars used to house rail employees. It does not include wreck trains.

Car shop repair track area means one or more tracks within an area in which the testing, servicing, repair, inspection, or rebuilding of railroad rolling equipment is under the exclusive control of mechanical department personnel.

Controlling locomotive means a locomotive arranged as having the only controls over all electrical, mechanical and pneumatic functions for one or more locomotives, including controls transmitted by radio signals if so equipped. It does not include two or more locomotives coupled in multiple which can be moved from more than one set of locomotive controls.

Designated crew member means an individual designated under the railroad's operating rules as the point of contact between a train or yard crew and a utility employee working with that crew.

Effective locking device when used in relation to a manually operated switch or a derail means one which is:

(1) Vandal resistant;
(2) Tamper resistant; and
(3) Capable of being locked and unlocked only by the class, craft, or group of employees for whom the protection is being provided.

Flagman's signals means a red flag by day and a white light at night, and fusees as prescribed in the railroad's operating rules.

Group of workers means two or more workers of the same or different crafts assigned to work together as a unit under a common authority and who are in communication with each other while the work is being done.

Interlocking limits means the tracks between the opposing home signals of an interlocking.

Locomotive means, except for purposes of subpart F of this part, a self-propelled unit of equipment designed for moving other railroad rolling equipment in revenue service including a self-propelled unit designed to carry freight or passenger traffic, or both, and may consist of one or more units operated from a single control.

Locomotive servicing track area means one or more tracks, within an area in which the testing, servicing, repair, inspection, or rebuilding of locomotives is under the exclusive control of mechanical department personnel.

Main track means a track, other than an auxiliary track, extending through yards or between stations, upon which trains are operated by timetable or train order or both, or the use of which is governed by a signal system.

Rolling equipment includes locomotives, railroad cars, and one or more locomotives coupled to one or more cars.

Switch providing access means a switch which if traversed by rolling equipment could permit that rolling equipment to couple to the equipment being protected.

Train or yard crew means one or more railroad employees assigned a controlling locomotive, under the charge and control of one crew member; called to perform service covered by Section 2 of the Hours of Service Act; involved with the train or yard movement of railroad rolling equipment they are to work with as an operating crew; reporting and working together as a unit that remains in close contact if more than one employee; and subject to the railroad operating rules and program of operational tests and inspections required in §§ 217.9 and 217.11 of this chapter.

Utility Employee means a railroad employee assigned to and functioning as a temporary member of a train or yard crew whose primary function is to assist the train or yard crew in the assembly, disassembly, or classification of rail cars, or operation of trains (subject to the conditions set forth in § 218.22).

Worker means any railroad employee assigned to inspect, test, repair, or service railroad rolling equipment, or their components, including brake systems. Members of train and yard crews are excluded except when assigned such work on railroad rolling equipment that is not part of the train or yard movement they have been called to operate (or been assigned to as "utility employees"). Utility employees assigned to and functioning as temporary members of a specific train or yard crew (subject to the conditions set forth in § 218.22 of this chapter), are excluded only when so assigned and functioning.

> Note: Servicing does not include supplying cabooses, locomotives, or passenger cars with items such as ice, drinking water, tools, sanitary supplies, stationery, or flagging equipment.

Testing does not include (i) visual observations made by an employee positioned on or alongside a caboose, locomotive, or passenger car; or (ii) marker inspections made in accordance with the provisions of § 221.16(b) of this chapter.

Information

Blue signal means a clearly distinguishable blue flag, blue sign, or blue light. The effectiveness of the blue signal is dependent upon the device being clearly distinguishable to the operator in control of the movement of rolling equipment; therefore, compliance must be evaluated with this in mind. A badly deteriorated blue signal or one that is covered with oil or dirt, shall not be considered compliant. A blue light with a weak battery, broken lens, and/or a blue signal which is obviously inadequate in size or intensity and cannot be clearly distinguishable, is not compliant with the requirements of the regulation. A blue signal used at night must be illuminated, unless an unlighted device is attached to the controls of a locomotive and the cab of the locomotive is adequately lighted as to make the blue signal **clearly distinguishable**. The law allows a blue light to be used by day, but the inspector should determine that it is **clearly distinguishable** by either its size or intensity. Inspectors should also consider the intensity of lights at night. If a floodlight washes out the effectiveness of a blue light, an exception should be taken. Small lights that are designed to be used in the cab of a locomotive should not be used in the gage of the track unless the intensity of the light makes it clearly distinguishable to the operator in control of rolling equipment.

Car shop repair track area means one or more tracks within an area in which the testing, servicing, repair, inspection, or rebuilding of railroad rolling equipment is under the exclusive control of the mechanical department personnel. It includes heavy repair tracks located within buildings, as well as tracks where total erecting or rebuilding of the rolling equipment occurs.

Controlling locomotive means the locomotive that is controlling from its cab the propulsion system, sanders, and power brake system of each locomotive that is pneumatically, electrically, and mechanically connected together in a consist. "*Electrically*" can be either by a jumper cable or by a radio signal. "*Mechanically*" means that the locomotive units are physically coupled together. "Pneumatically" means the appropriate air hoses that control the operation of the brakes are connected and cut in.

Effective locking device means a device that can be locked and unlocked only by the class, craft, or group of workers performing work on the rolling equipment. It must be of substantial construction or technically designed so that it is vandal-resistant and tamper-resistant. A rail clamp or switch point blocking device that cannot be locked does not comply with the requirements of this regulation. Train and yard crews should not be able to unlock switches or derails protecting workers, unless they are the group of workers performing work or tasks that require blue signal protection. If train or yard crews need to apply blue signal protection, a standard operating department switch lock will not satisfy the requirements of this regulation. An "other than standard" switch lock can be used, providing other train and yard crews cannot unlock it. A remotely controlled switch must have a plug, key, or cover properly applied to the control panel which immobilizes the switch control lever that is being secured to establish protection. It must be applied in such a manner that the control lever cannot be thrown for the

route into the protected track without first removing the device. A written tag alone, attached to the button or lever, does not comply. Any remotely controlled switch that can be overridden in the field by use of a manual lever, without establishing prior authority and taking that switch out of power, must be treated as a manual switch and effectively locked in the field. Inspectors should physically examine and test the locking device to ensure the lock functions as intended.
Group of workers means two or more workers from the same or different crafts that are assigned to work together as unit or group under a common authority (such as a lead man, roundhouse foreman, or car shop foreman) and all members of the group are in some form of communication with each other while the work is being performed.

Locomotive means a self-propelled, on-track piece of equipment designed for moving revenue freight and/or passenger cars over the railroad. It may be a traditional locomotive powered by electricity, diesel-electric, turbine, or steam. It could also be in the form of a self-propelled hi-rail vehicle used in revenue service. Based upon the definition as written for this regulation, an MU (multiple-unit) car would be a locomotive, but a cab car of a suburban push-pull passenger train operation would not, unless a locomotive were attached to it and the controls of the control car/cab car were cut in. Blue signal protection for remote-controlled locomotives is handled in the same manner as a traditional locomotive.

What is required to establish blue signal protection for remote controlled locomotives?

Place the locomotive into manual operation and establish blue signal protection as if it were a regular locomotive.

Locomotive servicing track area means one or more tracks within an area that is under the exclusive control of mechanical department personnel. It includes tracks known as the "back shops" and tracks within the area that are located inside of buildings where major overhauling or rebuilding of locomotives occurs. Access to, from, and within the protected area would have to come from the mechanical department personnel in charge of that area.

Main track has been used in railroad operating rule books for many years and should have a common meaning throughout the industry to the extent that there should be no mistaking it from tracks commonly known by such other defined terms as "yard tracks" or "siding" in judging compliance with this Subpart. The fact that movement authority on a track is Rule 93, "Yard limits," has no bearing. Therefore, any track that does not meet the definition of a main track is other-than-main track.

Rolling equipment refers to locomotives or railroad cars, or any combination of such. It is not meant to include, for the purposes of this Subpart, maintenance-of-way on-track equipment that is protected by other means. Also, derailment situations do not require blue signal protection.

Switch providing access: When protected equipment is standing on an entrance switch so as to prevent other equipment from entering the track through that switch, it ceases to be an access switch. However, once the switch becomes exposed so as to permit other equipment to enter the protected track and couple to the protected cars, it becomes a switch providing access.

Train or yard crew: Train or yard crew members are permitted to work on, under, or between any railroad rolling equipment they are called to operate, without establishing blue signal protection. **Note:** The train and yard crew exclusion applies only to the equipment they are called to operate, and traditional train & engine work (switching, classification, and assembly/disassembly of trains). They cannot assist another crew, ***unless*** blue signal protection is established (if the task warrants blue signal protection) ***or*** the entire crew (including the locomotive) is involved assisting another crew, provided that both crews are in communication with each other and are aware of the movements to be made.

Can a train crewmember perform a mechanical repair (change a brake shoe or air hose) without establishing blue signal protection?

Yes, if the repair is a task that has traditionally been performed by train or yard crews on the equipment the crew member is called to operate, and the repair is being made under the emergency provisions outlined in 49 CFR § 218.25 - *Workers on a Main Track*.

Can members of one crew assist another crew, such as making a coupling at a road crossing, replacing or changing EOT batteries, or changing a brake hose without establishing blue signal protection?

Yes; however, it would have to involve the entire crew, including using the locomotive, to handle the equipment and assist the other crew. If only a portion of one crew assists the other crew, then blue signal protection must be established.

Utility Employee (UE) is not restricted to any particular class, craft or job title. The UE may be any qualified railroad employee, provided all the prerequisites contained in 49 CFR § 218.22(a) are met.

Worker means any railroad employee assigned to inspect, test, repair, or service railroad rolling equipment and their components, including brake systems. Train and yard crews are excluded, except when assigned to perform such work on railroad rolling equipment that is not part of the train or yard movement they have been called to operate (or been assigned to as Utility Employees). The train and yard crewmember exclusion is based on the rationale that the crew members working together as an operating crew, with their assigned locomotive engineer at the controls of the locomotive, would have complete control over the movement of any rolling equipment on which they are working.

Railroad security forces or clerical personnel who board railroad cars for the purpose of checking lading for pilferage or vandalism, or store house employees loading or unloading cars (even when using a forklift) are not considered to be *workers* as defined in this Part because they are not assigned to inspect, test, repair, or service the railroad rolling equipment. Therefore, blue signal protection is not required under the regulation. Fueling and sanding locomotives would not require blue signal protection, provided the tasks do not require the individual to go on, under, or between the locomotive, or subject the person to the danger of personal injury.

Servicing, as noted in the footnote under this definition (49 CFR § 218.5), does not include supplying cabooses, locomotives, or passenger cars with such items as ice, drinking water, tools, sanitary supplies, stationery, or flagging equipment.

Testing does not include visual observations made by an employee positioned inside or alongside a caboose, locomotive, or passenger car. A worker involved in these specific work activities is not deemed to be in a hazardous position should the equipment inadvertently move.

Subpart B – Blue Signal Protection of Workers.

§ 218.21 Scope.

This Subpart prescribes minimum requirements for the protection of railroad employees engaged in the inspection, testing, repair, and servicing of rolling equipment whose activities require them to work on, under, or between such equipment and subjects them to the danger of personal injury posed by any movement of such equipment.

Information

Initially, the rationale in developing the language of this section was that these general work categories (inspecting, testing, repair, and servicing) usually require an employee to go on, under, or between rolling equipment. In doing so, the employee would be in close proximity to the equipment, where he or she would be vulnerable to the possibility of a serious personal injury if an unexpected movement of the equipment were to occur. However, in identifying those general work activities and positions in relation to railroad rolling equipment in such broad terms, it was inevitable that they would encompass several specific jobs which do not expose the worker to personal injury. FRA realized the predicament, and revised the language in 1979 by inserting the word “and” in the regulatory language -

“...**and** subjects them to the danger of personal injury...”

Therefore, it is not solely the work being done (inspecting, testing, repairing, or servicing) and where the employee is positioned in relation to the equipment (on, under, or between), but also whether this causes the person to be placed in a potentially hazardous position.

Generally, non-hazardous work will be combined with work that is hazardous, and blue signal protection is often required. However, there may be times when certain non-hazardous work can be isolated in such a manner that blue signal protection would not be required. For example, equipment inspections that can be made by an employee from a position on the ground alongside the equipment do not represent a hazardous situation. Seated at the controlling locomotive and manipulating the air brake handles or throttle or setting the MU valve on the control stand does not represent a hazardous situation. Testing of an air brake system, when purely visual in nature and requiring an employee to observe the position of air brake piston only while standing on the ground beside the cars, is another example of a non-hazardous situation that would not require blue signal protection. If the employee must go under the equipment to observe the piston travel, as with many truck-mounted brake systems, blue signal protection is often required. A Part 215 pre-departure inspection would require blue signal protection, because the individual making the inspection would have to go under and between the equipment to properly conduct the inspection. A train crew making an Appendix D inspection would not have to establish blue signal protection **if** it is the equipment they are called to operate, and the crew is in complete control of the equipment.

When conducting a purely visual inspection of a locomotive, providing the employee is not subjected to serious injury by going under the locomotive, stepping into the engine compartment, or going onto the roof of the locomotive, the employee would not be in a hazardous situation. For example, gaging wheels would require blue signal protection because the individual would be under the equipment in a manner that they may sustain an injury should the equipment inadvertently move. An employee could open engine compartment doors and look inside to inspect for oil or water leaks, exhaust leaks, check the cooling water sight glass, and check engine oil providing the employee does not physically step inside the engine compartment and does not do anything beyond visual checks—all without establishing blue signal protection. If the locomotive engineer is conducting the inspection on locomotives he or she is called to operate, no blue signal protection is required.

Certain servicing activities can be carried out without exposure to danger. Examples of such activities would include, but not be limited to:

- Bleeding of the air brake system on cars, oiling journal boxes, fueling locomotives, and cleaning passenger coach interiors and exteriors not requiring the use of ladders.
- Evacuating and recharging passenger car soil holding tanks.
- Supplying passenger cars with water or supplying locomotives with water and fuel by attaching a hose to an exterior outlet.
- Changing radios and HTDs on locomotives that use quick disconnect fittings.
- Instances where sanding a locomotive can be accomplished by attaching the sanding hose to a side filler cap without physically going on the locomotive.

Similarly, certain supplying activities such as supplying locomotives and cabooses with ice, water, fuzees, stationery, and paper towels can be carried out without exposure to danger. These and similar activities, when effectively confined to the specific non-hazardous work function, do not require blue signal protection.

There are certain activities that call for the display of blue signals. Examples of such activities (when performed other than by train or yard crew members) are:

- Breaking or making air hose connections.
- Connecting or disconnecting electric control cables between equipment.
- Installing/removing/servicing/repairing rear-end devices (markers and telemetry units).
- Any air brake test requiring an employee to go under or between rolling equipment.
- Replacing broken windows.
- Changing brake shoes, knuckles, or air hoses.
- Activities that require the use of a ladder.

- Performing electrical repairs that involve work partially or wholly within the confines of an electrical cabinet.
- Inspecting the undercarriage from a pit.
- Repairing and closing doors on a car.

All these and certain other activities cause the workers to position themselves in such a way that they are vulnerable to serious personal injury if unexpected movement of the equipment occurs. It is the function or nature of the work being performed that determines the protective provisions of the rule, **not** the class, craft, group, or title of the employee.

The blue signal regulation **does not** apply to derailment situations. Ensuring protection for workers involved in such operations is the responsibility of the individual railroad in accordance with its own operating rules. Such operations are usually well coordinated, controlled operations under the direction of a wreck master, and/or transportation supervisor at the scene. Requiring blue signals under these circumstances would unreasonably hamper re-railing operations. Unlike routine operations, all personnel involved in this type of work are aware of the special conditions that exist and are familiar with the necessary precautions to take when equipment moves take place.

Mechanized track maintenance operations **do not** require blue signal protection, as these operations are addressed by railroad operating rules and other regulations. Under railroad operating rules, flags of another color have been designated for this purpose, and those rules specify the exact manner in which they are to be displayed to provide protection for such operations.

Taking a track "out of service" **does not** provide relief from this regulation. Blue signal protection would have to be established on out-of-service tracks if the work being performed requires it.

§ 218.22 Utility Employee.

(a) A utility employee shall be subject to the Hours of Service Act, and the requirements for training and testing, control of alcohol and drug use, and hours of service record keeping provided for in parts 217, 219, and 228 of this chapter.

(b) A utility employee shall perform service as a member of only one train or yard crew at any given time. Service with more than one crew may be sequential, but not concurrent.

(c) A utility employee may be assigned to and serve as a member of a train or yard crew without the protection otherwise required by subpart B of part 218 of this chapter only under the following conditions:

> (1) The train or yard crew is assigned a controlling locomotive that is under the actual control of the assigned locomotive engineer of that crew;

(2) The locomotive engineer is in the cab of the controlling locomotive, or, while the locomotive is stationary be replaced in the cab by another member of the same crew;

(3) The utility employee established communication with the crew by contacting the designated crew member on arriving at the train (as defined for the purpose of this section as one or more locomotives coupled, with or without cars) and before commencing any duties with the crew.

(4) Before each utility employee commences duties, the designated crew member shall provide notice to each crew member of the presence and identity of the utility employee. Once all crew members have acknowledged this notice, the designated crew member shall advise the utility employee that he or she is authorized to work as part of the crew. Thereafter, communication shall be maintained in such a manner that each member of the train or yard crew understands the duties to be performed and whether those duties will cause any crew member to go on, under, or between the rolling equipment; and

(5) The utility employee is performing one or more of the following functions: Set or release hand brakes; couple or uncouple air hoses and other electrical or mechanical connections; prepare rail cars for coupling; set wheel blocks or wheel chains; conduct air brake test to include cutting air brake components in or out and position retaining valves; inspect, test, install, remove or replace a rear end marking device or end of train device; or change batteries on the rear end marking device or the end of train device. Under all other circumstances a utility employee working on, under, or between railroad rolling equipment must be provided with blue signal protection in accordance with §§ 218.23 through 218.30 of this part.

(d) When the utility employee has ceased all work in connection with that train and is no longer on, under, or between the equipment, the utility employee shall notify the designated crew member. The designated crew member shall then provide notice to each crew member that the utility employee is being released from the crew. Once each crew member has acknowledged the notice, the designated crew member shall then notify the utility employee that he is released from the train or yard crew.

(e) Communications required by § 218.22(c)(4) and (d) shall be conducted between the utility employee and the designated crew member. This communication shall be conducted either through direct verbal contact, by radio in compliance with part 220 of this chapter, or by oral telecommunication of equivalent integrity.

(f) No more than three (3) utility employees may be attached to one train or yard crew at any given time.

(g) Any railroad employee who is not assigned to a train or yard crew or authorized to work with a crew under the conditions set forth by paragraph (b) of this section, **is a worker** required to be provided blue signal protection in accordance with §§ 218.23 through 218.30 of this part.

(h) Nothing in this section shall affect the alternative form of protection specified in § 221.16 of this chapter with respect to inspection of rear end marking devices.

Information

Train and yard crews are excluded from the requirements of blue signal protection when doing traditional train and engine work on the train or yard movement they have been called to operate. When an individual is working as a utility employee (UE), he or she is working as a temporary member of a specific train or yard crew. This allows the UE to be excluded from the blue signal protection requirements in the same manner as the rest of the crew when performing the tasks listed in 49 CFR § 218.22(c)(5). Under all other circumstances, a UE working on, under, or between rolling equipment must be provided with blue signal protection. (Refer to Appendix C - FRA Technical Bulletin MP&E #21-02; August 20, 2021)

As defined in 49 CFR § 218.5, the UE is not restricted to any particular craft or job title. The UE may be any qualified railroad employee, provided that the prerequisites contained in 49 CFR § 218.22(a) are met, namely that the UE is subject to: (1) the railroad's operating rules and testing program, (2) the Hours-of-Service laws, and (3) Federal drug and alcohol regulations. If the UE is a mechanical department employee (carman, machinist, etc.), an abbreviated version of the instructions for operating rules can be given to satisfy the requirements of Part 217.

The regulation limits the assignment of the UE to only one crew at a time. This is necessary to prevent confusion as to the location and duties of that employee, and to ensure that the employee is, in fact, a member of the crew to which he or she is assigned for the duration of the assignment.

A train or yard crew member cannot become a UE and work with another train or yard crew, unless the train or yard crew he or she originally started with has completed its tour of duty or has been reconstituted as a new assignment.

When conducting inspections for compliance regarding the use of UEs, the inspector should monitor the following:

Communication between the UEs and ranking crew member. UEs and crew members must follow the required operating procedures when attaching to and/or detaching from the crew. Was the communication made face-to-face, by radio, telephone, or by some other form of communication?

Presence of locomotive engineer or other crew member in the control compartment or at the controls of the controlling locomotive when the UE performs duties on the rolling equipment assigned to that train or yard crew.

Nature of the work performed by the UE. Ensure the employee does not perform duties other than those functions listed in the regulation under § 218.22(c)(5). These restrictions apply to ALL crew members, as well as attached UEs.

No more than three (3) UEs can be assigned to a train or yard crew at the same time.

UEs are not assigned to or working with more than one train or yard crew at a time.

Inspection of the UEs Hours of Service and operating rules training records.

An attached UE must be working with their crew in the traditional manner of train and engine work, remaining in the vicinity and in close contact, and working together as a cohesive group with a common task. In the event **any member of the crew** becomes engaged in diverse tasks, separate and apart from traditional train and engine work, that crew member cannot be considered “attached” and must be provided blue signal protection.

§ 218.23 Blue signal display.

(a) Blue signals displayed in accordance with § 218.25, 218.27, or 218.29 signify that workers are on, under, or between rolling equipment. When so displayed -

(1) The equipment may not be coupled to;

(2) The equipment may not be moved, except as provided for in § 218.29;

(3) Other rolling equipment may not be placed on the same track so as to reduce or block the view of a blue signal, except as provided for in § 218.29 (a), (b), and (c); and

(4) Rolling equipment may not pass a displayed blue signal.

(b) Blue signals must be displayed in accordance with § 218.25, 218.27, or 218.29 by each craft or group of workers prior to their going on, under, or between rolling equipment and may only be removed by the same craft or group that displayed them.

Information

The regulation states that blue signals may only be removed by the same craft or group that displayed them. It need not be the same individual, just the same craft or group. If a particular worker is not a part of a group, as indicated by the definition of “group of workers” in 49 CFR § 218.5, then the individual would have to display his or her own blue signal. If a railroad chooses to adopt the policy of having different crafts or groups attach an individual disc to a common blue signal and having the last worker remove his or her disc also remove the common blue signal, that practice would comply with the regulation.

Can a supervisor remove a blue signal if the worker forgot to remove the blue signal and has gone home?

Yes. A supervisor can remove a blue signal displayed, but ONLY if it is **known** that workers are not on, under, or between rolling equipment and are clear of the protected equipment, and ONLY if he or she is the supervisor of the same craft or group of workers.

The use of blue signals and derails by industries served by railroads as called for under Department of Labor, Occupational Safety and Health Administration (OSHA), and hazardous materials regulations for the protection of industry employees involved in the loading and unloading of railroad cars, **is not part of** Subpart B - Blue Signal Protection of Workers. However, once a blue signal is displayed on tracks or on rolling equipment, regardless under whose authority that signal is displayed, railroad employees must respect the signal as though it was displayed in accordance with the requirements of this regulation. Blue signals displayed by industry employees must not be removed by railroad employees. Also, when a railroad employee is working on, under, or between rolling equipment inside an industry or plant served by a railroad, blue signal protection must be established.

A blue signal displayed at or near a manually operated switch providing access to the track must be displayed no farther into the track than the fouling (clearance point) of that entrance switch so that there can be no doubt as to which switch the blue signal applies. Once the blue signal is properly displayed, there can be **NO** movement of the equipment, except as provided for in 49 CFR § 218.29.

§ 218.24 One-person Crew

STAYED

Information

Per 49 CFR § 218.24, the one-person crew provision, was suspended effective May 15, 1995. Railroads are not required to comply with any part of this section. During the stay, until a revised rule is issued, FRA's policy regarding single person crews (i.e., locomotive engineer working alone, such as in hostler or in helper service) remains as follows:

While working on, under, or between equipment they are called to operate, no blue signal protection is required for single-person crews. However, if a single person remote control operation (RCO) crew does not have the operator's control box (OCB) in his or her possession when going on, under, or between equipment, or if for any other reason he or she no longer has control of the equipment he or she was called to operate per the definition of a "train or yard crew" member at 49 CFR § 218.5, blue signal protection would be required for the single person crew.

§ 218.25 Workers on a main track.

When workers are on, under, or between rolling equipment on a main track:

(a) A blue signal must be displayed at each end of the rolling equipment; and

(b) If the rolling equipment to be protected includes one or more locomotives, a blue signal must be attached to the controlling locomotive at a location where it is readily visible to the engineer or operator at the controls of that locomotive.

(c) When emergency repair work is to be done on, under, or between a locomotive or one or more cars coupled to a locomotive, and blue signals are not available, the engineer or operator must be notified and effective measures must be taken to protect the workers making the repairs.

Information

The important thing to realize when observing blue signal protection on a main track is that the regulation does not require lined and locked switches, or the application of derails. However, blue signals must be displayed at **each end** of the rolling equipment to be protected. *Ends of the equipment* refers to placement of a blue flag or blue light in the knuckle or on the coupler of the car or locomotive. The inspector should check to see if this has been done with an appropriate blue signal. (*See* “blue signal” definition in 49 CFR § 218.5.) The blue signal displayed at each end of the rolling equipment may be attached to the ends of the equipment, or it may be displayed on the track ahead and behind the equipment in such a manner that there is no doubt about the track and/or equipment to which it applies. If one or more locomotives are among the protected equipment, then a blue signal must **also** be attached to the controlling locomotive at a location where it is readily visible to someone seated at the controls of that locomotive. The inspector should evaluate how visible and obvious the blue signal is to someone seated at the controls of the locomotive. This requirement is in addition to the blue signals displayed at each end of the equipment. The signal should be placed so that the operator does not have to look for it. A clamp hanging from the windowsill with the blue signal positioned low on the car body of the locomotive would not comply. In other words, the signal must be immediately visible to the operator without any effort on his part. The absence of a blue signal at any one of the required locations (ahead, behind, and/or on the controlling locomotive) means that the equipment is unprotected, and other than the assigned train crew, employees may not work on, under, or between that equipment.

Remotely controlled switches cannot be used to fulfill the requirements of 49 CFR § 218.25(a)-(b) to provide protection on “main track”, as 49 CFR § 218.30 “Remotely controlled switches” references only 49 CFR § 218.27 “Workers on track other than main track.” While it is permissible for remotely controlled switches to be lined and locked against movement to the main track by a control operator or dispatcher in order to provide additional protection during a situation requiring blue signal protection on a main track, such action does not fulfill the requirements of 49 CFR § 218.25.

Normally, there are very few locations that routinely perform work requiring blue signal protection on a main track. An exception to this is when a railroad maintains a fuel and servicing facility on a main line for through trains. At a location such as this, first determine if any work is being done that requires blue signal protection. Remember that there are certain exceptions to what constitutes servicing and testing, and fueling is considered one of these exceptions. A fuel hose stretched over a track does not require blue signal protection.

The emergency provisions were intended to allow railroads flexibility when a train is stopped on the **main track** under emergency circumstances. Under these conditions, the provision can be used when blue signals are not available, provided that the train and engine crew have full control over train movement. The provisions were not intended to be used for convenience or simply because the carrier neglected to maintain a sufficient supply of blue signals for normal use by the mechanical personnel. The "emergency" provision provides an alternative means of providing protection for workers whenever a train is stopped under emergency circumstances en-route and blue signals are not available. This provision does not apply to a train that has any portion of its consist in a yard, unless there are no mechanical department employees working in the yard and there are no blue signals available. Any railroad employee not part of the crew or assigned to work with the crew as a UE must provide/establish their own blue signal protection.

When "emergency" repair work is to be done on, under, or between a locomotive and/or one or more cars coupled to a locomotive, and blue signals are not available, the locomotive engineer or an operator at the controls of the controlling locomotive must be notified, and effective measures must be taken to protect the workers making the repairs. The emergency must occur when the train movement is being controlled by the assigned train crew. A mechanical department employee assigned to accompany a train between terminals to monitor the performance of the equipment or accompany a dimensional load can use the emergency provision provided a train crew member is at the controls of the locomotive.

§ 218.27 Workers on track other than main track.

When workers are on, under, or between rolling equipment on track other than main track -

(a) A blue signal must be displayed at or near each manually operated switch providing access to that track;

(b) Each manually operated switch providing access to the track on which the equipment is located must be lined against movement to that track and locked with an effective locking device; and

(c) The person in charge of the workers[3] must have notified the operator of any remotely controlled switch that work is to be performed and have been informed by the operator that each remotely controlled switch providing access to the track on which the equipment is located has been lined against movement to that track and locked as prescribed in § 218.30.

[3] *See* FRA's letter of clarification to CSX Transportation at Willard Yard, Ohio, dated May 18, 2009, at the end of this chapter.

(d) If rolling equipment requiring blue signal protection as provided for in this section is on a track equipped with one or more crossovers, both switches of each crossover must be lined against movement through the crossover toward that rolling equipment, and the switch of each crossover that provides access to the rolling equipment must be protected in accordance with the provisions of paragraphs (a) and (b), or (c) of this section.

(e) If the rolling equipment to be protected includes one or more locomotives, a blue signal must be attached to the controlling locomotive at a location where it is readily visible to the engineer or operator seated at the controls of that locomotive.

Information

This is the type of blue signal protection used in train yards and sidings. It can also be used in a locomotive service track area or car shop repair area.

An appropriate blue signal (*See* "blue signal" definition in 49 CFR § 218.5) displayed at or near a manually operated switch providing access to the track must be displayed no farther into the track than the fouling point (clearance point) of that entrance switch. If a car or locomotive is positioned almost to the fouling point of the entrance switch, the blue signal display can be attached to the ends of the rolling equipment. Either way, the blue signal must be displayed in such a manner that there is no doubt about the track and/or equipment to which it applies. However, if a derail is used, the blue signal must be displayed at each derail. *See* 49 CFR § 218.29(c). The absence of a blue signal at any of the manually operated switches providing access to a track renders the track unprotected and workers cannot work on, under, or between equipment on that track. The absence of the blue signal at a derail also renders the track unprotected. Similarly, any unlocked derail, or manual or remotely controlled switch providing access to the track on which equipment is standing means that the equipment on the track is unprotected and workers cannot work on, under, or between that equipment.

May rolling equipment enter or depart from a protected track?

Yes, however only after all work activity has ceased, the workers have been notified to stand clear, and the blue signal protection has been removed from the switch through which the equipment will move. When using a derail locked in the derailing position with the proper blue signal displayed at the derail, the protected track is the area between the locked derails. Therefore, other rolling equipment may enter and depart from that track but **cannot** enter or depart the protected area of the track. Once blue signal protection is established, there can be **no** movement of rolling equipment within the protected area. In a situation involving a worker working a train under blue signal protection, road power could be added to the train by removing the blue signal on the head end only, thereby eliminating the need to walk to the rear. Similarly, this same worker can allow a train to depart after he removes the blue signal from the head end of the train. In both instances, work must stop while the blue signal has been removed. After the train has departed from the track, the remaining blue signal protection must be immediately removed.

When a crossover switch leads into the track on which protected equipment is standing, the switches at both ends of the crossover must be lined against entry into the protected track. The switch at the end of that crossover which connects directly to the protected track must be locked, and a blue signal must be displayed at that locked switch. However, if protected equipment is standing on the switch of such a crossover so as to block other equipment moves from entering the protected track through that crossover, the switch need not be locked, or blue signal displayed.

When workers are engaged in work on a train with the rear portion standing on other-than-main track, and the head-end portion is on a main track, the rear portion must be protected in accordance with 49 CFR § 218.27, "Workers on track other than main track," while the head-end would be protected by a blue signal ahead of the locomotive and one attached to the controlling locomotive in accordance with 49 CFR § 218.25, *Workers on main track*.

If one or more locomotives are among the protected equipment, then a blue signal must be displayed on the controlling locomotive at a location where it is readily visible to someone seated at the controls of that locomotive. The inspector should evaluate how visible and obvious the blue signal is to someone seated at the controls of the locomotive. The signal should be placed so that the operator does not have to look for it. A clamp hanging from the windowsill with the blue signal positioned low on the car body of the locomotive would not comply. In other words, the signal must be immediately visible to the operator without any effort on his part. The absence of a blue signal at any one of the required locations means that the equipment is unprotected, and workers may not work on, under, or between that equipment.

If there is a single locomotive on one end of a yard track and a locomotive consist (with or without cars) is located on the other end of the same yard track and workers are replacing a brake shoe on the single locomotive, but no work is being performed on the other consist, the controlling locomotive of the consist and the single locomotive would both have to be blue flagged.

§ 218.29 Alternate methods of protection.

Instead of providing blue signal protection for workers in accordance with § 218.27, the following methods for blue signal protection may be used:

(a) When workers are on, under, or between rolling equipment in a locomotive servicing track area:

> (1) A blue signal must be displayed at or near each switch providing entrance to or departure from the area;
>
> (2) Each switch providing entrance to or departure from the area must be lined against movement to the area and locked with an effective locking device; and
>
> (3) A blue signal must be attached to each controlling locomotive at a location where it is readily visible to the engineman or operator at the controls of that locomotive;

(4) If the speed within this area is restricted to not more than 5 miles per hour a derail, capable of restricting access to that portion of a track within the area on which the rolling equipment is located, will fulfill the requirements of a manually operated switch in compliance with paragraph (a)(2) of this section when positioned at least 50 feet from the end of the equipment to be protected by the blue signal, when locked in a derailing position with an effective locking device, and when a blue signal is displayed at the derail;

(5) A locomotive may be moved onto a locomotive servicing area track after the blue signal has been removed from the entrance switch to the area. However, the locomotive must be stopped short of coupling to another locomotive;

(6) A locomotive may be moved off of a locomotive servicing area track after the blue signal has been removed from the controlling locomotive to be moved and from the area departure switch;

(7) If operated by an authorized employee under the direction of the person in charge of the workers,[4] a locomotive protected by blue signals may be repositioned within this area after the blue signal has been removed from the locomotive to be repositioned and the workers on the affected track have been notified of the movement; and

(8) Blue signal protection removed for the movement of locomotives as provided in paragraphs (a) (5) and (6) of this section must be restored immediately after the locomotive has cleared the switch.

(b) When workers are on, under, or between rolling equipment in a car shop repair track area:

(1) A blue signal must be displayed at or near each switch providing entrance to or departure from the area; and

(2) Each switch providing entrance to or departure from the area must be lined against movement to the area and locked with an effective locking device;

(3) If the speed within this area is restricted to not more than 5 miles per hour, a derail capable of restricting access to that portion of a track within the area on which the rolling equipment is located will fulfill the requirements of a manually operated switch in compliance with paragraph (a)(2) of this section when positioned at least 50 feet from the end of the equipment to be protected by the blue signal, when locked in a derailing position with an effective locking device and when a blue signal is displayed at the derail;

(4) If operated by an authorized employee under the direction of the person in charge of the workmen, a car mover may be used to reposition rolling equipment within this area after workers on the affected track have been notified of the movement.

[4] *See* FRA's letter of clarification, dated May 18, 2009, at the end of this chapter.

(c) Except as provided in paragraphs (a) and (b) of this section, when workers are on, under, or between rolling equipment on any track, other than a main track:

> (1) A derail capable of restricting access to that portion of the track on which such equipment is located, will fulfill the requirements of a manually operated switch when positioned no less than 150 feet from the end of such equipment; and
>
> (2) Each derail must be locked in a derailing position with an effective locking device and a blue signal must be displayed at each derail.

(d) When emergency repair work is to be done on, under, or between a locomotive or one or more cars coupled to a locomotive, and blue signals are not available, the engineman or operator at the controls of that locomotive must be notified and effective measures must be taken to protect the workers making the repairs.

Information

This section provides a railroad with an alternate method of establishing blue signal protection for equipment occupying tracks in locomotive servicing areas and car shop repair track areas. At these locations, a railroad may establish blue signal protection in accordance with either 49 CFR § 218.27, "Workers on track other than main track," or in accordance with this section. The inspector must know whether 49 CFR § 218.27 or 49 CFR § 218.29 is being used before taking any kind of enforcement action.

Basically, 49 CFR § 218.27 requires blue signal protection be established for each individual track, while 49 CFR § 218.29 permits blue signal protection to be established for the area as a whole. It provides greater flexibility for movement of equipment within, as well as to and from, the area. This section also authorizes use of locked derails to fulfill the requirements of a manually operated switch on any track, other than a main track, when placed at a minimum distance of 150 feet from the end of the protected equipment. If speed is restricted to less than 5 mph, then this distance may be **reduced** to no less than 50 feet when used in locomotive servicing and car shop repair track areas, per 49 CFR § 218.29(a) and (b). The 5-mph restriction may be conveyed by a physical sign or by a written bulletin or timetable instruction. If a derail is used, it must be locked in a derailing position with an effective locking device, and a blue signal must be displayed at the derail.

Blue signals must be attached to the controlling locomotive whenever workers are on, under, or between that locomotive or any rolling equipment attached to that locomotive.

A locomotive not blue flagged within the area can be moved without removing blue signals displayed at the entrance switches provided:

1. The locomotive does not impact or couple to a locomotive on which a blue signal is displayed.
2. The locomotive is operated by an authorized employee under the direction of the person in charge of the workers.

3. The workers on the affected track(s) where the movement will take place have been notified of the movement.

When locomotives are moved into and out of the locomotive servicing area, the workers **do not** have to stop work on locomotives that have a blue signal properly displayed. The blue signal protection must be immediately restored after any movement into or out of the servicing area.

When inspecting for the adequacy of the blue signal protection in a locomotive servicing or car repair track area, first determine if workers are on, under, or between rolling equipment. Then determine if protection provided at each switch providing a means of entrance into the area is proper. Are the blue signals properly displayed? Physically test any locks, manual switches, and derails to ensure that they are secure. Next, observe the operations inside the area for compliance.

Keep in mind when using the alternate method in locomotive servicing areas, every locomotive that has a worker working on, under, or between requires a blue signal attached to each controlling locomotive where it is readily visible to the operator at the controls of that locomotive. This means that if the locomotive is by itself (not coupled to another locomotive) it must have a blue signal displayed at its controls. If, in another example, the locomotive being worked on was coupled to three other locomotives, then one of the following applies:

1. If the four locomotives were pneumatically, electrically, and mechanically coupled together so that all four respond to the controls of only one locomotive (the lead unit), then only the controlling (lead) unit requires a blue signal displayed at the controls.
2. If the four locomotives are coupled together but control cables and/or MU hoses are not connected so that all of the locomotives respond to one controlling locomotive, then all four locomotives would require a blue signal displayed at their controls.
3. If the four locomotives are coupled together with the intent to make them a four-unit consist controlled from one locomotive, FRA has determined that the brake hoses and jumper cables could be connected after the automatic brake valve is cut out and the MU valves are placed in the trail position on three of the locomotives, and the controlling locomotive (automatic brake valve cut in) has a blue signal displayed at the controls.

   Note: Unless the automatic brake valve is cut out and the MU valve is placed in the trail position, a blue signal has to be attached to all locomotives that are capable of being used as a controlling unit before the locomotive controls cables and MU cables are connected.

Additionally, an employee cutting the automatic brake valve in or out and setting the MU valve is not considered a worker on the equipment.

Remember, this provision has been made in the regulation for using alternate methods to reposition rolling equipment within the area. However, this may only be done when all conditions of the regulation are met.

§ 218.30 Remotely controlled switches.

(a) After the operator of the remotely controlled switches has received the notification required by § 218.27(c), he must line each remotely controlled switch against movement to that track and apply an effective locking device to the lever, button, or other device controlling the switch before he may inform the employee in charge of the workers that protection has been provided.

(b) The operator may not remove the locking device unless he has been informed by the person in charge of the workers[5] that it is safe to do so.

(c) The operator must maintain for 15 days a written record of each notification which contains the following information:

(1) The name and craft of the employee in charge who provided the notification;

(2) The number or other designation of the track involved;

(3) The date and time the operator notified the employee in charge that protection had been provided in accordance with paragraph (a) of this section; and

(4) The date and time the operator was informed that the work had been completed, and the name and craft of the employee in charge who provided this information.

Information

The operator referred to in this section is the employee who has been delegated the responsibility for the proper and safe operation of the control board.

When the term *effective locking device* is used in reference to a remotely controlled switch, it need not be a padlock, but may be a plug or key that, when properly inserted into the control panel of the installation, serves to immobilize the switch control lever being used to establish protection. The device must be applied in such a manner that the control lever cannot be thrown for the route into the protected track without first removing the locking device. Whatever type locking device is utilized to immobilize the switch lever or button, it must effectively prevent it from being moved. A written tag alone, attached to the lever or button, that does not prevent the lever or button from being manipulated, would not comply. Any remotely controlled switch that can be overridden in the field by use of a manual lever without obtaining prior authority and taking that switch out of power would have to be treated as a manual switch and be locked in the field.

Occasionally, a track on which blue signal protection is to be applied will have one or more switches that provide access to that track remotely controlled. If this is the case, certain measures must be taken by the carrier to ensure adequate protection. When you find a location like this, check where these switches are being controlled.

[5] *See* FRA's letter of clarification, dated May 18, 2009, at the end of this chapter.

An inspection should be made of the written records the railroad is required to maintain. The written records should be inspected for their completeness as to: (1) the date and time the operator received notification of the work to be performed (Note: Item (1) is not a regulatory requirement. It is a suggestion as a good practice); (2) the name and craft of the employee in charge who provided the notification; (3) the number or other designation of the track involved; (4) the date and time the operator notified the employee in charge that protection has been provided in accordance with paragraph (a) of this section; and (5) the date and time the operator was informed that the work had been completed, and the name and craft of the employee in charge who provided this information. Such written records should be made at once and never from memory or memoranda.

Check if effective locking devices are being applied to remotely controlled switches. Traditionally, levers, buttons, and similar devices have been used to control these switches. Mechanical locking devices, e.g., pins, clamps, sleeves, buttons, or toggles would then be applied to these devices to prevent accidental removal of the protection.

Increasingly, computer programs are now being used in place of levers, buttons, etc., to operate remotely controlled switches. The safeguard against accidental movement of a protected switch may not be so obvious with these systems. Applying a padlock, plug, or key would be impractical. The generally used method is for the computer program to require one or more extra entries with the computer keyboard before releasing the switch for movement. If only one additional step is required, evaluate whether it forces the operator to realize he or she is attempting to move a switch that has had blue signal protection applied to it. If you have a question concerning sufficient protection being provided, ask the operator to describe what steps he or she must take. Can the operator provide and remove switch protection for each individual group of workers, or only for all employees at once?

Regardless of the method used to operate remotely controlled switches, remember that the intent of the locking device provision is to force the operator to make some special effort to move a protected switch. This causes the operator to recall that there are workers on rolling equipment on the track. Use good judgment in determining if this has been accomplished.

Inspections of remotely controlled switches will require a different reporting procedure. In most cases, blue signal inspection reporting may be entered on FRA Form F6180.96 together with any equipment-related inspection results. This is true for any blue signal inspections, except when remotely controlled switches are involved. The reason for this is that in most cases, control of blue signal protection is under the direct supervision of the mechanical department. Therefore, blue signal and equipment can be combined on the same report and presented to the responsible mechanical department official for handling. However, in the case of remotely controlled switches, a separate report on FRA Form F6180.96 with its own number will be required.

It is best to provide a copy of your report to the railroad official directly responsible for the type of condition found. Remotely controlled switches are usually under the control of the transportation department, and defects must be handled with them for correction. Equipment conditions should be handled separately with a mechanical official, which is why there is a need for separate reports. The inspector should also provide a copy of this separate report to the mechanical department supervisor, because a failure in protection of a remotely controlled switch will most likely impact mechanical personnel.

U.S. Department
of Transportation

**Federal Railroad
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

MAY 18 2009

Mr. Richard A. Johnson
General President, Brotherhood of Railway Carmen Division
Transportation Communications International Union
3 Research Place
Rockville, MD 20850

Dear Mr. Johnson:

Thank you for your March 16, 2009, letter in which you requested that the Federal Railroad Administration (FRA) review the CSX Transportation Company's (CSXT) notice, dated September 22, 2008, for Blue Signal Protection of carmen at the Willard, Ohio, yard facility.

The FRA understands that you believe that CSXT's change of procedures regarding Blue Signal Protection on remotely controlled switches violates Title 49 Code of Federal Regulations Section 218.27(c). This regulation requires that the person in charge of workers contact an operator of a remotely controlled switch, and ensures that the switch is lined against movement when work is to be done. A corresponding regulation, § 218.30, requires the operator to lock the switch, wait for notification from the person in charge of workers to ensure it is safe to remove the lock, and create a record of the interaction.

The FRA has not defined what constitutes a "person in charge of workers." Therefore, individual employees may be considered "the person in charge" in the application of § 218.27(c). It has been FRA's longstanding policy to allow multiple individuals, even within the same group, to be considered such persons. FRA believes requiring multiple individuals to contact the operator to ensure on-track protection provides a higher level of safety than what our regulation requires. If a railroad chooses to define a person in charge of workers under Part 218 to include multiple individuals within the same group, FRA does not consider that a violation. It is FRA's understanding that the notice at issue is an attempt by CSXT to implicitly define such individuals as persons in charge of workers.

The FRA believes CSXT has met the burden of providing the best protection for its employees at Willard Yard and does not take exception to the September 2008 CSXT bulletin.

Sincerely,

Jo Strang
Associate Administrator for Railroad Safety/Chief Safety Officer

Chapter 6 - Rear End Marking Device–Passenger, Commuter, and Freight Trains, Part 221

49 CFR Part 221

Subpart A – General

§ 221.3 Application.

(a) Except as provided in paragraph (b) of this section, this part applies to passenger, commuter and freight trains when operated on a standard gage main track which is part of the general railroad system of transportation.

(b) This part does not apply to:

(1) A railroad that operates only trains consisting of historical or antiquated equipment for excursion, educational, or recreational purposes;

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

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

(4) A railroad that operates only one train at any given time.

Information

Paragraph (b)(1) excludes railroads that only operate trains consisting of historical or antiquated equipment. A railroad that conducts regular freight and/or passenger train service, but occasionally operates a train consisting of historic or antiquated equipment, would be required to comply with this Part.

Paragraph (b)(4) excludes railroads that operate only one train at any given time. However, it does not exclude trains operated on a railroad's branch line.

§ 221.5 Definitions.

As used in this part:

(a) *Train* means a locomotive unit or locomotive units coupled, with or without cars, involved in a railroad operation conducted on a main track. It does not include yard movements.

(b) *Commuter train* means a short haul passenger train operating on track which is part of the general railroad system of transportation, within an urban, suburban or metropolitan area. It includes a passenger train provided by an instrumentality of a State or political subdivision thereof.

(c) *Locomotive* means a self-propelled unit of equipment designed for moving other equipment in revenue service and includes a self-propelled unit designed to carry freight or passenger traffic, or both.

(d) *Main track* means a track, other than an auxiliary track, extending through yards or between stations, upon which trains are operated by timetable or train order or both, or the use of which is governed by a signal system.

(e) *Train order* means mandatory directives issued as authority for the conduct of a railroad operation outside of yard limits.

(f) *Red-orange-amber color range* means those colors defined by chromaticity coordinates, as expressed in terms of the International Commission on Illumination's 1931 Colormetric System, which lie within the region bounded by the spectrum locus and lines defined by the following equations:

$X + Y = .97$ (white boundary)

$Y = X - .12$ (green boundary)

(g) *Administrator* means the Federal Railroad Administrator, the Deputy Administrator, or any official of the Federal Railroad Administration to whom the Administrator has delegated his authority under this part.

(h) *Effective intensity* means that intensity of a light in candela as defined by the Illuminating Engineering Society's Guide for Calculating the Effective Intensity of Flashing Signal Lights, November, 1964.

(i) *Qualified person* means any person who has the skill to perform the task and has received adequate instruction.

Information

The term "yard movements," as used in paragraph (a), references movements of on-track rail equipment within the designated limits of a yard. By including such language, the rule excludes most switching operations when performed solely within the confines of a railroad yard. If, for example, a yard job with the locomotive in the lead pulled out onto a main track for headroom only to make a shove, the rear of the train wouldn't be on the main track and the train wouldn't require a marker. If the trailing end of the rear car makes it onto the main line outside the designated yard limits, then the equipment becomes a "train" for the purposes of Part 221 and the requirements of the regulation would apply.

§ 221.13 Marking device display.

(a) During the periods prescribed in paragraph (b) of this section, each train to which this part applies that occupies or operates on main track shall:

(1) be equipped with,

(2) display on the trailing end of the rear car of that train, and

(3) continuously illuminate or flash a marking device prescribed in this subpart.

(b) Unless equipped with a functional photoelectric cell activation mechanism complying with paragraph (c) of this section, the marking devices prescribed by this subpart shall be illuminated continuously or flash during the period between one hour before sunset and one hour after sunrise, and during all other hours when weather conditions so restrict visibility that the end silhouette of a standard box car cannot be seen from ½ mile on tangent track by a person having 20/20 corrected vision.

(c) Marking devices prescribed by this part and equipped with a functioning photoelectric cell activation mechanism shall illuminate or flash the device continuously when there is less than 1.0 candela per square meter of ambient light.

(d) The centroid of the marking device must be located above the coupler, where its visibility is not obscured and it does not interfere with an employee's access to, or use of, any other safety appliance on the car.

Information

Generally, an operating rear-end marking device is required to be displayed at the rear end of trains operating on, or occupying, a main line track during periods of restricted visibility. If part of a train is within yard limits but the rear car of the train still occupies the main track, that train is considered to be occupying main track and, therefore, a marking device would be required to be displayed until such time as the rear car of the train no longer occupies the main track.

§ 221.14 Marking devices.

(a) As prescribed in § 221.13, passenger, commuter and freight trains shall be equipped with at least one marking device, which has been approved by the Federal Railroad Administrator in accordance with the procedures included in appendix A of this part, and which has the following characteristics:

(1) An intensity of not less than 100 candela nor more than 1000 candela (or an effective intensity of not less than 100 candela nor more than 1000 candela for flashing lights) as measured at the center of the beam width;

(2) A horizontal beam with a minimum arc width of fifteen (15) degrees each side of the vertical center line, and a vertical beam with a minimum arc width of five (5) degrees each side of the horizontal center line as defined in terms of the 50 candela intensity points;

(3) A color defined by the red-orange-amber color range; and

(4) If a flashing light is used, a flash rate of not less than once every 1.3 seconds nor more than once every .7 seconds.

(b) Marking devices used on passenger and commuter trains in compliance with paragraph (a) of this section shall be lighted under the conditions prescribed in § 221.13 (b) and (c).
(c) When a locomotive is operated singly, or at the rear of a train, highly visible marking devices may be provided by the use of:

(1) At least one marking device that complies with paragraph (a) of this section; or
(2) At least one illuminated red or amber classification light on the rear of the locomotive, provided it complies with paragraph (a) of this section; or
(3) The rear headlight of the locomotive illuminated on low beam.

Information

Per 49 CFR § 221.14(c), when a locomotive is operated singly, or at the rear of a train (including at the rear of a lite locomotive consist), the rear headlight of the locomotive illuminated on low beam will satisfy the rear end marking device requirement.

§ 221.15 Marking device inspection.

(a) Each marking device displayed in compliance with this part shall be examined at each crew change point to ensure that the device is in proper operating condition.

(b) This examination shall be accomplished either by visually observing that the device is functioning as required or that the device will function when required by either:

(1) Repositioning the activation switch or

(2) Covering the photoelectric cell.

(c) This examination shall be conducted either by the train crew or some other qualified person, *provided that*, if a non-train crewmember performs the examination, that person shall communicate his or her findings to the locomotive engineer of the new train crew.

(d) When equipped with radio telemetry capability, a marker displayed in accordance with this part may be examined by observing the readout information displayed in the cab of the controlling locomotive demonstrating that the light is functioning as required in lieu of conducting a visual observation.

Information

Most (but not all) rear end marking devices are equipped with a photoelectric cell that will illuminate the marking device during reduced ambient lighting conditions. The device should operate as intended and its operation should be examined at each crew change point. The examination can be accomplished either visually or (when equipped) by using radio telemetry. As stated in paragraph (c), if a visual examination is performed by personnel other than a train crew member assigned to the train, the results of the examination must be communicated to the locomotive engineer.

§ 221.16 Inspection procedure.

(a) Prior to operating the activation switch or covering the photoelectric cell when conducting this test, a non-train crew person shall determine that he is being protected against the unexpected movement of the train either under the procedures established in part 218 of this chapter or under the provisions of paragraph (b) of this section.

(b) In order to establish the alternative means of protection under this section,

> (1) the train to be inspected shall be standing on a main track;
>
> (2) the inspection task shall be limited to ascertaining that the marker is in proper operating condition; and
>
> (3) prior to performing the inspection procedure, the inspector shall personally contact the locomotive engineer or hostler and be advised by that person that they are occupying the cab of the controlling locomotive and that the train is and will remain secure against movement until the inspection has been completed.

Information

This section of the regulation provides the procedures for establishing protection for non-train crew members while performing rear end marking device examinations as required by 49 CFR § 221.15(a) discussed above. As provided in paragraph (b)(3), if the train is standing on a main track and the task is limited to ascertaining the proper operation of the device, prior to performing the inspection the non-train crew member must personally contact the locomotive engineer positioned in the cab of the controlling locomotive and receive assurances from the locomotive engineer that the train will remain secure from movement until the inspection is completed. However, this section is not applicable if the proper operation of the device can be ascertained without positioning the non-train crew member in danger of injury due to unexpected movement of the equipment, and without the train crew member having to operate the activation switch or cover the photoelectric cell when conducting the test. Finally, if it becomes necessary for the railroad employee to perform tasks other than ascertaining the proper operation of the device, or if the train is located on other than main track, then the provisions of Subpart B of Part 218 (Blue signal protection of workers) would apply instead.

§ 221.17 Movement of defective equipment.

(a) Whenever the marking device prescribed in this part becomes inoperative enroute, the train may be moved to the next forward location where the marking device can be repaired or replaced.

(b) Defective rolling equipment which, because of the nature of the defect, can be placed only at the rear of a train for movement to the next forward location at which repairs can be made need not be equipped with marking devices prescribed in this part.

(c) When a portion of a train has derailed, and a portable marking device is not available, the remainder of the train may be moved to the nearest terminal without being equipped with the marking device prescribed in this part.

Information

The expectation of this rule is that railroads will maintain a sufficient number of approved rear end marking devices on their system to comply with the regulation. FRA safety inspectors should become sufficiently familiar with each railroad operation within their assigned inspection territory, to determine where marking devices are maintained and available. Per 49 CFR § 221.17(a), a railroad may continue the movement of a train that experiences a marking device failure while en-route, but the inoperative device must be repaired or replaced at the next forward location where such replacement or repairs can be made.

Although most end-of-train devices (EOT) incorporate a rear end marking device that is built into the EOT, the separate regulatory requirements for the two devices can be misinterpreted. Each device accomplishes a separate function; the rear end marker increases visibility of trains during low ambient lighting conditions, while the EOT transmits information to the head-end of the train, via radio telemetry. Another distinction is that all trains are required to have an operating rear end marking device (during specified low ambient lighting conditions), but not all trains are required to be equipped with an EOT. It is especially important to become familiar with and understand the differences between the “en-route failure” requirements specified in both regulations (*See* Part 232, Subpart E). Deficiencies and/or recommendations for civil penalty should reference the appropriate regulation (Part 221 for rear end marking device, or Part 232 for EOT).

Appendix B to Part 221 - Approved Rear End Marking Devices

Part i - approved devices tested for or by manufacturers

1. Manufacturer: Star Headlight & Lantern Co., 168 West Main Street, Honeoye Falls, NY 14472.
FRA identification Nos. FRA-PLE-STAR-845-F (flasher) and FRA-PLE-STAR-845-C (steady burn).

2. Manufacturer: Julian A. McDermott Corp., 1639 Stephen Street, Ridgewood, Long Island, NY 11227.
FRA identification Nos. FRA-MEC-MCD-100-C (steady burn), FRA-MEC-MCD-100-F (flasher), FRA-MEC-MCD-300-C (steady burn), and FRA-MEC-MCD-300-F (flasher).

3. Manufacturer: American Electronics, Inc.,[6] 40 Essex Street, Hackensack, NJ 07601.
FRA identification Nos. FRA-DRGW-YANK-300 (portable strobe), FRA-WP-YANK-301R (flashing), FRA-WP-YANK-305R (flashing), and FRA-WP-YANK-306R (steady burn).

Part ii - approved devices tested for or by rail carriers

1. Carrier: Atchison, Topeka & Santa Fe Railway Co., Technical Research & Development Department, 1001 Northeast Atchison Street, Topeka, Kans. 66616.
Manufacturer: Trans-Lite, Inc., P.O. Box 70, Milford, Conn. 06460.
FRA identification Nos. FRA-ATSF-TL-875-150, FRA-ATSF-TL-875-60, FRA-ATSF-TL-875-4412, and FRA-ATSF-TL-200.

2. Carrier: Amtrak - National Railroad Passenger Corporation, 400 North Capitol Street NW., Washington, DC 20001.
Manufacturer: (a) Trans-Lite, Inc., P.O. Box 70, Milford, Conn. 06460.
FRA identification Nos. FRA-ATK-TL-3895-1, FRA-ATK-TL-4491-2, FRA-ATK-TL-4491-3, and FRA-ATK-TL-FM-4491-1.

Manufacturer: (b) Luminator Division of Gulfton Industries, Inc., 1200 East Dallas North Parkway, Plano, Tex. 75074.
FRA identification No. FRA-ATK-LUM-0101890-001.

Manufacturer: (c) Whelen Engineering Co., Inc., Deep River, Conn. 06417.
FRA identification No. FRA-ATK-WHE-WERT-12.

Information

Since the regulation was published, FRA has approved additional devices. The following supplement is a listing of the current approved marking devices:

Manufacturer	Model Number
ALLCOM Products LLC 695 Sundown Road South Elgin, IL 60177	#RRP-265 Series LED
American Electronics, Inc.[1] 40 Essex Street Hackensack, NJ 07601	#300 #301 #305 #306

[6] Yankee Metal Products Corp. previously produced these devices.

[1] Yankee Metal Products Corp. previously produced these devices.

R. E. Deitz Company 225 Wilkinson Street Syracuse, NY 13201	#70-21/NAPA 510
DPS Electronics 2435 Outlaw Lane Belgrade, MT 59714	#DPS HVM II
Dialight Corporation 1501 Route 34 South Farmington, NJ 07727	#PAR46 LED Rail Car Marker Light
Donovan Associates P.O. Box 212 Exton, PA 19341	#21079
Dynamic Sciences Limited 359 St. Croix Blvd. St. Laurant, Quebec H4N 2l3 Canada	HVM-401 (also integrated in Digitar Unit)
Federal Sign and Signal Co. 140 East Tower-Burridge Chicago, IL	#372
General Electric P.O. Box 1262 Reading, PA 10603	—1 (60 PAR/2/R)
Grimes Manufacturing Co. Midland Ross Corp. 515 North Russell Street Urbana, OH 43078	85-0583-3 85-0602-1

Two Illinois Center 233 North Michigan Avenue Chicago, IL 60601	High Liner-P 36
Julian A. McDermott Corp. 1639 Stephan Street Long Island, NY 11227	Series 100 (Flasher) ; Series 100 (Steady) Series 300 (Flasher) ; Series 300 (Steady)
LEDSMART Inc. 18905 32 Ave Surrey , BC V3Z 1A7, Canada	LB-PAR46-2S-72-6-R-30-CF-N (72V, 6W) LB-PAR46-2S-37-6-R-30-CF-N (37.5V, 6W)

Liteco, Inc. 205 Main Street Chester, NJ 07930	36F REI 36F-2A
Luminator Division Gulfton Industries Inc. 1200 East Dallas North Parkway, Plano, TX 75074	#103086 #0101890-001
Matrix Railway Corporation 69 Nancy Street West Babylon, NY 11704	P21926-2 (LED)
Power Parts Co. 1860 N. Wilmot Avenue Chicago, IL 60647	#12155
Pulse Electronics, Inc. 5706 Frederick Ave. Rockville, MD 20852	FRA-BN-Pulse 4401 RTP (Portable) FRA-BN-Pulse Train line II
Pyle National 1334 North Kostner Chicago, IL 60651	20585DCJ (200PAR56)
Quantum Engineering, Inc. 352 Stowe Avenue Orange Park, FL 32073	Q348x (LED)
Railhead Corporation 10721 S. Western Avenue Chicago, IL 60643	#MK III USA #RH-PAR60-2R #RH-EOT
Rail-Tek Supply 959 Vashon Drive Greenbank, WA 98253	#EOT-1260
Safety Products Co. 6144 North Avenue Chicago, IL	#6551-77RTVL
Shenzhen Hengzhiyuan Technology Corp. (HZY) www.hyz2000.com Room 801, Block A, Shenzhen International Innovation Valley, Dashi Road, Xili Community, Xili Street, Nanshan District, Shenzhen	# HZYXH508-R-DC72V

Star Headlight and Lantern Co. 168 West Main Street Honeoye Falls, NY 14472	#845 (Flasher), #845 (Steady) #845S #860-F, #861-F Portables
TDG Transit Design Group Inc. 9-3770A Laird Rd Mississauga, ON, L5L 0A7	#190-100-1574 #190-100-1992
Teknoware (formerly Translite Incorporated) 673 Century Cir Conway, SC 29526	FM-875-2 (GE-4413R PAR 46) FM-875-2 (GE 60 PAR/2/R) FM-3895-1, (GE 60 PAR/2/R F-875 (150 PAR 46) F-875 (60 PAR 46) F-875 (4412 PAR 46) C-1785(200 PAR 56) FM-4 491-1 FM-4491-2 FM-4491-3 RC-4193 FM-886 FM-886A FM-5050-1 FM-5050-2 FM-5050-3 RC-2412 FM-5060-1 FM-2304 FM-5051-75 V FM-5051-32V FM-5158 FM-5403 FM-6227 M-46-1 (LED) M-46-1R M-46-1RC M-46-6R M-7039-2LED M-46-1G M-46-2 M-46-4 M-46-5 TL-TVN48310
Union Switch & Signal Inc. P.O. Box 539 Batesburg, SC 29006	(Digitar) 6695 Rear Telemetry Unit

Utah Transit Authority 3600 South 700 West P.O. Box 30810 Salt Lake City, UT 84130	Motive Power Inc. application of the General Electric (GE) 60PAR/2/R TRAIN sealed beam lamp Luminator Rear End Marking Device P/N 110103-001
Wabtec Railway Electronics 21200 Dorsey Mill Road Germantown, MD 20876	22161P 22415P 22810P 22899P 23131P 23743P 23792P 24071P 24186P 24201P 24261P 24262P 24973P 25244P 25455P 26062P 26482P 26494P 26495P 26621P 27340P 27385P
Whalen Engineering Co., Inc. Deep River, CT 06417	WERT-12

Chapter 7 - Safety Glazing Standards – Locomotives, Passenger Cars and Cabooses, Part 223

Introduction

The Safety Glazing Standards contained in Part 223 establish minimum safety requirements for glazing materials in the windows of locomotives, passenger cars, and cabooses to reduce the risk of death or serious injury for railroad crew members and railroad passengers from flying objects, including bullets. Although the basic requirements in the regulation are relatively straightforward, there are some items of interest that inspectors need to know to assist with compliance activities.

Figure 1: Coach car with FRA approved Type II (side-facing) glazing

Figure 2: Locomotive with FRA-approved Type I (end facing) glazing (degraded)

Figure 3: Failed Type I glazing

Please be advised that requirements for Type I and Type II glazing for locomotives and passenger cars can be found in the Appendix A to this Part, at item (b)(10) and (11) for Type I (*see* Figure 2 & 3) and Type II (*see* Figure 1), respectively. There are no related requirements in 49 CFR § 223.9, *Requirements for equipment built or rebuilt after June 30, 1980*.

FRA Type I and Type II glazing is manufactured to meet certain strength requirements, found in Appendix A to 49 CFR Part 223. FRA Type I compliance is for end facing glass and the FRA Type II compliance is for side facing glass.

Glazing Waivers

Inspectors should ask their regional specialist whether a railroad or equipment owner has a glazing waiver before pursuing any enforcement action. Numerous glazing waivers have been granted by FRA's Railroad Safety Board in accordance with the requirements contained in 49 CFR Part 211. Glazing waivers exempt specific equipment, owned by specific railroads or equipment owners, from the requirements of Part 223. If additional information related to an existing waiver is needed, a railroad or equipment owner should produce evidence related to the waiver, including FRA's letter granting their waiver request.

When an inspector is assigned to investigate a waiver request for glazing, the following information is needed by the Railroad Safety Board to process the waiver:

- A description of the operating environment, including the areas of operation (city or rural), any grade crossings, the maximum authorized speed, and the specific route(s).

- Information regarding the history for window breakage and/or vandalism.

- The date the equipment was built.

- Any other pertinent information. The information must be fact, not opinion.

Locomotive Glazing

Locomotives that have supplementary bay windows added to the side of the locomotive are not required to meet the safety glazing standards. These windows are normally used only during periods of adverse weather and are intended to improve crew visibility without exposing the crew to the adverse weather. It was never FRA's intent to include these supplementary windows, since they are used as an addition to existing glazing that must meet the impact requirements of this regulation.

Carbody type locomotives, such as model numbers F-9, F-40PH, E-9, SD40C, *etc.*, have windows and portholes in the end doors and the side carbody that enclose the motor. Since these are areas that are not in close proximity to the railroad worker during normal locomotive operations, such windows do not require the use of impact resistant glazing. Only windows located in the cab areas are required to have the safety glazing materials.

Type of glazing and proper orientation are marked on locomotive windows and, typically, appear as shown on Figures 4 and 5.

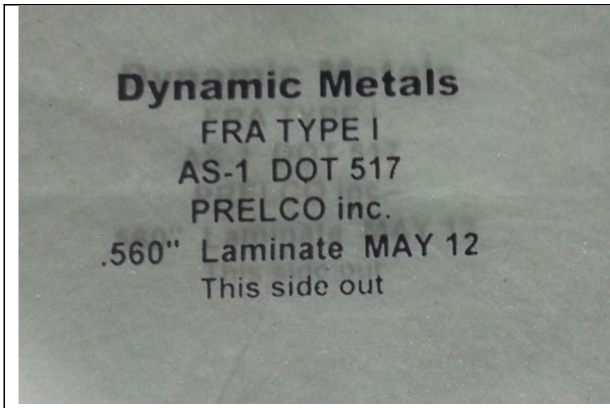
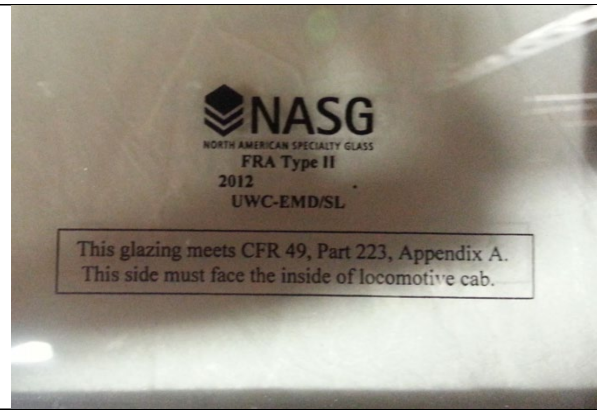
	

Figure 4: Type I – End-Facing	Figure 5: Type II – Side-Facing

Inspectors should verify the proper facing of the window glass inside or outside of the locomotive cab as it is very critical in providing protection to the cab occupants. Also, some glazing technologies are not directional dependent, and if inside/outside marking is not specific, the glazing may be installed either way.

Passenger Equipment Glazing

The Passenger Equipment Safety Standards have included additional requirements for glazing applications in 49 CFR § 238.221 for Tier I equipment. This section basically addresses the performance of the frame that attaches to the car body. It is intended to ensure the glazing stays in place when subjected to air pressure differences caused when two trains pass at the minimum separation for two adjacent tracks. It also secures the window glazing in place so it can resist spalling when struck by a projectile, and also resist being knocked out of the window frame.

The Passenger Equipment Safety Standards have included additional requirements for glazing applications in 49 CFR § 238.421 for Tier II equipment. These standards are far more stringent standards than prescribed in Part 223. This section applies to all passenger equipment that operates at speeds in excess of 125 mph, not to exceed 160 mph.

The Passenger Equipment Safety Standards have included additional requirements for glazing applications in 49 CFR § 238.721 for Tier III equipment. This section applies to all passenger equipment operating in a shared right-of-way at speeds not exceeding 125 mph and in an exclusive right-of-way without grade crossings at speeds exceeding 125 mph but not exceeding 220 mph.

Application of the Safety Glazing Standards

Title 49 CFR § 223.3(b)(3) generally excludes from Part 223 historic equipment and equipment that is more than 50 years old at the time of inspection and is used only for excursion, educational, recreational, or private transportation purposes. [8] There are two exceptions, as provided in 49 CFR § 223.3(c):

(1) *Passenger cars* that fit the above description and are also built **after 1945** must be equipped with emergency windows required by § 223.9(c) or § 223.15(c), as appropriate, when occupied and operated in an intercity passenger or commuter train subject to the Passenger Equipment Safety Standards, Part 238. In practice, this may require equipping the cars with certain emergency tools and instructions to ensure compliance, as a tool or other instrument may be used to remove or break an emergency window under this provision. (*See* 49 CFR § 223.3(c)(1))

(2) *Locomotives, passenger cars, and cabooses* that fit the above description and are also built **after 1945** that comply with Part 223 must continue to comply with Part 223. (*See* 49 CFR § 223.3(c)(2)).

For purposes of Part 223—

Historical equipment refers to locomotives, passenger coaches, or cabooses that have historical significance. For example, the Ferdinand Magellan, U.S.A.-1 passenger car used by President Roosevelt is considered historical equipment.

Equipment more than 50 years old (replacing the term Antiquated equipment that was previously used in Part 223) means equipment that is more than 50 years old, not equipment that was more than 50 years old as of a certain, fixed date.

Excursion means an operation that transports passengers to one or more points of interest and returns them to the original point of departure.

Educational means operated for a museum or similar purpose.

Title 49 CFR § 223.3(b)(3) also excludes c*abooses and passenger cars* in a railroad's fleet **as of April 11, 2016,** that are used only for the railroad's **private transportation** purposes; however, any such equipment that complies with Part 223 must continue to comply with Part 223. (*See* 49 CFR § 223.3(b)(3)(ii)).[9]

Title 49 CFR § 223.3(b)(5) excludes *locomotives, cabooses, and passenger cars* built or rebuilt **prior to July 1, 1980**, that are operated at speeds **not exceeding 30 mph**, and used only where there is **low risk** of propelled or fouling objects striking the equipment. Risk factors include reported incidents of propelled or fouling objects striking rail equipment, or infrastructure conditions or other operating environment conditions that have led or are likely to lead to objects striking rail equipment in operation. Paragraph (b)(5) provides that risk is presumed low, unless the railroad operating the equipment has knowledge, or FRA makes a showing, that specific risk factors exist. FRA will determine whether there is low risk primarily based on FRA's

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[8] 81 FR 6775. Incidental freight service is also generally excluded in this category, which includes operating a steam locomotive for conditioning purposes following major mechanical work and limited use of a passenger locomotive in freight service only when no other locomotive is available. 81 FR at 6783.

[9] This allows "business cars" without certified glazing that were already being used at the time this rule was issued to continue to operate without certified glazing. *Id.*

observations during routine inspections and from any reported incidents of propelled or fouling objects striking rail equipment in operation, and FRA expects the operating railroad to inform FRA of any such incidents known to the railroad.[10] If FRA has reason to believe there have been incidents of propelled or fouling objects striking equipment in operation, FRA may investigate further. As part of its investigation, FRA may contact local law enforcement for more information in determining the risk level.[11]

[10] 87 FR at 68916.
[11] *Id*.

Chapter 8 - Railroad Locomotive Safety Standards, Part 229

Introduction

In 1980, the Federal Railroad Administration (FRA) revised the sections of Title 49 Code of Federal Regulations (CFR) Part 230 related to non-steam locomotive inspection and maintenance standards and moved them into Part 229.

The following information is to be used by Federal and State inspectors when conducting inspections of locomotives (and locomotive tenders) for compliance with Federal railroad safety laws. To help better ensure uniform enforcement of the Federal railroad safety laws, it is important that FRA inspectors adhere to internal agency enforcement policies when conducting inspections.

The procedures and information provided in both this manual and the General Manual should be observed when determining appropriate corrective actions in response to noncompliance with Part 229 or other safety defects. When an FRA inspector finds a safety defect, the FRA inspector should decide if the defect(s):

Is a noncompliant condition based on the requirements of Part 229.

Should be documented on the FRA Form F6180.96, Inspection Report.

Warrants the issuance of a violation, and assessment of a civil penalty.

Warrants the issuance of a Special Notice for Repairs (Special Notice), as provided for in 49 CFR Part 216.

Should be reported (generally as a comment in the inspection report (FRA Form 6180.69)) to the railroad as an unsafe condition(s) that is not specifically encompassed in Federal regulation.

FRA inspectors will conduct most of their locomotive inspections at either a facility where periodic, annual, and biennial tests are performed, or at a location where locomotives are serviced and prepared for train service. However, with the increase of locomotive calendar-day inspections being performed by railroad transportation department employees away from mechanical facilities, it is important that FRA inspectors schedule time to monitor these practices for full compliance with Federal railroad safety laws.

As a matter of policy, violation recommendations should generally be limited to when a locomotive is being used or allowed to be used by the railroad. The locomotive must comply with all requirements contained in Part 229 and be free from any safety defects for the service it is performing, as required by the Locomotive Inspection Act.[12] Keep in mind, a locomotive can be placed in different types of service, including switching service, road service, dead service

[12] Codified at 49 U.S.C. 20701 *et seq*. Authority for Part 229 is also provided by the Federal Railroad Safety Act of 1970 (FRSA), codified at 49 U.S.C. 20101 *et seq.*

(moved without tractive power, for convenience, or due to defects that render the locomotive unable to be used for power), and stationary service (*e.g.*, providing power to light or heat vehicles or charge train brakes). For a locomotive that is not currently placed in service, but is available for service, it is in use and must be safe for the purpose of having it available for service. Generally, as a matter of policy, violations should not be recommended when a locomotive is only available for service. The condition of a locomotive in such status should be reevaluated when it is selected to perform service. A locomotive is generally taken out of service only when it is placed in a repair shop,[13] in storage,[14] or in retirement.

Part 229 addresses conditions that create an unsafe working environment, an unsafe condition, or an unsafe locomotive. It does not address housekeeping practices of a railroad. Accordingly, a locomotive that is not absolutely clean and free from all accumulations of oil may still be in compliance, if the conditions do not rise to a defect under Part 229. When a defect is found, responsibility for the defect should be taken into account in considering a violation recommendation. (*See* 229.119(c)). Anytime a locomotive has been recently released from a periodic test and is found with a noncompliant condition, a violation should strongly be considered.

When an FRA inspector discovers and substantiates a noncompliant condition that he/she believes makes a locomotive **unsafe and not fit for service**, a *special notice for repairs*, as provided by 49 CFR Part 216, may be issued to the railroad. The special notice for repairs should describe the condition or conditions for which it was issued. Except in rare circumstances, a violation must be submitted with any special notice for repairs.

Any railroad employee who authorizes the willful movement or operation of a noncomplying or unsafe locomotive, and who has knowledge of the circumstances, can be held personally responsible for the action. The FRA inspector should judge all pertinent facts and determine if it can be documented that the railroad employee can be cited for willful noncompliance with Federal railroad safety laws. Prior to advising a railroad employee that he/she will be cited for a willful violation, the FRA inspector must coordinate such action in accordance with established procedures. (*See* General Manual.)

Locomotive Safety Standards Inspection Procedures

Upon arrival at an inspection point where mechanical department personnel are assigned to perform locomotive inspection, testing, and repair, the FRA inspector should notify the local railroad supervisor of his/her presence and intentions. The railroad will determine whether an employee will accompany the FRA inspector. However, in some instances, it is not always advantageous to notify the railroad of FRA's presence, especially if an inspection is related to a complaint or investigation.

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[13] Under Part 229, a locomotive generally operates in a 92- or 184-day service cycle tied to the periodic inspection requirement in 49 CFR § 229.23. Locomotives are removed from service and required to be placed in an adequate facility to perform the periodic inspection (49 CFR § 229.23(a)). Locomotives with certain serious defects may also be removed from service for heavy repairs.

[14] Railroads generally have instructions for preparing a locomotive for storage. Taking these precautions helps ensure the locomotive will not be used.

It is not necessary for FRA inspectors to obtain "blue signal" protection when conducting any type of inspection activity. However, FRA inspectors should be alert and not place themselves in a position where the unexpected movement of equipment subjects them to the danger of personal injury. Railroad representative(s) accompanying the FRA inspector during the inspection must obtain blue signal protection if they engage in activities that require them to work on, under, or between the equipment.

Testing or operating any railroad equipment must be performed by railroad personnel, **not** FRA inspectors. Where practical, the FRA inspector should observe tests of the air brakes, speed indicators, high-voltage ground protection, and wheel slip/slide protection. The FRA inspector should point out any observed conditions, whether covered by the Federal railroad safety laws or not, that would jeopardize employee safety and/or the safe operation of the equipment.

After the inspection, FRA inspectors advise the proper railroad representative of all noncomplying conditions. The FRA inspectors use discretion in evaluating the condition of the equipment and whether to cite a defect on his/her inspection report as a recommended violation. Although a railroad need not have knowledge of a noncomplying condition on a locomotive to be assessed a civil penalty under the Locomotive Safety Standards, each FRA inspector is expected to use sound judgment along with the information outlined in the General Manual when deciding whether the issuance of a violation report is appropriate under the circumstances. The purpose of the civil penalty is to help promote compliance, not punish a railroad for each and every noncomplying condition regardless of the circumstances. Accordingly, FRA inspectors should limit the issuance of violation reports to situations where civil penalties will promote compliance. FRA inspectors should get a signature acknowledgement of receipt on any FRA Form 6180.96 reports submitted to railroad representatives whenever possible. If a railroad makes a serious, good-faith effort to comply with the standards, the filing of a violation report for an isolated, difficult to detect, noncomplying condition will typically serve no valid enforcement purpose.

The railroad should be notified of all cited conditions in a timely manner, so that appropriate corrective action can be taken. FRA inspectors do not have the authority to approve the use of a noncomplying locomotive once a defective condition is cited. If a railroad employee asks if a piece of equipment can be used after defects have been identified by an FRA inspector, remind the railroad that Federal defects have been identified and that they should contact their supervisor or mechanical desk for further handling instruction. The Inspection Report should be completed, and appropriate copies given to the railroad representative. If the inspection report cannot be prepared immediately after the inspection, then one must be completed during the next work period and delivered or forwarded to a railroad representative.

49 CFR Part 229

<u>Subpart A – General</u>

§ 229.3 Applicability.

<u>Information</u>

49 CFR § 229.3(b)(1): FRA inspectors should be aware that if a locomotive(s) of a private industry operates over a portion of a general railroad system's yard or tracks, such locomotives must comply with the Locomotive Safety Standards and other applicable Federal railroad safety laws. Legal action could be taken against the industrial railroad if its locomotives are not in compliance, but FRA usually holds the general railroad responsible and liable for the industrial locomotives that it permits to be used on its lines. If an industry leases a track in an adjacent railroad yard for its exclusive use, it may operate over that track as if it were part of the industrial facility and the locomotives do not come under the Locomotive Safety Standards. (*See* 49 CFR Part 209, Appendix A.) Whenever there is a question as to whether a railroad's operation and/or equipment fall under the requirements of Part 229, the regional office should be contacted for confirmation.

§ 229.4 Information collection.

<u>Information</u>

This section relates to information collection under Part 229, which was reviewed by the Office of Management and Budget. No enforcement action is attached to this section.

§ 229.5 Definitions.

<u>Information</u>

Carrier: The designation "carrier" should not be used in referring to a railroad. The Rail Safety Improvement Act of 1988 (RSIA 88) did away with the phrase "common carrier," and required that the word "railroad" be inserted in all FRA regulations that previously used the word carrier or common carrier.

Control Cab Locomotive: This could be either a passenger coach with a control stand located at one end, where the operator can operate a passenger train with the locomotive pushing/pulling the train; or a caboose or car equipped with remote control equipment that provides an interface between the remote-control transmitter (RCT) and a locomotive for remote control operation. Only those portions of the control cab locomotive that have appurtenances and items listed in, or covered by, Part 229 have to be in compliance with Part 229.

Dead Locomotive: A dead locomotive can have the diesel engine either idling or shut down. It cannot supply tractive effort. It must be "off-line."

Locomotive: This is a piece of on-track equipment other than hi-rail, specialized maintenance, or other similar equipment -
(1) With one or more propelling motors designed for moving other equipment;
(2) With one or more propelling motors designed to carry freight or passenger traffic or both; or
(3) Without propelling motors but with one or more control stands.

A hi-rail vehicle is a truck, automobile, or machinery with retractable flanged wheels, so that it may be used on either the highway or railroad track. Specialized maintenance or other similar equipment includes track motor cars, cranes, derricks, pile drivers, rail grinders, ballast cleaners, *etc*. Periodically, FRA receives inquiries about equipment requirements for self-propelled vehicles used to haul revenue freight on the main line. These vehicles include those built by Trackmobile Inc., Shuttle Wagon, Mitchell Equipment Corporation, and Brandt RoadRailer®. Self-propelled vehicles are used in a variety of railroad functions. When self-propelled vehicles are used only in the performance of typical maintenance-of-way functions, or if they are used to move cars or equipment within the confines of repair facilities, they are to be considered specialized maintenance equipment and are exempt from many Federal railroad safety laws. When a self-propelled vehicle is used to move freight over the railroad, outside the limits established for maintenance-of-way operations and repair facilities, it will be considered a locomotive and must comply with applicable Federal railroad safety laws. Even though these vehicles do not resemble a standard locomotive, the purpose for which they are being used requires compliance with 49 CFR Parts 223, 229, 231, and 232. The self-propelled vehicles are unique in construction, appearance, and use.

Many of these vehicles currently being used have already been modified by the manufacturers (as closely as construction would permit) to bring them into compliance with Federal railroad safety laws. FRA acknowledges that this equipment has a place in a well-rounded rail transportation system.

In an effort to recognize the unique characteristics of these vehicles, FRA inspectors should exercise enforcement discretion and good judgment in analyzing an operation where self-propelled vehicles are used for train movements. Items deemed to be safety-related that cannot meet specified requirements will have to be addressed through the waiver process. The following specifications should be used by FRA inspectors:

1. The vehicle glazing materials required by Part 223.

2. The calendar-day inspection when used, and the inspection report and record as described in 49 CFR § 229.21.

3. The periodic inspection as described in 49 CFR § 229.23, all pertinent data entered on FRA Form F6180.49A, and Locomotive Inspection and Repair Report displayed under a transparent cover in a conspicuous place in the cab of the vehicle.

4. Title 49 CFR § 229.31 regarding either hammer and hydrostatic testing or pre-drilling of the reservoir.

5. General safety, provided in 49 CFR §§ 229.41, 229.43, and 229.45.

6. Fuel safety cut-off devices described in 49 CFR § 229.93.

7. A speed indicator, if it is operated at a speed that exceeds 20 mph according to 49 CFR § 229.117.

8. Interior cab noise, as described in 49 CFR § 229.121.

9. Vehicle headlights, and if operated at speeds in excess of 20 mph over one or more public highway-rail grade crossings, auxiliary lights according to 49 CFR § 229.125.

10. A horn according to 49 CFR § 229.129.

11. If operated at speeds in excess of 30 mph while hauling cars, the vehicle must be equipped with a working event recorder in compliance with 49 CFR § 229.135.

12. Switching steps as defined in 49 CFR § 231.30.

13. Four horizontal handholds shall be secured to the front and back ends of the vehicle and shall be secured by bolts or other acceptable mechanical fastener (*see* 49 CFR § 231.30).

14. The vehicle should have vertical handholds painted in contrasting colors and secured by bolts or other acceptable fasteners in compliance with 49 CFR § 231.30.

15. The vehicle must be equipped with automatic couplers, to prevent the necessity of someone going between the vehicle and car for the purpose of coupling or uncoupling in compliance with 49 CFR § 231.30.

16. If conditions warrant, a two-way end-of-train device must be used in compliance with 49 CFR §§ 232.401–232.409.

17. As with any train movement, the vehicle must be equipped with a brake system that permits the operator to apply and release the brakes on cars being hauled. The brake equipment must also be arranged so that proper air brake leakage tests can be conducted as applicable in compliance with 49 CFR §§ 232.12 and 232.13. **(MP&E 98-71).**

Although a burro crane is excluded from the definition of "locomotive" under 49 CFR § 229.5 as specialized maintenance equipment, and is therefore not subject to Part 229, a burro crane is nevertheless subject to the statutory requirements of the Locomotive Inspection Act,[15] in particular, the requirement that it is safe to operate. In the rulemaking proceeding documents amending Part 229, FRA explicitly recognizes the applicability of the Act by stating that "FRA will continue to implement the basic statutory safety requirements with respect to such work equipment by using the Special Notice when appropriate."[16] **(MP&E 98-25).**

[15] 49 U.S.C. § 20701.
[16] 45 FR 21093.

MU Locomotive: This refers to the self-propelled passenger cars in commuter service in various large urban centers around the country (e.g., Long Island Rail Road, Southeastern Pennsylvania Transportation Authority). This definition does not apply to the common vernacular of the railroad industry, whereby MU locomotive is a generic term given to any locomotive that can be coupled in a consist with other locomotives and controlled from a single control location.

§ 229.7 Prohibited acts.

<u>Information</u>

Title 49 CFR § 229.7(a) is the regulatory codification of the general statutory language previously contained in the Locomotive Inspection Act, re-codified at 49 U.S.C. § 20701. This subsection should only be cited when defective conditions of a locomotive's appurtenances are disclosed on items not specifically covered by other provisions contained in Part 229. For example, this provision should be used to report a defective appurtenance, such as a warning bell or alerter equipment. Defective equipment associated with remote control locomotive (RCL) operations should be addressed under this subsection. The remote-control transmitter (RCT), when operating a locomotive in remote mode, becomes an appurtenance to that locomotive and is subject to the provisions of this subsection. Also, any lights added to an RCL that indicate the locomotive is operating in the remote-control mode are an appurtenance. Therefore, if any of the equipment associated with RCL operations is found defective **<u>at any time</u>** during remote mode operation, appropriate enforcement action should be taken.

The FRA inspector may consider filing a violation under this subsection if the following is evident:

1. The locomotive is not in safe or proper condition for the service in which it will be placed.

2. The involved condition endangers the railroad personnel and/or the public by exposing them to unnecessary peril to life or limb.

If an FRA inspector seeks a violation under this subsection, the FRA inspector must fully describe the defective part or appurtenance and must fully explain how the defective part or appurtenance endangers the safety of the crew and/or the general public. This subsection should not be cited if the condition or defective appurtenance is specifically addressed in another provision contained in Part 229; the more specific provision should be used.

Title 49 CFR § 229.7(b) recognizes FRA's ability to use individual liability as an enforcement tool in circumstances where a railroad employee willfully allows the use of a locomotive with a noncomplying condition covered by this Part. FRA inspectors must exercise care in these circumstances, ensuring that all the information discussed in Chapter 3 of this manual and in Appendix A to 49 CFR Part 209 are followed and addressed before pursuing enforcement action against an individual.

Title 49 CFR § 229.7(c) states: "Any person who knowingly and willfully falsifies a record or report required by this part is subject to criminal penalties under 49 U.S.C. 21311." Title 49 U.S.C. § 21311 states, in part, the following:

(a) Records and reports under chapter 201. A person shall be fined under title 18, imprisoned for not more than 2 years, or both, if the person knowingly and willfully –

- **(1)** makes a false entry in a record or report required to be made or preserved under chapter 201 of this title;
- **(2)** destroys, mutilates, changes, or by another means falsifies such a record or report;
- **(3)** does not enter required specified facts and transactions in such a record or report;
- **(4)** makes or preserves such a record or report in violation of a regulation prescribed or order issued under chapter 201 of this title; or
- **(5)** files a false record or report with the Secretary of Transportation.

§ 229.9 Movement of non-complying locomotives.

Information

Title 49 CFR § 229.9(a): When a noncomplying condition under Part 229 is found by either a railroad inspector or an FRA inspector (except as provided in 49 CFR § 229.9 (b), (c), § 229.125(g), and § 229.131(b) and (c)(1)), the railroad may move the locomotive only as a lite locomotive or dead locomotive under appropriate conditions that a qualified person determines are suitable for safe movement. A locomotive may be safe to move for certain types of service, but not others (*e.g.*, a locomotive may be safe to move in a trailing position, but not as a lead or controlling locomotive). If a locomotive is not safe for any type of service requiring movement, it cannot be moved under 49 CFR § 229.9. At that point, the railroad may affirmatively take the locomotive out of service and repair it prior to any movement. If the locomotive can be moved under 49 CFR § 229.9, it may be moved to any location the railroad designates to have it brought into compliance (all tagging and notification requirements must also be met). If an FRA inspector determines that movement of the locomotive in one or more types of service is unsafe, the FRA inspector may issue a Special Notice for Repairs to effectively remove it from service. This should be done only when operation would constitute an immediately unsafe situation (such as possible derailment). The FRA inspector should never dictate to a railroad the condition(s) for the movement of any noncomplying locomotive

Title 49 CFR § 229.9(b): Allows for the continued use of a locomotive that develops an en route noncomplying condition until the earlier of (1) the next calendar-day inspection, or (2) the nearest forward point where the repairs necessary to bring it into compliance can be made. Use of a locomotive under this provision is permitted only if the requirements of 49 CFR § 229.9(a) are fully met, which includes that a properly filled out "noncomplying tag" must be in the cab of the noncomplying locomotive.

If the noncomplying condition can be brought into compliance by shifting the position of the locomotive in the consist, the noncomplying condition should be rectified by doing so at the next forward location where this can be accomplished. This could be a siding, a wye, or any location where it is physically possible to reposition the locomotive. Railroad employees performing this task may do so if it does not endanger the safety of the employees, locomotives, or trains. This location should not be construed or designated as a repair point.

Title 49 CFR § 229.9(a)(1) states: "A qualified person shall determine - (i) That it is safe to move the locomotive; and (ii) The maximum speed and other restrictions necessary for safely conducting the movement."

The term "qualified person," as used in 49 CFR § 229.9(a)(1), is not defined, and must be evaluated on a case-by-case basis. A person qualified to perform a daily inspection may not necessarily possess the qualifications to make the determination that it is safe to move a defective locomotive. A qualified person must have demonstrated to the railroad, at a minimum, the knowledge and ability to inspect locomotives and provide recommendations regarding the criteria listed in 49 CFR § 229.9(a). This does not imply that the qualified person must possess intimate knowledge of and experience with all of the components and functions of a locomotive. Additionally, there are varying levels of qualified persons. As an example, a journeyman electrician may not have the necessary knowledge to make safety recommendations concerning locomotive running gear. However, that person should be qualified to address problems associated with the electric control apparatus.

Title 49 CFR § 240.123 requires that each railroad provide for initial and continuing education of certified locomotive engineers to ensure that each engineer maintains the knowledge, skills, and ability with respect to (among other areas) the mechanical condition of equipment. As such, the locomotive engineer is considered qualified to provide safety recommendations concerning certain en route noncomplying conditions. Normally, these conditions are limited to those that are evaluated during the daily inspection required by 49 CFR § 229.21, such as headlights, speed indicators, cab seats, air brakes, wipers, and alerter malfunctions. The locomotive engineer would also be expected to identify certain obvious mechanical problems such as major wheel defects and some running gear problems. However, the engineer would not be expected to properly assess the safety implications of continued movement of the locomotive for most mechanical defects. In these cases, recommendations regarding the continued safe movement of a noncomplying locomotive (in accordance with 49 CFR § 229.9(a)(1)) need to be made by a person that is more qualified, such as a mechanical department employee. These recommendations may be based on telephone or radio conversations between the engineer and the more qualified individual. If the noncomplying condition cannot be resolved solely via voice communication, a qualified individual must conduct a physical onsite inspection to identify all appropriate restrictions for continued safe movement of the locomotive.

While it is the transportation/operating department that controls the daily operation of the railroad, operating personnel may not possess the qualifications and technical expertise to make safety recommendations regarding noncomplying locomotives. When investigating an issue involving enforcement of 49 CFR § 229.9, FRA inspectors must carefully examine the qualifications of the individual who made the safety recommendations when determining if the railroad was in compliance with the Federal railroad safety laws.

Certain non-complying conditions require a locomotive to be removed from the lead position at the first available location, but would not require it to be removed from all types of service.

Examples of such conditions include, but are not limited to, issues related to speed indicators, headlights, cab windows, and audible warning devices. When such conditions exist, it may be possible to move the locomotive safely in a trailing position. FRA inspectors must exercise sound judgment when determining whether to take an enforcement action under this section. For example, a defective cab heater during warm weather would not necessitate removal of the locomotive from the lead or controlling position. In the interest of safety, when a locomotive is repositioned from the lead position to correct a noncomplying condition, the "noncomplying locomotive tag" should remain attached to the locomotive until repairs are made.

Where an FRA inspector has knowledge that a railroad permits locomotives (that develop noncomplying conditions en route) to continue in service past mechanical facilities where repairs can be made, he/she should investigate to determine that the railroad is complying with the requirements of 49 CFR § 229.9(a). If a noncomplying locomotive is moved beyond a forward repair location that has previously demonstrated the ability to effect repairs of the noncomplying condition, the subject locomotive can only move under 49 CFR § 229.9, if it is NOT used as a propelling or lead locomotive. There is no implication in 49 CFR § 229.9(b) that each repair location must be capable of repairing all en route noncomplying conditions that can occur.

Title 49 CFR § 229.9 only permits the movement of a noncomplying locomotive with a Part 229 defect. Nothing in 49 CFR § 229.9 authorizes movement of a locomotive with power brake or safety appliance defects. Such locomotives can only be moved under the statutory provisions of the Safety Appliance Act (49 U.S.C. § 20303) and/or the Brake System Safety Standards (49 CFR Part 232). **(MP&E 98-50)**. It is the responsibility of the railroad to ensure that any locomotive that is moved with a noncomplying defect is moved in accordance with the applicable Federal railroad safety law. If there is any doubt, the railroad should contact FRA. The move may require the railroad to submit for one-time movement authority. (*See* Chapter 2).

Title 49 CFR § 229.9(d) restricts the use of a dead locomotive as a controlling locomotive following a calendar-day inspection. If a noncomplying condition occurs en route that renders the locomotive dead, it can continue to control the locomotive consist until a daily inspection is performed. The intent of this restriction is to ensure that crew members are not permitted or required to occupy the cab of a noncomplying locomotive over an extended period of time.

Title 49 CFR § 229.9(e) means that a locomotive is a locomotive at all times and must be in full compliance when in service or tagged as required by 49 CFR § 229.9(a).

§ 229.11 Locomotive identification.

Information

If vandals have painted graffiti on the locomotive and obscured the identification marks, the FRA inspector should point the defect out to the railroad and use appropriate discretion to help achieve compliance. Railroad initials do not have to be clearly legible on a locomotive. The regulation does not require railroad initials, only a number.

The "F" is very important in remote control locomotive operations.

§ 229.13 Control of locomotives.

Information

This section applies to controls of distributed power locomotives (DPU), which are controlled from a lead locomotive by either a radio signal, or an electrical signal through a hard wire. This section also applies when a locomotive consist is operated via remote control, using an operator control unit (OCU). The OCU (often called a belt pack) is treated the same as the cab of the controlling locomotive when remote control locomotive operation is in effect.

§ 229.14 Non-MU locomotive control cab locomotives.

Information

Only those components added to a passenger car or an "RCL caboose" that make it function as a locomotive (e.g., the controller, speed indicator, etc.), related to controlling speed and braking of a train, are subject to Part 229.

§ 229.15 Remote control locomotives.

Information

Title 49 CFR § 229.15(a)(6) mandates that each RCL shall have a distinct and unambiguous audible or visual warning device that indicates to nearby personnel that the locomotive is under active remote control operation. If an RCL is equipped with lights that are supposed to indicate when the locomotive is operating in remote mode, then it must function as intended since they are an appurtenance to the locomotive. If such lights are found to be inoperative then a defect or violation is warranted under 49 CFR § 229.7. A defect or violation should also be considered under 49 CFR § 229.7, if an RCL is used in remote control mode of operation and found having no audible or warning devices activated.

Title 49 CFR § 229.15(a)(9) mandates that operating control handles (air brake, reverser handles, and so on) be removed, pinned in place, protected electronically, or otherwise rendered inoperable as necessary to prevent movement caused by the RCL's cab controls while the RCL is being operated by remote control.

Title 49 CFR § 229.15(a)(11) mandates that each RCL shall be tagged at the locomotive control stand throttle indicating the locomotive is being used in a remote-control mode. The tag shall be removed when the locomotive is placed back in manual mode. For a locomotive to be compliantly setup for remote operation, both conditions must be met.

Title 49 CFR § 229.15(a)(13)(i) requires each OCU to be equipped with a breakaway safety feature. OCUs being used for locomotive operation are deemed non-compliant if the breakaway feature is ineffective.

Title 49 CFR § 229.15(b)(1) mandates that **each time** an OCU is linked to an RCL, and at the start of each shift, a railroad shall test:

(i) The air brakes and the OCU's safety features, including the tilt switch and alerter device; and
(ii) The man down/tilt feature automatic notification.

See definitions and guidance regarding *Lead locomotive* and *controlling locomotive* under 49 CFR § 229.5 and this manual.

Additionally, as explained during the rulemaking proceeding,[17] an OCU is as an appurtenance to the locomotive and must operate as intended when present on a locomotive. Title 49 U.S.C. § 20701 prohibits use of a locomotive unless the entire locomotive and its appurtenances are in proper condition and safe to operate in the service to which they are placed.

§ 229.19 Prior waivers.

Information

FRA inspectors can review the block on the locomotive cab card for a listing of current waivers.

§ 229.20 Electronic recordkeeping.

Information

Title 49 CFR § 229.20(d)(1) requires that, except for product testing results and records (49 CFR § 229.313), railroads that have elected to utilize an electronic recordkeeping system are required to provide FRA inspectors with **all** electronic records maintained for compliance with Part 229 for **any** specific locomotives at any mechanical department terminal upon request. A railroad that utilizes electronic record keeping and claims to be unable to produce a requested record is non-compliant; FRA inspectors should exercise good enforcement discretion in such circumstances. Violations should not be taken in the event of a computer outage or similar event unless a railroad frequently claims to not be able to produce records for this reason. FRA inspectors may ask a railroad to forward requested records when the computer outage problem is resolved.

Subpart – B Inspections and Tests

§ 229.21 Daily inspection.

Information

The purpose of the calendar-day inspection is to ascertain that the locomotive is safe to operate in the service for which it is used and is in total compliance with Part 229 prior to being placed or continued in service. It is a visual walk-around inspection of the locomotive that provides an opportunity, every day the locomotive is used, to find and correct incipient problems before they lead to an accident or safety incident. An effective locomotive calendar-day inspection requires

[17] See 77 FR 21330.

that the individual performing the inspection be alert for telltale signs of any condition or defect that is a potential hazard.

After a daily inspection is performed, the locomotive should be free of any noncomplying conditions before it is offered for or continued in service. The locomotive cannot legally be used until all Federal defects are corrected.

If the FRA inspector continues to find recurrent defects or a pattern of noncomplying conditions at a particular location, he/she should monitor the performance and the results of the daily inspections, as well as question the individual(s) performing the inspections, to ascertain if the individual(s) has the knowledge and ability to perform such inspections.

If daily inspection reports reflect noncomplying conditions on a locomotive and the FRA inspector finds the conditions were not corrected by the railroad, and the locomotive continues to be used, violations should be submitted. Such violations should be accompanied by all of the documentation available, with a complete explanation regarding the railroad operation at the location.

Failure to complete, or produce a record or report, in and of itself is not sufficient evidence to establish that a railroad failed to perform an inspection. It is a "records" violation, unless other evidence (*e.g.*, witness statements, interviews, event recorder downloads, visual observations, *etc*.) is obtained to establish the failure to conduct the inspection. If the only evidence available merely establishes a failure to complete the cab card or a failure of a railroad to produce a required inspection report, then the appropriate section to cite for civil penalty is 49 CFR § 229.21(a). Use the "lack of a record and/or report" to **support** the other evidence obtained to establish a "failure to perform an inspection" violation.

Title 49 CFR § 229.21(a): A daily inspection is required by this section for each day a locomotive is in use. A written report and record are required when the inspection is performed. The inspection can be conducted at any time during the calendar day. It can be done just before midnight or just after midnight. If an inspection were performed just after midnight, the locomotive can operate in compliance with this section for almost 48 hours before the next inspection is required. An inspection is not required unless the locomotive is in use during the calendar day. As a matter of policy, violation recommendations should be limited to situations when a locomotive is used in service and a daily inspection is not performed in compliance with this section. For example, if a locomotive completes an assignment prior to the expiration of the calendar day and is available for service, but does not perform service (any type, including road, switching, dead, stationary) for several days, a violation should be recommended if the locomotive does not receive a daily inspection before midnight of the day it performs service.

Title 49 CFR § 229.21(a)-(b): The inspection reports are to be filed and retained for at least 92 days at the terminal where the locomotive is maintained. FRA allows railroads to keep the reports at a central location, and waivers have been granted to individual railroads that allow for these reports to be electronically generated and kept. Whether it is a written or electronic report, it must contain the name of the railroad; initial and number of the locomotive; the place, date, and time of the inspection; a description of any noncomplying conditions; and the signature of the FRA inspector. An FRA inspector can request the reports for a specific locomotive(s) for the past 92 days and the railroad is obligated to provide such reports in a timely manner. A written or electronic record of the previous inspection must be physically kept on each locomotive until the next inspection is performed. The record must contain the place, date, and time of the previous inspection.

FRA has determined that 49 CFR § 229.21(a) permits railroads to make either a single written report for each locomotive inspected or a single written report that covers multiple locomotives (usually an entire consist); provided, the report contains the necessary information and is properly retained as indicated below.

When FRA proposed and adopted the locomotive inspection reporting requirements currently contained in 49 CFR § 229.21(a), FRA specifically eliminated the previously existing requirement for an approved reporting form. (*See* 44 FR 29613, May 21, 1979.) When proposing the existing reporting requirements, FRA specifically stated that a railroad could adopt any type of written report as long as it included the required information. (*See* 44 FR 29613.) Consequently, FRA will permit railroads to use a single written report that covers multiple locomotives to meet the written reporting requirements contained in 49 CFR § 229.21(a). However, in order to ensure that all of the required information is contained on such reports and to ensure their proper retention, the following conditions must be met if multiple locomotives are addressed on a single daily inspection report:

Each multiple locomotive daily inspection report provides a space for the initials and number of each locomotive inspected; the place, date, and time of the inspection; and the signature of the railroad inspector.

The inspection report contains a space for entering the initial and number of each noncomplying locomotive adjacent to the noncomplying condition(s) disclosed by the inspection. There must also be a space to enter the corrective action(s) taken and the signature of the person making the repairs.

A copy of the multiple locomotives' inspection report is made for each locomotive entered on the report and retained for at least 92 days at a location designated by the railroad.

A written record is maintained on each locomotive, indicating the date, time, and location of the previous calendar-day inspection.

Any condition that constitutes noncompliance with any requirement contained in Part 229, Locomotive Safety Standards, is repaired before the locomotive is used, or the locomotive must be tagged and moved in accordance with 49 CFR § 229.9.

When performing records inspections, FRA inspectors should review the railroad's calendar-day inspection report procedures. If FRA inspectors make a request for inspection reports, and the railroad is unable to provide a copy for each individual locomotive, appropriate enforcement action should be taken. **(MP&E 00-04).**

Title 49 CFR § 229.21(c): This subsection gives the railroad sole prerogative to designate qualified persons to perform the required inspections. FRA has not set forth any specific qualification standards for the railroad's designated inspectors. Note that a qualified person (QP) is NOT the same as a qualified mechanical inspector (QMI) for purposes of conducting a mechanical calendar-day inspection at least once every 33 days, as required for locomotives on a 184-day periodic inspection schedule (*see* 49 CFR § 229.5 and 49 CFR § 229.23(b)(2) for more details).

FRA inspectors should consider issuing a violation report if any of the following questions are answered in the affirmative:

Were noncomplying conditions previously reported on the calendar-day inspection report not repaired?

Does the railroad have a history of ignoring the requirements of the calendar-day inspection regulation?

Can a violation be documented from railroad records for the use of a locomotive overdue for a calendar-day inspection?

Does the overdue inspection create an imminent hazard?

If an FRA inspector finds a locomotive being used, with multiple, obvious defects after it just received an inspection, a violation can be submitted for both the defective condition(s) and failure to perform a proper inspection.

Remote Control Locomotive (RCL)

A locomotive operating as an RCL is given the same daily inspection as a traditional locomotive. The only difference between the two would be the operating controls. If the locomotive is operating in manual mode during the inspection, the brakes would be tested from the controls of the locomotive. If the locomotive is operating in remote mode during the inspection, the brakes would be tested from the operator control unit (OCU). Additionally, all features on the OCU would be tested to determine that they are functioning properly.

If the OCU received its daily inspection when the locomotive was operating in manual mode, and later a crew links the OCU to operate the locomotive in remote mode, the transmitter must be tested to determine that it functions as intended prior to commencing remote control operations. No additional reporting is required regarding the daily inspection report.[18]

The OCU, when operating the locomotive, becomes an appurtenance to that locomotive and is subject to the provisions of 49 CFR § 229.7. Therefore, if an OCU is found to be defective during the calendar-day inspection, it may not be used. Since the transmitter is not permanently

[18] All RCL equipment must be tested to ensure it works as intended before use, because it becomes an appurtenance to the locomotive.

mounted to the locomotive, if found to be defective, it can be removed from service and another OCU can be linked to the locomotive after receiving a proper test and inspection.
If the RCL equipment that is permanently mounted to the locomotive becomes defective, the defect and repairs made must be noted on the locomotive's daily inspection report. OCUs are portable and interchangeable. If the OCU is found to be defective, it does not affect the locomotive if the locomotive can still be operated manually, or another OCU can be linked to the RCL. Because the OCU can operate with several locomotives, the defective OCU does not need to be reported on the locomotive inspection report. To satisfy the requirement to tag and track defective equipment (49 CFR § 229.21), the railroad should develop a means to (1) readily identify defective OCUs, (2) record defective conditions, (3) indicate repairs made, (4) name the person making the repairs, and (5) maintain that record for 92 days.

The requirement to maintain the onboard record does not change. If the RCT is inspected and tested as part of the daily inspection, the onboard record is inclusive of this. If the RCT is added to the locomotive sometime after the daily inspection, the device must be tested and inspected to ensure that the brakes, throttle, and all safety features function as intended. **(MP&E 02-01).**

§ 229.23 Periodic inspection: general.

<u>Information</u>

49 CFR § 229.23(a): The 92-day service cycle begins (day 1) on the date entered on FRA Form F6180.49A. The 92-day service cycle ends 11:59 p.m. on day 92, unless there is legitimate out-of-service time as defined in 49 CFR § 229.33. Some Class I railroads are performing inspections and reporting them on the FRA Form F6180.49A report at intervals shorter than 92 days. FRA takes no exception to this practice, but the FRA inspector should take sufficient time to examine the report to determine that all tests have been performed within the required time periods.

The modern locomotive equipped with microprocessor-based controls has diagnostics that monitor the functioning of locomotive equipment and record faults, particularly with respect to features relevant to periodic inspection. Major faults are instantly addressed, and minor faults are addressed through later data analysis. In some cases, railroads have the capability of analyzing data remotely, without the need for the locomotive to be shopped. Among the features monitored by the self-diagnostic equipment on the newer locomotive models are the ground relay, locked power axle, slipped pinion, traction motor flashover, contactor faults, electrical feedback signal faults, and electronic air brake faults. The newer model locomotives also use a very viscous oil instead of grease to lubricate the pinions and bull gears on traction motor wheel assemblies. The oil does not degrade with age, thicken or thin as ambient temperature varies. Other relevant features are the traction motor brushes last well over 184 days (most last up to a year), improved seals and gaskets, greatly reducing the occurrence of fluid leaks and the need to inspect gusseted and sealed joints. There is also improved insulation that protects against the deterioration of wiring (microprocessors have reduced the generation of heat, which enhances the wiring life. Traction motor support bearings are sealed roller bearings, with lubrication only required when wheels are changed.

An adequate facility is required to perform the periodic inspection, but the term "adequate facilities" is deliberately not spelled out in the regulation. The regulation does not mandate that a pit is the only type of adequate facility, but it must be possible to thoroughly inspect the underneath portion of the locomotive safely. This allows small shortline railroads, which may not have a pit, the flexibility to place or arrange a locomotive in some position or location so that a person can safely inspect under the locomotive.

Generally, the periodic inspection is expected to examine the condition of all mechanical components located in the underneath portion of the locomotive. These components include: equipment that directly affects truck lateral, such as the wear plates on the bolster and frame transom area, and pedestal liners; brake assemblies, clevis pins, bushings, hangars, or the binding of these assemblies; stress cracks on the draft gear pockets, bolsters, and trucks in known stress areas; and high voltage cabling and chafing insulation.

Older locomotives are more likely to have existing or developing cracks in and around the locomotive truck assemblies. Specifically, the upper coil spring pockets, the four corners of the bolster pocket, and the truck access opening for the traction motor air duct, are prone to stress cracks. It is also necessary to periodically inspect the specific traction motor cabling, which can become a safety hazard if the cables are chafing or wear to the point that they have poor insulation. As such, an adequate facility for these particular locomotives would be one that allows sufficient lighting for the employee to see and be able to examine the locomotive equipment mentioned above. Sufficient lighting is required to facilitate adequate inspection. Without an adequate facility to perform the periodic inspection and identify cracks, cracks in locomotive components will develop into breaks, which can lead to a derailment, and the traction motor defects listed above can lead to fires or electrocution.

An adequate facility also protects employees by allowing them to quickly escape from under the locomotive during an emergency.

49 CFR § 229.23(e): The FRA Form F6180.49A must be signed by the worker performing the inspection and the supervisor in charge of the workers. A signature is required. On some small railroad operations, the owner, supervisor, and worker may be one individual. Therefore, one individual would sign as the worker and the supervisor.

Some railroads have gone to a computer-generated FRA Form F6180.49A, which is replaced at each periodic inspection. This form must bear the original signatures of the personnel involved with the most recent inspection and tests. The computer-generated form and the form used at intervals of less than 92 days will require FRA inspectors to spend more time to determine if the locomotive is in compliance with the time elements in 49 CFR §§ 229.23, 229.25, and 229.27.

If an FRA inspector finds locomotives without an FRA Form F6180.49A displayed in the locomotive cab, he/she shall make inquiry of the railroad as to the reason. If the FRA inspector is satisfied with the railroad's backup records and the form was lost or destroyed, the railroad is allowed to reproduce a physical copy of the record and place it in the cab. The reproduced copy must be legible and contain all the required information and signatures from the original.

Unless requested, a railroad does not have to forward an FRA Form F6180.49A to the Washington, DC, Office of Railroad Infrastructure and Mechanical.

Periodic Inspections – Locomotives that operate outside of the United States

With the increase in railroad traffic at both the U.S./Canadian border and the U.S./Mexican border, FRA inspectors should be governed by the following information relative to required daily and periodic inspections and tests for locomotives.

Locomotives that operate outside of the United States are governed by the laws of the country where they operate. Neither Canada nor Mexico requires the types of inspections that are commensurate with the tests and inspections described in 49 CFR §§ 229.21, 229.23, 229.25, 229.27, and 229.29. However, FRA requires that all locomotives that operate in the United States must be in full compliance with Federal railroad safety laws.

Therefore, FRA requires that all locomotives entering the United States from either Canada or Mexico must not be used until all the tests and inspections required by 49 CFR §§ 229.21, 229.23, 229.25, 229.27, and 229.29 have been completed and properly recorded. Those inspections and tests must be done either at the point of entry into the United States, or arranged to be done within Canada or Mexico, prior to entry into the United States. If the inspections and tests are not properly performed and/or the locomotive is not in compliance with Federal railroad safety laws upon entry into the United States, the locomotive may be moved only under the provisions of 49 CFR § 229.9 as a dead or lite locomotive. **(MP&E 98-37).**

§ 229.25 Tests: every periodic inspection.

Information

49 CFR § 229.25(a): Many railroads use a portable air gauge test device that allows testing without removal of the gauges. The use of such a device is acceptable as long as the gauge is tested throughout its entire range. These requirements do not apply to electronic displays, as they are checked annually.

49 CFR § 229.25(b): Sufficient inspection covers are to be removed from traction motors, traction generators, and electrical cabinets in order to thoroughly inspect such equipment for general safety conditions and safety defects.

49 CFR § 229.25(c): Cable connections between mother and slug locomotive combinations should be thoroughly cleaned, inspected, and tested for continuity during periodic inspections as several of these connections carry well more than 600 volts. To be inspected correctly, these connections are required to be disconnected.

49 CFR § 229.25(d): FRA inspectors are advised to inquire about and monitor the periodic inspection, maintenance practices, and test intervals used by the railroads for event recorders when performing routine inspections at locomotive facilities. **(MP&E 98-02).**

§ 229.31 Main reservoir tests.

<u>Information</u>

49 CFR § 229.31(c): If the reservoir is drilled in lieu of the tests provided for in paragraphs (a) and (b), the word “drilled” is to be inserted in the hammer and hydro block on the FRA Form F6180.49A. The exterior of the drilled reservoirs is to be examined for its general condition.

§ 229.33 Out-of-use-credit.

<u>Information</u>

The out-of-use credit inserted on an inspection line of the FRA Form F6180.49A accounts for the continuous record of a locomotive’s use for a calendar year. Out-of-use days cannot be accumulated nor used to extend the intervals prescribed for any test or inspection under this Part, unless the locomotive is out-of-use for 30 or more consecutive days. The creditable out-of-use time of 30 or more days, which is used to extend the test or inspection intervals, must be recorded in Block Number 11 on the FRA Form F6180.49A when a new form is created. Once the credit is used, it should be deleted from the form.

Whether a locomotive is being stored in a remote location or a more accessible location like a yard, it can accumulate out-of-use credit, if the railroad takes affirmative steps to take it out of use. This may include disconnecting batteries or placing signage on the locomotive notifying employees that the locomotive is not in use.

If a railroad leases a locomotive to a private industry that FRA does not exercise jurisdiction over (it is used entirely within the confines of a plant that is not a part of the general railroad system), the locomotive cannot be credited out-of-use time, because the locomotive is being used. The locomotive is required to comply with the Locomotive Inspection Act (49 USC 20701) while used by the lessee, but not Part 229. When the leased locomotive is returned, the railroad must bring it into compliance with all of Part 229 before it can be used in any type of service.

<u>Subpart C – Safety Requirements</u>

§ 229.41 Protection against personal injury.

<u>Information</u>

The requirements of this section are designed to protect against safety hazards that could cause personal injuries.

There are several locations on locomotives where high-voltage equipment is easy to get to for servicing purposes. These locations are usually protected by metal, plastic, or fiberglass covers that protect railroad employees from accidentally coming in contact with live electrical components. Many of these covers break or get lost over time (**Figure 1**); as a result, inspectors should be cognizant of such locations and be on the lookout for exposed high voltage electrical equipment.

Figure 1: Missing high voltage electrical cover on GE locomotive; top of frame.

The same hazards exist for rotating mechanical equipment. Fly wheel covers are frequently misplaced or left unattached and sitting in locomotive engine sumps (**Figure 2**). Drive shaft covers that provide rotational force to components such as air compressors and auxiliary generators are frequently found missing as well.

Figure 2: Missing flywheel cover on EMD locomotive.

§ 229.43 Exhaust and battery gases.

Information

49 CFR §229.43(a): The exhaust system of a locomotive should be inspected closely while the diesel engine is running for cracks in the manifolds and expansion bellows, broken or blown out manifold gaskets, and other signs of exhaust gas discharge into the engine compartment, as evidenced by heavy accumulations of soot and residue. The lay shaft should not be operated by FRA inspectors to accelerate the diesel engine to check for exhaust leaks. If there is evidence of an exhaust leak, the railroad should be requested to operate the lay shaft or rev the engine to locate the leak. Instances have been mentioned by some railroads in which FRA inspectors have

reported exhaust leaks and railroad inspectors could not find them. Since the advent of the EMD GP-30 and its successors, and the GE U-25-B and its successors, the locomotive diesel engine compartments are pressurized to the extent that any residual fumes in the car body will be scavenged to the atmosphere around the exhaust stack opening in the roof.

§ 229.45 General condition.

Information

This section is basically a compendium of many regulations found in the former Part 230. When this regulation was written, the railroads were concerned that the provisions of this regulation created a degree of discretion in interpretation and application by FRA inspectors. FRA's position is that its inspectors have always interpreted the regulations in Part 230 in a reasonable manner. FRA also believes that "conditions that endanger the safety of the crew, locomotive, or train" provide the proper and lawful limit to the application of this section.

Conditions described as fuel, oil, water, steam, and other leaks must be qualified by stating that they constitute a personal injury hazard. Insecure attachments of those items such as third rail shoes or beams, traction motors and motor gear cases, and fuel tanks should have some relevancy to safety, or have deteriorated to the point that it is immediately unsafe and could cause an accident. A locomotive should not be cited for conditions described above if they do not constitute a hazard, but rather are technical in nature. However, the railroad should be required to correct the condition and bring the locomotive into compliance with the Federal railroad safety laws. Similarly, if the sander hose or pipe has a hole in it that discharges sand at eye level, the FRA inspector must establish the personal injury hazard under 49 CFR § 229.45. The inspector must explain how the blowing would cause the injury (*e.g.*, sand blowing at eye level on locomotive walkway, *etc*.). Any safety appliances not covered in Part 231, such as steps and handholds that aid in sanding locomotives, safety railings, and ladder treads affording access to the roof of the locomotive, are covered by 49 CFR § 229.45. FRA inspectors should use this code if or when they find a handle missing or the locking feature defective on locomotive air brake MU end-cocks, since these conditions may affect the operation of the locomotive's brakes.

When a violation is submitted for any of the conditions described in this section, the personal injury hazard should be described. Violation descriptions should include a full explanation of the condition and how it creates a personal hazard.

§ 229.46 Brakes: general.

Information

Inspectors should observe railroad personnel performing the required air brake test on a locomotive(s).

Inspectors should check that someone, *before the start of the trip*, drained the oil and water from the air brake system. FRA considers the *trip* in "yard operations" to be the start of the shift. The presence of water or oil in the brake system in and of itself does not establish a violation under this section. Nor does the fact that there is oil or water in the system following a daily inspection establish a violation. To establish a violation, FRA must prove that the water or oil was not drained from the system before the trip (for which the violation is being sought) began. Thus, if oil or water is present, the inspector should discuss why the presence of such could not have occurred while the locomotive was en route on its trip (length of trip vs. amount of oil and water). The fact that a daily inspection was performed does not establish a violation under this section. FRA must establish that the oil or water was not drained prior to the commencement of the involved trip.

Most of the road locomotives are equipped with some type of automatic main air reservoir drain valve to drain the water and oil from the air brake system. Usually, when the automatic drain valve is cut out or inoperative, water and oil will accumulate in the reservoir. In this case, inspectors should take exception to an inoperative (defective or nullified) automatic drain valve. If the automatic drain valve is found to be inoperative or nullified, but no water or oil is present in the reservoir, a noncomplying condition **does not** exist under this section. Since it is an appurtenance to the locomotive, 49 CFR § 229.7 could be used for enforcement.

§ 229.47 Emergency brake valve.

Information

49 CFR § 229.47(a): The emergency brake valve may be found in various locations on different locomotives. There is no precise location where the emergency brake valve must be placed except that it must be readily **accessible** to someone other than the engineer, and on locomotives with enclosed walkways there must be an additional valve adjacent to the rear exit doors. Although the requirement does not address location of the valve within the cab, the required stenciling near each valve must be visible. If a valve is located behind a cab seat where a crew member must fold the seat down in order to activate it, the required stenciling must not be obstructed. The required stenciling must be visible to identify the valve's location**.**

49 CFR § 229.47(b): For DMU, MU, and control cab locomotives operated in road service, an emergency brake valve is to be located in the passenger compartment and connected to the brake pipe.

Good enforcement discretion should be used if the "Emergency Brake Valve" designation is found not intact. The condition should be brought to the railroad's attention for correction. Inspectors should periodically have the railroad test the emergency valve on the locomotive on a random basis to ensure proper operation.

§ 229.49 Main reservoir system.

Information

Inspectors should periodically have the railroad demonstrate the functioning and setting of the safety valve and compressor governor at locations where periodic inspections are performed.

If a locomotive is found with an air compressor that appears to pump constantly and with a safety valve that activates at constant intervals, the inspector should ask the railroad to verify that the governor is functioning correctly by ensuring the compressor cuts in at not less than 15 pounds per square inch (psi) above the maximum brake pipe pressure fixed by the carrier and that it will not stop the compressor until the reservoir pressure has increased at least 10 pounds.

Union Pacific Railroad (UP) requested and was granted a conditional waiver to permit UP locomotive main reservoir system safety valves to accumulate up to 25 psi above the maximum working air pressure fixed by the chief mechanical officer. The maximum allowed by regulation is 15 psi. This waiver was assigned Docket Number FRA-2005-21179. A copy of the decision letter is available in the MP&E waiver section of this manual.

§ 229.51 Aluminum main reservoirs.

Information

Currently, aluminum main air reservoirs are not in use. This section is included in the regulation to provide design guidance. If an inspector finds an aluminum main air reservoir, the regional office should be immediately notified and the information forwarded to the MP&E Staff Director.

§ 229.53 Brake gauges.

Information

This section pertains only to gauges and displays used by the engineer for controlling or braking a train or locomotive pneumatically and preset pressure devices on the OCU (*i.e.*, belt pack) used in remote control locomotive operations. All other air gauges located at other locations on a locomotive are not covered by this section.

§ 229.55 Piston travel.

Information

49 CFR § 229.55(b): This subsection requires that, when brakes are applied on a standing locomotive, the piston's travel not exceed 1½ inches less than the total possible piston travel. This measurement can be found on the locomotive's blue card, FRA Form F6180-49A. Inspectors should periodically check the 49A card for accurate measurements. On a typical locomotive in service today, the total piston travel for truck-mounted brake cylinders is 8 inches; therefore, the allowable piston travel shall not exceed 6½ inches. Excessive piston travel of a minor nature on only one cylinder should not necessarily result in a violation, but the railroad should be requested to repair it. When measuring piston travel on locomotives, the measurement is from the opening of the cylinder to the collar. It is not the grease ring, as is the practice when measuring piston travel on freight cars.

49 CFR § 229.55(c) prescribes the minimum locomotive brake cylinder pressure. This regulation was written when cast iron brake shoes were the standard, and the brake cylinder relay air valve delivered 100 percent of the control pressure to the brake cylinders. With the advent of the high friction composition brake shoe, various relay valves have been used depending on whether the rigging was designed for cast iron or composition shoes. To best match the stop distance of cast iron, a two-step relay valve is used for composition shoes. One level is used for the automatic brake where speeds are generally above “switching” speeds, and a higher level for the independent brake that is normally used in switching. By tailoring the relay valve to the locomotive, a standard independent brake valve setting can be used universally on a railroad. This setting is usually 45 psi. The resulting brake cylinder pressure may vary from 27 psi (with a 60 percent relay) to 72 psi (with a 160 percent relay). The 60 percent relay valves (J-46 or J-64) are normally found on older locomotives that were converted from cast iron shoes with clasp rigging to composition shoes with clasp rigging. Therefore, FRA considers such locomotives to be in compliance with the regulations. **(MP&E 98-41).**

§ 229.57 Foundation brake gear.

Information

When out-of-line (overriding) brake shoes are discovered, inspectors should try to determine the root cause of the defect (*e.g.*, bushings, hangers, pins, *etc.*). Additionally, the wheel should be examined for thermal stress at the edge of the wheel, as evidenced by small thermal cracks, metal flow, or discoloration.

§ 229.59 Leakage.

Information

49 CFR § 229.59(a): An air leak from the main air reservoir system cannot be considered noncomplying unless it is **in excess of** 3 psi as described in this subsection. If the inspector believes that the leak is excessive, he/she should have the railroad perform the required test procedure.

49 CFR § 229.59(b): After an automatic brake pipe reduction of at least 20 psi (not to exceed full service) is made, wait 45–60 seconds, and if the locomotive is equipped with the means for maintaining brake pipe pressure, this feature must be cut out. Next, observe if the brake pipe leakage exceeds 5 psi per minute.
49 CFR § 229.59(c): Leakage of air observed at a brake cylinder is not itself a noncomplying condition. A noncomplying condition would be present if the brakes did not remain applied for 5 minutes as a result of the leak. This can only be determined after communication from the automatic brake valve is cut off at the completion of a full-service application. The railroad should perform the required test for the MP&E inspector.

49 CFR § 229.59(d): This system will only be found on locomotives which use air-operated electric power contactors and/or an air-operated throttle.

§ 229.61 Draft system.

Information

Coupler heights and safety appliances should be examined for compliance with the Safety Appliance Standards, and all deficiencies should be reported under Part 231. To determine compliance, FRA inspectors must measure coupler heights on level, tangent track. The standard height for a locomotive coupler is identical to couplers on freight and passenger cars: the standard gauge railroad center of the knuckle shall be a maximum of 34½ inches, and a minimum of 31½ inches, above the top of the rail.

49 CFR § 229.61(a)(2): The definition of a crack or break must be applied judiciously when examining a coupler for noncomplying conditions. If the condition observed is a shrinkage crack or a hot tear (a phenomenon that occurs during the casting process), it does not significantly diminish the strength of the coupler, and thus is not considered to be a crack or noncomplying condition. For additional information on coupler cracks, see the information related to draft systems for freight cars (49 CFR § 215.123) contained in Chapter 4.

49 CFR § 229.61(a)(3): Most freight-hauling locomotives have a top-operated lock lifter. If there is clearance in the operating loop when the knuckle is closed, the anti-creep should be functioning.

49 CFR § 229.61(a)(4): This pertains to all types of locomotives regardless of the service to which they are put. The lost motion or draft system free slack is that which is not absorbed by the draft gear or similar equipment. The free slack can be determined by manually placing the coupler in draft and buff position, scribing a mark at each position on the side of the coupler horn, and then measuring the distance between the two marks.

§ 229.63 Lateral motion.

Information

The "total uncontrolled lateral motion" referred to in this section means the lateral motion provided for in the design of the parts, plus any additional lateral motion due to wear. Inspectors may have to measure several points of an axle assembly to calculate the total clearance.

§ 229.64 Plain bearings.

Information

Only plain bearing boxes are referenced in this section, and then only in a very restrictive manner. Any mechanical defect in the friction bearings, as well as any defects found in a roller bearing assembly, shall be reported under 49 CFR § 229.45, General Conditions. Obvious hazardous conditions found when inspecting either friction or roller bearings not specifically covered by the Federal railroad safety regulations may be handled using a Special Notice for Repairs, FRA Form F6180.8.

§ 229.65 Spring rigging.

Information

49 CFR § 229.65(b): This subsection is restricted in application. Many of the locomotives presently in service using elliptical springs have more than three leaf springs in a nest. A locomotive may have a long leaf broken and up to two other smaller leaves broken. This information applies to elliptical springs that are only part of a nest of three or more. At no time may a locomotive have two (2) long leaves broken.

Also, many locomotives are equipped with rubber/steel laminated pads instead of leaf springs, and where such pads are found to be defective or deteriorated and they create an unsafe condition, they should be reported under 49 CFR § 229.45.

Only the outer coil spring is covered by this subsection. All coil springs in a truck assembly are to be inspected and considered, such as those that are used to support the span bolster on the EMD SD series of locomotives and must be in compliance with this subsection. A spring plank resting on or in contact with the safety hanger should be reported.

49 CFR § 229.65(c): **"Clearly formed droplets"** means a **fresh** accumulation of oil (not dirty or dried) that continually and/or slowly forms into beads. If there is evidence of the unit being ineffective, it is considered defective. This applies to shock absorbers including yaw dampers.

§ 229.69 Side bearings.

Information

49 CFR § 229.69(b): Side bearings may not run in contact unless they are designed to carry weight. To determine that there is no clearance between a pair of side bearings that appear to be in contact at both sides, the inspector must use a thin feeler gauge to make the determination as to whether clearance exists.

There are two measurements allowed on a locomotive which has two (2) trucks under the same structure. A total not to exceed ½ inch is allowed at the side bearings of one truck and under the same superstructure; a total not to exceed 1 inch is allowed on trucks with more than one pair of side bearings per truck. The superstructure is only that part over the trucks. Inspectors must be cognizant of truck configurations that allow for more than one pair of side bearings on one truck. No exception should be taken if all of the side bearing clearance is to one side and there is no apparent problem with the locomotive. **All side bearing measurements must be taken on tangent, level track.**

§ 229.71 Clearance above top of rail.

No part or appliance of a locomotive except the wheels, flexible nonmetallic sand pipe extension tips, and trip cock arms may be less than 2 1⁄2 inches above the top of rail.

Information

Components that are closer than 2 ½” to the rail other than wheels, flexible nonmetallic sand pipe extension tips, and trip cock arms are subject to damage and creating safety hazards.

The plane between and outside each rail head must be clear of all locomotive components and appurtenances; the gage between rails must not have anything hanging lower then 2 ½” above the top of the rail.

Anytime traction motors or truck components have been changed out, inspectors should check to make sure that items such as traction cables have been re-hung so has not to hang too low.

§ 229.73 Wheel sets.

Information

49 CFR § 229.73(b): This section deals with the problem of mismatched wheels. Mismatched wheels may be identified as (1) wheel slip control, (2) traction motor current unbalance, or (3) axle load variations.

> (1) The wheel slip control system brings into play either manual sanding by the engineer or automatic sanding triggered as the response to arrest the wheel slip. In either case, sanding may substantially increase the ratio of lateral to vertical forces creating a derailment possibility.
>
> (2) Traction motor current unbalance results in different current levels between the motors in the truck that affects the traction motor operating temperature, and the distribution of tractive effort.
>
> (3) The axle load variation caused by different wheel sizes affects the adhesion level demand at various axle locations since some axles are called upon to accept more or less of the locomotive’s weight than they would with equal wheel sizes. This affects the tracking characteristics of the locomotive. A lightly loaded leading axle of a truck would have a greater tendency to climb the rail in a curve or at track irregularities, while a heavily loaded axle has the same effect on the track structure as a heavier locomotive.

Inspectors are advised that this regulation applies only to three powered axle trucks. Inspectors should employ the witness groove method to determine the wheel diameter. To properly measure the diameter of a locomotive wheel, measure the distance from the top of the reference (witness) groove to the outer edge of the rim, multiply by two, and add 36 inches. A standard steel wheel gage (finger gage) would normally be used for this measurement. Gauge W319 can also be used to determine a wheel’s diameter, especially if 44-inch wheels are involved.

§ 229.75 Wheels and tire defects.

Information

Great care should be exercised when measuring wheels for flat spots and high flanges. Inspectors should use appropriate wheel gages and not include a non-gage measurement along with a noncomplying condition, unless the wheel defect in question is so severe that a higher monetary penalty can be established, as reflected in the penalty schedule. Additional information on how gages are used to measure wheels can be found in the discussion on 49 CFR § 215.103 in this manual.

49 CFR § 229.75(k): Identifying a crack in the wheel will require some judgment on the part of inspectors, especially those who regularly inspect MU locomotive equipment or locomotives used in commuter service. Cracks that are found in discolored wheels that extend from the tread outward over the edge of the rim or into the flange should be considered as dangerous to the safety of the wheel and handled for correction with the railroad. If any crack appears to be opened, it should be reported because the wheel has gone into a state of tension, and any further thermal abuse may result in a broken wheel. These cracks are often referred to as thermal cracks, resulting from the high speed, short distances, and heavy braking required in commuter service. Inspectors should be aware of such conditions, bring the issue to the MP&E specialist's attention for evaluation, and monitor the situation as required.

49 CFR § 229.75(m): At the option of the railroad, welding of the wheels is permitted to make emergency repairs to move a road locomotive from an accident site or a location where a defective wheel cannot be replaced. However, any subsequent move can then only be made as permitted by 49 CFR § 229.9 (*i.e.*, the locomotive must be: properly tagged; only moved lite or dead-in-tow; operate under appropriate restrictions; and, used only in a type of service that will be safe). It is also permissible to weld wheels on locomotives used only in yard service. For this purpose, yard is defined by "yard limits," which are designated by the railroad and are usually found in the current timetable or established by posted signs. Locomotives with welded wheels can operate only on tracks within the designated limits of a yard. The minimum requirements for railroad yard limits rules are defined in 49 CFR § 218.35.

§ 229.77 Current collectors.

Information

The pantograph control switches or buttons are usually located on or near the engineer's control panel, and should be operated by railroad personnel only. **Inspectors should be alert when inspecting locomotives and MU locomotives in electrified territory.** Inspectors should consider the catenary system and the current-carrying parts of the third-rail system to be energized and dangerous at all times. Inspectors should not get on the roof of any equipment when it is under the catenary system. Extreme care should be exercised with the use and handling of metal gauges and tools around electrical equipment and especially third-rail equipment.

§ 229.79 Third rail shoes.

Information

Inspectors should be aware that considerable force is exerted on third-rail shoe beams when in operation. Therefore, these beams must be properly secured on brackets, and not split or cracked.

§ 229.83 Insulation or grounding of metal parts.

All unguarded noncurrent-carrying metal parts subject to becoming charged shall be grounded or thoroughly insulated.

Information

Frequently, traction motor ground wires are left unattached during traction motor changeouts. Inspectors should take proper steps to ensure compliance if these wires are found not connected as intended.

Many hinged electrical cabinets have small grounding jumper wires that are installed to maintain a constant ground path for fault currents. If these jumpers are found disconnected or missing, inspectors should take proper steps to ensure compliance.

§ 229.85 High voltage markings: doors, cover plates, or barriers.

Information

49 CFR § 229.85 warns people of a potential shock hazard before the high voltage equipment is exposed. A conspicuous marking on the last cover, door, or barrier guarding the high voltage equipment satisfies the purpose of this section.

§ 229.89 Jumpers; cable connections.

Information

49 CFR § 229.89(a): Jumper cables with one end hanging loose should not be taken as a violation when the locomotive is found standing unattended and the locomotive is not **in use** or assigned for service. Conversely, if locomotives are observed in use with one end of the jumper cable hanging free, appropriate enforcement action should be taken. This applies to a locomotive standing in a yard or within the confines of a locomotive servicing area.

Inspectors should periodically lift the jumper receptacle lid to ensure that all terminal pins are in suitable condition for service. In addition, the jumper housing should be inspected to ensure that it seals properly and is free of cracks.

§ 229.91 Motors and generators.

<u>Information</u>

One of the defects most often reported is accumulation of oil. The key word in the regulation is **<u>excessive</u>**. If the accumulation over the exterior of the motor or generator is not excessive, it should not be reported. Also, if it is an old accumulation as evidenced by debris and dirt, and no fresh oil is found, it should not be reported as a defect.

When a traction motor is cut-out on most locomotives, the dynamic brake functions of that locomotive (if equipped) are nullified. Additionally, the wheel slip detection system may be affected, especially on EMD DC locomotives. (*See* information for 49 CFR § 229.115 of this manual about wheel slip).

§ 229.93 Safety cut-off device.

<u>Information</u>

Since the introduction of the EMD GP-30 series locomotives in the 1950s and the GE U-25 series, fuel safety cut-off devices have been incorporated in the emergency shut down switches. The earlier fuel safety cut-off devices consisted of a mechanical valve manually operated through a cable system from three locations. Resetting this valve is also manual. Safety shut-off devices of this type must be operable from three locations, one in the cab and one on each exterior side of the locomotive. Inspectors may not operate the safety cut-off device. Inspectors should request that the railroad demonstrate the functionality of fuel safety cut-off devices on random inspections and whenever there is reason to believe the device is inoperable. If the required marking is missing or incomplete, a violation should not be filed, but it should be brought to the attention of the railroad for correction.

As a result of an accident involving a runaway UP freight train that derailed at Hayden, California, FRA published a Notice of Safety Bulletin 97-1 in the Federal Register on January 30, 1997. The notice urged all railroads to inspect locomotives to determine if the emergency MU fuel cut-off switch is located in such a position that it can be inadvertently activated by the engineer. Inadvertent actuation of a switch located at knee level to the engineer is suspected as the cause of the Hayden, California, accident.

During normal inspections, inspectors should carefully examine the locomotive fuel cut-off switch for vulnerability to inadvertent actuation. When a locomotive is found to have such vulnerability, inspectors should work with the railroads to conform with the Notice of Safety Bulletin as quickly as possible. Any disagreements arising over whether a switch is vulnerable, that cannot be resolved at the regional level, should be referred to the MP&E Staff Director. **(MP&E 98-60).**

§ 229.97 Grounding fuel tanks.

Information

There is no requirement for any type of fuel level gauge at fuel oil reservoirs. Generally, all locomotives have fuel sight glasses of some type, but they are for the railroad's convenience, as is the automatic fuel shut-off equipment that is used when fueling locomotives.

§ 229.99 Safety hangers.

Information

The drive shaft hangers described in this section deal with a shaft that, if disconnected, could fall to the track structure and cause a derailment. These types of drive shafts are found on locomotives where the motive power uses a mechanical drive system to power the drive axles (e.g., Budd Company RDCs and French Turbotrains (turbine trains)).

§ 229.101 Engines.

Information

49 CFR § 229.101(a): Inspectors should be alert to safety switches being nullified when inspecting the diesel engine on locomotives. Where actual tampering of the engine protective devices is found, violations should be considered.

§ 229.113 Warning notice.

Information

The steam generator regulations are not included in their entirety in this chapter because there are none in service at the present time. Inspectors should refer to the complete Part 229 if a steam generator is found in service in his/her Region.

Amtrak and commuter railroads use electricity to heat passenger cars, operate air conditioning units, provide train lighting, and for all other ancillary equipment. The power source is usually a generator installed in the diesel-electric locomotive or an inverter in the electric current. Generators could be a stand-alone engine/generator unit located in a car, in an auxiliary car, or in a compartment of the locomotive. This equipment is to be inspected by FRA. It is the railroad's responsibility to maintain the equipment in a safe and suitable condition for service and all deficiencies should be reported under 49 CFR § 229.45.

§ 229.115 Slip/slide alarms.

Information

On most DC-powered traction motors, the slip/slide device is nullified when a traction motor is cut-out. Therefore, movement of a locomotive with a DC traction motor cut-out can only be made under the provisions of 49 CFR § 229.9. GE provided information concerning wheel slip slide and wheel lock protection provided on the GE Dash 8 and Dash 9 locomotive models. These wheel slip/wheel lock devices function independently of the DC electrical energy provided to power the traction motors. FRA determined that since the wheel slip/slide detection remains fully active, even though one or more of the traction motors are cut-out, it is not a safety-related item and is in proper condition and safe to operate without unnecessary peril to life and limb under 49 CFR § 229.7. This condition also meets the requirements for slip/slide alarms under 49 CFR § 229.115. Being consistent with its enforcement guidance and policies relating to wheel slip/slide and wheel lock on alternating current locomotives, FRA takes no exception to the continued use of locomotives with wheel slip/slide alarms described above provided all of the following conditions are met:

1. Locomotives so equipped will not be permitted to operate with defective or cut-out traction motors beyond any periodic inspection required under 49 CFR § 229.23.

2. Any railroad operating such locomotives must clearly identify within the operating cab of the locomotive that the locomotive is using the wheel slip/slide design, as described, within the operating cab of the locomotive.

Locomotives operating with AC traction motors have a wheel slip/slide detection system that remains active regardless of whether an inverter and related traction motor are cut-out. With the slip/slide system active, FRA has determined that a cut-out AC traction motor/inverter is not a safety-related item and does not take exception to the continued use of locomotives with the AC traction motor cut-out, provided the locomotives does not operate with the defective or cut-out traction motor beyond the periodic inspection required under 49 CFR § 229.23. This applies to both GE and EMD locomotives.

49 CFR § 229.115(a): The wheel slip/slide device must be provided with either an audible or visual alarm in the cab; only one is required. In a multiple locomotive consist, the wheel slip/slide action that may occur on a trailing locomotive or on a remote-controlled locomotive must activate a device that can be heard or seen in the cab of the controlling locomotive. This also applies to locomotives operating in DPU service.
49 CFR § 229.115(b): This section is referenced in 49 CFR § 229.101(c). Wheel slip/slide protection shall be provided on a locomotive with an engine displaying a warning notice whenever required by § 229.115(b).

49 CFR § 229.115(c): Only MU locomotives built prior to January 1, 1981, are excluded from this requirement. MU locomotives built on or after that date must be equipped as required by 49 CFR § 229.115(a). All MU locomotives that have powered wheels equipped with slip/slide protection must maintain and have such equipment in operating condition.

§ 229.117 Speed indicators.

Information

49 CFR § 229.117(a): Inspectors must recognize that this regulation has several qualifiers: (1) the locomotive must be a controlling locomotive, and (2) it must be on a train that will exceed a speed of 20 mph. These two criteria must be met before enforcement procedures can be instituted. If a locomotive is placed in service in a non-controlling position without a speed indicator or with an inoperative speed indicator, the locomotive is in compliance with this section. This section applies to MU locomotives, and when it was promulgated, FRA informed the affected commuter lines that they could apply for waivers.

49 CFR § 229.117(b): If a speed indicator of a controlling locomotive becomes inoperative en route, it may continue in service under 49 CFR § 229.9. It does not require the railroad to reduce the train speed to 20 mph or less. If the noncomplying condition can be brought into compliance by shifting the position of the locomotive in the consist, the noncomplying condition should be rectified by doing so at the next forward location. This could be a siding, a wye, or any location where it is physically possible to reposition the locomotive without endangering the safety of employees, locomotives, or trains. **(MP&E 98-50).**

If the inspector can develop a case in which a railroad dispatched a controlling locomotive with a reported defective speed indicator, suitable enforcement action should be taken.

§ 229.119 Cabs, floors, and passageways.

Information

49 CFR § 229.119(a): Cab seats should be reported as defective only when they are not securely mounted and braced. Wall-mounted seat bracket guideways should have no openings in them that would allow the seat bracket to inadvertently fall out. Hydraulic cab seats should be checked for operation and leaks.

49 CFR § 229.119(b): Cab window defects can only be reported if they interfere with the crew's undistorted view of the right-of-way from their normal seated position in the cab. This is a performance standard that should be sufficient to require the railroads to properly maintain such things as windshield wipers and defrosters to meet this standard. Defective cab windows for any other reason may either be taken under the glazing regulations found in Part 223, or under 49 CFR § 229.45, if broken and sharp edges create a personal injury hazard.

49 CFR § 229.119(c): Accumulations of oil, water, debris, and other items on passageways, walkways, cab control compartment floors, or engine compartment floors should not be kept in such a nature as to present a **potential hazard and unsafe condition for** any person who **would use them (**e.g., a slipping or tripping hazard, or not providing secure footing). When an inspector discovers a condition that presents a potential hazard and unsafe condition for any person who would use them, he/she should also determine the source and take appropriate enforcement action. The regulation does not require that such things as portable ice chests or

crew luggage be secured in the cab, but if these items create a personal injury hazard, they should be addressed. Keep in mind, a locomotive that is not absolutely clean and free from all accumulations of oil may still be in compliance, if the conditions do not rise to a defect under Part 229. When a defect is found, responsibility for the defect should be considered in considering a violation recommendation.

Locomotive air compressor compartments are routinely used for the storage of tools and materials for servicing the locomotive and train (e.g., air hoses, jumper cables, wrenches, etc.), thereby requiring train crew members to enter the air compressor compartment to retrieve many of these items. If the floor in the air compressor compartment is cluttered with loose material or is covered with oil, a tripping or slipping hazard exists.

Several railroads have installed toolboxes on their locomotives in the doorway leading into the air compressor compartment. The toolbox location is identified and all other doors leading into the air compressor compartment are marked for maintenance personnel only. The railroad believes that by removing the tools from the compartment and denying access to all except maintenance personnel, the slipping hazard has been removed. In addition, maintenance personnel entering the compartment are required to inspect the floor first and then remove any slipping or tripping hazard prior to entry.

In late 1999, an MP&E Technical Resolution Committee (TRC) examined the application of 49 CFR § 229.119(c) relevant to air compressor compartments, considering the scenario noted above. Based on the discussions and recommendations developed by the TRC, FRA has determined that the presence of oil on the floor of the locomotive air compressor compartment does not constitute a slipping or tripping hazard under 49 CFR § 229.119(c), if **all** of the following conditions are complied with:

Train crews are prohibited from entering the air compressor compartment by general order, bulletin order, timetable instructions, or other formal instructions.

The air compressor compartment doors are stenciled to indicate that train crew members are not to enter the compartments.

Tool storage compartments are readily and clearly identified by stencils.

Tool storage compartments are self-contained units, arranged and designed so that any tools or materials falling from the storage hooks or racks do not fall onto the floor of the air compressor compartment.

When a train crew member identifies (without entering the compartment) a slipping hazard in the air compressor compartment, the condition is listed on the inspection report (current or next daily). Identification of such a condition should not be treated as a noncomplying condition under Part 229 if all other conditions contained in this list are otherwise met.

When any tools or materials intended for use by the train crew are found on the air compartment floor, the condition is treated as a tripping hazard, a noncomplying condition under 49 CFR § 229.119(c), and corrective action is taken.

Railroads should continue to clean the air compressor compartment as necessary in a timely fashion.

FRA inspectors should take appropriate enforcement action, if there is oil on the air compressor compartment floor that creates a slippery condition **and** there is a tool, part, or material inside that may be needed by a train crew member, even though all other conditions noted above have been met (i.e., restricted access, separate tool storage compartment area).

Furthermore, if the locomotive is not properly stenciled, as noted above, or the train crew is unaware of the access restrictions to the air compressor compartment, then any loose material or oil on the air compressor compartment floor that creates a slipping or tripping hazard would constitute noncompliance with 49 CFR § 229.119(c), and appropriate enforcement action should be taken. **(MP&E 00-05).**

49 CFR § 229.119(e): The regulation does not require that a locomotive connected with another locomotive has to have an open-end platform. It only requires that if the locomotive does not have a continuous barrier, such as a solid handrail, then the passage between the two locomotives must be safe and protected by chains or other devices. Continuous barriers missing should not be reported as a defect if the locomotive is not being **used** and is inspected in a locomotive service facility. Although there are no minimum height restrictions when a chain is used, inspectors should ensure the chain does not present a tripping hazard.

§ 229.121 Locomotive cab noise.

Information

(TBD)

§ 229.123 Pilots, snowplows, end plates.

Information

This section also applies to MU locomotives. For a locomotive consist, this requirement applies only to the lead locomotive. The measurement should be taken on relatively level track. The inspector should not record a defect on a locomotive for only a minimal deviation of the height requirement. The railroad should be told to adjust the end arrangement so that it is in compliance. When the locomotive is equipped with a combination of the equipment listed in this paragraph, each extending across both rails, only the lowest piece of that equipment must satisfy the clearance requirements of this section.

§ 229.125 Headlights and auxiliary lights.

Information

The candela rating established in this section corresponds to the intensity level implicitly required under the prior rules in Part 230. That rule was more a detailed performance standard that required not only that a headlight illuminate a person 800 feet ahead and in front of the headlight, but that the engineer in the operating compartment possess the visual capacity to see in a clear atmosphere a dark object as large as a man of average size standing erect at least 800 feet ahead and in front of the headlight.

Inspectors should also be aware that the qualifier in this section is that only the **lead locomotive** must be equipped with the prescribed headlight. Intermediate locomotives in a consist with inoperative headlights are not to be considered as noncomplying. Also, the requirement for rear headlights on road locomotives has certain conditions. Inspectors should take appropriate enforcement action when a headlight is found defective. However, if the locomotive has a light arrangement using two sealed beam headlights, the inspector must ascertain whether they are 200-watt, 30-volt lamps or if they are 350-watt, 75-volt lamps. The reason for this is because if the dual light system is using 200-watt, 30-volt lamps, both lamps would have to be defective before enforcement action can be taken. However, inspectors should take appropriate enforcement action if one of the bulbs is defective on dual-light systems using 350-watt, 75-volt lamps.

A locomotive may remain in the lead position until the next calendar day inspection after an en route failure of one incandescent PAR 56, 350-watt, 75-volt lamp, if certain safety conditions are satisfied. Intensity requirements are at 7.5 degrees and 20 degrees to the headlight to clarify the criteria by which equivalence of new design head-light lamps will be evaluated to achieve the same safety benefit.

When one of two lamps in a headlight utilizing PAR-56, 350-watt, 75-volt lamps is inoperative, the center beam illumination for that headlight often drops below 200,000 candela due to manufacturing tolerances. A locomotive equipped with these lamps may continue in service as a lead unit until the next calendar day inspection, when one of the two lamps becomes inoperative, under the conditions specified in 49 CFR § 229.125(a)(2)(i). Specifically, the conditions listed in 49 CFR §§ 229.125(a)(2)(i)(A), (B), and (C) ensure that neither locomotive conspicuity at grade crossings, nor the illumination of the right-of-way will be compromised. Alternatively, when locomotives are handled under the general movement for repair provision of 49 CFR § 229.9, they are required to be repaired or switched to a trailing position at the next forward location where either could be accomplished.

With the advancement of technology, LED headlights have made an introduction into the locomotive industry. LED headlights differ from the traditional halogen or incandescent headlights mainly due to their low power consumption (light output is mainly driven by the amperage as opposed to the voltage) and efficiency.

LED headlamps are usually comprised of multiple diodes instead of a single bulb. Thus, if the LED headlamp submission does not include data that clearly indicates the lamp can achieve all luminous intensities with less than 100% of all the diodes operating, then FRA will consider any LED headlamp with 1 or more diodes not operating to be a defective headlamp. Also, LED headlamps do not exhibit the typical heat output that halogen or incandescent bulbs produce. LED headlamps are being evaluated for their ability to prevent ice and snow build up over the lens throughout North American operating environments via means of integrated heating. Thus far, all LED headlamps FRA has found compliant have demonstrated some sort of ability to keep the headlamp lens heated to above freezing conditions. Please refer to HQ staff any concerns regarding questionable LED headlamps found in service.

There have been instances where some locomotives have had the auxiliary lights (ditch lights) installed in a manner that covers a portion of the uncoupling levers, which serve as the end handhold on a locomotive. If this condition exists, it should be handled for correction.

The following questions and answers are based on a previously issued Technical Bulletin **(MP&E 98-03)** that addressed the many inquiries concerning the application, operation, and inspection requirements of auxiliary lights:

1. When does a locomotive have to be equipped with auxiliary lights?

A. Each lead locomotive that operates over one or more public grade crossings at a speed greater than 20 mph shall be equipped with operative auxiliary lights on the <u>forward</u> end of the locomotive as it approaches a public highway-rail grade crossing.

2. What is a public highway-rail grade crossing as it applies to auxiliary lights?

A. It is the location where railroad tracks intersect a roadway that is part of the general system of public streets and highways and is under the jurisdiction of and maintained by a public authority and open to the general traveling public.

3. What are auxiliary lights?

A. Auxiliary lights are two white lights producing at least 200,000 candela that are located on the front of the locomotive to form a triangle with the locomotive headlight. They must be mounted at least 36 inches above the top of the rail, except on MU locomotives and control cab locomotives where such placement would be impractical. On such MU locomotives and cab control locomotives, the lights shall be mounted at least 24 inches above the top of the rail. Other mounting and focusing requirements are listed in 49 CFR § 229.125(d). There are other arrangements that are “grandfathered” to satisfy auxiliary light requirements.

4. What are the "grandfathered" arrangements?

A. 1) Oscillating lights may fulfill the requirements of 49 CFR § 229.125(d) for auxiliary lights, provided they meet the "grandfathering" requirement of 49 CFR § 229.133(c)(1), *i.e.*, the oscillating light meets the requirements of 49 CFR § 229.133(b)(4)(A) or (B) and was "ordered for installation on that locomotive prior to January 1, 1996."[19]

2) Strobe lights that were applied to the locomotive prior to March 6, 1996, will satisfy the auxiliary light requirements until the locomotive is either retired or rebuilt (whichever comes first), but the speed of the locomotive is restricted to 40 mph when used as a lead locomotive.

3) Two white auxiliary lights spaced at least 44 inches apart on at least one axis, and that were installed on the locomotive prior to May 30, 1994, satisfies the auxiliary light requirements until the locomotive is either rebuilt or retired, whichever comes first. *This is the headlight arrangement commonly used in commuter service.*

5. Do auxiliary lights have to work when a calendar-day inspection is performed?

A. Yes. Auxiliary lights are treated the same as headlights when calendar-day inspections are performed.

6. When do the auxiliary lights have to be illuminated?

A. Auxiliary lights must remain continuously illuminated immediately prior to and during the movement of the locomotive, except as provided by railroad operating rules, timetables, or special instructions. This not only increases conspicuity at public highway-rail grade crossings, but also addresses private crossings, pedestrians, and roadway workers.

7. Do the lights have to flash on approaching a crossing?

A. The lights may burn steadily or flash (pulse) on approach and while passing over a public highway-rail grade crossing.

8. Are there circumstances where the lights can be legally extinguished?

A. Yes. The regulations permit railroads to designate specific locations where auxiliary lights can be extinguished, if these designated locations are identified in either the railroad's operating rules, timetable, or special written instructions. This

[19] Note that 49 CFR § 229.133(b)(4)(A) refers to a traditional mechanically oscillating light (Marrs or Gyra style lights), whereas 49 CFR § 229.133(b)(4)(B) refers to electrically oscillating (alternately flashing) lights "at one location on the front of the locomotive" (not separated as regular auxiliary lights would be) aimed within 5 degrees of the centerline of the locomotive.

would typically be at locations where existing operating rules require the headlight to be dimmed, such as: at stations; when passing another train; in yards where switching is performed; or at locations where train operations parallel a public highway, and the night vision of motorists would be impaired by the use of auxiliary lights. Any exceptions from the use of auxiliary lights at specific locations are subject to disapproval for a stated good cause by FRA's Associate Administrator for Railroad Safety/Chief Safety Officer, or one of FRA's Regional Administrators, after FRA investigation and an opportunity for response by the railroad.

9. Can a train be dispatched from the initial terminal without auxiliary lights on the lead locomotive?

A. If the lead locomotive is <u>not</u> equipped with auxiliary lights, the train can be dispatched out of an initial terminal, with the understanding that the locomotive cannot operate over any public highway-rail grade crossing at a speed greater than 20 mph. Otherwise, if the lead locomotive <u>is equipped</u> with auxiliary lights, <u>all</u> must be functioning on the end of the locomotive in the forward direction of the train movement.

10. Can the train leave the initial terminal with one light defective on the lead locomotive?

A. No, all auxiliary lights must be working on the lead locomotive in the forward direction of the train movement.

11. What about en route failures?

A. If <u>one</u> light becomes defective en route, the locomotive can continue to operate in the lead at track speed, but the defective light must be repaired no later than the next calendar day. This locomotive could not be used in the lead position out of an initial terminal unless repairs were made. If <u>two</u> lights become defective en route, the locomotive (train) may only proceed to the next location where repairs can be made, and the locomotive is restricted to 20 mph or less over all public highway-rail grade crossings until the lights are functioning.

12. If the mechanism that causes the oscillating light to oscillate is defective, how should this condition be treated?

A. This would be treated as a complete failure of the auxiliary light. It could not be dispatched from an initial terminal as a lead unit, and if the failure occurred en route, it would have to be repaired at the next point where repairs could be made with the locomotive restricted to 20 mph over all public highway-rail grade crossings.

13. Are locomotives that operate in both directions (dual-control) required to be equipped with auxiliary lights on each end of the locomotive?

A. These types of locomotives should be equipped on each end, since they frequently operate as a lead in both directions. However, if a locomotive is equipped with auxiliary lights on only one end, then it could only be dispatched out of an initial terminal as the lead unit, if the equipped end is placed in the forward direction of the train movement. If during the trip this same locomotive made a reverse move as a lead unit, it would be restricted to 20 mph over all public highway-rail grade crossings.

14. When a speed restriction at a public highway-rail grade crossing is required, does this mean the whole train is restricted to 20 mph over the crossing?

A. No, just the lead locomotive is restricted to 20 mph over the crossing.

15. Are steam locomotives required to be equipped with auxiliary lights?

A. No. Also, any locomotive built before December 31, 1948, which is not used in commuter or inter-city passenger service, is excepted from auxiliary light requirements. **(MP&E 98-03).**

§ 229.127 Cab lights.

Information

49 CFR § 229.127(b): The preamble to this rule states that it was intended to be similar to the former rule, 49 CFR § 230.233(b), which includes the qualifier that when employees are required to pass from one cab to another, the platform and passageway between shall be illuminated. There are no passageways on the road-switcher type of locomotives; these are found on the car body type locomotives where people walk inside, and illumination is important. Lights that are inside the car body of a road-switcher type locomotive are not to be considered as compartment lights and shall not be taken as a noncomplying condition. Where the criteria for a passageway exist, illumination must be provided, and the lights maintained. The same is true for the walkway platforms between locomotives found on road-switchers. A flashlight or other hand-held light does not satisfy the requirements of this rule.

§ 229.131 Sanders.

Information

49 CFR § 229.131(b): This paragraph provides for handling of inoperative sanders discovered after departure from an initial terminal on locomotives in road service. The locomotive must be tagged per 49 CFR § 229.131(d), and an inoperative sander should be recorded per 49 CFR § 229.21, as part of the daily inspection. Lead and trailing units are handled similarly, but no more than 14 days after discovery of inoperative sanders, a road locomotive may only be used in

trailing service. Note also the triggering event concerning a locomotive placed in a facility with a sand delivery system. If a road locomotive with inoperative sanders runs through a location with a locomotive servicing facility that includes a sand delivery system, but does not enter the servicing facility, that requirement to repair the sanders is not triggered.

49 CFR § 229.131(c): Locomotives in switching service do not depart from an initial terminal and so are to be handled according to this section. Locomotives used in yard switching service, which normally move in both directions, should have the outboard sanders operational.

49 CFR § 229.131(d): Note that it is only the tagging requirement of 49 CFR § 229.9(a) that is referenced here. Other restrictions of 49 CFR § 229.9, such as the power penalty or the requirement to repair at the next daily inspection or next forward repair point, do not apply to a locomotive with inoperative sanders.

If sand is being discharged at eye level and constitutes a personal injury hazard, it should be reported under 49 CFR § 229.45.

§ 229.133 Interim locomotive conspicuity measures - auxiliary external lights.

Information

Information regarding this section can be found under **§ 229.125, Headlights and Auxiliary Lights.**

§ 229.135 Event recorders.

Information

Requires replacement, by October 1, 2009, of each event recorder using magnetic tape as a storage medium with a certified crashworthy event recorder memory module (ERMM) capable of recording at least the same data elements as the recorder it replaces. Any magnetic tape recorder replaced after October 1, 2006, must be replaced with a certified crashworthy event recorder memory module.

Requires all new lead locomotives, lead manned helper locomotives, and controlling distributive power locomotives (ordered after October 1, 2006, or placed in service after October 1, 2009) to be equipped with a certified crashworthy ERMM capable of recording up to 25 data elements for traditional locomotives and 22 data elements for MU and DMU locomotives, as listed in the regulation.

Requires all locomotives remanufactured after October 1, 2007, to be equipped with a certified crashworthy ERMM capable of recording at least the same data elements as the event recorder on that locomotive prior to remanufacture.

Requires event recorders originally manufactured after January 1, 2010, and installed on a covered locomotive, to be equipped with a certified crashworthy ERMM.

Contains specific performance criteria for determining the crashworthiness of an ERMM. These include criteria for fire, impact shock, static crush, fluid immersion, and hydrostatic pressure and contains testing sequence requirements. The criteria are based on existing crashworthiness standards of the IEEE, modified for the locomotive environment.

Requires preservation of event recorder data for a period of 1 year for any locomotive involved in an accident or incident required to be reported to FRA under Part 225.

Provides relief from the periodic inspection requirements for microprocessor-based event recorders with self-monitoring features. Requires inspection of these types of event recorders annually. (*See* 49 CFR § 229.25(d).

§ 229.136 Locomotive image and audio recording devices.

Information

By October 12, 2027, each lead locomotive of a train used in commuter or intercity passenger service must be equipped with an image recording system to record images of activities ahead of the locomotive in the direction of travel (outward-facing image recording device), and of activities inside the cab of the locomotive (inward-facing image recording device).

Each railroad with locomotives in commuter or intercity passenger service subject to this section must provide the FRA Associate Administrator for Railroad Safety and Chief Safety Officer with a description of the technical aspects of any locomotive image recording system installed to comply with this section. The FRA Associate Administrator for Railroad Safety and Chief Safety Officer will review a railroad's submission and must approve any locomotive image recording system intended to comply with this section before the system can be installed or put into service.

§ 229.137 Sanitation, general requirements.

(reserved)

§ 229.139 Sanitation, servicing requirements.

Information

There are several types of locomotive cab toilet facilities in use today. Micophor, Envirovac Vacuum Systems (EVAC), and Motive Equipment, Inc. (MEI) are a few of the most common types. Norfolk Southern Railway and Amtrak primarily use the EVAC systems.

Microphor uses a two-tank system, the only one of its kind. Human waste is deposited in the tank directly below the user; when flushed, it is passed by way of piping into a chemical (chlorine) holding tank for biological break-down, and then passed out to a drip pipe to atmosphere (right-of-way).

Other manufacturers' toilets use only one tank. The same tank that waste is passed into is used as a holding tank. The flush simply opens a flapper and forces clean water to wash or rinse the bowl and then allows the waste to pass into the tank below where it is biologically (chemically) broken down. If the proper amount of chlorine is used, and the tank is not overfilled to capacity, it is retained until it is sucked out by the railroad maintenance person when it is time for service.

The most common causes for locomotive toilet systems failing, regardless of the manufacturer, is the lack of maintenance by the railroads, vandalism, and paper towels and/or various other types of foreign matter being introduced into the toilet system. Toilet systems are only designed to break down human waste and common toilet paper.

Surveys indicate that any kind of paper towel will clog and foul these toilet systems. By being too thick to be broken down by the chlorine, it clogs the system and makes the filtering system ineffective.

The quality and/or lack of maintenance by the railroads greatly contribute to noncompliance problems. Individual railroads are responsible for maintenance schedules. The frequency of maintenance and servicing really depends on the use of the facility, the number of crew members, crew changes, and use by outside parties. Servicing personnel may also use the wrong or improper chemicals to break down the bacteria in the toilet systems. Additionally, if an improper cleaning agent is used to clean the toilet, it can contaminate and render the toilet's chemicals ineffective.

The most common complaints are:

1. Toilet compartment stinks/dirty
2. System toilet tank plugged
3. Toilet does not flush
4. Lack of or no water in holding tank
5. Waste system pipe leaks
6. Water tank leaks
7. Strong chlorine odor in toilet compartment
8. Low voltage ground from tank heating system
9. Full or overflowing tanks (models with holding tanks)
10. Insufficient chlorine in chlorinator
11. Strong chlorine odor in cab (poor or no ventilation)
12. Vent pipe or vent hole plugged
13. Waste holding tank or fresh water holding tank frozen
14. Broken or damaged chlorinator caps and seals
15. Loose chlorine slugs on floor in toilet compartment
16. Toilet does not flush
17. Restrooms not properly equipped to handle the disposal of feminine hygiene products.

Title 49 CFR § 229.137(c) prohibits a railroad from placing a locomotive with an unsanitary or defective toilet in the lead position. The railroad makes this determination *at the time of the* *daily inspection* required by 49 CFR § 229.21. For FRA to take a violation of 49 CFR § 229.137(c), among other things, FRA must show that the railroad determined at the time of the daily inspection that the locomotive toilet facility was defective and/or unsanitary. Without that showing, FRA will not be able to sustain a violation.

This also applies if FRA wants to take violations under 49 CFR § 229.137(d)–(h). For each of those subsections, FRA must show that the railroad made the determination (*e.g.*, lack of toilet paper, inadequate ventilation, or lack of a modesty lock, etc.) at the time of the daily inspection.

As noted in the preamble to the final rule establishing the requirements, en route failures that occur after the daily inspection impose no burden on the railroad until the next daily inspection is due. According to working group members involved in development of the rule, railroad practice concerning en route toilet failures is to move locomotives with defective toilets into the trailing position, where it is possible to do so. Please note, however, that the final rule does *not* require such a movement.

Proper Ventilation

Ventilation is a serious problem. Some of the problems found during a field survey are that the vent caps have been pulled off or removed and the vent pipe has been plugged with paper towels. With the toilet in use and no ventilation, the odor will soon migrate into the cab and crew area of the locomotive.

Some railroads simply cut a hole in the nose of the cab and place a vent over it, to avoid outside debris from entering the toilet compartment. This is the basic system using ambient air to circulate. It works best when the toilet compartment door is closed, and the locomotive is in motion. However, some railroads have installed a positive pressure ventilation system. This is done by a pipe that runs from the toilet compartment through the cab wall and into the engine room exhaust fan compartment. This system vents even if the locomotive is standing still and the toilet compartment door is open. However, this system still works best with the toilet compartment door closed. Some locomotives will not vent while standing still. They only vent with the locomotive in motion, and when the toilet compartment door is kept closed. This is commonly known as negative air flow. However, this is not an exception nor a violation, if the door is open and the locomotive is standing still. If the toilet is operating properly and the door is closed with the locomotive standing still, the cab odor should be minimal and diminish when the locomotive is in motion. There are no specifications as to how a locomotive toilet facility can be or has to be vented. The important thing is that it works. All toilet compartments, regardless of type of locomotive or venting system, work best with the toilet compartment door closed.

Toilet compartment door gaskets (seals) make a difference in ventilation and should be replaced when needed. Although the regulation does not specifically address the door seals or gasket, inspectors should note a defective door seal or gasket and inform the railroad supervisor in charge of locomotive repairs and/or service that the defective condition could lead to an odor problem, which could become a compliance issue.

Toilet Facility Lighting

The sanitation regulations do not specifically address lighting for the toilet compartment. However, because the toilet facility is considered a compartment of the locomotive, the provisions of 49 CFR § 229.127(b) apply. Therefore, if the lighting is inadequate, missing, or inoperative, then it should be considered as a defect. Surveys have indicated that lighting problems are attributed to either the use of light bulbs with improper wattage or burned-out light bulbs. This can also be considered a tripping hazard if the compartment is dark enough or even near black (zero visibility). In the case of many older locomotives, appurtenances have been installed or retrofitted in the nose of the locomotive in such a manner as to impose an obstruction in the way of the toilet, and in some cases can cause accident or injury to the person using the facility.

Modesty Locks

A modesty lock is a latch that can be operated in the normal manner only from within the sanitary compartment that is designed to prevent entry of another person when the sanitary compartment is in use. A modesty lock may be designed to allow deliberate forced entry in the event of an emergency. However, the modesty lock does not have to be able to be opened from the outside in an emergency. Most modesty locks currently in use consist of a secondary latch and are generally made of plastic and can easily be broken with moderate force. If the secondary latch is being used as a modesty lock and is broken, then this should be considered a defective modesty lock and handled in accordance with 49 CFR § 229.139(e).

Acceptable Forms of Sanitation (Personal Hygiene)

There should also be a sufficient quantity of fresh water, either for drinking or for washing hands after using the toilet facility.

There are many types of acceptable forms of cleaning and washing solutions for crew members to use for personal hygiene. The most common is crew packs. This package contains waterless hand cleaner, paper towels, a small quantity of toilet paper, and a trash bag. These are usually available either when the crew reports for duty or placed in the cab by railroad service employees. Some locomotives may also be equipped with sinks for washing hands. If this is the case, then an ample amount of water must be available for washing hands. However, sinks are not mandatory, and even if a sink is in place, it may not have to be used if crew packs are available.

§ 229.140 Alerters.

Information

Several modern alerters are combined into event recorder modules. What this can mean is that a locomotive equipped with such a system can experience an alerter and event recorder failure at the same time due to the same component. If either system is found to be inoperative, inspectors should inquire as to whether both systems are functioning as intended.

49 CFR § 229.140(a): All locomotives that are operated at speeds in excess of 25 mph are required to be equipped with a functioning alerter. Special requirements and exceptions pertain to passenger locomotives; see Part 238 for details. Additionally, as explained during the rulemaking proceeding,[20] an alerter is as an appurtenance to the locomotive and must operate as intended when present on a locomotive. 49 U.S.C. 20701 prohibits use of a locomotive unless the entire locomotive and its appurtenances are in proper condition and safe to operate in the service to which they are placed. Therefore, if a locomotive that operates at speeds not exceeding 25 MPH is equipped with an alerter, the alerter will be required to function.

49 CFR § 229.140(f): Alerters installed on controlling locomotives are required to be tested prior to departure from each initial terminal or prior to being coupled as the lead locomotive in a consist by allowing the warning timing cycle to expire and ensuring that a penalty brake application occurs as result. On most locomotives, this can be accomplished by releasing the "cut-in" automatic air brake and waiting for the alerter to initiate an alarm then waiting for the air brakes to apply after the alarm. Usually the "PCS" light will illuminate in conjunction with the alerter timing out. For a stationary (moving at zero mph) locomotive, the alerter should time out within 110 to 130 seconds assuming none of the "automatic" resets are triggered. Railroads should be able to demonstrate this test upon request.

Subpart D – Locomotive Crashworthiness Design Requirements

Information

Although Subpart D is not expected to be used by field inspectors during routine inspection activity, it must be considered when conducting accident investigations, especially when there has been a head-on or rear-end collision. Also, event recorder preservation requirements must be observed.

Information

Subpart E – Locomotive Electronics

Most provisions of Subpart E will be enforced through headquarters review of submitted documents (the Safety Analysis) prior to covered electronics systems entering service. Field audits that discover non-compliance with 49 CFR § 229.315m Operations and Maintenance

[20] See 77 FR 21330.

Manual, 49 CFR § 229.317, Training and Qualification Program, or 49 CFR § 229.317, Operating Personnel Training. should also be brought to the attention of Headquarters staff.

Chapter 9 – Steam Locomotive Inspection and Maintenance Standards, Part 230

Introduction

The first Federal statute addressing steam locomotives was the Ash Pan Act passed by Congress on May 30, 1908. The Act described how the ash pans were to be attached to the steam boiler, that they were to be maintained in a safe and suitable condition for service, and that all operating mechanisms of the ash pans were to be arranged so that they may be safely operated. Prior to the Act, a person had to empty the ash pan by crawling under the locomotive, and if the locomotive moved, he was either killed or injured. The Ash Pan Act was repealed by Congress as part of the "Federal Railroad Safety Authorization Act of 1982", but ash pans are still under Federal regulations and referenced in 49 CFR § 230.69, *Ash Pans*, of the Steam Locomotive Inspection and Maintenance Standards.

On February 17, 1911, Congress passed the Locomotive Inspection Act, bringing all locomotive steam boilers under Federal auspices and laying out the structure of the Bureau of Locomotive Inspection with its attendant administrative and field force personnel of 50 locomotive inspectors and their specific duties. The Bureau was made a part of the Interstate Commerce Commission. The Act held the district inspector responsible for the locomotives housed in his district. On March 4, 1915, the Act was amended to include not only the steam boiler but the entire locomotive and its appurtenances. The steam locomotive regulations are codified today under 49 CFR Part 230.

Regulations pertaining to steam locomotives were last updated in November 1999, under 49 CFR Part 230, when FRA issued a Final Rule on Steam Locomotive Inspection and Maintenance Standards. The rule went into effect on January 18, 2000; however, implementation of the rule was designed to allow steam locomotive owners/operators to phase in the new requirements over a period of time. The rule was revised to consider the operating realities of today's steam locomotive operations, which consist primarily of tourist and excursion service. A new inspection scheme was developed subjecting steam locomotives to periodic inspections and tests based on "service days" rather than "calendar days." The new regulation required all owners/operators of steam locomotives to conduct an engineering survey of the boiler, which must reflect the current condition of the boiler at the time the survey is conducted. Results of the survey are reported on the boiler specification card, FRA Form 4.

A steam locomotive boiler is an external combustion engine in which burning fuel converts water into steam in a horizontal boiler. The steam is directed into that portion of the locomotive called a steam engine where the expansion properties of the steam are allowed to act on both sides of a driver piston to rotate the driving wheels. Most of the steam locomotives in service today have two steam engines (cylinders), but several railroads have locomotives which have four steam engines (cylinders). The piston is connected to the drive wheels through a cross head arrangement, main rods, and side rods. Control of the speed of the locomotive is accomplished through the throttle mechanism as manipulated by the engineer in the cab. When steam locomotives were the predominant form of tractive power, there were approximately 75,000 in service. The steam locomotive is a labor-intensive piece of machinery requiring constant attention and hard work to maintain in a safe and suitable condition for service.

The most critical area of the steam locomotive is the boiler. Keep in mind that 1 cubic inch of water is converted to 1,600 cubic inches of steam (at atmospheric pressure); and at a pressure of 150 psi, the temperature of saturated steam is 366 degrees. This pressure is attempting to rupture the boiler; and it is the design, maintenance, and inspection required by FRA regulations, and good maintenance practices by the owners/operators of steam locomotives, which prevent this from occurring. When steam boilers do rupture, it is of a cataclysmic nature which can move the mass of the boiler off the rail, and in many cases kills the engineer and fireman. These facts are presented so that you are aware that the steam boiler is a pressure vessel which can be extremely dangerous if not properly inspected and maintained.

There are over 200 active steam locomotives operating in the United States under FRA's jurisdiction. The monitoring of the steam locomotives is the responsibility of the FRA inspector that has attended Technical Training Standards Division (TTSD) training addressing Part 230. The FRA inspector should endeavor to inspect each steam locomotive under his/her jurisdiction no less than twice each year, once under hydrostatic pressure, and once when under working steam pressure. <u>Excluding steam locomotives that do not permit access due to physical size of the entry points, FRA policy requires inspectors to perform an interior inspection of the boiler proper (steam space), firebox, and smokebox once each year, when possible, and at every 1,472-service day inspection</u>. The FRA inspector is also responsible for maintaining all records and associated reports for each steam locomotive under his/her charge. Each railroad and owner of a steam locomotive, which falls under these Federal regulations, should forward all required reports to the Office of Railroad Infrastructure and Mechanical Equipment at FRA Headquarters in Washington, D.C., specifically, to the Staff Director of the Motive Power & Equipment Division.

Locomotives are required to receive a 1,472-service day inspection (49 CFR § 230.17), which includes the boiler survey and new specification card. Any waiver from these requirements would be processed under Part 211 and the FRA Railroad Safety Board. All previous waivers shall lapse on the date the locomotive comes under current requirements, unless a copy of the grant of waiver is filed for reassessment with FRA's Office of Railroad Safety in Washington, DC, prior to that date. FRA will review the waiver and notify the applicant whether the waiver has been continued.

Regarding the actual boiler inspection, asbestos may be observed at certain points of a steam locomotive used as insulation to prevent thermal loss. If the asbestos is not friable (i.e., loose and flaking with fibers floating in the air, which could be inhaled into the lungs) and/or is completely shielded to prevent contact, it is not considered to be hazardous. If the asbestos is friable, the inspector must not expose himself/herself to any danger and shall inform the railroad or owner of the locomotive that the asbestos must be properly removed or completely sealed and isolated from contact before the requested inspection can be performed. Asbestos fibers are known to be carcinogenic and if carried into the lungs can cause cancer or asbestosis.

Information

FRA's TTSD developed and provided training to FRA MP&E inspectors on design and inspection of steam locomotives and the requirements of the Steam Locomotive Inspection and Maintenance Standards. Those inspectors who successfully completed the TTSD training are deemed qualified to inspect steam locomotives for compliance with these regulations.

For those MP&E inspectors who have successfully completed the Steam Locomotive OJT Standards without formally attending classroom training, it has been determined that holding their qualification in order to inspect steam locomotive rolling equipment for compliance under 49 CFR Part 230, Steam Locomotive Inspection and Maintenance Standards, before formally attending classroom training is not in the best interest of safety.

Effective immediately, MP&E inspectors who have successfully completed the Steam Locomotive OJT may conduct independent inspections for compliance with Part 230. Be aware that the Office of Railroad Safety continues to encourage using two qualified Steam Locomotive inspectors when feasible, especially when conducting interior inspections.

Any inspector having questions related to steam locomotive inspections covered under Part 230 should immediately contact their specialist or headquarters specialist for assistance.

The National Boiler Inspection Code (NBIC) (Supplement 1, Parts 2 and 3) contains specific rules and special requirements for inspection, repairs, alterations, and storage of steam locomotive boilers. This is one national standard that railroads, owners, and operators may use during inspection and repair. Inspectors should have a copy of the NBIC with them when conducting steam locomotive inspections and be familiar with its requirements. Note: The "historical boiler" sections of the NBIC do not apply to steam locomotive boilers under the jurisdiction of the FRA.

49 CFR Part 230

FRA inspectors should review Part 230, FRA Steam locomotive Daily Inspection video, and these sections prior to conducting inspections of steam locomotives. Any need to clarify the application of any requirements in these sections should be brought to the attention of the MP&E Staff Director, Regional MP&E specialist, and assigned HQ MP&E specialist.

Subpart A – General

§ 230.3 Implementation.

49 CFR § 230.3(b): FRA no longer considers requests for flue removal extensions under the provisions of 49 CFR § 230.10 (reserved) of the regulations in effect prior to January 18, 2000.

49 CFR § 230.3(c): FRA will consider reasonable requests for flue removal extensions per 49 CFR § 230.17. A reasonable request would be one to allow the locomotive to operate through the holiday seasons, or towards a specific date. The approval of the request will be based on the

condition of the locomotive at the time of the request, how well it is maintained, and an economic justification. Any request must be accompanied by all relevant documentation to be considered, and all records that demonstrate the number of days the locomotive has been in service.

§ 230.6 Waivers

A person, or operator, may petition for a waiver of any Part 230 requirement. Each petition for waiver must be filed according to Part 211 of this chapter.

§ 230.7 Responsibility for compliance.

This section states that the locomotive owner and/or operator is directly responsible for ensuring that all requirements of the Steam Locomotive Inspection and Maintenance Standards are satisfied, and also that it complies with the broader statutory requirements (Locomotive Inspection Act) that its locomotive is safe and suitable for service. To evaluate whether a locomotive is safe and suitable for service, boiler calculations and other critical information must be available to FRA. This Part does not relieve the railroad, over which the steam locomotive is operating, from its responsibility that the steam locomotive or tender are in proper condition and safe to operate.

§ 230.8 Definitions.

Alteration. Any change to the boiler which affects its pressure retention capability and change to boiler construction geometry. Rating changes are considered alterations. An alteration could lower or raise the pressure vessels' ability to retain pressure.

Renewal. Replacement in kind with a newly manufactured or remanufactured (restored to original tolerances) component. Materials shall be suitable for the service intended. A replacement in kind would be considered a repair.

§ 230.12 Movement of non-complying steam locomotives.

This section dealing with movement of a noncomplying steam locomotive is similar to the requirements for movement of a defective locomotive found in 49 CFR § 229.9.

49 CFR § 230.12(a): When a noncomplying condition under Part 230 is found by either the railroad's inspector or an MP&E Inspector, except as provided in paragraph (b), the railroad may only move the steam locomotive as a lite locomotive or dead locomotive under whatever conditions that the qualified person and the railroad deem suitable for a safe move (except as provided in paragraph (b)). The steam locomotive may be moved to any location the railroad designates to have it brought into compliance. If the FRA Inspector believes that the movement of the locomotive by the railroad under this section constitutes an immediately unsafe situation, such as a possible derailment, a Special Notice for Repairs (FRA Form F6180.8) may be issued to effectively remove the locomotive from service. In addition to describing the immediate unsafe condition, the inspector must also note that the movement restrictions or lack of (i.e.,

speed, distance, etc.), as proposed by the railroad, would create an additional unsafe condition. The inspector should never dictate to a railroad the conditions for the movement of any noncomplying locomotive, unless the condition is so deplorable that movement at any speed would create an unsafe condition. In either case, the inspector should consult with MP&E HQ Staff prior to making any decision. Any restrictions are the railroad's responsibility.

49 CFR § 230.12(b): Requires that a qualified person determine (i) that it is safe to move the locomotive, and (ii) the maximum speed and other restrictions necessary for safely conducting the movement. Difficulty in the enforcement of 49 CFR § 230.12 arises as this section does not provide information with respect to the criteria used to "qualify" a person to make the determination required above. Decisions to continue the use of a noncomplying locomotive, in some cases, are being made by persons not qualified to make these decisions. A person qualified to perform a daily inspection may not necessarily possess the qualifications to make the determination that it is safe to move a defective locomotive.

The qualified person must have demonstrated to the owner/operator, at a minimum, the knowledge and ability to inspect steam locomotives and provide recommendations regarding the criteria listed in 49 CFR § 230.12(b). This does not imply that the qualified person must possess intimate knowledge of and experience with all components and functions of a steam locomotive.

When investigating an issue involving enforcement of 49 CFR § 230.12, inspectors must carefully examine the qualifications of the individual who made the safety recommendations to determine if the owner/operator acted in compliance with the regulations.

49 CFR § 230.12(d): Allows for the continued use of a steam locomotive that develops an en-route noncomplying condition until the earlier of: (1) the next calendar day inspection, or (2) reaching the nearest forward point where the repairs necessary to bring it into compliance can be made. Use of a locomotive under this provision is permitted only if the requirements of 49 CFR § 230.12(a) are fully met, which means a "noncomplying tag" that is properly filled out must be in the cab of the noncomplying steam locomotive.

Where an MP&E Inspector has knowledge that a railroad permits steam locomotives that develop en-route noncomplying conditions to continue **in service** past mechanical facilities where repairs can be made, the inspector should investigate to determine that the requirements of 49 CFR § 230.12(a) are being complied with. If the inspector is made aware that a noncomplying locomotive was moved beyond a forward repair location that has previously demonstrated the ability to effect repairs of the type of noncomplying condition, the inspector must ensure that the subject locomotive would no longer be used as a propelling or lead locomotive.

Title 49 CFR § 230.12 allows a railroad to move a noncomplying steam locomotive as a light or dead locomotive to a more distant repair point of its choice, provided it meets all other requirements of 49 CFR § 230.12, and such action does not endanger the safety of employees, locomotives, or trains.

Title 49 CFR § 230.12 only permits the movement of a noncomplying locomotive with a Part 230 defect. Nothing in 49 CFR § 230.12 authorizes the movement of a steam locomotive with power brake or safety appliance defects. Such locomotives can only be moved under provisions of 49 U.S.C. § 20303 or the Power Brake Regulations. **(MP&E 98-50).** It is the responsibility of the railroad to ensure that any locomotive moved with a noncomplying defect is done in accordance with the applicable law. If there is any doubt, the railroad should contact the FRA. The move may require the railroad to submit for one-time movement authority. (*See* Chapter 2).

§ 230.13 Daily inspection.

Title 49 CFR § 230.13(a) is similar to the requirements found in the Locomotive Safety Standards, 49 CFR § 229.21, *Daily inspection*, for each day that the steam locomotive is in service. The purpose of the daily inspection is to ascertain that the locomotive is safe to operate in the service for which it is used and is in total compliance with Part 230 prior to being placed in service. It is a visual walk-around inspection of the locomotive that provides an opportunity, every day the locomotive is used, to find and correct incipient problems before they lead to an accident or safety incident. An effective locomotive calendar day inspection requires that the individual performing the inspection be alert for telltale signs of any condition or defect that is a potential hazard. Daily inspection reports shall be maintained in the office of the locomotive owner and operator and shall be made available at FRA's request.

Reference to Appendices A (Inspection Requirements) and B (Diagrams and Drawings) reference items should not be considered all-encompassing. They are only provided as an example and do not relieve the locomotive owner and operator from performing a proper inspection.

After a daily inspection is performed, the steam locomotive should be free of any noncomplying conditions before it is offered for service. The locomotive cannot legally be used until all Federal defects are corrected.

If the inspector continues to find recurrent defects or a pattern of noncomplying conditions at a particular location, the inspector should monitor the performance and the results of the daily inspections, as well as question the individuals performing the inspections, to ascertain if the individuals have the knowledge and ability to perform such inspections.

If daily inspection reports reflect noncomplying conditions on a steam locomotive and the inspector finds the conditions were not corrected by the railroad <u>and</u> that the locomotive continues to be used, violations should be submitted. Such violations should be accompanied by all the documentation available, with a complete explanation regarding the railroad operation at the location.

Failure to complete or produce a record or report (in and of itself) is not sufficient evidence to establish that a railroad failed to perform an inspection. It is a "records" violation, unless other evidence (i.e., witness statement, interviews, event recorder downloads, visual observation, etc.) is obtained to establish the failure to conduct the inspection. If the only evidence available merely establishes a failure of a railroad to produce a required inspection report, then the appropriate section to cite for civil penalty is 49 CFR § 230.13(c), for a report not properly executed or retained. Use the "lack of a record and/or report" to **support** the other evidence obtained to establish a "failure to perform an inspection" violation.

49 CFR § 230.13(a): A daily inspection is required by this section for each day a locomotive is in use. A written report and record are required when the inspection is performed and documented on FRA Form No. 2. The inspection can be conducted at any time during the calendar day. It can be done just before midnight or just after midnight.

49 CFR § 230.13(b): Pre-departure inspection requires that, at the beginning of each day the steam locomotive is used, an individual competent to do so inspect the steam locomotive and its tender and appurtenances to ensure that they are safe and suitable for service, paying special attention to the following items: (1) water glasses and gauge cocks; (2) boiler feedwater delivery systems, such as injectors and feedwater pumps; (3) boiler relief valves and pressure gauges; and (4) air compressors and governors, and the air brake system[21]. While the time for the daily inspection can be performed at the operator's discretion, the items listed in 49 CFR § 230.13(b) must be inspected at the beginning of each day. Note: If an MP&E Steam Inspector is present on an operating day, the inspector is urged to confirm that the locomotive crew can perform a proper test of the water glasses and gauge cocks as well as confirm the boiler relief valves are relieving pressure appropriately at Maximum Allowable Working Pressure (MAWP).

§ 230.14 Thirty-one (31) service day inspection.

49 CFR § 230.14(a): The 31-service day inspection must be performed no less then each time the steam locomotive accrues 31 service days. The reference to Appendix A to 49 CFR Part 230, *Inspection Requirements*, is a tool and should not be considered all encompassing. The lists are only provided as an example and do not relieve the owner/operator from performing a proper inspection.

Operators are required to maintain a list of all service days accrued by a locomotive. These lists must be provided to FRA upon request so that service days may be verified. A service day is accrued each day the locomotive boiler has steam pressure above atmospheric pressure, with fire in the firebox; in the case of a fireless steam locomotive, any calendar day that the boiler has steam pressure above atmospheric pressure.

49 CFR § 230.14(b): Allows FRA to request to be present during the 31-service day inspection. Once an agreeable date is reached, the railroad should plan to perform the required tests, and may do so even if FRA is unable to be there. If FRA feels that a particular operator is not performing all required tests or inspections, this is a way to verify.

49 CFR § 230.14(c): Requires that the locomotive owner and/or operator, within 10 days of the 31-day inspection, file a copy of FRA Form No. 1 with the FRA Motive Power and Equipment Division Staff Director, as well as maintain a copy in the office of the locomotive owner and/or operator. A sample of FRA Form No. 1 is provided in Appendix C to 49 CFR Part 230.

[21] U.S. DOT FRA Steam Locomotive Daily Inspection Video for Locomotive Owners and/or Operators.

§ 230.15 Ninety-two (92) service day inspection.

The 92-service day inspection is performed at the third 31-service day inspection and includes additional inspection items. The record retention and forwarding requirements remain the same as the 31-service day inspection requirements.

§ 230.16 Annual inspection.

49 CFR § 230.16(a): Annual inspection requirements are calendar day-driven not service day-driven. Even if a steam locomotive has only had 1 service day over the previous 368 service days, it would still require an annual inspection. The annual inspection includes all requirements of the daily inspection, and the 31- and 92-service day inspections found in appendix A to Part 230. At each fifth annual inspection, a flexible staybolt and cap inspection is required in accordance with 49 CFR § 230.41. Grates, grate-bearer bars, and sufficient refractory material must be removed at the fifth annual inspection to allow for a visual examination of the covered areas.

49 CFR § 230.16(b): The FRA inspector, MP&E specialist, and FRA Motive Power and Equipment Division Staff Director shall be provided notice, via email, at least 1 month prior to an annual inspection and shall be afforded an opportunity to be present. If the inspector is unable to make the agreed upon date and a new date cannot be agreed to, the inspection may be performed on the previously scheduled date.

49 CFR § 230.16(c): Requires that the locomotive owner and/or operator, within 10 days of the annual day inspection, file a copy of FRA Form No. 3 with the FRA Motive Power and Equipment Division Staff Director, as well as maintain a copy in the office of the locomotive owner and operator. A sample of FRA Form No. 3 is provided in appendix C to this Part.

§ 230.17 One thousand four hundred seventy-two (1,472) service day inspection.

49 CFR § 230.17(a): The 1,472-service day inspection includes all inspection requirements found in Appendix A to Part 230 for daily, 31-service day, 92-service day, annual, 5^{th}-annual, and 1,472-service day inspections. The 1,472-service day or 15-year timeframe begins when the locomotive is placed in service or 1 year from the day the first tube is reinstalled in the boiler, whichever occurs first.

The 1,472-service day inspection requires that all tubes be removed from the locomotive so that the interior of the boiler can be thoroughly cleaned and inspected. Title 49 CFR § 230.31(b) allows not removing the superheater flues if they don't interfere with the interior inspection and if NDE testing shows that they are safe and suitable. The boiler shell thicknesses are verified, and FRA Form No. 4 is recalculated based on the new minimum measurements of each boiler shell element. Please note, all thicknesses are to be measured as the minimum only and no averages are to be used on the FRA Form 4 and supporting documentation.

49 CFR § 230.17(b): Requires that the operator, within 30 days of completing the 1,472-service day inspection, file a copy of FRA Form No. 4 with the FRA Motive Power and Equipment

Division Staff Director, as well as maintain a copy in the office of the locomotive owner and operator. A sample of FRA Form No. 4 is provided in Appendix C to Part 230. The filed copy of the FRA Form 4 must include supporting documentation. Supporting documentation includes boiler shell element measurements, boiler calculations, all documentation of repairs and/or alterations, and supporting repair/alteration documentation completed during the 1,472-service day inspection. The FRA Form 4 supporting documentation package is verifiable proof that the locomotive is in compliance with the requirements of Part 230. FRA inspectors shall instruct locomotive owners and/or operators to provide all FRA Form No. 4s and supporting documentation to the subject locomotive's 1,472-service day inspection to the MP&E Division at Headquarters for review.

Recordkeeping Requirements

§ 230.18 Service days.

49 CFR § 230.18(a): The steam locomotive owner and/or operator shall maintain and make available to FRA a current copy of the service day record that contains the number of service days the steam locomotive has accrued since the last 31, 92, annual, and 1,472 service day inspections. A service day is accrued each day the fired, or fireless, locomotive boiler has steam pressure above atmospheric pressure.

49 CFR § 230.18(b): The service day report, FRA Form No. 5, must be submitted January 31 with the FRA Motive Power and Equipment Division Staff Director. Additionally, a copy shall be maintained in the office of the locomotive owner and/or operator, accounting for the days the steam locomotive was in service from January 1 through December 31 of the preceding year, even if the locomotive had no service days.

49 CFR § 230.18(c): If no report is filed on January 31, the steam locomotive shall be considered retired by FRA, and the locomotive owner/operator may have to complete all 1,472 service day inspection items to return the steam locomotive to service.

§ 230.19 Posting of FRA Form No. 1 and FRA Form No. 3.

FRA Form Nos. 1 and 3 must be posted under a transparent cover in the cab of an in-service steam locomotive. FRA Form No. 1 will not be required for the first 31 service days following an annual inspection and the posting of an FRA Form No. 3.[22]

§ 230.20 Alteration and repair report for steam locomotive boilers.

49 CFR § 230.20(a): Alteration and/or repair reports (FRA Form No. 19), detailing the changes to the locomotive, must be filed with the FRA Motive Power and Equipment Division Staff Director within 30 days from the date the work was completed. Additionally, they shall be attached to and maintained with FRA Form No. 4 until such time as a new FRA Form No. 4 (reflecting the repairs and alterations) is submitted to the MP&E Staff Director. A copy of the Alteration and/or Repair reports shall be maintained in the office of the locomotive owner and/or

[22] *See* appendix C to Part 230.

operator and shall be made available at FRA's request. Repair and/or Alteration reports shall be filed and maintained for the life of the boiler.[23] FRA inspectors should be familiar with the boilers in their territory and monitor alterations and repairs to ensure that the FRA Form 19 reports are submitted when this type of work is performed. Alterations and repairs are frequently performed during off-season nonoperating periods. Inspectors should make an effort to perform occasional checks on locomotives in their territory during those periods to ensure compliance.

Subpart B – Boilers and Appurtenances

§ 230.23 Responsibility for general construction and safe working pressure.

The steam locomotive owner and/or operator is responsible for the general design and construction of the steam locomotive boilers under their control. While the locomotive is to have a minimum safety factor of 4 for all parts of the boiler per 49 CFR Part 230.24, it is important that an inspector understands that locomotive boiler design frequently implemented, and still implements, a factor of safety of 4.5 or greater.

Allowable Stress

§ 230.24 Maximum allowable stress.

The maximum allowable stress value on any component of a steam locomotive boiler shall not exceed ¼ of the ultimate tensile strength of its material. All steam locomotive boilers in service must be maintained to have a safety factor of at least 4, or greater. To clarify, a steam locomotive boiler must be able to withstand a pressure of at least 4-times the Maximum Allowable Working Pressure (MAWP) before failure.

At all times, it is the locomotive owner and/or operator's responsibility to monitor the boiler's condition. This responsibility includes ensuring no boiler shell element thickness has fallen below the minimum calculated thickness as laid out in the FRA Form no. 4, even during each 1472-service day period, or 15 years.

§ 230.27 Maximum shearing strength of rivets.

When the rule was published in November 1999, there was a requirement to calculate the maximum shearing strength of rivets, but there was no place to record the figure on FRA Form No. 4. On July 11, 2005, FRA issued a correction to the rule which requires that the maximum shearing strength of rivets calculation be recorded on FRA Form No. 4.

§ 230.28 Higher shearing strength of rivets.

A higher shearing strength may be used for rivets when it can be shown through material tensile and metallurgical testing that the rivet material used, or to be used, is of such quality as to justify a higher allowable shearing strength.

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[23] *Id.*

Inspection and Repair

§ 230.29 Inspection and repair.

The term "accepted industry standard" is used in several places throughout the regulations and refers to established repair, alteration, and construction practices used by American and Canadian Pressure vessel and steam railroad industries over many years. Each inspector assigned to steam locomotive inspection was provided files during their TTSD training that contain many of these standards. As changes are made to these standards, new copies are available to inspectors through the MP&E HQ staff.

Accepted national standards include the National Board Inspection Code (NBIC), American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME BPVC), American Petroleum Institute (API), and American Welding Society (AWS). Additionally, an original code of construction, such as from the original locomotive manufacturer, or repair procedures from a U.S. railroad that built, maintained, and/or operated steam locomotives is also accepted. When standards from a U.S. railroad, original locomotive manufacturer, or procedures from outside the U.S. are to be used, they shall be forwarded to the MP&E Staff Director and the assigned HQ specialist for review for acceptance and use.

> **NOTE**: The railroads often issued procedures to keep steam locomotives running at the end of the steam era (1950–1960) until they could be retired and replaced with diesel locomotives. Accordingly, care should be exercised before determining that railroad repair procedures from this time are acceptable.

Each steam qualified inspector, the MP&E Staff Director, and assigned HQ specialist shall understand how each accepted national standard is to be applied to a steam locomotive boiler repair and/or alteration, as well as new construction. The regulation's legacy interpretation requires that repair, alteration, and/or new construction procedures follow the chosen accepted national standard in full as prescribed by the standard holder organization. These procedures exclude picking and choosing from multiple accepted national standards or not following the standard in full as prescribed by the standard holder organization, to complete a repair, alteration, or new construction.

49 CFR § 230.29(b)(2):

Unstayed surfaces of boiler shell elements are considered as such if they do not contain any staying elements (rivets, staybolts, braces, tubes, and/or flues). For example, in a repair or alteration to a fluesheet knuckle, if the area to be repaired does not contain staying elements, then the repair shall be considered as unstayed.

§ 230.30 Lap-joint seam boilers.

Upon inspection of a lap-joint, pay close attention to the edges of the seams for grooving or cracking. If a visual indication is observed, the inspector shall request that the locomotive owner/operator perform a non-destructive test to verify the finding. If a lap-seam boiler is presented for restoration, please advise the MP&E Staff Director for further instructions.

§ 230.31 Flues to be removed.

The purpose of the removal of flues, or boiler tubes, is to inspect the entire interior of the boiler and its bracing, not the tubes, although the tubes should be inspected while removed.

Title 49 CFR § 230.31(b) allows for superheater flues to be left in place, if the boiler interior can be thoroughly cleaned and inspected without removal of the superheater flues. The inspector may require their removal for cause. If left in place, the superheater flues shall be non-destructively examined (NDE tested) and measured for thickness by the locomotive owner and/or operator. The results of this inspection shall be provided to the inspector as well as included in the complete FRA Form no. 4 package.

§ 230.32 Time and method of inspection.

49 CFR § 230.32(b):

(1) Entire boiler. The 1,472-day inspection is the most comprehensive inspection performed on the boiler, and inspectors should closely monitor the railroads' inspection procedure, and take this opportunity to personally inspect both the interior and exterior for the conditions described in this section.

(2) Boiler interior. FRA inspectors entering the boiler should consider the following:

Prior to entering a steam locomotive boiler, the locomotive owner and/or operator shall, to the best of their ability, clean the interior of the boiler for ease of the inspector and the inspection process. If at any point, the boiler is not cleaned well enough to make good determination of soundness of the interior, the inspector shall decline to perform the internal inspection. In this case, the inspector will then re-schedule a time with the locomotive owner and/or operator where verification of the boiler's internal condition can be made.

The entire interior of the boiler shall be examined for, but is not limited to:

- Cracks
- Pitting
- Grooving
- Erosion
- Loose, eroded, or missing rivets/rivet heads, pins and/or bolts
- Indications of overheating, burned, and/or bulging/corrugated plates
- Surfaces where hard or soft scale has formed
- The edges of all plates, all laps, seams, and points where cracks and defects are likely to develop, or which an exterior examination may have indicated, must be given extra scrutiny.
- All braces and stays are taut

- All pins are to be properly seated and secured in place and that each is in safe and suitable condition to support its portion of the load.
- All welded joints, staybolts, and braces, shall be visually and auditorily examined for soundness.
- All rivets, nuts, staybolts, and bolts on the interior of the boiler shall be tight and safe and suitable.
- The foundation ring, or mud ring, shall be examined for breakages.

Where the foundation ring meets the inner and outer sheets, the inspector shall look for grooving and/or erosion of the inner and outer sheets in the water legs of the boiler. If these defective conditions are found, the inspector shall direct the locomotive owner and/or operator to perform an appropriate non-destructive examination (NDE) of the sheets to assess if minimum sheet thickness has been met, or exceeded, and if the defective condition has travelled through the cross-section of the boiler plate.

> Note: Special attention is to be paid by inspectors to locomotives with foundation rings with square corners as this construction geometry increases water turbulence in areas already prone to grooving and erosion due to high water velocity. Furthermore, this attention also includes locomotives with foundation rings with thin cross sections containing square corners, or not, as erosion and grooving can comprising the holding power of the foundation ring in this style of construction.

Where inspectors can physically enter the boiler interior, interior boiler condition shall be recorded with photos and/or video. These are to be included in conjunction with the inspector’s report. Any questions from the inspection, during or after, shall be directed, along with the generated inspection report, to the MP&E Staff Director and assigned HQ specialist.

On locomotive boilers where it is not possible to enter the interior, but the interior is suitable and clean for inspection, the inspector may use a borescope style camera to verify the internal condition of the boiler. In this case, the inspector shall include the photos and/or video files in conjunction with the inspector’s inspection report. Any questions from the inspection, during or after, shall be directed, along with the generated inspection report, to the MP&E Staff Director and assigned HQ specialist.

Any defective conditions found shall render the locomotive out of service until such time as repairs are made correcting the defective condition(s).

Prior to entering a steam locomotive boiler, the inspector is required to complete the “Confined Space” training module provided by TTSD. This training module should be completed once a year by the inspector before entering a steam locomotive boiler.

Steam boilers are recognized as confined spaces. As such, the hazards they may contain must be evaluated before entry to ensure that persons entering them will be able to work safely. FRA has a policy in place that defines the circumstances under which FRA employees can enter confined spaces–such as steam boilers–safely. It is not expected that very many, if any, steam boilers will present hazards severe enough to prohibit entry. However, the procedures that are part of the policy must be followed to ensure that it is safe to enter a boiler.

The primary stricture in the policy is the following statement:

> "No person shall enter or order a subordinate to enter any permit-required confined space. Entry into other classes of confined spaces shall be done in accordance with the regulatory requirements, and this policy and procedure."

The key words here are "permit-required confined space." MP&E inspectors following the procedures will be able to determine whether a boiler is "permit-required" and, if not, make the entry safely. A brief review of some of the key definitions and procedures begins with the definition of confined space:

Confined Space means a space that has all three of the following characteristics:

- It is large enough and so configured that an employee can bodily enter and perform assigned work.
- It has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, pits, etc.).
- It is not designed for continuous human occupancy.

An **"Entry**" into a confined space is considered "breaking the plane" of the opening into the confined space in such a manner that you are exposed to the hazards.

Confined spaces can be classified based on the nature and severity of the safety and health hazards they contain. **Permit-required** spaces contain the most severe hazards and can't be controlled or eliminated. **Alternate-procedure** spaces only have atmospheric hazards "bad air" that can be controlled by ventilation. **Non-permit** spaces do not contain, but have the potential to contain, any hazard capable of causing death or serious physical harm.

Keep in mind that confined spaces that can be entered without restriction **MUST** be evaluated and found to be free of recognized serious safety hazards (those that can cause serious illness, injury, or death), free of atmospheric hazards, and have sufficient oxygen to support the life of the inspector for the maximum time required to be in the space.

FRA procedures use a "Confined Space Evaluation Checklist," which provides a standard format for the evaluation process. It is to be used by FRA personnel to make the evaluations necessary for deciding whether or not to enter the space. Each region has a 4-gas atmosphere test instrument for determining the levels of oxygen, carbon monoxide, hydrogen sulfide, and flammable gas/vapor in an atmosphere. Your specialist or Regional Collateral Duty Safety Officer will be able to facilitate getting the instrument and a supply of the checklists.

FRA inspectors shall strictly follow the guidelines below when entering a confined space:

1. Comply with the confined space entry requirement in related OSHA standards.
2. Two inspectors shall participate consistent with FRA policy.
3. The more experienced (formally certified) inspector takes the lead on all inspections related to Part 230.
4. This information does not excuse the trainee from completing all of the task(s) outlined in the OJT Standards. It is understood that a task (*e.g.*, Duty 5: Identify Steam Locomotive 1472 Service Day Inspection Requirements) could take longer to complete due to the operating constraints of the railroad.

(3) Boiler exterior. A thorough inspection shall be made of the entire exterior of the boiler while under hydrostatic pressure.

Prior to examining the exterior of a steam locomotive boiler, the locomotive owner and/or operator shall, remove all jacketing and brackets which obstruct the inspection of all pressure retaining elements of the boiler. If the locomotive exterior has not been properly prepared for inspection or the exterior surfaces are obstructed, where the soundness of the exterior of the boiler cannot be fully ascertained, the inspector shall decline to perform the inspection. In this circumstance, the inspector will re-schedule a time with the locomotive owner and/or operator upon which the verification of the boiler's exterior condition shall be made.

As with the interior inspection, the exterior of the boiler shall be examined for defects. Some items to look for, but not limited to are:

- Cracks
- Pitting
- Grooving
- Leaks
- Missing, undersized, or broken pins and/or bolts
- All rivets shall be visually and auditorily examined for soundness
- Front flue sheet and boiler barrel course connections where caustic erosion is known to take place
- Tube sheets, tubes, superheater flue ends, and superheater elements
- Indications of leaking, overheated, burned, and/or bulging/corrugated plates and surfaces should also be looked for.
- Edges of all plates, all laps, welts, seams, and points where cracks and defects are likely to develop, or which an interior examination may have indicated, must be given extra scrutiny.
- Staybolts are not leaking, that there are no cracks where the staybolt meets the boiler sheets, and that they have a telltale hole of appropriate size drilled at both ends per 49 CFR 230.38.
- All flexible staybolts, caps, and sleeves are to be inspected for any leaks or cracks
- All threaded or welded studs are to be checked for cracking or leaks.
- For all welded joints and staybolts, each shall be visually and auditorily, as appropriate, examined for soundness.

Any defective condition shall render the locomotive out of service until such time as repairs are made correcting the defective condition(s).

§ 230.33 Welded repairs and alterations.

Unstayed surfaces of boiler shell elements are considered as such if they do not contain any staying elements (rivets, staybolts, braces, tubes, and/or flues). For example, in a repair or alteration to a fluesheet knuckle, if the area to be repaired does not contain staying elements, then the repair shall be considered as unstayed.

When the regulation cites an accepted national standard for boiler repairs and/or alteration, it refers to the NBIC, API, ASME BPVC, and AWS. Additionally, an original code of construction, such as from the original locomotive manufacturer, or repair procedures from a U.S. railroad that built, maintained, and/or operated steam locomotives are also accepted. The regulation requires that the repair and/or alteration procedures follow the chosen accepted national standard in full as prescribed by the standard holder organization. These procedures exclude picking and choosing from multiple accepted national standards or not following the standard in full as prescribed by the standard holder organization, to complete a repair and/or alteration.

If a locomotive owner and/or operator proposes to make an unstayed welded repair or alteration, in addition to submitting their written request to the MP&E Staff Director, a copy of the repair or alteration, and its supporting documentation, must be sent to the MP&E Staff Director for review prior to granting approval. All alteration and/or repair reports for steam locomotive boilers submitted for review and filing to the FRA Motive Power and Equipment Division Staff Director shall be submitted with supporting documentation that detail work done to the locomotive. This supporting documentation includes, but is not limited to, supporting calculations, dimensional drawings of relevant boiler geometry involved in the repair, material certifications, welding or riveting processes followed (with detailed reference to an accepted national standard), repair standard followed (with detailed reference to an accepted national standard), and welding certification of the individual(s) who performed the repairs. This documentation details the work and provides a repair and alteration pedigree, not only for FRA, but also for the locomotive owner/operator.

§ 230.34 Riveted repairs and alterations.

Unstayed surfaces of boiler shell elements are considered as such if they do not contain any staying elements (rivets, staybolts, braces, tubes, and/or flues). For example, in a repair or alteration to a fluesheet knuckle, if the area to be repaired does not contain staying elements, then the repair shall be considered as unstayed.

When the regulation cites an accepted national standard for boiler repairs and/or alteration, it refers to the NBIC, ASME BPVC, the original code of construction (such as from the original locomotive manufacturer), and repair procedures from a U.S. railroad that built, maintained, and/or operated steam locomotives are also accepted. The regulation requires that the repair and/or alteration procedures follow the chosen accepted national standard in full as prescribed by the standard holder organization. These procedures exclude picking and choosing from multiple accepted national standards or not following the standard in full as prescribed by the standard holder organization, to complete a repair and/or alteration.

If a locomotive owner and/or operator proposes to make an unstayed riveted repair or alteration, in addition to submitting their written request to the MP&E Staff Director, a copy of the repair or alteration, and its supporting documentation, must be sent to the MP&E Staff Director for review prior to granting approval. All alteration and/or repair reports for steam locomotive boilers submitted for review and filing to the FRA Motive Power and Equipment Division Staff Director shall be submitted with supporting documentation that detail work done to the locomotive. This supporting documentation includes, but is not limited to, supporting calculations, dimensional drawings of relevant boiler geometry involved in the repair, material certifications, riveting processes followed (with detailed reference to an accepted national standard), and repair standard followed (with detailed reference to an accepted national standard). This documentation details the work and provides a repair and alteration pedigree, not only for FRA, but also for the locomotive owner/operator.

<u>Pressure Testing of Boilers</u>

§ 230.35 Pressure testing.

Any time hydrostatic pressure is applied to the boiler the temperature of the steam locomotive boiler shall be raised to at least 70 degrees Fahrenheit and not higher than 120 degree Fahrenheit. It is important that the owner/operator conduct an internal inspection of the boiler following any hydrostatic test where the pressure exceeds Maximum Allowable Working Pressure (MAWP). Refer to the guidance under 49 CFR Part 230.32(b) for further guidance on applicable points of boiler inspection.

§ 230.36 Hydrostatic testing of boilers.

A hydrostatic test must be conducted at each 1,472-service day and annual inspection. Other factors that trigger a hydrostatic test are any alteration, and repair to an unstayed portion of the boiler. Whenever a hydrostatic test is performed under this Part, the temperature of the boiler shall be between 70- and 120-degrees Fahrenheit. Additionally, no air is to be present in the boiler after it is filled with water. The pressure applied shall be 25% above MAWP, or 1.25 times the MAWP. The hydrostatic test of the boiler puts a load on all elements of the boiler in a safe manner so that if a boiler component fails, no one is in danger.

> **Note:** This section also requires an internal inspection of the boiler anytime a hydrostatic test is applied above MAWP. <u>FRA policy requires FRA inspectors to conduct a physical internal inspection of the boiler, firebox, and smokebox at each annual inspection,</u> provided the boiler is safe to enter as discussed in the information above under 49 CFR § 230.32(b)(2). If the boiler, firebox, and smokebox are not entered and inspected, FRA inspectors shall note, “Interior inspection of boiler not made” and show reason on the inspection report using the comment feature.

The dome lid and throttle must be removed at the time of making the hydrostatic test, unless it is being used to hydrostatically test superheater units, and the interior surface and connections of the boiler examined as thoroughly as conditions permit. In cases where the boiler can be entered and thoroughly inspected without removing the throttle, the inspector may make the inspection by removing the dome cap only, but the variation from the rule must be clearly noted on the inspector's 96 report. This notation includes, "Boiler entered through auxiliary dome" or "throttle standpipe not removed." If the boiler cannot be entered because of its construction, it should be so stated, such as "Not entered because...". In these cases, a borescope inspection must be made and photos included with the inspectors 96 report verifying the condition of the boiler.

When the hydrostatic test is performed by the locomotive owner and/or operator, an authorized representative of the locomotive owner and/or operator may be present if they are thoroughly familiar with the boiler construction of the locomotive being tested. At the time of the test, either the locomotive owner and/or operator, or their authorized representative, must personally witness the test and thoroughly examine the boiler while under hydrostatic pressure.

Hydrostatic testing is a process whereby water is forced into the locomotive boiler to determine the soundness of the complete boiler structure to withstand such test pressure. While FRA always requires a safety factor of 4 for the boiler, it must be understood that this test pressurizes the boiler in a manner which creeps into the safety factor. This test can only be performed properly and safely when all air has been purged from the boiler being tested. After all air has been purged from the boiler, the pressure should be slowly increased by use of a suitable water pump, or other device, that will not introduce air into the boiler during testing. Any air in the boiler under test will defeat the principle of hydrostatic testing. The pressures exerted in this manner subjects all internal surfaces and parts of the boiler structure to equal pressure.

Also of very significant importance is the matter of safety. Water is incompressible and can store extremely little energy. The force exerted is furnished by the pump only. On the other hand, if air is trapped in the boiler being tested, it will be compressed to the test pressure attained. The air will build up potential energy which can be extremely dangerous and damaging to the boiler being tested should a failure occur. In the event of a structural failure, the trapped air pressure will continue to expend its built-up energy until exhausted. With a true hydrostatic pressure, stopping the pump ends the pressure source.

In almost all boilers of horizontal fire tube type, the highest part of the boiler will be the dome. During the filling of the boiler, preparatory to hydrostatic testing, air should be vented from as near the top of the dome as possible as pressure can be applied more quickly and easily when there is no air present. It is important to know the safe condition of all parts of the locomotive, and that all other appurtenances should not interfere with a proper hydrostatic test of the boiler. Below is further information concerning problems associated with trapped air in boilers during hydrostatic testing:

WHERE AIR CAN BE TRAPPED

1. If not properly vented, or purged, during filling of the boiler as described above, air can also be trapped in the superheater system if the locomotive is so equipped, or in the piston valves and cylinders and related piping, if included in the hydrostatic test.
2. If the locomotive has a throttle valve located in the dome and features type “A” or “E” superheating, and the throttle valve is opened to permit testing of the superheating system during the hydrostatic test, additional air purging procedures will have to be made in order to obtain a true hydrostatic test.
3. If the locomotive is provided with a throttle valve located in the outlet side of the superheater header, also known as a front-end throttle or American Multiple Throttle, special precautions are necessary in order to prevent the trapping of air in the superheater system. It must be known without a doubt that all air has been purged from the superheater system, otherwise a true hydrostatic test will not be attainable. It is therefore recommended that a blanking plate and gasket with an appropriate size, fitment, and thickness be applied to the entrance to the dry pipe prior to the hydrostatic test of the boiler. All leaks from this step shall be nullified prior to testing. Upon which, the boiler shall be vented, as previously described, from the highest point of the boiler.

As a matter of information to make you aware of hazard of trapped air, the following example is provided, covering a locomotive having a front end, or American Multiple style, throttle integral with the superheater header:

A locomotive having 1,946 square feet of type E superheating surfaces and having superheater units within 202 superheater flues, or 404-unit tubes, will require approximately 34.15 cubic feet, within the system. This is equivalent to two cylindrical reservoirs 21 inches inside diameter and 85 inches in length, a comparable 34.06 cubic feet. The working pressure in this example locomotive is 245 psi, requiring a hydrostatic test pressure of 25% above working pressure, or 306.25 psi.

Whether type "A" or "E" systems are provided, during filling of the boiler water enters the dry pipe near the top of the dome, as possible, then passes into the unit pipes located below and at right angle to the filling water level, and then forces the air from each unit. Type "A" units consist of four pipes, and three return ends. In the type "E" system, a unit may consist of four pipes and three return ends entering two flues, or as many as eight pipes and three return ends entering two flues, or as many as eight pipes and six return ends entering four flues comprising a very complex system of pipes and turns. This is compounded when the type "A" or "E" systems utilize the front-end throttle and all air must be purged from the systems through the throttle if it is opened. If the throttle is not opened, all air within the unit system will be compressed by the incoming water and leaks will probably appear.

Under the hydrostatic test, safety valves are either removed and plugs inserted in their places, or they are closed and clamped, otherwise known as “gagged,” in an appropriate manner. An accurate calibrated test gauge is applied to the boiler and the indicated pressure must be watched closely. It must be seen that the prescribed test pressure is not exceeded, as it is very easy to strain, unduly, parts of the boiler. As mentioned previously, cold water is not satisfactory for testing and it is not complaint. As the boiler plates are cold and contracted, leaks could appear using cold water giving a false test. A boiler that is in good condition, and tight under steam, may show leaks when full of cold pressurized water. Therefore, the use of cold water makes the test unnecessarily severe.

While under a hydrostatic test, broken staybolts are more easily detected by hammer testing when the boiler is under a hydrostatic pressure, than when it is not. This is because the broken staybolt ends may be more separated due to inner and outer shell plates moving away from each other while under hydrostatic pressure. This can give a more distinct and pronounced sound when the staybolt is hammered. Whereas, if the boiler is not under pressure, the broken ends may then be in contact giving a sound closer to a good staybolt, a false negative. Special attention shall be made to staybolts surrounding a broken staybolt. These staybolts may also be broken due to a high shift in plate load when the originating staybolt breaks. The inspector shall insist that staybolts surrounding a broken staybolt are hammer tested or, as appropriate, tested using a Flannery style tester.

When all necessary repairs have been completed, the boiler shall be fired up and the steam pressure raised to not less than the allowed working pressure, and the boiler and appurtenances carefully examined. Under this steam test, all cocks, valves, seams, bolts and rivets must be tight under this pressure. At this point, the locomotive’s boiler shall be safe and suitable for service. Any found defects must be disclosed and repaired before the locomotive returns to service.

§ 230.38 Telltale holes.

For staybolts that are shorter than 8 inches, with the exception of flexible staybolts, the telltale holes shall be 3⁄16 inch to 7⁄32 inch diameter and at least 1 1⁄4 inches deep in the outer ends of the staybolt. On reduced body staybolts, the telltale hole shall extend beyond the fillet and into the reduced section of the staybolt. Staybolts may have through telltale holes. For locomotives with heritage rigid wrought iron, or steel, staybolts which are only drilled on one end, these staybolts are to be drilled on both ends while in place, or replaced, when broken, with a staybolt which has telltale holes on both ends. Locomotive owner and/or operator shall keep track of which staybolts have been replaced using drawings, or sketches, and the FRA Form no. 19 for the life of the locomotive.

A "plugged" staybolt means telltale hole has been plugged or riveted over or telltale hole missing. Telltale holes leaking, plugged, or riveted over will be counted as broken staybolts.

§ 230.39 Broken staybolts.

As stated previously, for locomotives with heritage rigid wrought iron, or steel, staybolts which are only drilled on one end, these staybolts are to be drilled on both ends, or replaced, when broken, with a staybolt which has telltale holes on both ends. Locomotive owner and/or operator shall keep track of which staybolts have been replaced using drawings, or sketches, and the FRA Form no 19 for the life of the locomotive.

Special attention shall be paid to staybolts surrounding a broken staybolt. These staybolts may also be broken due to a high shift in plate load when the originating staybolt breaks. The inspector shall insist that staybolts surrounding a broken staybolt are hammer tested or, as appropriate, tested using a Flannery style tester.

§ 230.40 Time and method of staybolt testing.

When the inspector is on a site inspection and hammering of staybolts is to take place, the inspector shall witness the hammer testing of staybolts whether under hydrostatic pressure, or not. The inspector may also hammer staybolts himself, to assess soundness of each staybolt. The inspector shall be familiar with the sound of an unbroken vs. broken staybolt as well as the visual signs.

§ 230.41 Flexible staybolts with caps.

An inspector shall be familiar with the methods used in testing flexible staybolts as well as be able to identify an unbroken vs. broken flexible staybolt. The use of and operation of a Flannery style staybolt tester shall be similar to the reporting inspector.

Steam Gauges

§ 230.45 Method of testing.

During a site inspection, the inspector shall verify the calibration date on the steam gauge and shall also verify the locomotive owner and/or operator has ready access to a dead weight tester for calibration. If the locomotive is to be under steam, or hydrostatic pressure, the inspector shall verify that the gauge is reading appropriately. The inspector shall also verify that the gauge shall agree with the relief valve when MAWP is achieved.

§ 230.46 Badge plates.

All badge plates shall be affixed to the backhead with either a nut and stud, welds, or rivets. During an inspection, the inspector shall verify that this badge is clear and legible with nothing acting as an obstruction to its readability.

§ 230.47 Boiler number.

During site inspections, the inspector shall verify that the boiler number and name of manufacturer or owner, whether assigned or given from original manufacturer, is clear and legible on the steam dome or manhole flange.

Safety Relief Valves

§ 230.48 through § 230.50

An inspector shall be familiar with and be able to perform an accumulation test. This test is crucial in affirming the reliving capabilities of the boiler relief valves and thus the safety of the locomotive's operation.

General Accumulation Test Procedure:

1. An accumulation test is performed by shutting off all other steam-discharge outlets from the boiler and forcing fires to the maximum, usually with the aid of the blower. The safety valve relief capacity shall be sufficient to prevent increased pressure in excess of 5 PSI, or 6 percent, of the MAWP for a given amount of time.

2. If relief capacity is insufficient, the fire should be extinguished, or dumped, and additional relief valves be added.

If a locomotive owner and/or operator wishes to use another version of an accumulation test, the inspector shall ask for a copy of this test. The procedure will be reviewed by the MP&E Staff Director and the assigned HQ specialist before it's use by the locomotive owner and/or operator.

Water Glasses and Gauge Cocks

§ 230.51 through § 230.56

Inspectors shall be familiar with the testing procedures of blowing down water glasses, whether connected to a water column or directly piped into the locomotive's boiler. All water glasses must be blown down before each day's work or each trip. Additionally, inspectors shall be familiar with the testing and operation of gauge cocks as well as the visual differences which indicate steam and/or water leaving the gauge cocks.

Procedure for blowing down a water glass is as follows:

1. First, close the lower water glass valve.
2. Open the drain valve. The water glass should immediately empty and steam should rush through the water glass and out the drain.
3. Close the upper water glass valve. Once closed, nothing should be going through the water glass or coming out of the drain line.
    a. Note: If there is evidence of water and/or steam coming out of the drain line, it could be one, or more, faulty or failing water glass valves. This condition is dangerous as water and steam may not be able to be shut off should the water glass fail.

4. Open the lower water glass valve. Water should flow out of the drain line.
    a. Note: If the water glass is directly connected to the boiler, water may fill the water glass. If the drain valve is wide open, bubbles may appear in the water.
    b. Note: If the water glass is connected to a water column, water will most likely not appear in the glass.
5. Open the top water glass valve. The glass should show no water level, unless the boiler is very full.
6. Close the drain valve and the water level should return quickly in the water glass.

If the water glass does not respond as described in this procedure, if water continues to drain when it shouldn't, or it responds sluggishly, a serious condition may exist and the fire must be extinguished, or dumped. The inspector shall require that the water glass assembly be removed, inspected, cleaned, and repaired. Inspectors should inquire over the safe and suitable nature of tubular water glasses, and they should be familiar with how a worn tubular water glass assembly looks.

All water glass and gauge cock valves must be kept tight, and must be so constructed that they can be kept clean and open and so located and maintained that they can be easily opened and closed by hand, extension handles being provided if necessary.

Procedure for using gauge cocks is as follows:

1. Open the top cock, then close it. Water or steam may appear. If water doesn't flow, open the next cock below it.
2. Water or steam should flow at this cock. Open the top cock, then close it.
3. Finally, open the lowest cock, then close it. Water should flow at least from this. If no water is flowing or steam appears instead, a serious low water condition is present and the fire should be extinguished or dumped.

Note: Investigations of locomotive boiler operations in the 1920s confirmed a long-held suspicion. There is a water surge phenomenon, or false head effect, associated with a locomotive boiler during operation. This produces a false head effect can give false readings to gauge cocks. This is caused by heated high velocity circulating water between the inner and outer door sheets. As the water moved and comes over the crown sheet, it provides more water for the gauge cocks than may actually be present. Therefore, the gauge cocks are to be a backup at most for checking water levels.

Since July 1, 1911, the effective date of the locomotive boiler inspection law, a great number of accidents have been reported growing out of burst water and hydrostatic lubricator glasses. In an effort to affect the diminution of water and lubricator glass accidents, inspectors shall remove from service all locomotives which are not equipped with water and hydrostatic lubricator glass shields in accordance with the rules.

As practically all water glass shields are patented, FRA cannot undertake to approve any particular style of shield. Additionally, a spiral used as a shield is not considered satisfactory compliance with § 230.55. Shields of wire mesh have been accepted, provided the wire used in their construction is allowed to run no coarser than eight meshes per inch. Water glasses and water glass shields should be so located, constructed, and maintained that the enginemen shall, at all times, have a clear and easy view of the water in the glass from their usual and proper positions in the cab.

Repairs, alterations, and new construction of pressure retaining piping and water columns shall be completed in accordance with an accepted national standard such as the NBIC, ASME BPVC, the original code of construction (such as from the original locomotive manufacturer), or repair procedures from a U.S. railroad that built, maintained, and/or operated steam locomotives are also accepted

Injectors, Feedwater Pumps, and Flue Plugs

§ 230.57 Injectors and feedwater pumps

Injectors, feedwater systems, and long injector steam pipes should be securely braced so as to avoid vibration. FRA records show that, in the past, many serious and fatal accidents have been caused by the failure of injector steam pipes and connections. Repairs and Alterations to pressure retaining piping shall be completed in accordance with an accepted national standard such as NBIC, API, ASME BPVC, and AWS. Additionally, original code of construction (such as from the original locomotive manufacturer), or repair procedures from a U.S. railroad that built, maintained, and/or operated steam locomotives are also accepted.

Washing Boilers

§ 230.60 Time of washing.

49 CFR § 230.60 (a) and (b): All water changes have not been considered as washouts, and no objection has been made to the removal of the plugs in the water legs to facilitate the emptying of the boiler. However, where all plugs in the boiler are removed and hose used, it is considered a washout. The inspector shall emphasize that all plugs be removed when the boiler is washed.

The removal of all plugs and thorough washing of the boiler is also insisted on as often as water conditions require and is accordance with § 230.60. It is not compliance with this rule to remove all plugs once every 31 service days where water conditions require more frequent washing. All plugs must be removed each time the boiler is washed. FRA's understanding is that it is just as important to get all the soluble matter which causes foaming out of the boiler as it is to get out the incrusting solids.

FRA has found in the past that some locomotive owners and/or operators claim that washout plugs are inspection plugs. As the plugs were put in the boiler for the purpose of washing and inspecting the boiler during the washout, all inspection plugs shall be considered as washout plugs.

§ 230.61 Arch tubes, water bar tubes, circulators and thermic siphons.

Arch tubes, water bar tubes, circulators, and thermic syphons should be thoroughly cleaned with a mechanical cleaner each time the boiler is washed. It is expected that they be thoroughly cleaned in this manner as laid out under 49 CFR Part 230.61(a). Arch tubes, water bar tubes, circulators, and thermic syphons found defective, cracked, blistered, burned, or bulged shall render the locomotive out of service until an alteration, or repair, is made in accordance with an accepted national standard.

Steam Pipes

§ 230.62 Dry pipe

Repairs, alterations, and new construction of dry pipes shall be in accordance with an accepted national standard. FRA does consider this to be an unstayed portion of the boiler.

§ 230.63 Smoke box, steam pipes and pressure parts.

The superheater header, branch pipes, exposed feedwater system elements, and exposed superheater elements shall be examined for cracks, pitting, grooving, excessive sand or cinder cutting, and leaking or defective joints and connections. Inspectors should also look for loose, leaking, and missing rivets/rivet heads, cotter pins, and bolts. All rivets shall be visually and auditorily examined for soundness. Indications of leaking, overheated, burned, and/or bulging/corrugated surfaces should also be looked for.

All superheater elements shall be hydrostatically tested to at least 1.25 times MAWP after being installed and prior to entering service after a 1472 service day inspection. Repairs, alterations, and new construction to steam pipes and pressure parts shall be in accordance with an accepted national standard.

Brake and Signal Equipment

§ 230.71 Orifice testing of compressors.

Inspectors shall understand how, and be able to implement, the orifice test procedure for each compressor type. Failure to understand these procedures can cause a false result, or compressor damage. In cases where locomotives have two compressors, each compressor shall be tested individually for compliance. Additional manufacturer specific information is available from the MP&E Staff Director, or the assigned HQ specialist, and the inspector should have a copy for reference.

§ 230.72 Testing main reservoirs.

Inspectors shall verify that all drilled main reservoirs are drilled over its entire surface with telltale holes that are 3⁄16 of an inch in diameter. They also shall check that the blind holes shall be spaced not more than 12 inches apart, measured both longitudinally and circumferentially.

§ 230.73 Air gauges.

During a site inspection, the inspector shall affirm that the last date of calibration is in accordance with 49 CFR Part 230.73(b) and that the railroad has ready access to a dead weight tester.

§ 230.77 Foundation brake gear.

Look for loose, worn, or missing pins, cotter pins, brake keys, and brake shoes. Locomotives using composite brake shoes should have some method of compensating for the necessary brake ratio difference required by composite shoes vs cast iron shoes.

<u>Cabs, Warning Signals, Sanders and Lights</u>

§ 230.80 Cabs.

49 CFR 230.80(a): Safety chains, or cables, from the rear cab wall to the tender shall be kept in a safe and suitable manner. There shall be no excessively worn chain links, cables, or hooks. They shall be hung from the cab wall to the tender, or secured if not in use, in a manner where they cannot become unsecured during normal operations.

49 CFR 230.80(b): As live boiler steam, or hot water, may flow through the cab piping and radiators, they shall be kept in a safe and suitable manner. If the system is not to be used or is defective, the system shall be repaired in accordance with an accepted national standard or disconnected from live boiler steam and water. In this case, all external boiler connections shall be permanently capped in accordance with an accepted national standard.

§ 230.81 Cab aprons.

49 CFR 230.81(a): Cab apron safety tread shall be renewed, replaced, or repaired, when worn smooth or excessively thin. Repairs, renewals, or new cab apron materials shall be applied and completed before the locomotive is to be in service again.

§ 230.82 Fire doors.

Fire doors with multiple cast pieces, or fabricated, should be checked for loose or worn components. Additionally, the door shall have the ability to be mechanically secured open safely for entering and exiting the firebox.

§ 230.86 Required illumination.

49 CFR 230.86(b): Inspectors shall confirm that locomotives equipped with Light Emitting Diodes (LED) for headlights can dim when in operation as not all LEDs are dimmable.

§ 230.87 Cab lights

Cab light sockets which need repair, no longer used, shall be repaired, or removed and terminated appropriately. Exposed electrical sources are a hazard whether they use direct current or alternating current source.

Throttles and Reversing Gear

§ 230.88 Throttles

Throttles, and associated linkages, shall be maintained so that in an emergency, the flow of steam can be terminated immediately.

§ 230.89 Reverse gear.

Reverse gears, powered or manual, shall be maintained such that the neutral position is true when the locomotive is in operation but stationary. This prevents undesired locomotive movement should the flow of steam from an ajar, damaged, or steam cut, throttle overcome open cylinder cocks and/or brakes.

Draw Gear and Draft Systems

§ 230.90 Draw gear between steam locomotive and tender.

Where exposed for inspection, inspectors shall see that there are no missing, excessively worn, cracked, or broken parts present between the engine and tender. Safety chain links shall not have excessively worn links and shall hang in free space without binding up. Inspectors shall see that there is not excessive play as prescribed under this section.

To help ensure tenders are safe and suitable for service as required,[24] the draw gear between the first and second tenders on geared locomotives (*i.e.*, Shay, Heisler, Climax, etc.) are maintained in the same manner as conventional steam locomotives and tenders.

§ 230.93 Pistons and piston rods.

Worn, scored, or hour glassed piston rods shall be checked the side using a steel rule. This condition can prevent the piston rod packing from sealing correctly to the piston rod and allowing excessive steam leakage. During cold weather especially, this should be checked for these leaks not only degrade the locomotive's performance, but also can become a visibility and safety hazard for the operating crews and the general public. Inspectors shall check that all piston keys and fasteners are in place and have not worked loose or have defects.

[24] *See* 49 U.S.C. § 20701 and 49 CFR § 230.7(c).

The following abbreviations may be used in stamping "kind of material" on driving, trailing, and engine truck axles, piston rods, and crank pins:

I - Iron.
S - Steel.
H. T. S. - Heat Treated Steel
Chr - Chrome.
Van - Vanadium.
Nkl - Nickel.
Nik - Nikrome.
Cof. Proc. - Coffin Process.
Cam. Spec. - Cambria Special.
Tay. I - Taylor Iron.

§ 230.94 Crossheads.

Inspectors shall check that all the lateral has not become excessive using their steel rule. Loose shoes in the crosshead, whether bronze, plastic or synthetic material, or babbitted bronze, is a condemning defect.

§ 230.95 Guides.

Check for cracks and/or loose nuts and bolts on the guides and supporting castings. High stress areas where forces are greatest, can develop cracks in castings in and around the guides.

§ 230.96 Main, side, and valve motion rods.

All planned welded repairs to rods shall be presented to the FRA Motive Power and Equipment Division Staff Director prior to the repair. Failure of the locomotive owner and/or operator to present the repair plan ahead of time, shall render the locomotive out of service until the repair has been reviewed, or corrected.

Where present, any means may be adopted for securing grease-cup plugs in place that will prevent them from being thrown out.

During a site inspection, the inspector shall look for cracks in the side and main rods, loose wedges nuts and bolts, and that the rods have not exceeded the maximum allowable motion in side rods, main rods and bushings.

§ 230.97 Crank pins.

During a site inspection, the inspector shall look, where accessible, for any defects such as cracks, discoloration from overheating, and loose nuts and missing or broken cotter pins.
The following abbreviations may be used in stamping "kind of material" on driving, trailing, and engine truck axles, piston rods, and crank pins:

I - Iron
S - Steel
H. T. S. - Heat Treated Steel
Chr - Chrome
Van - Vanadium
Nkl - Nickel
Nik - Nikrome
Cof. Proc. - Coffin Process
Cam. Spec. - Cambria Special
Tay. I - Taylor Iron

RUNNING GEAR

§ 230.98 Driving, trailing, and engine truck axles.

Worn-down axles may be turned down and used under lighter equipment. It is suggested, however, that such axles be thoroughly annealed before being further used under such circumstances. The following abbreviations may be used in stamping "kind of material" on driving, trailing, and engine truck axles, piston rods, and crank pins:

I - Iron
S - Steel
H. T. S. - Heat Treated Steel
Chr - Chrome
Van - Vanadium
Nkl - Nickel
Nik - Nikrome
Cof. Proc. - Coffin Process
Cam. Spec. - Cambria Special
Tay. I - Taylor Iron.

§ 230.100 through § 230.104

Inspectors are highly encouraged to spot check these areas during an inspection to ensure that the defects listed in these sections are not present.

§ 230.105 Lateral motion

The inspector shall use a steel rule to ensure that lateral motion does not exceed the amounts listed in this section. Excessive lateral can allow the locomotive to “nose” back and forth while operating and can cause damage to the locomotive and excessive forces on the gauge face of the rail. This effect can lead to the rail rolling over or a wheel climb derailment. The only exception to the requirements under 49 CFR 230.105 is the Chinese National Railways QJ locomotives as these were designed with a higher lateral allowable and operate under a waiver.

§ 230.106 Steam locomotive frame.

During a site inspection, it is important to look for defects. Some of these include, but are not limited to:

- Evident cracks
- Poor repairs to frame members
- Missing or loose frame keys
- Broken or cracked frame extensions or cross braces
- Broken frame pedestal legs
- Bottom or top frame members broken
- Missing or loose nuts and bolts (taper and straight thread)
- Pedestal binders are missing or loose
- Missing or broken pedestal shoes and wedges

§ 230.107 Tender frame and body.

During a site inspection, it is important to look for defects. Some of these include, but are not limited to:

- Tank sill in bad condition or loose
- Tank hose leaking
- Tank leaking around draw casting
- Tank cistern leaking
- Back of tender tank filled with debris blocking, or may block, drain
- Oil tank leaks and/or safety valve in oil supply pipe defective
- Missing or defective tender tank well screen
- Missing or loose fasteners holding tender tank to frame
- Wooden boards under tender tank excessively degraded or missing
- Defective or leaking steam heat for water or oil cisterns
- Missing safety appliances on tender and on oil conversions for safely traversing over oil bunker
- Frame cracks or missing frame elements
- Missing or loose rivets or nuts and bolts on bolsters

§ 230.108 Steam locomotive leading and trailing trucks.

During a site inspection, it is important to look for any defects and check wear limits prescribed in this part. Some of these defects may include, but are not limited to:

- Evident cracks
- Poor repairs to truck members or castings
- Missing or loose pins, cotter pins, nuts, and bolts
- Broken frame pedestal legs
- Missing or broken pedestal liners (where equipped)

- Bissel post wearing or rubbing into other parts
- Truck is binding or not supporting engine weight correctly
- Broken leaf(s) or coil springs
- Leaf or coil spring solid, bottomed, or leaning excessively to one side out under locomotive weight
- Spring rigging connection points excessively worn or not functioning in conjunction with truck
- Missing or loose nuts and bolts (taper and straight thread)
- Pedestal binders missing or loose.
- Journal lid missing, broken, or not functioning as originally designed (if equipped with plain bearings)
- Safey chains excessively worn or missing
- Safety chain hanging lower than acceptable

Appendix A to Part 230 - Inspection Requirements

The lists in this appendix are intended as information only. Adherence to these lists does not relieve the steam locomotive owner and/or operator of responsibility for either: (1) completing the inspection and maintenance requirements described in this part; or (2) ensuring that the steam locomotive, tender, and its parts and appurtenances are safe and suitable for service.

Chapter 10 – Railroad Safety Appliance Standards, Part 231

Introduction

The Safety Appliance Act (SAA) established Federal requirements for railroad safety appliances beginning in 1893.[25] The Federal Railroad Safety Act of 1970 (FRSA) later provided supplemental authority to regulate all aspects of railroad safety, including safety appliances.[26] Federal regulations establishing safety appliance standards were issued in 1911 by the Interstate Commerce Commission (ICC), which had created the Division of Safety Appliances. Soon, the ICC issued several "Orders." These ICC Orders served the same purpose as today's FRA regulations. In accordance with a statutory directive, the ICC Orders identified the number, dimensions, location, and manner of application of all safety appliances. After the formation of the FRA in 1967, the Railroad Safety Appliance Standards[27] (Part 231) were issued in 1968, using the ICC Orders as a basis for the rule text. In 1974 and 1976, FRA amended the Railroad Safety Appliance Standards to add two new sections, 49 CFR §§ 231.29 and 231.30. More recently, in 2011, FRA again amended the safety appliance regulations to add two new provisions establishing a special approval process for existing industry standards. Despite these changes, the present-day regulations retain many similarities in substance and form with the original ICC Orders issued beginning in 1911.

On July 19, 2013, AAR petitioned FRA for special approval of an existing industry safety appliance standard (S-2044). This standard included safety appliance arrangement requirements for multiple car types (18 total) that were not explicitly detailed in Part 231. FRA's Safety Board reviewed the petition and ultimately granted the special approval to use S-2044 in lieu of the safety appliance requirements for a number of the various new car type builds on or after January 1, 2015. The remaining car types that were not initially included, because they had not yet been completed at that time, were eventually added in the special approval. Thus, by January 1, 2019, all 18 car types covered in S-2044 were approved by FRA to be applied to new builds.

The following information and explanations have been developed to aid Federal and State inspectors conducting inspections for compliance with the Railroad Safety Appliance Standards in Part 231, as well as AAR Standard S-2044. It is important that every inspector adhere to the contents of this document when conducting these inspections, so that uniformity of compliance activity is better achieved. The procedures and information provided in both this manual and the General Manual should be observed when assessing the need for appropriate enforcement action regarding any noncompliance with safety appliance requirements. Reports of safety appliance inspections are made on the Motive Power and Equipment Inspection Report, FRA Form F6180.96. Violations, as well as recommended civil penalties, are to be submitted on the Violation of Safety Appliance Law Report, FRA **Form F6180.109**. Cars built after 2015 require specific documentation from RCC (attachments). These are: (1) the new standard for the car, (2) the table of deviations for the specific car, and (3) the portion of the old regulations for that car.

[25] Codified at 49 U.S.C. § 20301 *et seq.*
[26] Codified at 49 U.S.C. § 20101 *et seq.*
[27] 49 CFR Part 231.

Every rail vehicle (car, locomotive, tender, or similar vehicle) has very specific and defined safety appliance requirements. Inspectors must be knowledgeable of the common types of vehicles and their unique safety appliance arrangements prior to performing Part 231 inspections. Inspectors also need to familiarize themselves with the many complexities and requirements of the various vehicles that are categorized as "cars of special construction." A car of special construction is required to comply with the Railroad Safety Appliance Standards for the car type that it most closely resembles or to the "nearest approximate type" of car. If there are questions about a particular car type, the inspector should contact the regional specialist for a definitive classification. For consistency, the regional specialists will follow information provided by headquarters staff.

The SAA imposes a strict liability standard when a railroad uses, or allows to be used, a vehicle with defective safety appliances.[28] FRA is not required to prove that the railroad knew or should have known of the defect to support a violation. If a railroad uses, or allows to be used, a vehicle that is discovered to have a non-compliant safety appliance, and the vehicle is not being properly moved for repair, pursuant to the statutory provisions,[29] appropriate enforcement action must be taken. If a railroad is unaware of the existence of a non-compliant condition, it cannot be considered moving the vehicle for repair and is subject to civil penalties. Inspectors are expected to use sound judgment, along with the information outlined in both the General Manual and Chapter 3 of this manual, when deciding whether the issuance of a civil penalty violation is appropriate.

FRA is not required to wait for a car with a non-compliant safety appliance to depart or engage in an actual "haul" to assess a violation. FRA's broadest authority to enforce safety regulations is from the FRSA, but as a matter of policy, violation assessments are generally limited to when the vehicle is in use under the SAA. The SAA applies broadly to any vehicle that a railroad employee, in the course of his/her duties, would have the occasion to approach and use a safety appliance.[30] For example, a railroad employee who for the purpose of inspection climbs on a freight car and uses a grab iron, is covered by the statute and regulations.[31] To support a violation assessment, the FRA inspection report is expected to include evidence to show how the safety appliance was used. Be as specific as possible. Inspectors should include names, if they are available In some situations, it may not be the best or appropriate approach to include such information (for example, it would not be appropriate to include a person's name if doing so would reveal the identity of a complainant in a complaint-based investigation). As a matter of enforcement discretion, due to FRA's limited resources, FRA inspectors are encouraged to focus inspections on vehicles that have been inspected by the railroad and are ready for service. In many circumstances, the best approach is still to establish actual use or movement of the vehicle.

The SAA also governs the movement of vehicles with defective safety appliances.[32] This allows the railroad to move the defective vehicles only from the place where the defect is first discovered to the nearest location where the necessary repairs can be made. This movement can

[28] 49 U.S.C § 20302.
[29] 49 U.S.C. § 20303 (previously 45 U.S.C. § 13).
[30] *Brady v. Terminal Railroad Assn*., 303 U.S. 10 (1938).
[31] *Id*.
[32] 49 U.S.C. § 20303.

either be on the railroad where first discovered or at the option of the connecting railroad, on the line of the connecting railroad if the move is no farther than the location on the line where the defect was first discovered. Thus, in order to properly move a car for repairs, the railroad must know the defect exists. There is no regulatory tagging process for safety appliance defects. At interchange, a railroad can refuse to accept a defective car. Until the receiving railroad accepts the car by moving it or otherwise exercising control over it, it is not liable for civil penalties nor is it required to make any repairs. However, it should be noted that the delivering railroad remains liable for each defective car it tenders at interchange.[33]

The SAA's movement for repair provision is an affirmative defense to be established by the railroad.[34] The seven elements which must be established are:

- The car was properly equipped with safety appliances in the beginning.
- The car became defective while being used by the railroad on its line.
- The railroad discovered the defect prior to movement.
- The movement was from the place where the defect was first discovered.
- Repairs could not be made at the location where the defect was first discovered.
- Movement was necessary to make the necessary repairs.
- The car moved only to the nearest available point where the necessary repairs could be made, and any necessary restrictions were placed on the equipment to ensure it moved safely.

Federal regulations on freight power brakes contain guidelines to be considered by FRA inspectors and the railroads in determining what constitutes the nearest location where necessary repairs can be performed.[35] The guidelines are equally applicable to determining such locations for all safety appliance defects. The guidelines must be applied on a case-by-case basis to determine if the railroad acted in good faith in moving defect equipment. The following locations should be considered when applying the guidelines discussed in detail below:

- Locations where a mobile repair truck is used on a regular basis.
- Locations where a mobile repair truck originates or is permanently stationed.
- Locations with an operative repair track or repair shop.

[33] *Brady v. Terminal Railroad Assn.*, 303 U.S. 10 (1938).
[34] 49 U.S.C. § 20303.
[35] *See* 49 CFR § 232.15(f).

- Locations where the railroad performs mechanical repairs other than safety appliance repairs.

In determining whether a location noted above is capable of making a particular repair, the following factors must be considered:

- The accessibility of the location to persons responsible for making repairs.

- The presence of hazardous conditions that affect the ability to safely make repairs of the type needed at the location.

- The nature of the repair necessary to bring the car into compliance.

- The need for railroads to have in place an effective means to ensure the safe and timely repair of equipment.

- The relevant weather conditions at the location that affect accessibility or create hazardous conditions.

- A location need not have the ability to effectuate every type of safety appliance repair in order to be considered a location where some safety appliance repairs can be made.

- A location need not be staffed continuously in order to be considered a location where safety appliance repairs can be performed.

- The congestion of work at a location shall not be considered.

  In addition to considering the factors noted above, the following factors must be considered in determining whether the location is the nearest location where the necessary repairs can be made:

- Distance to the location. Although this is a key factor it should not be the determining factor. This must be considered in conjunction with all the factors previously noted as well as the following safety considerations.

- The safety of the employees responsible for getting the equipment to or from a particular location.

- The safety hazards involved in moving the equipment in the direction of travel necessary to get it to a particular location.

Inspection Information[36]

General Explanations & Information

Although the regulations are precise as to the dimensions, location, and manner of application for the various car types, information has been developed over the years by FRA to help clarify ambiguities in the regulations. The following information is provided to help the inspector conduct inspections for compliance with the Safety Appliance Standards.

(MP&E 98-7) Errors in U.S. Department of Transportation's Safety Appliance Standards Booklet Published 1977

Many inspectors use the September 1977 reprint of the Safety Appliances and Power Brake Requirements (orange) Booklet when conducting safety appliance inspections. Please note there are two textual errors in this book. The first is in the "Note" to § 231.1 on page 9, lines 12 to 23. The correct text should read as follows, with the portions associated with the error underlined:

> Note: <u>After December 31, 1976</u>, cars of this type built on or before April 1, 1966, or under construction prior <u>to that date</u> and placed in service before October 1, 1966, <u>must</u> be equipped <u>(as nearly as possible) with the same</u> complement of safety appliances, depending upon type, <u>as specified</u> in § 231.27 for box and other house cars without roof hatches, **or** in § 231.28 for box and other house cars with roof hatches. Cars built after April 1, 1966, or under construction prior thereto and placed in service after October 1, 1966, <u>must</u> be equipped, (depending upon type) as specified in § 231.27 for box and other house cars without roof hatches, **or** in § 231.28 for box and other house cars with roof hatches.

The second textual error involves the omission of two lines after line 12, page 64 in § 231.30(a)(2). The two lines omitted should read as follows:

> ...1977, seventy percent (70 percent) by October 1, 1978 and all such locomotives by October 1, 1979.

(MP&E 98-13) Interpretation of Sill Step Application, 49 CFR §§ 231.1(d)(2) and 231.27(c)(2)

It has been brought to the Office of Railroad Safety's attention that some sill step applications on certain types of cars are being considered by field forces as noncomplying conditions under the Railroad Safety Appliance Standards when in fact, the sill steps are in compliance. To minimize confusion in this area, the following guidelines should be used when considering sill step applications.

[36] For convenience, this section incorporates several FRA Technical Bulletins that were previously issued separately. To better ensure their accuracy, the language and formatting have been largely retained from the original documents, which may not be consistent with other portions of this manual.

> 49 CFR §§ 231.1(d)(2) and 231.27(c)(2) both address sill steps dimensions and provide the minimum standards for cross-sectional area, material, length and clear depth. The minimum standard for clear depth is 8 inches. *Please note carefully* the words "clear depth." Clear depth should be understood as meaning a vertical space the width of, and above, the sill step material or strap, and that vertical space shall be clear and unobstructed for 8 inches.

Note how this differs fundamentally from the dimensional requirements for handholds and ladder treads in the Railroad Safety Appliance Standards which stipulate, "minimum clearance..., 2 inches ...." No limiting direction orientation for clear space is provided; therefore, clearance of 2 inches is required in all directions or 360 degrees around the handhold or ladder tread.

As in all considerations of safety appliances, whether or not the appliance can be used "safely" must be considered along with the clearances and dimensions.

(**MP&E 98-36**) **Judgment in the Enforcement of the Safety Appliance Standards**

In the past, FRA inspectors have taken exception to minimal deviations from the measurements specified in the Railroad Safety Appliance Standards on cars that have been in service with the condition for a long period of time without any known incident or casualty. Although these civil penalty citations are valid from a strictly technical and legal point of view; from a commonsense point of view, the cars operated safely for years, so these minimal deviations did not materially reduce safety.

Inspectors tend to view the Railroad Safety Appliance Standards as requiring the issuance of civil penalty citations if strict adherence to each clearance, size, or placement dimension is not maintained (i.e., either the clearance, placement, or size of each safety appliance is within the exact dimensions required by the regulation, or it is not). Our world has changed and is no longer that simple. The railroad operating environment has drastically changed. Crews are smaller, and the number of run-through trains is much greater - all decreasing the use of safety appliances. In addition, the limited resources available to both FRA and the railroads require that care be taken to avoid the frivolous use of these resources pursuing minor infractions that do not materially reduce safety.

Most of the Railroad Safety Appliance Standards were developed nearly 100 years ago in a time when almost all cars were of a standard design. Application of the regulations to these cars was simple and required little, if any, judgment on the part of the inspector. Today most new cars are built to one of the 18 car types outlined in AAR S-2044, or as a "Car of special construction," outlined under 49 CFR § 231.18. The Safety Appliance Standards for such cars must be determined from the "nearest approximate type" of a standard car. Id. As a result, the Safety Appliance Standards cannot be applied directly to these cars without exercising good judgment.

Today, inspectors must exercise this judgment, not just take measurements and file exceptions for minimal deviations. An exception should be taken when the condition of the safety appliance materially reduces safety. For example, a safety appliance with a slight looseness that is still firmly fastened with all of the securing bolts in place, or a safety appliance with a slightly reduced clearance that is still more than adequate for its intended use does not materially reduce safety. However, one court found that a handhold moving as little as ½ inch was not "firmly fastened." See Roe v. Port Terminal R.R. Ass'n, 620 S.W.2d 870 (Tex. App. 1981). Therefore, exactly what materially reduces safety is not always clear. It is a judgment call often dependent on the unique set of conditions governing the operation at the time.

Some general guidance for exercising judgment in the enforcement of the Safety Appliance Standards is as follows: 1) Do not take exception to a noncomplying design feature of a type of car that has a long and continuous, safe service history. However, if individual cars of that type or class have another noncomplying condition, an exception may be taken. 2) If exertion of a significant force (a force greater than that which would be encountered in the normal use or operation of the appliance) is required to move a safety appliance, exception should generally not be taken. 3) On the other hand, if the safety appliance moves easily to the touch, exception certainly should be taken.

Although safety appliances remain an extremely important part of railroad safety and the standards pertaining to these appliances must continue to be enforced, the enforcement of the Railroad Safety Appliance Standards needs to be determined through the exercise of good judgment so that scarce FRA and railroad resources are not consumed pursuing minor infractions that do not materially reduce safety.

A thorough sample-car inspection is the proper time to enforce the Safety Appliance Standards strictly. An excellent sample-car inspection will ensure safety appliance compliance before that type of car is placed in service.

Locomotive Applications and Guidance[37]

Safety appliances for other than steam locomotives are not addressed in Part 231, with the exception of § 231.29, "Road locomotives with corner stairways," and § 231.30, "Locomotives used in switching service." This does not mean that non-steam locomotives are not required to have proper safety appliances. It is FRA's position that other than steam locomotives must have proper safety appliances and are covered as cars of special construction.[38]

(MP&E 98-68) Locomotives Used in Switching Service–Location End Handholds

Questions have been raised regarding the placement of horizontal end handholds relative to the side of the locomotive as referenced in 49 CFR § 231.30(g)(1)(ii).

When the switching step regulation was developed, some handholds were installed by measuring from the side of the locomotive and some from the side of the end plate. The placement of the

[37] ((**MP&E 98-14**) Safety Appliance Securement).
[38] As "cars of special construction," non-steam locomotives are required to have, as nearly as possible, the same complement of safety appliances as contained in the categories governing steam locomotives. ((**MP&E 98-14**) Safety Appliance Securement).

preponderance of end handholds is measured from the side of the end plate. Electro-Motive and General Electric have been and are presently applying subject handholds in relation to the side of the end plate.

The Federal Railroad Administration will not take exception, if application of horizontal end handhold placement is measured from either the side of the locomotive or side of the end plate.

(MP&E 98-48) Securement of Handrail to the Locomotive Carbody North American Cab Structure

Some locomotives having the wide body North American cab configuration have the upper end of the front vertical handrail not properly secured to the carbody. The Safety Appliance regulation, Section 231.30(e)(1)(i) states in part that each vertical handhold… be securely fastened to the locomotive with one-half (½) inch or larger bolts or rivets….

Some locomotives have the upper end of the front vertical handhold bolted to a bracket that is welded to that section of the carbody that comprises the outside of the front sand reservoir. Although there appears to be adequate strength in the welded bracket, this is not permitted because the regulation specifically requires that the handhold be securely fastened with a bolt or rivet.

However, FRA has permitted welding of some permanent fixtures on locomotives to which safety appliances are mechanically fastened. The welding was made under quality-controlled conditions with a full enclosure penetration weld of the fixture to the locomotive, using modern shop welding practices, which provide 100 percent full strength requirements of the joint.

This condition, if found, is <u>not</u> to be taken as a defective condition, but should be brought to the railroad's attention for corrective action.

(MP&E 98-25) Burro Crane Requirements

The following interpretations of the Federal regulations regarding the operation of burro cranes should be used for consistent compliance and enforcement guidelines:

1. Chapter 203 – Safety Appliances, § 20302. General requirements (a)(4), which requires power driving-wheel brakes on locomotives, applies to a Burro Crane being used to pull or push cars on tracks that are part of the general rail system.

2. Railroad Power Brakes and Drawbars, 49 CFR Part 232, states that power brakes are not required to be installed on "locomotive cranes" built prior to September 21, 1945. By implication, power brakes are required on all locomotive cranes, including Burro Cranes, built on or after September 21, 1945.

3. Chapter 203 – Safety Appliances, § 20302. General requirements (a)(1)(A), which requires automatic couplers; (a)(1)(B), secure sill steps and hand brakes; and (a)(2), grab irons or handholds; all of which apply to a Burro Crane.

4. If the Burro Crane is used as a road locomotive, § 231.29 of the Safety Appliance Standards, a road locomotive with corner stairways apply.

5. If the Burro Crane is used as a locomotive in switching operations as defined in § 231.30(b)(2), the requirements of § 231.30 of the Safety Appliance Standards apply.

6. Other sections of the Safety Appliance Standards do not appear to apply.

7. Despite the fact that the Burro Crane is excluded from the definition of "locomotive" under § 229.5 of the Locomotive Safety Standards, the Burro Crane is nevertheless subject to the statutory requirements of the Locomotive Inspection Act (in particular, the requirement that it be safe). In the preamble to the final locomotive rule, FRA explicitly recognizes the applicability of the Act by stating that "FRA will continue to implement the basic statutory safety requirements with respect to such work equipment by using the Special Notice for Repair when appropriate." 45 FR 21093.

(MP&E 98-71) Self-Propelled Vehicles Considered to Be Locomotives (excerpted)

Recently, we have had several inquiries about equipment requirements for self-propelled vehicles used to haul revenue freight on the main line. Self-propelled vehicles are used in a variety of railroad functions. These vehicles include those built by Trackmobile Inc., Shuttle Wagon, Mitchell Equipment Corporation, and Brandt RoadRailer.

….

When a self-propelled vehicle is used to move freight over the railroad, outside the limits established for maintenance-of-way operations and repair facilities, it will be considered a locomotive and must comply with applicable regulations. Even though these vehicles do not resemble a standard locomotive, the purpose for which they are being used requires compliance with 49 CFR Parts 223, 229, 231 and 232.[39]

The self-propelled vehicles are unique in construction, appearance, and use. Many of these vehicles currently being used have already been modified by the manufacturers (as closely as construction would permit) to bring them into compliance with Federal regulations. FRA acknowledges that this equipment has a place in a well-rounded rail transportation system. In an effort to recognize the unique characteristics of these vehicles, FRA inspectors should exercise enforcement discretion and good judgment in analyzing an operation where self-propelled vehicles are used for train movements.

The following specifications should be used by inspectors for enforcement guidance:

….

[39] Technical Bulletin: *Self-Propelled Vehicles Considered to Be Locomotives* (MP&E 98-71), refers to 49 CFR Parts 223, 229, 231 and 232. The reference is changed here to 49 CFR Parts 223, 229, 231 and 232 to avoid any confusion.

- Switching steps as defined in Section 231.30.
- Four horizontal handholds secured to the back and front ends of the vehicle, secured by bolts or other acceptable mechanical fastener. Section 231.30.
- Vertical handholds painted in contrasting colors and secured by bolts or other acceptable fasteners. Section 231.30.
- Equipped with automatic couplers, to prevent the necessity of someone going between the vehicle and car for the purpose of coupling or uncoupling. Section 231.30.

….

Items deemed to be safety related, that cannot meet specified requirements, will have to be addressed through the waiver process.

(MP&E 07-03) Enforcement of Rail Grinders (excerpted)[40]

49 USC 20303 (Safety Appliance Act) - Section 20303 (which restricts the use and movement of vehicles with defective or inoperative safety appliances) only permits the movement of a vehicle with defective safety appliances to the nearest available place where the necessary repairs can be performed.

If power brakes are discovered defective at a location where repairs are routinely made, repairs are required to be made before the vehicle departs that location. Similarly, if the brakes become defective en route, the rail grinding set maybe moved only for the purpose of repair to the nearest location where the necessary repairs can be made. Guidelines for determining locations where necessary repairs can be performed can be found in 49 CFR 232.l5(f). FRA should cite only the statute for violations of this type.

49 CFR Part 231 (Safety Appliance Regulation) - Due to their unique design and purpose, rail grinding sets are considered “cars of special construction” under 49 CFR 231.18. Therefore, they are required to have, as nearly as possible based on the design limitations of the vehicle, the same complement of handholds, sill steps, ladders, hand brakes, and running boards as required for a car of the nearest approximate type. As with any equipment covered by 49 CFR Part 231, any additional safety appliances on the equipment must comply with the requirements of 49 CFR Part 231.

§ 231.15 Steam locomotives used in road service.

The vast majority of, if not all, steam locomotives in use today are used in tourist and excursion road service. The focus of safety appliance inspection on steam locomotives should be directed at whether or not the appliance is structurally sound, securely fastened and located, provides proper clearance, is unobstructed, and is safe to use.

[40] The complete technical bulletin can be found in chapter 15.

§ 231.16 Steam locomotives used in switching service.

The regulations pertaining to steam locomotives in switching service require footboards. However, inspectors **should not** take exception to steam locomotives that have had the footboards removed. Conversely, many steam locomotive owners/operators have elected not to remove the footboards from their locomotives for historical purposes but may prohibit railroad personnel from occupying the footboard while the locomotive is moving. In either case, the focus of safety appliance inspection on steam locomotives should be directed at whether or not the appliance is structurally sound, securely fastened and located, provides proper clearance, is unobstructed, and is safe to use.

§ 231.17 Specifications common to all steam locomotives.

Steam locomotives with Vanderbilt-type tenders require additional handrails, running boards and handholds that vary from other tenders.

§ 231.29 Road locomotives with corner stairways.

Road locomotives without corner stairways may not be used in switching service after September 30, 1979, except for passenger cars switching service at passenger stations. (*See* 49 CFR § 231.30(a)(3)).

§ 231.30 Locomotives used in switching service.

Locomotives used in switching service, regardless of built date, must be in full compliance with 49 CFR § 231.30. However, some relaxation of the regulations is allowed with respect to switching step height and width for six-axle locomotives in switching service, built prior to April 1, 1977.

It should be noted that this section specifically allows for the fastening of the switching step to the switching step bracket by weld, provided the weld is at least twice the strength of a bolted attachment. Since this issue can obviously be subjective and open to interpretation, inspectors should exercise discretion. Generally speaking, most welds applied during manufacture are as strong as or stronger than any mechanical fastener made. Welding by the manufacturer is typically performed under controlled circumstances and in accordance with strict Weld Procedure Specification (WPS). The problems associated with welding occur when no WPS exists, as is the case in most railroad locomotive shops. When inspecting switching steps that have been applied by weld, carefully inspect the weld for discontinuities such as incomplete fusion, undercut, overlap, porosity or inclusions. If any of these defects exist in the weld, the integrity of the weld should be questioned.

The outer edge of the bottom switching step must be illuminated on all locomotives built after March 31, 1977. Switching steps on locomotives built prior to March 31, 1977, may be illuminated, or have the outer edge of the switching step painted a contrasting color. If multiple locomotives (two or more) are used in switching service, only the front switching steps of the leading locomotive and the rear switching steps of the trailing locomotive must be illuminated or painted a contrasting color, depending on built date. Vertical handholds must also be painted a contrasting color. In addition, a minimum of 2½ inches of clearance must be maintained through the entire length of the vertical handhold. Attention must be given to safety tread surface of the switching step as it wears over time and, potentially, creates a foot slip condition. The height of the switching step may not exceed 19 inches from ATR to the step's safety tread.

Freight and Passenger Car Applications and Guidance

(MP&E 98-14) Safety Appliance Securement[41]

The Railroad Safety Appliance Standards, 49 CFR Part 231, require that safety appliances and their brackets be secured by ½-inch bolts with nuts outside (when possible) and riveted over, or with not less than ½-inch rivets. Additionally, in order to comply with the Safety Appliance Regulations, there must be a deformation of the threads to prevent the fastener from becoming insecure. This can be accomplished by one of the following methods:

1. Rivet the fastener;
2. Check the threaded portion of the bolt nearest the fastener with a chisel to ⅛-inch depth at two locations; or
3. Apply weld to the threaded portion of the threads so as to deform them.

Figure 1- A typical two-part mechanical fastener

[41] Sometimes referred to as "fasteners."

Additional approved safety appliance securement fasteners are: one, and two piece rivets, bolts, Huck bolts (See **Figure 1**), and Unilock and Disclock fasteners when properly applied.[42]

Part 231 is explicit in requiring that handholds be securely fastened. By definition, "secure" means free from danger or risk of loss; free from fear or doubt; and not likely to fail or give way.

FRA's longstanding policy concerning the securement of all safety appliances requires that safety appliances or supports for safety appliances must be mechanically fastened. Brackets or supports that are applied to a car structure (other than a tank car tank) solely for the securement of safety appliances are to be mechanically fastened to the car structure.

Many years of railroading experience has shown that welds are not uniform and are subject to failure, despite improvements in welding procedures. Cracks and breaks in welds are difficult to detect during inspections. Therefore, welding is not considered to meet the definition of secure. This is particularly evident at repair facilities, where quality of workmanship is not always assured.

Safety appliances for other than steam locomotives are not addressed in Part 231, with the exception of 231.29, "Road locomotives with corner stairways," and 231.30, "Locomotives used in switching service." This does not mean that non-steam locomotives are not required to have proper safety appliances. It is FRA's position that other than steam locomotives must have proper safety appliances and are covered as cars of special construction.

This requires that locomotives other than steam have as nearly as possible the same complement of safety appliances as contained in the categories governing steam locomotives.

However, FRA has not enforced the deformation of threads of bolts used to secure safety appliances on locomotives. These appliances are usually secured by self-locking nuts and/or lock washers, and, to our knowledge, have not presented a safety problem.

If self-locking nuts are used to secure a safety appliance, they must be properly aligned and torqued against the mating surface of the safety appliance. There should not be any gaps between the safety appliance and car-body element it is secured to by the self-locking nut due to potentially unintentional loosening caused by vibration. The threads must protrude at least two full threads beyond the top of the self-locking nut. It should be noted that excessive protrusion can create a safety risk.

Exception should only be taken when the safety appliances on other than steam locomotives are insecure or presenting a potential safety hazard to railroad employees. Out-of-service form F6180.8 should only be issued if the safety appliance is defective to the extent it creates an immediate unsafe condition.

[42] Nord-Lock is another example of this type of washer system.

(MP&E 98-22) Adjustable Handhold/Ladder Tread

The adjustable handhold/ladder tread is ¾ inch in diameter. Its length may be adjusted as needed, by the application of a ¼ inch roll pin into the desired hole. The remaining portion is to be cut off, leaving a smooth surface.

In 1988 FRA ruled that this adjustable safety appliance meets the specified requirements, if properly applied. However, FRA expressed concern of the possibility of improper application, such as the substitution of the roll pin, improper securement, etc.

If any deficiency is found concerning this safety appliance, such as substitution of the roll pin, improper securement, etc., it should be reported to the District MP&E specialist with all pertinent information, including photographs. The specialist is to promptly advise the MP&E Staff Director.[43]

(MP&E 98-49) Dimensions Applicable to Handles of Uncoupling Levers

In the past, some inspectors have taken exception to the handles of bottom operated uncoupling levers being more than 6 inches from the side of the car.

Section 231.1(k)(2) states in relevant part: (i) Handles of uncoupling levers, except those shown on plate B or of similar designs, shall be not more than 6 inches from sides of car. (ii) Uncoupling levers of design shown on plate B and of similar designs shall conform to the following prescribed limits: (iii) Handles shall be not more than 12, preferably 9, inches from sides of cars. Center lift arms shall be not less than 7 inches long.

The top operated uncoupling lever shown in plate B is similar in design to bottom operated uncoupling levers and is fundamentally the same, as both are operated in the same manner by an upward lift of the uncoupling lever handle to disengage the coupler lock block.

The reference in § 231.1(k)(2)(i) to uncoupling levers of other than plate B design requires that the uncoupling lever handle be not more than 6 inches from side of car. This refers primarily to those uncoupling levers which are operated by a downward motion of the uncoupling lever either by hand or foot. This type of uncoupling lever could be operated from the side ladder while the car was in motion.

Therefore, FRA will not take exception to bottom operated uncoupling levers that are similar in design to that shown in plate B, unless the uncoupling lever handle is more than 12 inches from the side of the car.

Also, for your information, the Association of American Railroads (AAR) Rule 22 for bottom operated uncoupling levers shows the maximum distance of the uncoupling lever handle to be 12 inches from the side of the car.

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[43] Technical Bulletin *Adjustable Handhold/Ladder Tread* (MP&E 98-22) refers to the MP&E Division Chief. After multiple FRA reorganizations, the proper title for the most equivalent position is the MP&E Staff Director and the manual has been updated to reflect that change.

(MP&E 98-51) Definition of Left and Right

The purpose of this bulletin is to provide Railroad Safety Inspectors with the position the Federal Railroad Administration has adopted, as a result of an MP&E Technical Resolution Committee interpretation, for determining and reporting the location of noncomplying and/or defective railroad car components. The definition of "left" and "right" is defined in § 231.19:

> **"Right or Left refers to the side of person when facing end or side of car from ground"**

This bulletin further identifies the "A" and "B" end of the car from which the definition will be applied and provides additional guidance for uniformly identifying various components on a car.

The railroad industry's generally established and accepted practice for determining the location of applicable components on rail cars equipped with four, six, or eight-wheel trucks is as follows:

- The "B" end of a car is determined by the location of the hand brake. The end of the car on which the hand brake is located is the "B" end. The opposite end of the car is known as the "A" end. On cars equipped with hand brakes on both ends, the "A" and "B" end shall be determined as stenciled.
- When facing the "B" end of the car, the car is divided into four sections known as BR, BL, AR, and AL. The order of applicable components on the right side of the car shall be known as R1, R2, R3, etc.… The order of applicable components on the left side of the car shall be known as L1, L2, L3, etc... See **Figure 2**.
- Beginning at the "B" end of the car, brake beams shall be numbered consecutively, see **Figure 3**.

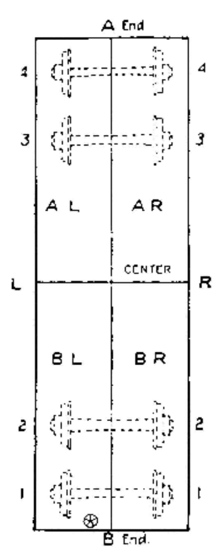

Figure 2 - The definitions of "A" end, "B" end, Left, Right and component order numbers

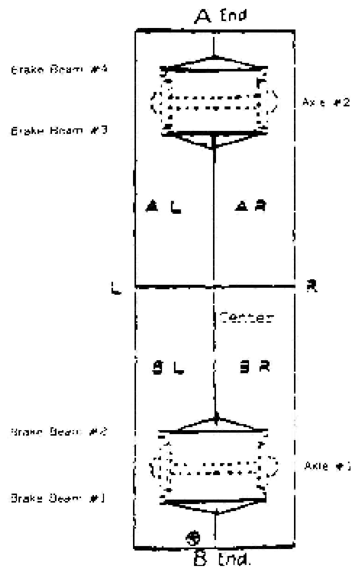

Figure 3 - The definition of break beam numbering order

The railroad industry's generally established and accepted practice for determining the location of applicable components on articulated and multi-level cars is as follows:

- The "B" end of the car is determined by the location of the hand brake. The end of the car on which the hand brake is located and is stenciled "B" end, is the "B" end. The end unit opposite the "B" end, is the "A" end. The unit adjacent to the "B" end will be known as the "C" unit and each additional unit will be stenciled consecutively and alphabetically from the "B" end toward the "A" end, see **Figure 4**. For cars equipped with multiple hand brakes, report the unit location.

- When facing the "B" end of the car, the right side is known as the "R" side and the left side is known as the "L" side. Wheel sets and applicable components will be numbered consecutively from the "B" end to the "A" end, 1 through 9. Applicable components above 9 will be identified alphabetically in reverse order from Z (e.g., Z, Y, X, W, etc.) until the last wheel set on the "A" unit is identified, see **Figure 4**.

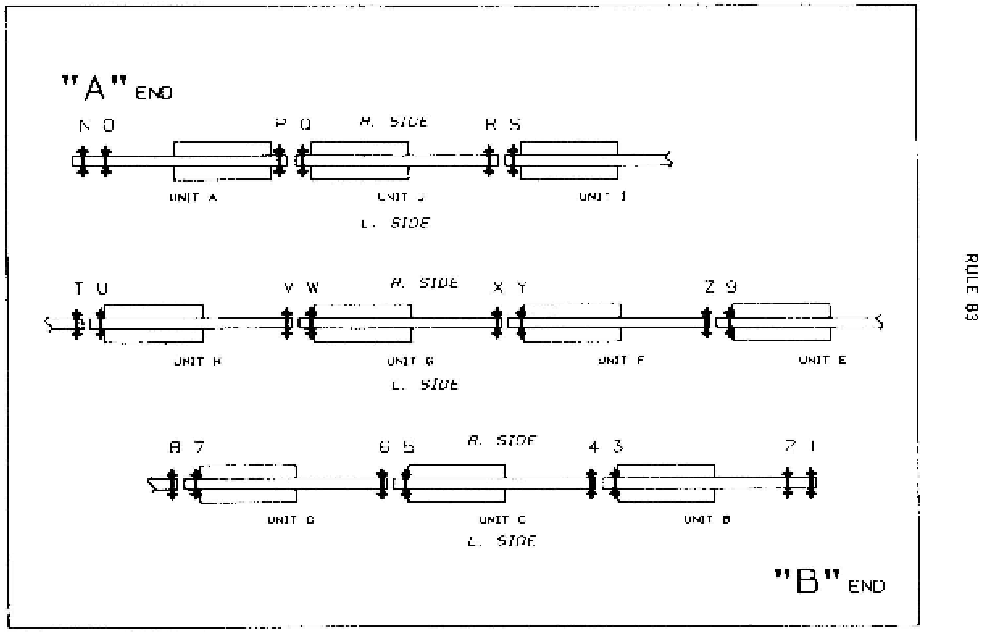

Figure 4 - Definition of the location of applicable components on articulated and multi-level cars

- Facing the "B" end of the car, the articulated connection locations will be lettered beginning with "C" and will continue consecutively and alphabetically from the "B" end toward the "A" end. See **Figure 5**.[44]

- The end truck on the "B" end will be location "B" and the end truck on the "A" end will be location "A." Starting with the first truck inboard from the "B" end, the truck location will be lettered beginning with "C" and will continue consecutively and alphabetically from the "B" end toward the "A" end. See **Figure 5**.[45]

[44] This information is from the Association of American Railroads Intermodal Committee Loading Capabilities Guide.
[45] *Id*.

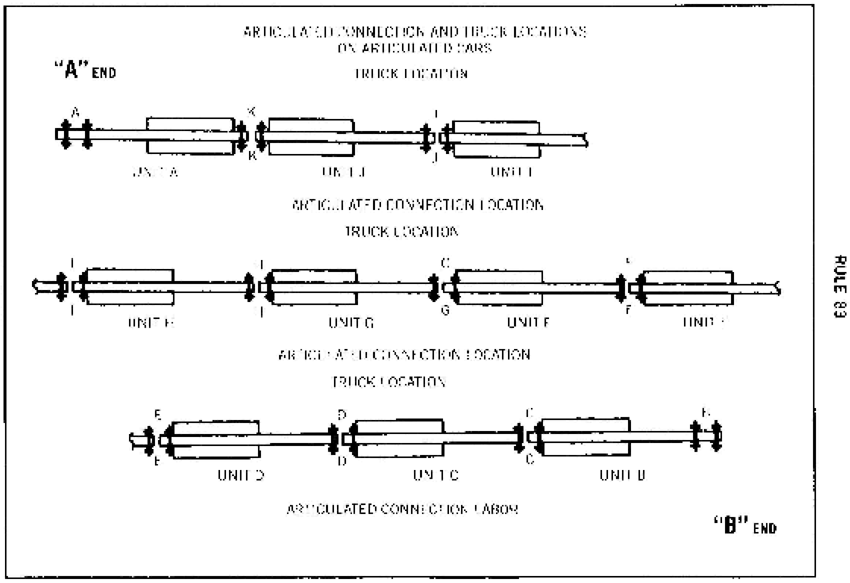

Figure 5 - Definitions of the articulated connection locations and truck locations

- The drawbar connection will be reported as the combination of the locations of the two trucks closest to the drawbar. See **Figure 6**. (i.e., CD, EF, GH, etc.) The end truck on the "B" end will be location "B" and the end truck on the "A" end will be location "A." Starting with the first truck inboard from the "B" end, the truck location will be lettered beginning with "C" and will continue consecutively and alphabetically from the "B" end toward the "A" end. See **Figure 6**.[46]

[46] *Id*.

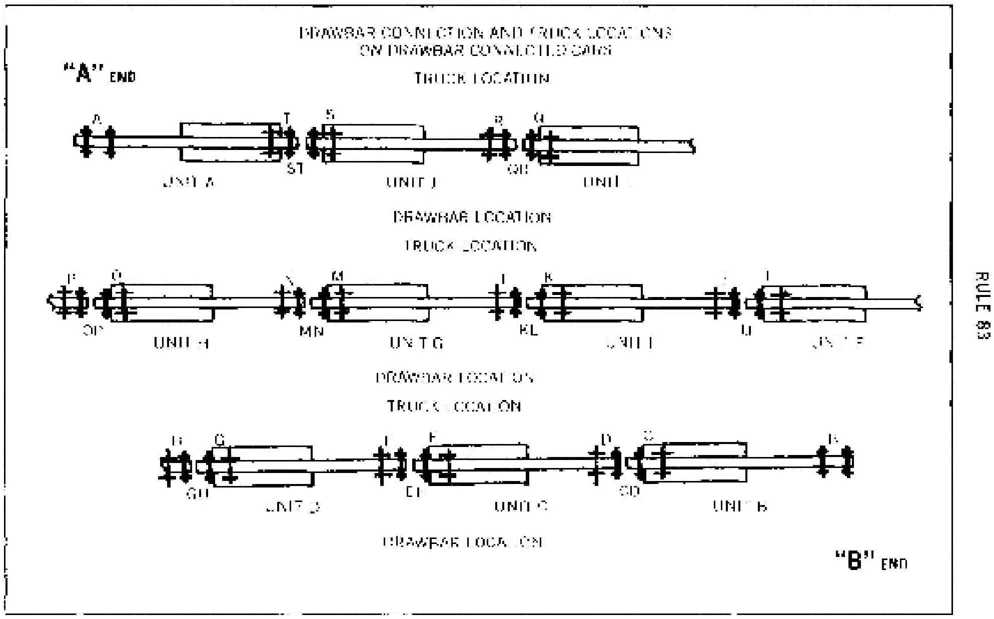

Figure 6 - Definitions of drawbar connection and truck location

The above information should be applied when reporting the location of applicable non-complying components under the provisions of Parts 215, 231, and 232. It can also be applied to passenger cars unless the passenger railroad utilizes some other generally accepted method of identifying the location of passenger car components (e.g., No. 1 end, No. 2 end, etc).

(MP&E 98-18) Aluminum Safety Appliances

In the past, exception has been taken to various cars equipped with aluminum safety appliances; ladder treads, handholds and sill steps.

Our (FRA's) Office of Research and Development has confirmed that the ladder treads, handholds of circular cross-section, 13/16-inch diameter and sill steps, 5/8-inch thick and 2 inches wide, when constructed of 6061-T6 aluminum alloy exceed the current FRA requirements. Therefore, no exception should be taken to this material.

(MP&E 98-53) Hand brake Chains

It has been brought to our attention that freight cars of recent construction are being equipped with hand brake chains that are not in compliance with FRA regulations. Handbrake chains are described in the present Safety Appliance Standard Regulation, Section 231.27(a)(2)(vi), as follows:

> All chains shall be not less than nine-sixteenths (9/16) inch BBB coil chain.

The Association of American Railroads (AAR) Manual of Standards S-404-74, 2.1.9, has the following requirements for handbrake chains:

> Handbrake power chain shall be 9/16 inch BBB coil chain or meet the minimum specification (working load 5,875 lbs., proof test of 11,750 lbs.) of sufficient length so that the distance from center line of lower attaching rivet hole in housing to center line clevis rivet is 21- 9/16 inches.

It has been determined that both the three-eights (3/8) inch alloy chain and the ½-inch steel alloy chain currently being used by new car manufacturers exceed the specifications for the 9/16-inch BBB coil chain.

Therefore, in accordance with 49 CFR 231.27(a), ***exception should <u>not</u> be taken*** to hand brake chains that provide the same degree of safety, or a greater degree of safety, as the 9/16 inch BBB coil chain.

The 9/16 inch BBB coil chain is no longer being used by handbrake manufacturers.

(MP&E 98-26) Handbrakes - Articulated Cars

Handbrake performance requirements as specified in Title 49 CFR Part 231 include the following:

- Must be an efficient design;
- Must operate in harmony with the power brake;
- Must provide equal or greater total force on the brake shoes as the brake cylinder with 50 psi air pressure; and
- One handbrake per car.

The Association of American Railroads (AAR) is more specific in their requirements in that a minimum braking ratio of 11 percent must be achieved at the brake shoes with a specified force output at the hand brake (equivalent to 125 pounds on the rim of the wheel). Further, the handbrake force must act on one-half of the axles including the "B" end truck. If these requirements cannot be met with a single handbrake, a secondhand brake must be applied with appropriate stenciling at each handbrake location.

On some articulated multi-platform cars, it is not feasible to apply the hand brake force to half the axles with one hand brake and a second-hand brake has been applied at the opposite end ("A" end) of car.

FRA takes no exception to this practice, if the following conditions are met:

- Stencils must be placed adjacent to each handbrake advising that the car is equipped with two handbrakes.
- Each handbrake shall be so located that it can be safely operated while car is in motion.
- The handbrake force should comply with AAR standards.

(MP&E 98-35) Multi-Unit Articulated Flat Cars - Crossover Platforms

Trailer Train Company's (TTAX) 5 unit All Purpose Spine Cars are equipped with handbrakes which face outward at each end of the 5 unit consist. The handbrake arrangement is designed so that it can be operated while standing on the sill step or from the ground.

When a 48-foot container is placed on the "A" end unit, the end "crossover" platform is partially covered by the container and has only 10 inches exposed. The "crossover" platforms on these TTAX cars and/or platform extensions on other multi-unit articulated flat cars are not a requirement of the current safety appliance standards. Additionally, they are not used for the proper operation of the handbrakes.

Therefore, FRA will not take exception to these TTAX 5 unit All Purpose Spine Cars when loaded on the A and B units with 48-foot containers that partially cover the end "crossover" platforms.

However, FRA requires that safety appliances or supports for safety appliances be mechanically fastened. Brackets that are applied to a car structure other than a tank car, solely for the securement of safety appliances are to be mechanically fastened to the car structure.

(MP&E 98-05) Standard Level and Low-Level Auto Rack Cars - Safety Appliance Arrangements

Since the origination of the radial door and its application to autorack cars, many clearance problems have developed. Because of the nature of these problems, the **vertical** relationship of the side ladders and sill steps has been altered in such a manner that there are variations of misalignment from 5 to 13 inches. FRA feels that this has created a potential safety hazard and that FRA needs to establish guidelines to implement improvement in this area.

FRA and the Car Manufacturers determined that the following dimensions be adopted:

Standard Level Cars	Relationship of Sill Step to Side Ladder
All cars	2-3/16 inch maximum
Low Level Cars	
Built 1978 and prior	5-inch maximum
Built after 1978	4-inch maximum

Flat Cars

(MP&E 98-16) DODX 4000 Series Flat Cars

In the past, inspectors have questioned whether DODX 4000 series flat cars are in compliance with Title 49 CFR Section 231.6(a)(3)(i), which requires that "Each handbrake shall be so located that it can be safely operated while car is in motion."

These cars are designed to have a 2½ by 8-inch slot in the car floor near each corner. These slots are considered by FRA as "grab holes," so that the handbrake can be safely operated using this "grab hole" when the car is in motion.

These cars were built primarily to haul M-1 tanks, which are 12 feet wide. The car floor is only 10 feet - 8 inches wide. The handbrake is located so that the tanks can be loaded or unloaded.

Also, it has been reported that these cars have a missing bottom rod safety support.

These cars are equipped with Buckeye 6-wheel trucks with truck mounted brakes. Because of the truck mounted brakes, bottom rods requiring safety supports are found only on the handbrake truck. There are two bottom rods. One is equipped with two safety supports, while the other has only one. The truck, as designed, lacks a bracket or other location to which an effective fourth safety support can be attached. The brake rod in question measures 35 inches between pivot points. The loss of a connecting pin at the unsupported end of the rod would cause the rod to drop ½ inch over a distance of 7 inches before it encountered the existing safety support. The minimum clearance above the rail would still be more than 2½ inches.

Inspectors should take no exception to cars so equipped.

Newly built flat cars with full decks that opt to utilize deck slots must follow AAR S-2044 Appendix D1, *"Safety Appliances for Flatcars with Full Decks,"* Section 6.0 for deck slot dimensions and requirements.

(MP&E 98-69) Safety Appliance Arrangements on Flat Cars

Title 49 CFR 231.6 specifies the minimum requirements for safety appliance on flat cars. However, over the years, other arrangements have been agreed upon without being incorporated into the standards. Therefore, new and reassigned employees, as well as new car builders, may not be aware of such agreements.

One revised arrangement of horizontal side handholds occurred when the Trailer Train Company decided to eliminate the vertical handhold on long bridge plates. This side handhold arrangement follows:

Side Handholds

(1) Dimensions:
Same as specified for flat cars, except length not less than eighteen (18) inches, and diameter not less than one (1) inch when legs are extra long.

(2) Manner of Application:
Same as specified for “Box and Other House Cars.”

(3) Location:
One (1) over each sill step on top of rub rail projecting upward, not less than twenty-seven (27) nor more than thirty-four (34) inches above tread of sill step. Clearance at outer end should not be more than eight (8) inches from end of car.

All other safety appliances on piggy-back cars should conform to those specified for flat cars. Also, additional handholds provided to facilitate use of handbrakes, including handholds on stub bridge plates, should be retained.

Any flat car that has a low mounted side handbrake, should be equipped with a second handhold at the hand brake corner fifteen (15) to sixteen (16) inches above the handhold described previously. The tread of the sill step at this location should be widened to not less than four (4) inches and be provided with an anti-skid surface. When possible the length of such sill step should be increased to not less than fourteen (14) inches.

The additional handholds and wider sill step to facilitate the use of the low mounted side hand brake were agreed upon because of the requirement in § 231.6(a)(3)(i), “Each hand brake shall be so located that it can be safely operated while car is in motion.”

The Motive Power and Equipment Inspector should become familiar with these arrangements.

(MP&E 00-07) Safety Appliance Arrangements on Flat Cars with Low-Mounted Side Hand Brakes

Section 231.6 specifies the minimum requirements for safety appliances on flat cars. However, over the years, other alternative safety appliance arrangements have been used by the industry and permitted by FRA in order to accommodate the unique designs of various flat cars. This is particularly true with regard to flat cars equipped with low-mounted side hand brakes. FRA previously issued guidance related to these types of flat cars in Technical Bulletin (TB) **MP&E 98-69**. This bulletin is intended to supplement that previously provided guidance.

Section 231.6(a)(3)(i) requires that “Each hand brake shall be so located that it can be safely operated while car is in motion.” FRA has consistently viewed compliance with this provision as dependent on whether safe operation is possible given the intended location of the hand brake in relation to other safety appliances necessary for its safe operation. As a result, merely providing the handholds explicitly required by § 231.6, does not guarantee that a hand brake can be safely operated. For example, flat cars with low-mounted side hand brakes may need to be equipped with additional safety appliances, over and above those specifically required in § 231.6, in order for the hand brake to be safely operated while the car is in motion.

TB **MP&E 98-69**, incorporating guidance contained in previous FRA technical bulletins dating back to the mid-1970s, contained guidance regarding one safety appliance arrangement that was acceptable to FRA on flat cars equipped with low-mounted side hand brakes to ensure compliance with the requirement contained in § 231.6(a)(3)(i). In that TB, FRA made clear that it would not take exception to such flat cars if: (i) they were equipped with a second handhold at the hand brake corner 15 to16 inches above the handhold located over each sill step; (ii) the tread of the sill step at that location was widened to not less than four (4) inches and was provided with an anti-skid surface; and (iii) when possible, the length of such sill step was increased to not less than 14 inches. Such guidance, while not imposing new requirements, provides the industry with certainty about how to comply with the existing requirement at § 231.6(a)(3)(i).

Recently, FRA has discovered that the safety appliance arrangements on numerous flat cars with low-mounted side hand brakes are being modified to eliminate the second handhold described above. This handhold is being removed due to the constant damage being sustained by the appliance during the loading and unloading of the flat cars. In order to prevent the continuous damage to these necessary appliances and to ensure the safety of employees while applying the hand brake on these flat cars, FRA believes that additional guidance is needed to provide an alternative to the safety appliance arrangement described in TB **MP&E 98-69**.

Consequently, in addition to the safety appliance arrangement described above, FRA will not take exception to the safety appliance arrangement on any flat car equipped with a low-mounted side hand brake if: (i) the flat car is equipped with a second handhold at the hand brake corner mounted on the end sill not more than 12 inches from the end of the car so as to align with the outer edge of the sill step and not less than 2 inches, nor more than 6 inches, from the side of the car; (ii) the handhold is a minimum of 18 inches in width and not less than 15 inches, nor more than 21 inches, in height; (iii) the tread of the sill step at this location is widened to not less than 4 inches and is provided with an anti-skid surface; and (iv) when possible, the length of such sill step is increased to not less than 14 inches.

As noted above, the guidance contained in TB **MP&E 98-69** remains in effect, and the present guidance merely provides an additional safety appliance arrangement to which FRA will not take exception. Although this TB recognizes two safety appliance arrangements that are acceptable to FRA for meeting the requirement contained in § 231.6(a)(3)(i), with regard to flat cars with low-mounted side hand brakes, there may be other safety appliance arrangements that would also ensure compliance with this requirement on such flat cars. However, merely removing a handhold that followed the guidance of TB **MP&E 98-69** will likely result in a car that does not comply with § 231.6(a)(3)(i).

<u>Covered Hopper Cars</u>

(**MP&E 98-23**) **Covered Hopper Cars Running Board Extensions**

There have been several inquiries concerning running board extensions.

FRA's position is that a running board end extension is not required if the end of the longitudinal running board is at least 6 inches from the vertical plane and the longitudinal running board extends at least the entire length of the roof. In other words, if the longitudinal roof running board does not extend at least the entire length of the roof, a running board extension is required.

Roof Hatch/Walkway Blockage

FRA does not find open hatch covers on top of cars to be a significant safety issue due to prohibitions on individuals on the top of cars and the ease with which the obstruction can be rectified. If an inspector finds a significant number of instances of open hatch covers, the inspector should contact the MP&E Specialist and/or Staff Director, prior to issuing any violations.

Cars of Special Construction

(MP&E 98-17) Applicable Safety Appliance Regulation Governing Bulkhead Flat Cars

…

Although the Safety Appliance Standards do not specifically address bulkhead flatcars, these cars would be considered a car of special construction. Section 231.18 states that cars-of special construction must have as nearly as possible, the same complement of handholds, sill steps, ladders, handbrakes, and running boards that are required for cars of the nearest approximate type.

FRA is of the opinion that this car, with fixed ends above the floor, most closely resembles cars described in § 231.27, "Box and other house cars without roof hatches or placed in service after October 1, 1966."[47]

Therefore, bulkhead flat cars built or placed in service after October 1, 1966 should comply as nearly as possible with all sections of this part.

Newly built bulkhead flat cars shall follow AAR S-2044 Appendix C1, *"Safety Appliances for Bulkhead Flatcars with High Bulkheads."*

(MP&E 98-19) Safety Appliance Arrangement on "Differential" 100-Ton Covered Hopper Cars Built by the Thrall Car Manufacturing Company.

On "pressure differential" 100-Ton Covered Hopper Cars, built by the Thrall Car Manufacturing Company, the end platform and end platform handholds are less than 60 inches long because of structural considerations.

Structural justification for the design is to place supports on the flat end sheet, at locations that will prevent over stressing the sheet when the car is pressurized.

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[47] Section heading revised from Technical Bulletin MP&E 98-17, which referred to "House and other box cars without hatch covers built or put in service after October 1, 1966."

A letter was sent to the Thrall Car Manufacturing Company, General Electric, and Rail Car Services with the following information:

> Concerning the safety appliance arrangement on "Differential" 100-ton covered hopper cars. Specifically, the end platforms and horizontal end platform handholds having a length of less than 60 inches.
>
> Please be advised that due to the structural design of these cars (curved-sided), the Federal Railroad Administration (FRA) will not take exception to the end platforms and horizontal end platform handholds having a length of less than 60 inches. FRA will consider these cars to be of special construction and conform to those requirements, as specified in Title 49, CFR, Section 231.18.

Coil Steel Cars

Because Coil Steel Cars do not conform to any of the car types specifically identified in Part 231, it is inferred they are **cars of special construction,** pursuant to 49 CFR § 231.18, which states:

> *Cars of construction not covered specifically in the foregoing sections in this part, relative to handholds, sill steps, ladders, hand brakes and running boards may be considered as of special construction, but shall have, as nearly as possible, the same complement of handholds, sill steps, ladders, hand brakes, and running boards as are required for cars of the nearest approximate type.*

Historically, the determination of what type of car specifically identified in Part 231 is the "nearest approximate type" to a Coil Steel Car has differed depending on the manufacturer, railroad, and/or FRA personnel involved in making the decision. For the most part, the differing views are the result of the reality that all Coil Steel Cars are not designed or manufactured in an identical fashion. Thus, although this type of car is universally referred to as a "Coil Steel Car," the cars have unique designs and are constructed differently depending on the manufacturer of the car and/or the date on which the car was built. These variations in the design and construction of Coil Steel Cars have resulted in a number of different explanations relating to what constitutes the car of "nearest approximate type" under 49 CFR § 231.18.

To date, FRA has generally determined that the nearest approximate type of car, specifically identified in Part 231, to a Coil Steel Car is either a flat car or a low-sided gondola car. *See* 49 CFR §§ 231.5 and 231.6. FRA considers either of these applications to be appropriate and acceptable. Thus, if a Coil Steel Car conforms to the requirements related to either of the above-noted car types, then no exception should be taken. When inspecting Coil Steel Cars, FRA inspectors must base their determination of what constitutes the "nearest approximate type" of car under Part 231 on previous FRA sample car inspections, if one was performed, and upon the historical application of the regulations to that particular car.

Furthermore, historically, FRA has not taken exception to covers on Coil Steel Cars as to the location and fastening of handholds, railings, or covers that are mixed on a different car than the original design except if a cover handhold or railing does not have proper clearance, is broken, or is included as part of the hand brake arrangement to support the operation of a hand brake while the car is in motion.

In situations where an FRA inspector cannot determine the "nearest approximate type" of car, the following procedures shall be applied:

- The inspector should request from the operating railroad the letter issued by FRA, relating to the sample car inspection performed on that series of cars, indicating the sample car inspection "car type" as determined by FRA headquarters. If the car conforms to the requirements related to "car type" indicated by the sample car inspection, then no exception should be taken.

- If the operating railroad cannot produce the above-described document or a sample car inspection was not performed, the "nearest approximate type" of car will be determined by the FRA inspector and the inspector will document all noncomplying conditions on FRA Form F6180.4a to include photos.

- FRA's inspector should also request an UMLER or AAR report that indicates the "car type" as determined by the industry from the operating railroad.

- The above-noted information should be sent to the district MP&E Specialist, who will then submit all of the above information to headquarters with a request for assistance.

  Newly built coil cars shall follow AAR S-2044 Appendix G1, *"Safety Appliances for Cars with Recessed Car Body Ends."*

<u>Tank Car Applications and Guidance</u>

(**MP&E 98-31**) **Safety Chains on Tank Cars**

Operating platforms on tank cars without underframes are addressed in 49 CFR 231.21(j)(3), which states:

> (3) *Location*. (i) Operating platform to be of sufficient length to provide access to all operating fittings. Ladder to be located on sides of car at center.
>
> (ii) The safety railing shall enclose the operating platform, manway and fittings used in the loading and unloading of the tank. Railing shall be open only at the ladders where it shall extend in a vertical direction down, and be securely attached to the platform. Maximum width of opening, twenty-four inches.

Additionally, there are tank cars constructed with top operating platforms which have end ladders at each end of the tank car, rather than side ladders, in accordance with Section 231.18, Cars of special construction.

Therefore, openings in the operating platform allowing access to the ladders <u>do not</u> require safety railing (safety chain) enclosure. All other openings of the operating platform require enclosure. See **Figures 7 and 8**.

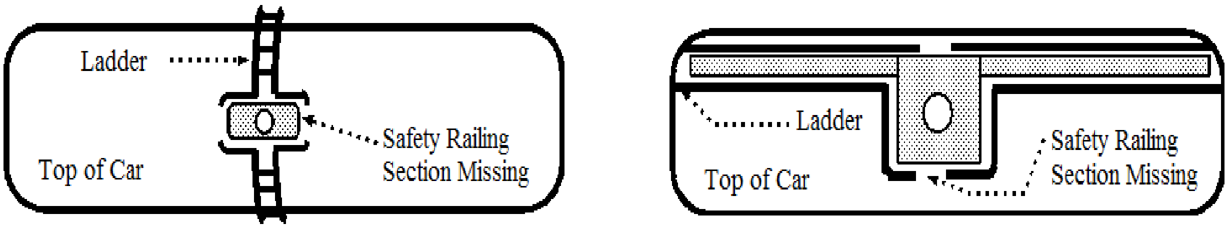

Figure 7 - Noncompliance conditions for tank car operating platform

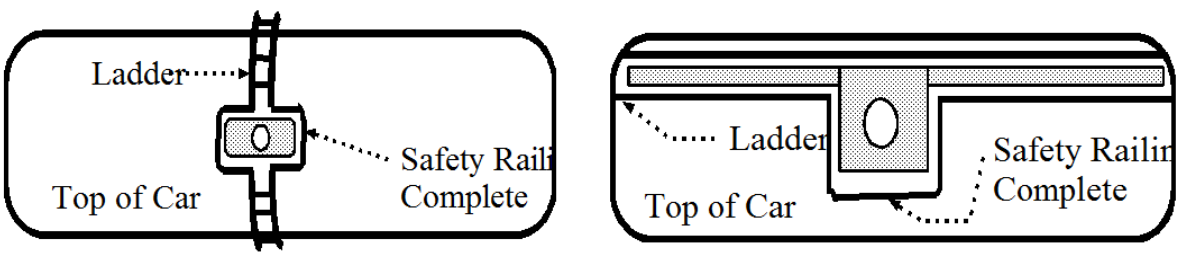

Figure 8 - Compliant railing on tank car operating platform

(MP&E 00-06) Manufacture and Repair of Operating Platforms and Operating Platform Safety Railings on Tank Cars Without Underframes

Section 231.21(j) of title 49, Code of Federal Regulations specifies the minimum requirements for operating platforms on tank cars without underframes. However, many variations in the manufacture and repair of these platforms and the platform safety railings have been in use for a number of years, causing confusion among FRA inspectors and manufacturers as to which methods comply with Federal regulations.

In order to establish consistency within the industry, FRA hosted a committee comprised of representatives from FRA, the Association of American Railroads, Railway Progress Institute, and several major tank car manufacturers. Based on the information provided at the committee meetings and FRA’s prior enforcement of the requirements pertaining to operating platforms on these tank cars, this technical bulletin and its attachments provide guidance regarding the various methods of manufacture and repair of operating platforms and operating platform safety railings on these tank cars that are acceptable to FRA.

Section 231.21(j) requires the operating platforms and related safety railings on tank cars without underframes to be "securely attached" or "securely fastened." FRA has a longstanding interpretation of these phrases which requires that the safety appliances be mechanically fastened. See MP&E Technical Bulletin 98-14. However, FRA believes it is necessary and consistent with both safety and FRA's previous enforcement of Part 231 to exercise its enforcement discretion and continue to allow the weldment of certain portions of the safety appliances on these operating platforms. Tank cars have been manufactured for numerous years with operating platforms that have handrails welded to stanchions and stanchions welded to car body brackets. Tank cars built in this manner have operated for decades without creating any known safety hazard. Thus, FRA will not take exception to existing equipment with these types of safety appliance arrangements, but will require mechanical attachment of such appliances on all tank cars with operating platforms built after January 1, 2000, and when repairs are required on equipment built prior to that date. See Exhibit G, Figures 17 and 18.

Similarly, FRA has allowed safety railings on operating platforms to be repaired using weldment under certain controlled conditions. Thus, the guidance contained in this bulletin merely acknowledges repair and fabrication requirements for safety railings on operating platforms that are consistent with existing practices to which FRA has not taken exception in the past. FRA believes that the fabrication and repair requirements related to handrails, contained in Exhibits A and F, Figures 13 through 16, do not result in a reduction of the structural integrity of the railings. Furthermore, although weldment is permitted at intermediate points in the railing, the railing is mechanically fastened at the end locations where it is attached to the operating platform or stanchion.

FRA will exercise its enforcement discretion and not take exception to the factory weldment of safety appliance brackets at intermediate locations on the grating of operating platforms. See Exhibits A and D, Figures 7 through 9. There are several reasons for this exercise of discretion. The gratings used on operating platforms have been manufactured for years with these intermediate brackets being directly welded to the gratings, and FRA is not aware of any safety hazards arising from this design. Furthermore, due to the high quality of factory welds, a mechanical fastener would add little or no structural strength to the attachment. In addition, this type of weldment will be permitted only on intermediate brackets, where less stress is being placed on the attachment. All platform attachments at end supports will be required to be mechanically fastened. See Exhibits A and C, Figures 6 and 6A. Moreover, the only field repair that will be permitted on intermediate brackets will be replacement of the grating assembly with a factory-made assembly or application of mechanical fasteners. See Exhibits A and D, Figures 7 through 9.

The guidance contained in this bulletin applies only to operating platforms on tank cars without underframes and is not intended to apply to safety appliances at any other location on a car. See Exhibits A through I.

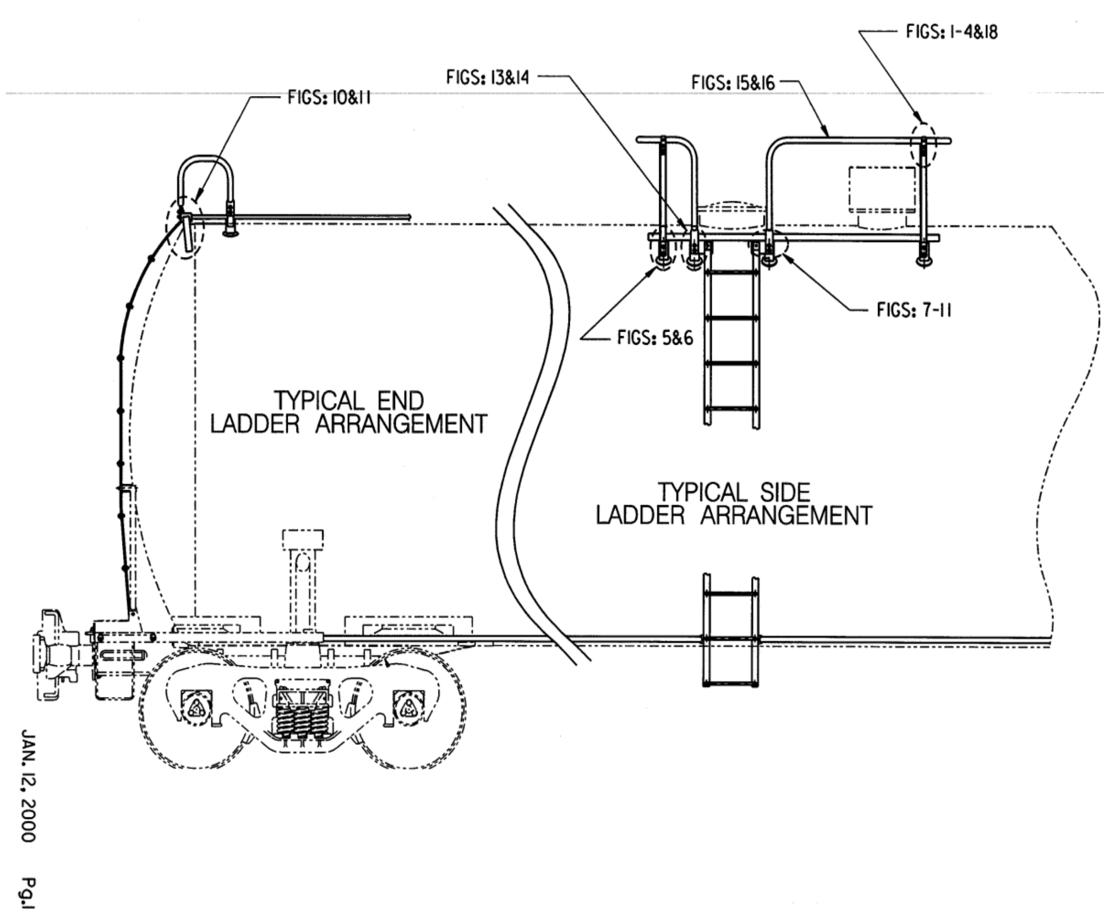
FIGS: 1-4&18
FIGS: 13&14
FIGS: 15&16
FIGS: 10&11
FIGS: 7-11
FIGS: 5&6
TYPICAL END
LADDER ARRANGEMENT
TYPICAL SIDE
LADDER ARRANGEMENT
JAN. 12, 2000 Pg.1

Exhibit A

STANCHION TO RAILING ATTACHMENT OPTIONS

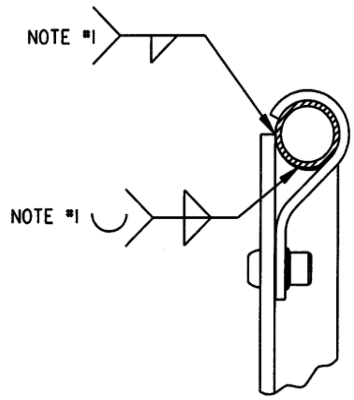

Fig. 1
Fastened Single Clip

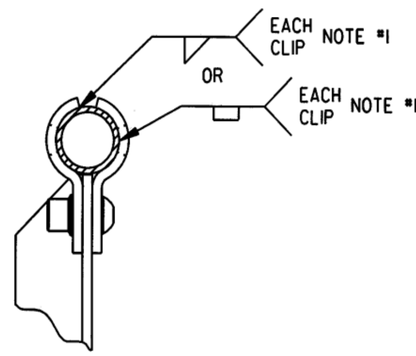

Fig. 2
Fastened Double Clip

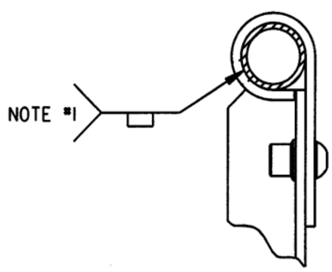

Fig. 3
Fastened Wrap-around Clip

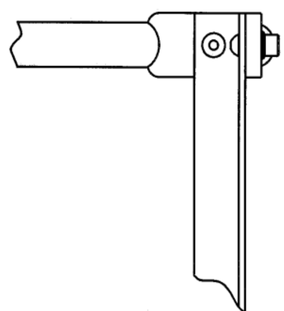

Fig. 4
Fastened

NOTE *1: Welding in addition to Mechanical Fasteners is acceptable at the option of industry. Additional fasteners are acceptable.

JAN. 12, 2000 Pg.2

Exhibit B

TYPICAL GRATING ASSEMBLY, WELDING

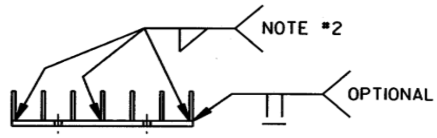

Fig. 5

TYPICAL PLATFORM ATTACHMENT AT END SUPPORTS

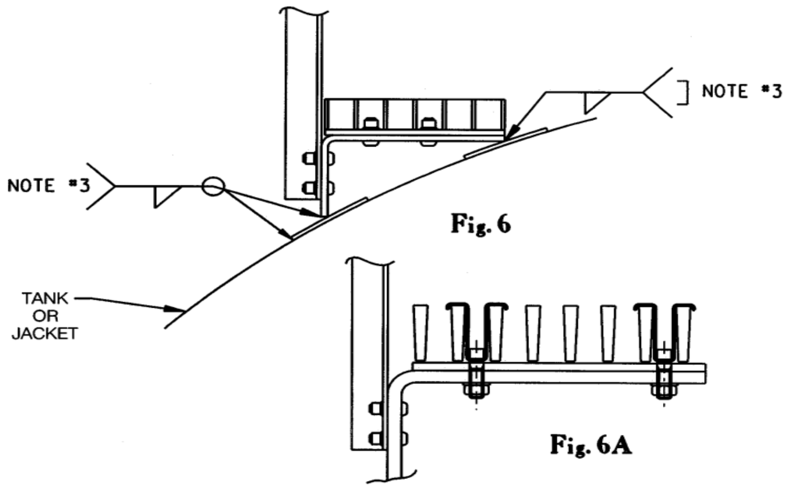

Fig. 6

Fig. 6A

NOTE *2: Factory Welds or Mechanical Fasteners are acceptable securement at these locations. Field repairs require Mechanical Fasteners or Factory Made Assemblies.

NOTE *3: Field welding acceptable at these locations.

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Exhibit C

ATTACHMENT TO GRATING AT INTERMEDIATE LOCATIONS

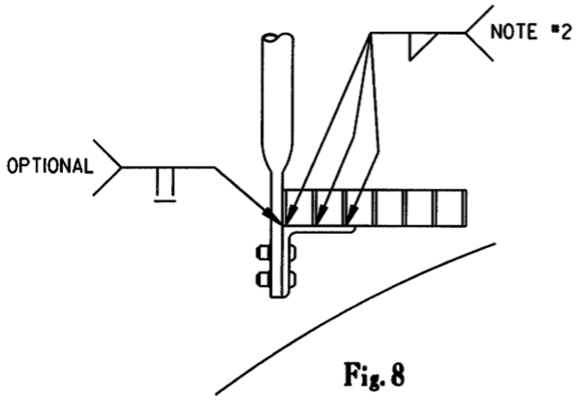

Fig. 8

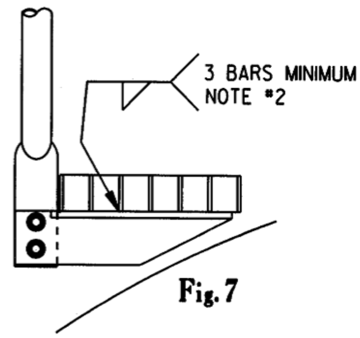

Fig. 7

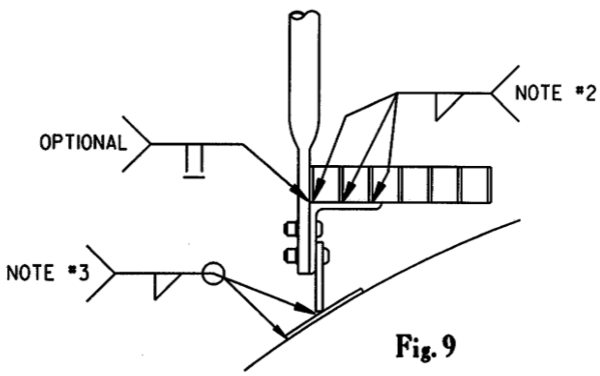

Fig. 9

NOTE #2: Factory Welds or Mechanical Fasteners are acceptable securement at these locations. Field repairs require Mechanical Fasteners or Factory Assemblies.

NOTE #3: Field welding acceptable at these locations.

Jan. 12, 2000 Pg. 4

Exhibit D

TYPICAL LADDER TO GRATING ATTACHMENT

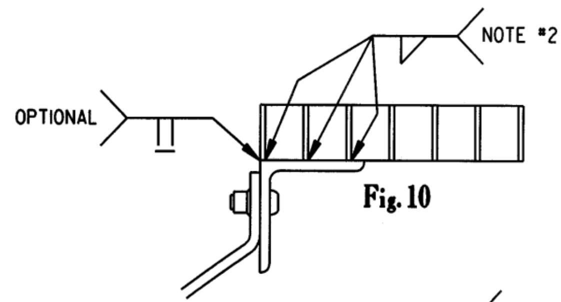

Fig. 10

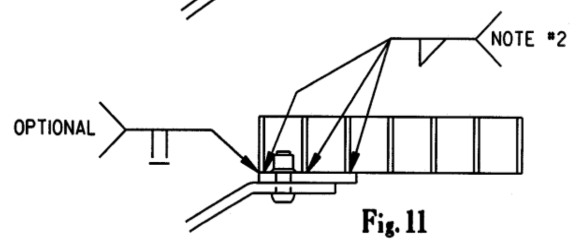

Fig. 11

Fig. 12

NOTE *2: Factory Welds or Meshanical Fasteners are acceptable securements at these locations.
Field repairs require Mechanical Fasteners or Factory Made Assemblies.

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Exhibit E

FABRICATION AND REPAIR OF PIPE RAILING

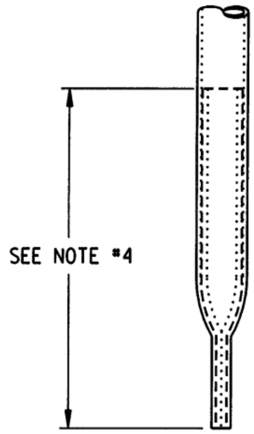


Fig. 13
Typical
Reinforcement Insert
where Flattened

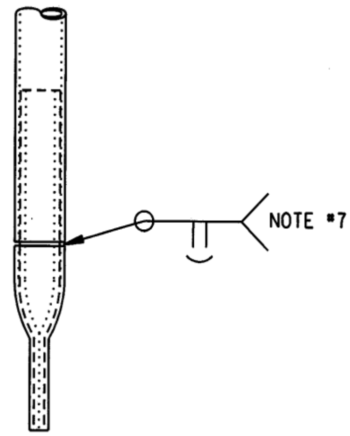


Fig. 14
Typical Repair
See Note 5

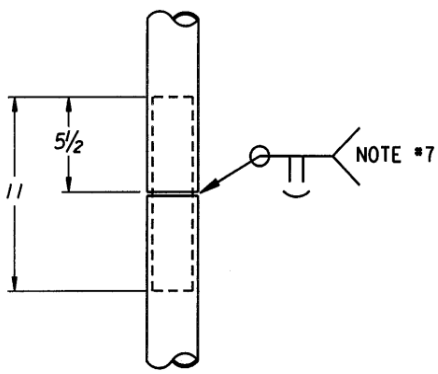


Fig. 15
See Note 6

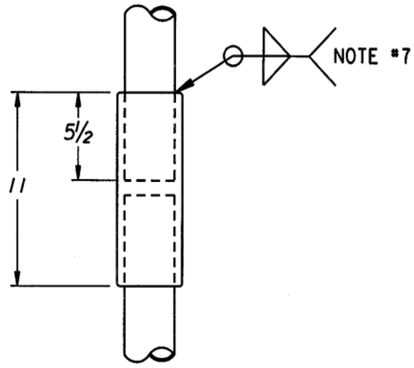


Fig. 16

NOTE *4: When safety railing is 1 1/4 inch pipe and involves flattening, pipe must be reinforced with a steel pipe insert at least 11 inches long or twice the length of the flattened portion, whichever is greater.

NOTE *5: Repair in accordance with AAR Interchange Rule 81 Figure 81, 1999 revision, attached.

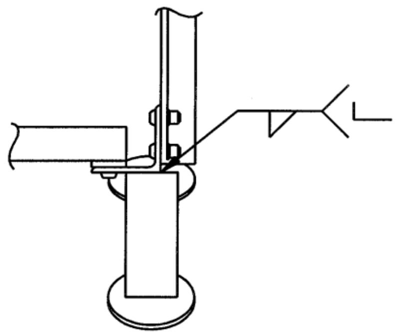
NOTE *6: In Accordance with 6/28/96 FRA Letter to UTC and sketch x-6994.

NOTE *7: Break sharp edges

Jan. 12, 2000 Pg. 6

Exhibit F

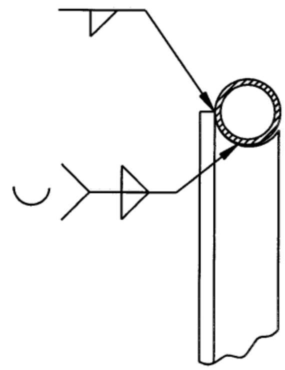
*ATTACHMENTS APPROVED ONLY FOR
EXISTING CARS BUILT PRIOR TO JAN. 01, 2000



Stanchion to Bracket Attachment*

Fig. 17

See Note 8



Railing to Stanchion Attachment
All Welded*

Fig. 18

See Note 9

NOTE #8: Field repairs require mechanical attachment similar to Figure 6.

NOTE #9: Field repairs require mechanical fasteners similar to Figures 1 thru 3.

JAN. 12, 2000 Pg. 7

Exhibit G

RULE 81 – TANK AND TANK CAR REPAIRS

A. Cause For Repairs

1. As required

B. Correct Repairs

1. End platform safety railing may be renewed in kind or substituted for each other when used as specified providing steel pipe and solid steel are not intermixed.
   a. 1¼ inch schedule 40 steel pipe.
   b. ⅞ inch diameter solid steel.
2. When safety railing is 1¼ inch pipe and involves flattening, pipe must be reinforced with a steel pipe insert at least 11 inches long or twice the length of the flattened portion, whichever is greater (see Figure A).
3. Tank cars with tanks requiring welded repair, removal of deformations, alteration, conversion or qualification must be processed in a facility that has a current AAR M-1003 Certification per AAR Specification for Quality Assurance, Section J.

C. Recondition Requirements

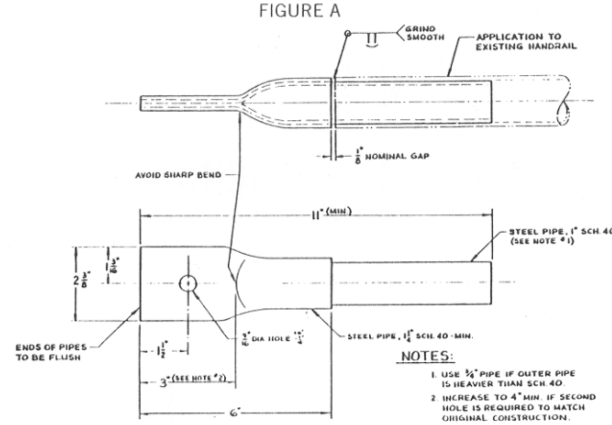
1. As required

D. Welding Requirements

1. Welding is not permitted to tanks of tank cars unless;
   a. Facility (or an extension thereof) performing welding is certified to M-1002 and M-1003 by the AAR for welded repairs to tanks of welded construction.
   b. All applicable requirements of the current Hazardous Materials Regulations of the Department of Transportation and Appendix R of AAR Specifications for Tank Cars have been complied with.
2. On tank cars without continuous center sills (stub sill design) welding of cracks in parent metal of the stub sill structural members, or in sill-to-pad welds, is not permitted if any portion of the cracks are within 12 inches of the attachment of the stub sill or in the tank reinforcing pad, except welding which is performed by welders qualified in accord with the latest revision of AAR's Specifications for Tank Cars, and by a M-1002/M-1003 certified facility.
3. Welding is not permitted to the following:
   a. Tank car end platform safety railings, side railings, or operating platform safety railings, all other handrails/guardrails, except as shown in Figure A, or as provided for in the original approved design.

RULE 81

FIGURE A

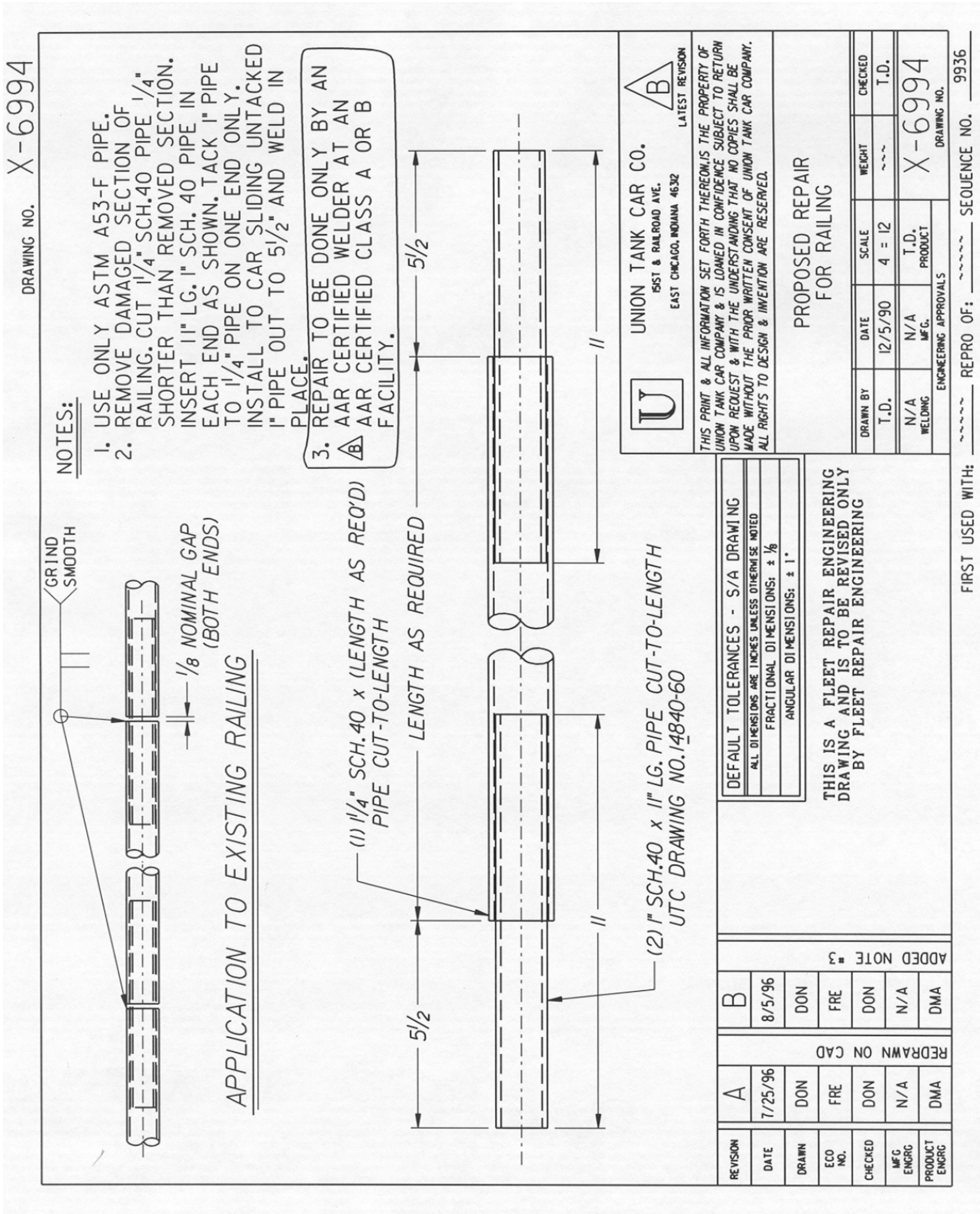


4. Welding is permitted to handrail supports if provided for in the original approved design.

E. General Information

1. For items of repair to tank cars that are common to all cars, see the specific Rule that governs.
2. Painting tanks of tank cars, including underframe and parts, will be reported as outlined in Rule 80.
3. For actual time in repairing and testing tank of tank car, see Rule 75.
4. Cleaning tanks of tank cars, in connection with repairs to tank proper, shall be on actual time basis, per Job Code 4450 of Rule 75.
5. Repairs to tank car head shields and their attachments (excluding hand brake and safety appliance attachments) must be performed only at the direction of the car owner and by an AAR certified shop as shown in Appendix B of Specifications of Tank Cars.
6. Pipe union must not be used in making repairs to handrails of tank cars.
7. Additional charge may be made for accessories such as pipe clamps which require R&R or R in order to make repairs.
8. The application of fabricated tank car handrails/dome safety platform handrails as provided for in the original approved construction shall be reported on a securement basis per Rule 74.

Exhibit H:


DRAWING NO. X-6994
NOTES:
1. USE ONLY ASTM A53-F PIPE.
2. REMOVE DAMAGED SECTION OF RAILING. CUT 1 1/4" SCH.40 PIPE 1/4" SHORTER THAN REMOVED SECTION. INSERT 11" LG. 1" SCH. 40 PIPE IN EACH END AS SHOWN. TACK 1" PIPE TO 1 1/4" PIPE ON ONE END ONLY. INSTALL TO CAR SLIDING UNTACKED 1" PIPE OUT TO 5 1/2" AND WELD IN PLACE.
3. REPAIR TO BE DONE ONLY BY AN AAR CERTIFIED WELDER AT AN AAR CERTIFIED CLASS A OR B FACILITY.
GRIND SMOOTH
1/8 NOMINAL GAP (BOTH ENDS)
APPLICATION TO EXISTING RAILING
(1) 1 1/4" SCH.40 x (LENGTH AS REQ'D) PIPE CUT-TO-LENGTH
LENGTH AS REQUIRED
5 1/2
11
(2) 1" SCH.40 x 11" LG. PIPE CUT-TO-LENGTH UTC DRAWING NO.14840-60
DEFAULT TOLERANCES - S/A DRAWING
ALL DIMENSIONS ARE INCHES UNLESS OTHERWISE NOTED
FRACTIONAL DIMENSIONS: ± 1/8
ANGULAR DIMENSIONS: ± 1°
THIS IS A FLEET REPAIR ENGINEERING DRAWING AND IS TO BE REVISED ONLY BY FLEET REPAIR ENGINEERING
UNION TANK CAR CO.
151ST & RAILROAD AVE.
EAST CHICAGO, INDIANA 46312
LATEST REVISION B
THIS PRINT & ALL INFORMATION SET FORTH THEREON IS THE PROPERTY OF UNION TANK CAR COMPANY & IS LOANED IN CONFIDENCE SUBJECT TO RETURN UPON REQUEST & WITH THE UNDERSTANDING THAT NO COPIES SHALL BE MADE WITHOUT THE PRIOR WRITTEN CONSENT OF UNION TANK CAR COMPANY. ALL RIGHTS TO DESIGN & INVENTION ARE RESERVED.
PROPOSED REPAIR FOR RAILING
DRAWN BY T.D.
DATE 12/5/90
SCALE 4 = 12
WEIGHT ~~~
CHECKED T.D.
N/A WELDING
N/A MFG.
T.D. PRODUCT
ENGINEERING APPROVALS
X-6994 DRAWING NO.
FIRST USED WITH: ~~~~~
REPRO OF: ~~~~~
SEQUENCE NO. 9936
REVISION A B
DATE 7/25/96 8/5/96
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MFG ENGRG N/A N/A
PRODUCT ENGRG DMA DMA
REDRAWN ON CAD
ADDED NOTE #3

Exhibit I

Chapter 11 – Brake System Safety Standards for Freight & Other Non-Passenger Trains & Equipment; End-of-Train Devices, Part 232

The following information has been developed to aid Federal and State Inspector(s) conducting inspections for compliance with Part 232. To help ensure uniform enforcement of the Federal railroad safety laws, it is important that FRA inspectors adhere to internal agency enforcement policies when conducting inspections. Reports documenting Part 232 inspections are made on the Motive Power and Equipment (MP&E) Inspection Report **F6180.96**. Violations are to be submitted on the MP&E Violation Report – **FRA F6180.109**.

Like locomotives and safety appliances that are not power brakes, the applicable statutes authorize FRA to enforce the power brake requirements whenever such equipment is in use.[48] However, FRA recognizes that different factors apply when determining whether each type of equipment is considered "in use." For instance, when it issued the 2001 power brake rule, FRA stated that "that any train, railroad car, or locomotive covered by this part [232] will be considered 'in use' prior to departure but after it receives or should have received the necessary tests and inspections required for movement."[49] Generally, any train, railroad car, or locomotive covered by this part will be considered "in use" after it receives or should have received the necessary tests and inspections, even if completed prior to movement or departure. In other words, FRA is not required to wait for a vehicle with a non-compliant power brakes to depart or engage in an actual "haul" in order to enforce the power brake regulations.

While en route, a railroad may be immune to a civil penalty assessed under part 232 if it is moving the brake equipment for repair in accordance with the applicable laws.[50] However, to take advantage of this protection, the railroad must have knowledge of the brake defect; otherwise, it could not be considered moving the equipment for repair. If the railroad is not compliantly moving the equipment for repair, then it could be subject to a civil penalty assessment.

When reviewing a railroad for compliance, Inspectors are expected to use sound judgment, along with the guidance outlined in both the General Manual and Chapter 3 of this manual, when deciding whether the issuance of a violation report is appropriate. When drafting inspection and violation reports, inspectors should avoid using employee names, especially if doing so would reveal a complainant's identity.

In the past, questions were raised concerning the method of compiling air brake inspection data. Therefore, a variety of activity codes and source codes were developed for power brake inspection activities. There are codes that distinguish whether cars are "on-air" or "off-air" when inspections for air brake compliance, Part 232, are performed. For the purposes of this

[48] *See* the Safety Appliance Acts (1893, 1903, 1910), and the Federal Railroad Safety Act of 1970, currently codified at 49 U.S.C. § 20301 *et seq.*; *see also* the Locomotive Inspection Act (1911), currently codified at 49 U.S.C. Ch. 207.
[49] 66 FR 4104, 4149, 4196 (Jan. 17, 2001); 49 CFR § 232.9(a).
[50] *See* 49 U.S.C. § 20303(a); 49 CFR § 232.15.

discussion, "on-air" means the car has sufficient brake pipe pressure to operate the air brake pistons, and the car is inspected with the brakes applied. This could be either with a full service or an emergency brake application. "Off-air" means the car is inspected without the brakes applied. FRA Inspectors routinely examine cars that are not "on-air" to inspect for the securement of the brake equipment, the position of the retainers, condition of the brake pipe and valves, the operation of angle cocks, etc. Such inspections are included in the car count under the activity code for Part 232. However, many functions of the brakes cannot be observed, i.e., piston travel limits, binding or fouling, audible air leaks, etc.

FRA also needed to distinguish inspection activities between MP&E Inspectors and OP Inspectors. Therefore, to accomplish the above, Inspectors shall use the following activity or source codes for Part 232 inspection activities:

Activity Code	Inspection Activity
232	Any car inspected for Part 232 compliance that does not have the brakes applied. MP&E inspector (only) to determine compliance of a locomotive or railcar (both sides) for compliance with Part 232.
232A	Any car inspected for Part 232 compliance that has the brakes applied by either a service reduction or an emergency application, so that the functionality of the brakes and piston travel limits can be observed. MP&E inspector (only) to determine compliance of a locomotive or railcar (both sides) for compliance with Part 232.
232T	Anytime a train air brake test is observed. MP&E inspector (only).
232E	An inspection of the End-of-Train Device is conducted.
232S	Monitoring a single car or repair track air brake test. MP&E inspector (only).
232O	OP Inspectors observing and Initial Terminal brake test in the cab of the locomotive only. The purpose of this inspection is for any inspector, other than an MP&E inspector, to determine compliance with Part 232 not covered in activity code 232E or 232X.
232X	The purpose of this inspection is to determine if railroad equipment is in compliance with 49 CFR § 232.103(n). Inspectors should review the Activity Codes table of definitions to determine recording of units. (MP&E and OP)

Source Code	
Z	Outbound Extended Haul train inspections.

Inspectors are also reminded that they need to verify the number of cars inspected before entering the number on the inspection report. Do not rely solely upon the representation of railroad personnel or train consist sheets to determine how many cars are inspected. There are several methods Inspectors could use, including counting the cars with hand-held counters, or using the train consist and checking off the cars as they are inspected.

49 CFR Part 232

Subpart A – General

§ 232.3 Applicability

Part 232 generally applies to all freight and other non-passenger train brake systems and equipment. However, Subpart E – End-of-Train Devices, applies to both freight and passenger train operations.

Circus trains are required to comply with Part 232. Tourist, scenic, historic, or excursion operations that are part of the general railroad system of transportation have to comply with the provisions of Part 232 as it existed on May 31, 2001, prior to the effective date of the new regulations. The text of the regulations as they existed on May 31, 2001, is found in Subpart H of Part 232.

Private cars are designed to carry passengers and are generally hauled in both freight and passenger trains. These types of cars may be covered by Part 232 as well as the Passenger Equipment Safety Standards in Part 238. For example, private cars will typically be subject to the maintenance and equipment standards applicable to passenger equipment in Part 238 but will also be covered by the inspection requirements contained in Part 232 when hauled in a freight train.

Maintenance-of-way (MOW) vehicles must comply with Part 232. This includes passenger MOW vehicles as long as they were built on or after September 21, 1945.

Railgrinding sets and other similar equipment are a train under the statute, 49 U.S.C. § 20302 (Safety Appliance Act), but not the regulations (Part 232). However, the requirements in Part 232 are helpful in determining how to apply the statute.

- The power brake portions of the statute apply to the rail grinding sets, and the specific requirements in 49 CFR Part 232 are not applicable. Section 20302(a)(4) requires that a locomotive be equipped with a power-driving wheel brake and appliances for operating the train-brake system.

- 50% equipped brake requirement: Section 20302(a)(5) requires that at least 50% of the vehicles in a train be equipped with power brakes and that all the vehicles on an associated train line that are equipped with power brakes shall have their brakes used and operated by the engineer.

- 100% operative brake requirement: As all of the units in a rail grinding set are equipped with power brakes and are on an associated train line, the statute requires that 100% of the vehicles in the train have operative brakes unless they are being moved for repair under 49 U.S.C. § 20303.

- Brake inspections: Because the rail grinding sets are subject to 49 U.S.C. §20302(a)(5), FRA expects the railroads and operators of this equipment to have an inspection regimen in place that will ensure that the crews operating the equipment are aware of whether the brakes are in compliance with the applicable statutory requirements.

§ 232.5 Definitions

Title 49 CFR § 232.5 provides an extensive set of definitions intended to clarify the meanings of important terms used in the text of the rule. Each definition is drafted carefully to minimize potential misinterpretations. However, a few terms have elicited further questions that will be addressed as follows:

Air flow indicator, AFM: As the definition states, the indicator face must display markings from 10 cubic feet per minute (CFM) in increments of 10 CFM or less. It must also display numerals indicating 20, 40, 60, and 80 CFM. If an indicator is marked with numerals of 2, 4, 6, 8, 10, 12, it is not an indicator that can be used to qualify the brake pipe pressure of a train, in lieu of conducting a brake pipe leakage test. It may still be used by the engineer for the purpose of operating a train and it must be tested for accuracy within the prescribed time periods. An AFM is not an appurtenance of a locomotive.

Brake, effective: Means a brake that is capable of producing its nominally designed retarding force on the train. Inspectors often find instances where only the top or bottom half of a brake shoe is in contact with the wheel and question whether this is an effective brake. FRA conducted studies with the Association of American Railroads (AAR) and found that this condition does **not** render a brake ineffective. Therefore, it is not, and should not be considered, a defective condition.

Off air: Means not connected to a continuous source of compressed air of at least 60 pounds per square inch (psi). If the automatic brake valve is drawn down below 60 psi, the train is considered off air.

Previously tested equipment: Means equipment that has received a Class I brake test and has not been off air for more than 4 hours. If equipment is charged to 60 psi and recharged every 3 hours and 45 minutes, then the equipment would **not** be considered off air.

Qualified Mechanical Inspector (QMI): The only time a QMI is required is for the inspection and testing requirements for extended haul trains found in 49 CFR § 232.213 and electronically controlled pneumatic (ECP) brakes per 49 CFR § 232.607(a)(1).

Qualified person: An inspector should observe the performance and outcome of an individual conducting an inspection or test and ask appropriate questions to determine if an individual is a qualified person. If there are questions concerning the knowledge, skills, or ability of an individual, the Inspector must notify the RegionalSpecialist for further instructions on how to obtain the training records to determine if the training requirements have been fulfilled. The agency does not want Inspectors requesting training records on individuals. This should be done by the Regional Specialist or Headquarters Specialist.

"Roll-by" inspection: This is only applicable for the "release of brakes" portion of the inspection. It does not constitute an inspection of one side of the train for the purpose of satisfying the requirement of inspecting both sides of the train during a brake inspection.

Switching service: Is defined as the classification of freight cars according to commodity or destination; assembling of cars for train movements; changing the position of cars for purposes of loading, unloading, or weighing; placing of locomotives or cars for repair or storage; or moving of rail equipment in connection with work service **that does not constitute a train movement**. Thus, even if a train is involved in switching, it will require a brake test, if it will engage in a "train movement," as determined by FRA.

The determination of whether the movement of cars is a "train movement" or a "switching movement" is and will be based on the extensive case law developed by various courts of the United States. *See e.g., United States v. Seaboard Air Line R.R. Co.*, 361 U.S. 78 (1959); *Louisville & Jeffersonville Bridge Co. v. United States*, 249 U.S. 543 (1919). Accordingly, when determining whether a particular movement constitutes a "train movement," FRA will conduct a multi-factor analysis considering: the purpose of the movement; the distance traveled without a stop to set out or pick up cars; the number of cars hauled; and the hazards associated with the particular route traveled (*e.g.*, the existence of public or private crossings with or without crossing protection, the steepness of the grade, the existence of curves, any other conditions that minimize the locomotive engineer's sight distance, and any other conditions that may create a greater need for power brakes during the movement). The existence of any of these hazards would tend to weigh towards the finding of a "train movement," since these are the types of hazards against which the power brake provisions of the Federal rail safety laws were designed to give protection.

Under such an analysis, FRA will typically consider a **"train movement"** any operating that includes 5 or more cars coupled together that are hauled a distance of at least 1 mile without a stop to set off or pick up a car and not moving for the purpose of assembling or disassembling a train. However, FRA may consider movements of less than one 1 mile "train movements" if the operation includes at least one or more of the aforementioned factors, such as the presence of hazardous materials or grade crossings.

Transfer train: May pick-up and set-out cars while enroute. Any cars picked up will have to receive, at a minimum, a transfer train brake test. However, this does not start a new 20-mile transfer train unless a transfer train brake test is performed on the entire train at that particular location. A train could travel 100 miles as a transfer train, if a transfer train brake test is performed at every 20-mile segment of the trip.

Unit or Cycle train: Must remain coupled as a consist and continuously operate from location A to location B and back to location A. FRA will not take exception if the train is separated for the purpose of loading or unloading, as long as the cars are not off-air for more than twenty-four (24) hours and the consist remains in the original order. A block of cars can be added and removed as long as the cars added are given a Class-I brake test before the block of cars are added to the train.

§ 232.9 Responsibility for compliance

This section contains the “use” or “haul” language as previously discussed. It basically states that any train, railroad car, or locomotive covered by Part 232 will be considered “in use” prior to departure, but after it receives or should have received the necessary tests and inspections required for movement. FRA will not necessarily wait for a piece of equipment with a power brake defect to be hauled before issuing a violation report and recommending a civil penalty. FRA believes that this approach increases FRA’s ability to prevent the movement of defective equipment that creates a potential safety hazard to both the public and railroad employees. If Inspectors rely on the “in use” provision, the violation report must establish that the railroad has completed or should have completed all necessary inspections capable of discovering each defective condition. Therefore, evidence must be included in the violation report that establishes the Inspector’s basis for each finding. Be as specific and thorough as possible.

At interchange, a railroad may refuse to accept a vehicle with a non-complying condition. In this scenario, if a railroad elects to receive the defective vehicle and the vehicle is not properly tagged, both the offering railroad and the receiving railroad can be held liable.

Title 49 CFR § 232.9(c) states that any “person” that performs any function or task required by this Part will be deemed to have consented to FRA inspection of the person’s operation to the extent necessary to ensure that the function or task is being performed in accordance with the requirements of Part 232. This provision is intended to put railroads, contractors, and manufacturers that elect to perform tasks required by Part 232 on notice that they are consenting to FRA’s inspection for rail safety purposes of that portion of their operation that is performing the function or task required by this part. In most cases, this function or task involves a contractor’s performance of certain required brake inspections or the performance of specified maintenance on cars, such as conducting single car or repair track tests on behalf of a railroad. FRA believes that if a person is going to perform a task required by Part 232, FRA must have the ability to view the performance of such a task to ensure that it is conducted in compliance with Federal railroad safety laws. This is supported by 49 U.S.C. § 20107, which requires that FRA be allowed access to a railroad’s property at a reasonable time and a reasonable way to conduct inspections. If an inspector encounters a location that prohibits access on the property to perform an inspection, the Regional Specialist should be immediately notified, who will then contact Headquarters for further instructions.

§ 232.11 Penalties

This section identifies the penalties that may be imposed upon a person, including a railroad or an independent contractor providing goods or services to a railroad, that violates any requirement of Part 232. While the responsibility for non-complying equipment is usually applied to the hauling railroad, if a contractor is performing one of the required inspections or tests, the responsibility can be placed on either the contractor or the railroad, or both. The Inspector should consult with the Regional Specialist to determine where the enforcement action should be directed. The schedule of civil penalties is listed on FRA's website.

§ 232.15 Movement of defective equipment

This section contains the provision regarding the movement of equipment with defective brakes without civil penalty liability.

Title 49 CFR § 232.15(a) contains various parameters that must exist to permit a railroad to haul a piece of equipment with defective brakes for repairs without civil penalty liability. The rule text accurately reflects the statutory language pertaining to the movement of equipment with defective brakes.

The statutory provisions contained in 49 U.S.C. § 20303 (previously 45 U.S.C. § 13) govern the movement of equipment with defective or insecure safety appliances, which includes power brakes. This only allows the railroad to move the defective equipment from the place where the defect is first discovered to the **nearest** location where the necessary repairs can be made. This movement can either be on the railroad where the defect is first discovered or on the line of the connecting railroad, only if the connecting railroad has elected to accept the non-complying equipment and the point of repair on the connecting railroad's line, where the equipment will be repaired, is no farther than the point where the repairs could have been made on the line where the equipment was first found defective. A railroad may refuse to accept a defective car at interchange. Until the receiving railroad accepts the car by either moving it or otherwise exercising control over it, it cannot be found liable for civil penalties. Nor is it required to make any repairs. <u>It should be noted that the delivering railroad remains liable for each defective car it tenders in interchange unless the car is properly tagged.</u>

A car or locomotive with a defective air brake condition cannot be tagged and moved from or past a location that has the capability to make the necessary repairs. Nor can a car or locomotive with a defective brake condition be tagged and moved in a train that receives a Class I brake test on the **entire** train, irrespective of whether it is at a location where repairs cannot be made.

To take advantage of the affirmative defense provided by 49 U.S.C. § 20303, a railroad must establish the following 7 elements (*see* 49 CFR § 232.15(a)):

1. The car was properly equipped with power brakes.
2. The car became defective while being used by the railroad on its line.
3. The railroad discovered the defect prior to the movement.
4. The movement was from the place where the defect was first discovered.
5. Repairs could not be made at the location where the defect was first discovered.
6. Movement was necessary to make the necessary repairs.
7. The car moved only to the nearest available point where the necessary repairs could be made.

Title 49 CFR § 232.15(b) contains the specific requirements regarding the tagging of equipment found with defective brake components. The requirements contained in this paragraph are very similar to the tagging requirements contained in Part 215, regarding the movement of equipment not in compliance with the Freight Car Safety Standards. In contrast, there are no regulations establishing tagging requirements for safety appliance defects under Part 231.

In lieu of directly tagging equipment, this paragraph (b) permits an automated electronic tracking system that is:

- Listed in a Headquarters-issued Technical Bulletin as FRA-approved;
- Capable of being reviewed and monitored by FRA at any time (i.e., 24 hours a day, 7 days a week);
- Outfitted with monitoring and tracking security features specific to the defective equipment; and
- Subject to procedures accounting for its breakdown, malfunction, and unavailability to railroad personnel.

In the event of any interchange of defective equipment, the originating railroad will have to ensure that any receiving railroad without access to the originating railroad's automated tracking system also receives the information necessary to handle the defective equipment and otherwise comply with the regulations. Without adopting and complying with such a method, the originating railroad may remain liable for any related violation.

Title 49 CFR § 232.15(c) restricts the movement of a vehicle with defective brakes for the purpose of unloading or purging, unless it is necessary for the safe repair of the car. Therefore, cars with defective brakes cannot be moved to a location to be loaded or unloaded until the defective condition is corrected, unless the location is where the repairs will be made.

Title 49 CFR § 232.15(e) contains the guidelines for train placement. If a freight car or locomotive has inoperative brakes, it cannot be placed as the rear car of a train. This provision would apply to multi-unit articulated equipment if the rear control valve is cut-out. Additionally, there cannot be two or more freight cars consecutively placed in the same train if both cars either have inoperative brakes or are not equipped with power brakes. Finally, multi-unit articulated equipment with a defective brake cannot be placed in a train if more than two consecutive individual control valves are cut-out.

Title 49 CFR § 232.15(f) contains general guidelines that FRA will consider when determining whether a location is one, and the nearest, which should be considered the location where brake system repairs must be made. FRA expects a railroad to consider the information contained in paragraph (f) when making its decisions on where equipment containing brake defects will be repaired. The information contained in this paragraph is based upon, and consistent with, voluminous case law. These guidelines are equally applicable to determine such repair locations for all safety appliance defects and should be applied on a case-by-case basis to determine whether the railroad moved the defective equipment in good faith. When determining if a location should be considered a repair location, consider whether:

- The location has an operative repair track or repair shop;
- The location is a place where the railroad performs mechanical repairs other than safety appliance or power brake repairs;
- Repair truck(s) are permanently stationed there or whether they come from another location; and
- The location is a place where a mobile repair truck is used on a regular basis.

While each Inspector should consider these factors, they will need to provide details to support their conclusions. For instance, each Inspector should describe trackage availability in the narrative if the location is a place where a mobile repair truck is used. Similarly, if the location is being identified as a mobile repair truck location, the Inspector should explain the location of the nearest major facility in relation to the mobile repair truck location (*i.e.*, repair shop or location where mobile repair truck is permanently stationed or originates). Additionally, the Inspector should discuss the type of repairs the facility is capable of performing and any other pertinent information.

While not every location where a mobile repair truck is capable of making repairs should be considered a repair location, FRA firmly believes that locations where repair trucks are used similarly to a fixed facility.

In determining whether a location is capable of making a particular repair, the following factors will also be considered (*see* 49 CFR 232.15(f)(1)):

- The accessibility of the location to persons responsible for making repairs.
- The presence of hazardous conditions that affect the ability to safely make repairs of the type needed at the location.
- The nature of the repair necessary to bring the car into compliance.
- The need for railroads to have in place an effective means to ensure the safe and timely repair of equipment.
- The relevant weather conditions at the location that affect accessibility or hazards.
- A location need not have the ability to effectuate every type of safety appliance or power brake repair in order to be considered a location where some safety appliance or power brake repairs can be made.
- A location need not be staffed continuously in order to be considered a location where safety appliance repairs can be performed.
- The congestion of work at a location shall not be considered.

In addition to considering the aforementioned factors, the Inspector must also consider distance to the location and the following safety considerations:

- The safety of the employees responsible for getting the equipment to or from a particular location; and
- The potential safety hazards involved in moving the equipment in the direction of travel necessary to get it to a particular location.

Inspectors should address the items discussed in 49 CFR § 232.15(f) in the written narrative if civil penalties are being pursued.
Title 49 CFR § 232.15(g) provides a method by which a railroad may designate locations where various brake system repairs will be conducted. *See* Appendix B of the Compliance Manual for the railroads that have designated locations where brake system repairs will be conducted. Appendix B also includes the list of locations designated by each railroad.

§ 232.17 Special approval procedure

This section contains the procedures to be followed when seeking FRA's approval of: (1) a plan under § 232.15(g); (2) an alternative standard under § 232.305 or § 232.603; (3) an alternative technology under § 232.407(b) or (c); a single car test procedure under § 232.611; or pre-revenue service acceptance testing plans under subpart F of part 232.

Subpart B – General Requirements

§ 232.103 General requirements for all train brake systems

This section contains general requirements that are applicable to all freight and non-passenger train brake systems. This section specifically includes certain basic train brake system practices and procedures that form the foundation for the safe operation of all types of trains.

Title 49 CFR § 232.103(d) requires 100% operative brakes where a Class I brake test is required to be performed. This applies only where the Class I test is required to be performed on the **entire** train. It does not apply at locations where a railroad elects to perform a Class I brake test on cars that are picked-up en route and added to an existing through-train. Therefore, if a railroad conducts a Class I brake test on cars picked-up en route, the train may still move a car with defective brakes from that location in accordance with 49 CFR § 232.15 – *Movement of defective equipment*. Although FRA recognizes that the 100% requirement may be somewhat burdensome for some railroads at certain locations, FRA believes that the number of locations involved is relatively low and should be formally handled on a case-by-case basis through the existing waiver process. Railroads applying for such waivers must be able to establish a true need for the exception and must be willing to provide alternative operating procedures that ensure the safety of the trains being operated from those locations.

Title 49 CFR 232.103(g) requires the piston travel limits be indicated by either a stencil, sticker, or badge plate on all cars except for cars equipped with nominal 12-inch stroke (8½ and 10-inch diameter) brake cylinders. **Note**: there are some applications of 12 x 10-inch brake cylinders that have a 5-inch range. For these applications, a stencil, sticker, or badge plate would have to convey that information. When alleging a violation of § 232.103(g), the violation report should include a photograph of the stencil, sticker, or badge plate, and any other information to which the actual measurement must be compared.

Furthermore, pursuant to FRA's conditional approval of a waiver request related to minimum piston travel requirements (*see* docket number FRA-2004-19402), these cars shall have the empty/load valve tested, if so equipped, as prescribed in AAR Standard S-486-04, Sections 4.6.1

through 4.6.5, anytime a single car test is performed on the car, irrespective of whether the valve has been changed. Please note that this test is not required if the car is loaded, since the test can only be performed when the car is empty.

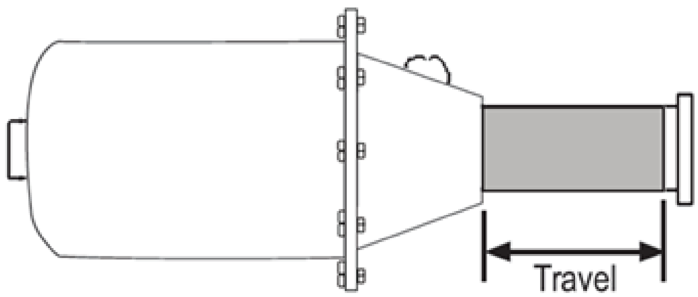


Figure 1: Method of measuring the piston travel

In order to achieve consistent brake cylinder piston travel compliance, each must be measured using the proper method. The actual movement of the piston is the distance that must be measured. To determine this measurement, the longstanding practice of measuring piston travel from the front of the brake cylinder (non-pressure head) to the grease mark on the hollow rod will be used. If a grease mark is not evident, a line scribed on the hollow rod would suffice (*see* **Figure 1**). If there is confusion as to what the piston travel should be on a particular car, refer to either the badge plate or stenciling located in a conspicuous place near the brake cylinder.

Title 49 CFR § 232.103(h) requires that all cars ordered on or after August 1, 2002, or placed into service for the first time on or after April 1, 2004, be designed so that an Inspector does not have to place himself or herself on, under, or between components of the equipment to observe brake application or release. This paragraph also allows railroads the flexibility of using a reliable indicator in place of requiring direct observation of the brake application or piston travel because the designs of some freight car brake systems make direct observation extremely difficult unless the Inspector places himself or herself underneath the equipment. Although the rule permits the use of an indicator for purposes of determining piston travel, the individual inspecting such equipment is required to inspect all components of the brake system for proper operation.

Title 49 CFR § 232.103(m) requires that an en route train shall be stopped if its brake pipe gradient is greater than 15 psi between the front and the rear of the train, or if the brake pipe air flow is greater than 60 CFM for conventional trains, and 90 CFM for trains with two or more air source locations. Note that if a Class III air brake test is performed under 49 CFR § 232.211 the test is completed once “the brake pipe pressure at the rear of freight train is being restored,” however, the train shall not proceed until either the gradient or air flow requirement of this section is met.

Title 49 CFR § 232.103(n) addresses the securement of unattended equipment. Paragraph (n)(1) includes a performance-based requirement that a sufficient number of hand brakes be applied to hold the equipment and that railroads have to develop and implement a process or procedure to verify that the applied handbrakes will sufficiently hold the equipment when the air brakes are released. This requires a railroad to develop appropriate operating rules to verify the sufficiency of the handbrakes applied, which can be tailored to the specific territory and equipment operated by the railroad. This can be as elaborate as the use of a sophisticated matrix or some type of "set calculations" that specify exactly how many handbrakes have to be applied on specific numbers of cars; or it can be as simple as having the engineer release the pneumatic brakes after the handbrakes have been applied, to determine if the equipment is secure. To simply have instructions that state "a sufficient number of handbrakes have to be applied" does not satisfy the intent of the regulation, unless there is the provision that the pneumatic brake has to be released to determine the equipment is secure.

Paragraph (n) only applies to unattended equipment, which is defined as equipment left standing and unmanned in such a manner that the brake system of the equipment cannot be readily controlled by a qualified person. When assessing unattended equipment for compliance with paragraph (n), the Inspector should take into account the following factors:

- Can a person take corrective action if the equipment should start to roll away?
- Can the individual readily mount the car and apply the handbrake, or can the individual safely open an angle cock, should the equipment start to roll away?
- Can the individual readily mount the locomotive and either apply the handbrake or operate the brake handles or emergency brake valve to stop the unexpected movement?
- Is the qualified person focused on the situation? For example, if the individual is eating lunch or in the bathroom, full attention is not being given to the equipment. If the individual is in a crew room or talking on the phone, full attention is not being given to the equipment.

If an engineer and crew get off of their train to watch a passing train, and remain in close proximity of their locomotive consist, handbrakes would not have to be applied on the locomotives, as long as someone is close enough to readily mount the locomotive and apply an emergency brake or handbrake, should the locomotives or train start to roll away. If, however, the engineer and crew get off their train and stand where a passing train would block access to their train, then the handbrakes would have to be applied, as their train would be considered unattended. *See* 49 CFR § 232 Docket No. FRA-2014-0032, Notice No. 2 page 278

Title 49 CFR § 232.103(n)(2) addresses the securement of unattended equipment by means of venting its brake pipe to zero and leaving the angle cock open on one end of a cut of car(s), and requires the railroad. Per § 232.103(n)(11)(ii), FRA will not take exception to a train crew cutting away from a cut of cars, initiating an emergency brake application on the cut of cars, and then closing the angle cock for the sole purpose of taking the locomotives to the opposite end of the cut of cars to either: (1) couple the locomotives to the cars; or (2) open the angle cock at the other end and leave the angle cock open and vented to atmosphere as required under 49 CFR § 232.103(n)(2). However, if the locomotive cuts away from the cars and closes the angle cock without going "directly" to the other end to either open the angle cock or couple the locomotives to the cars, the railroad would be in violation of 49 CFR § 232.103(n)(2). It is only with the understanding that the train crew goes "directly" to the other end of the cars to take the appropriate action that FRA will permit this type of activity. Even if the crew is directed to perform another task by a supervisor, colleague, or dispatcher that would prevent it from going directly to the opposite end of the cars to take the appropriate action, a violation is still committed.

Title 49 CFR § 232.103(n)(3) applies when the unattended equipment concerns locomotives and locomotive consists. A locomotive consist is one or more locomotives coupled together regardless of whether the electrical cables are connected or air hoses coupled. As long as the locomotives are coupled together via the coupler, it is a locomotive consist. While the securement requirements contained in paragraph (n)(3) do not apply to distributed power locomotives when placed in a train, appropriate hand brakes must be applied if they are left unattended in a yard or siding waiting to be used as distributed power.

Paragraph (n)(3) has different requirements for locomotives and consists left inside and outside of a yard. In this context, the term "yard" means:

> A system of tracks, other than main tracks and sidings, used for classifying cars, making up and inspecting trains, or storing cars.

See 49 CFR § 232.5.

FRA does not believe its resources are well used for enforcing paragraph (n) on locomotives located in a locomotive servicing area[51] under the control of mechanical forces preparing them for service. However, if mechanical personnel are not in place to take immediate control of the locomotives, a train crew must comply with paragraph (n). Moreover, once the mechanical personnel indicate completion (*e.g.*, placing a locomotive on a "ready track" and left unattended for transfer to the train crew or hostler), a sufficient number of handbrakes must be applied. In fact, anytime mechanical forces are not on duty at a service track location, and there are no other qualified persons attending the equipment, appropriate handbrakes must be applied.

During active yard switching, FRA will at least require that a sufficient number of cars be secured on both ends of a yard track. FRA does not believe its resources are well used to enforce compliance on the unattended, unattached railcars between the secured ends. At all other locations outside of actively switched yards, such as sidings, storage yards, or the mainline; each car and/or each individual block of unattended equipment must be secure in compliance with the regulation.

§ 232.105 General requirements for locomotives

This section contains general provisions related to locomotives. It does not include provisions related to the inspection and maintenance of the locomotive braking systems, as these

[51] 49 CFR § 218.5 defines a "locomotive servicing tack area" as "one or more tracks, within an area in which the testing, servicing, repair, inspection, or rebuilding of locomotives is under the exclusive control of mechanical department personnel."

requirements are adequately addressed in Part 229. The exception is the locomotive handbrake or parking brake, which requires that an inspection, and any necessary repairs be made as often as service requires, no less frequently than every 368 days. The date of the last inspection must be entered on Form FRA F6180-49A or suitably stenciled or tagged on the locomotive. Transport Canada's Cab Form 22 ("yellow card"), Item 8(a) includes this same information. The information in Item 8(a) of Transport Canada Cab Form 22 satisfies FRA's requirements. For information, Transport Canada indicates that both forms are compliant in Canada.

§ 232.107 Air source requirements and cold weather operations

This section contains requirements directed at ensuring that freight brake systems are devoid, to the maximum extent practical, of water and other contaminants that could conceivably deteriorate components of the brake system and, thus, negatively impact the ability of the brake system to function as intended.

Title 49 CFR § 232.107(a) requires railroads to adopt and comply with a plan to monitor all yard air sources to ensure that the yard air sources operate as intended, are in proper condition, and do not introduce contaminants into the brake system of freight equipment. Each inspection required under this paragraph must thoroughly review the entire yard air source—including, but not limited to, all compressors, piping, hoses, and valves—to ensure it is in proper condition and operates as intended. Corrective action must be taken on any component that does not operate as intended, such as replacing desiccant in air dryers, tightening pipe connections in the yard to stop air leaks, and replace defective valves and hoses.

These inspection requirements apply to any air compressor that is capable of introducing contaminants into the brake pipe of a car or locomotive. Shop compressors, rental compressors, and portable air compressors must receive the periodic inspections and repairs and have a written plan and records.

Railroads must maintain records (either electronically or in writing) related to yard air monitoring plans. FRA believes that these records are necessary to ensure that railroads are properly conducting the required inspections and are taking timely and appropriate remedial action when a problem with air source is detected.

The yard air source systems are to be inspected at least twice each calendar year with the inspection dates not less than 5 months apart. Excessive air leaks in the underground piping indicate poor integrity of the yard air supply system, which may lead to contamination of airbrake components.

When assessing railroad's compliance with this section, inspectors should ensure that the condensation is blown from the air hose before any equipment is connected to the yard air source.

The monitoring plans apply to any yard air source, including any stationary or portable air compressor, that is used to introduce compressed air into cars and locomotives.

While this rule does not contain specific requirements regarding the use of air dryers on either locomotives or yard air sources, it is FRA's position that air dryers are to be properly maintained. Therefore, if an Inspector finds an air dryer that is inoperative or has contaminated desiccant, appropriate enforcement action should be taken. For locomotives, 49 CFR § 232.105(a)'s "safe and suitable" requirement should be cited. If the defection condition is found on a yard air source, the Inspector should review the air monitoring plans and records for compliance.

Title 49 CFR § 232.107(e) requires that a railroad adopt and comply with detailed written operating procedures tailored to the equipment and territory of the railroad to promote safe train operations during cold weather situations.

§ 232.109 Dynamic brake requirements

Title 49 CFR § 232.109(a) requires that a locomotive engineer be informed of the operational status of the dynamic brakes on the locomotives the engineer will be required to operate. This information is to be provided to the locomotive engineer at a train's initial terminal and at other locations where a locomotive engineer first begins operation of a train. While it allows railroads to provide a locomotive engineer with the required information by any means they deem appropriate, the rule is clear that a written or electronic record of the information provided shall be maintained in the cab of the controlling locomotive. This will ensure that relief or other oncoming engineers will have the information that was provided to the previous locomotive engineer. The information required has to inform the engineer of exactly how many units have operating dynamic brakes. This is only required on railroads that use or operate locomotives with dynamic brakes.

Title 49 CFR § 232.109(b) requires that a locomotive with inoperative dynamic brakes must be repaired within 30 days of being found inoperative or at the locomotive's next periodic inspection, whichever occurs first. If the locomotive is not in a shop that can effectuate the dynamic brake repairs at either the 30-day time period or the locomotive's periodic inspection, the locomotive must be tagged and moved as prescribed in 49 CFR § 232.15, as this is a power brake defect. It cannot be tagged and moved under the provisions of 49 CFR § 229.9. If the locomotive happens to be on a foreign railroad when either the 30-day time period or periodic inspection is due and the movement would require the locomotive to pass several repair locations before it could be returned to the owning railroad, the foreign railroad must make repairs or ask FRA for permission to move the locomotive past the repair points.

Title 49 CFR § 232.109(c) contains the requirements related to the tagging of a locomotive found with inoperative dynamic brakes. This should be done when the defective condition is initially identified. Since the locomotive engineer generally discovers this defect, they should properly fill out the tag and apply it to the locomotive.

Title 49 CFR § 232.109(e) permits a railroad to declare a locomotive's dynamic brakes "deactivated" if the following requirements are met: (1) the locomotive is clearly marked with the words "dynamic brake deactivated" in a conspicuous location in the cab of the locomotive; and (2) the railroad has taken appropriate action to ensure that the deactivated locomotive is incapable of utilizing dynamic braking effort to retard or control train speed. It should be noted that FRA intends for this provision to be a permanent application and not used as a solution to circumvent or delay the repair of a defective dynamic brake.

Title 49 CFR § 232.109 applies to trains that utilize dynamic brakes during the train movement. Thus, if the involved run is one on which dynamic brakes are usually employed, then all of the requirements of 49 CFR § 232.109 would apply. Similarly, if the train operation is one where dynamic brakes are not used, then 49 CFR § 232.109(f) and (g) would not be applicable. Section 232.109(f) and (g) do not apply to trains used in helper service.

Q: Is it permissible to depart a location where a train originates, or a terminal where locomotives can be rearranged, without the controlling unit having dynamic brakes?

A: Yes, but only in two (2) limited circumstances:

1. The locomotive consist is not intended to have dynamic brakes used while in transit (if the run generally requires or usually utilizes dynamic brakes, then this would not apply);
2. The controlling locomotive is capable of controlling the dynamic brakes on trailing units **and** is equipped with either an accelerometer or a dynamic brake indicator.

Q: If a train departs location A with all of the dynamic brakes working and prior to arrival at an intermediate terminal (crew change point), the dynamic brake fails on the lead unit, does the unit have to be swapped or repaired prior to departure from the crew change point?

A: If the unit is equipped as stated above, no. If not so equipped, then the unit needs to be switched out where it is <u>safe</u> to do so. This may or may not be the crew change point depending on the track availability.

Q: If a train consist that departed an initial terminal with working dynamic brakes arrives at its destination with defective dynamic brakes, can it depart if there are no other locomotives available?

A: Yes, but <u>only</u> if the controlling locomotive is capable of controlling the dynamic brakes on trailing units **and** is equipped with either an accelerometer or a dynamic brake indicator. If none of the units had an operative dynamic brake, and if this train operated over a route that required the use of dynamic brakes, FRA would still require an accelerometer.

§ 232.111 Train handling information

This section contains the requirements regarding the handling of train information. This information has to be updated whenever a new train crew takes charge of a train. This information is applicable to trains receiving a transfer air brake test and operating as a transfer train movement. However, this information would not have to be on a transfer move made within the confines of a yard, as defined in 49 CFR § 232.7.

Title 49 CFR § 232.111(b)(4) requires railroad to provide the train crew with Class I or Class IA brake test information, including the planned brake test en route and its location.

Each train crew must be informed of the train brake system's condition. This includes the consist information to ensure a safe train operation from origin to destination. Any consist-change events must be properly documented and maintained in the cab of the controlling locomotive. More specifically, if a car or a solid block of cars is being added to the train, it must be reflected in train documentation in detail, including Class I brake test information.

Subpart C – Inspection and Testing Requirements

§ 232.203 Training requirements

This section contains the general training requirements for railroad employees and contractor employees that perform the inspections and test required by this part. Each railroad is responsible for training its employees and maintaining the required records. Likewise, the contractor is responsible for providing appropriate training to its employees and maintaining the required records and information. However, this does not relieve the railroad from potential civil penalties if a contractor's employee is not qualified to perform an assigned task (*e.g.*, a proper Class I brake test). Both the railroad and the contractor could remain liable for potential civil penalties if the employees used to perform a particular task were not properly trained and qualified in accordance with the training requirements contained in this rule.

For purposes of this section, a "contractor" is defined as a person under contract with a railroad or car owner, or an employee of a person or company under contract with a railroad or a car owner.

The training that an employee is required to receive need only address the specific skills and knowledge related to the tasks that the person will be required to perform under this part. Thus, a railroad or contractor may tailor its training programs to the needs of each employee based on the assigned tasks. If an individual never performs a single car test, the railroad would not have to train that person for this task. If the railroad never performs a Class II brake test, the railroad would not have to train for Class II brake inspections.

Title 49 CFR 243--Training, Qualification, and Oversight for Safety-Related Railroad Employees contains additional guidance for training requirements. Please consult the *Training, Qualification, and Oversight for Safety-Related Railroad Employees; Compliance Guide,* May 2019 for further information.[52] In particular, existing on-the-job training requirements will need to be reviewed to ensure they contain the elements specified in 49 CFR §§ 243.101(d) and 243.103(a)(3).

The section requires that refresher training be periodically provided at least once every three years. The refresher training must consist of both classroom and "hands-on" training. FRA does not intend for such training to be as lengthy or formal as the initial training originally provided, but believes that training should re-emphasize key elements of various tasks and focus on items

[52]https://railroads.dot.gov/sites/fra.dot.gov/files/fra_net/18757/Part%20243%20Compliance%20Guide%20-%20May%202019.pdf.

or tasks that have been identified as being problematic or of poor quality by the railroad, contractor, or its employees through the periodic assessment of the training program.

FRA believes that in order for a supervisor to properly exercise oversight of an employee's work, the supervisor is to be properly trained and qualified to perform the tasks for which they have oversight responsibilities. Therefore, supervisors have to receive some level of documented training.

Title 49 CFR § 232.203(f) requires that each railroad or contractor adopt and comply with a plan to periodically assess the effectiveness of its training program. Although FRA agrees that a formal audit process may not be necessary, FRA continues to believe that railroads and contractors should periodically assess the effectiveness of their training programs. Nevertheless, FRA believes that each railroad or contractor should conduct periodic assessments tailored to its operation. Small railroads may assess employee training program quality by conducting periodic supervisory spot checks or efficiency tests. FRA expects larger railroads to periodically assess their training programs regarding all affected workforce segments.

§ 232.205 Class I brake test – initial terminal inspection

This section describes when and how a railroad must perform a Class I brake test.

A Class I brake test is required at locations where more than one "solid block of cars" is added to or removed from a train. Title 49 CFR § 232.205 permits both the addition and the removal of a "solid block of cars" at a location without requiring the performance of a Class I brake test on the entire train. However, depending on the make-up of the block of cars, certain inspections will have to be performed on that block of cars at the location where it is added to the train. A railroad can add a single block of cars to a train that is composed of cars from numerous different trains, as long as the railroad assembles the cars into one block and performs a Class I test (or at least a Class II test) on the solid block of cars **before** adding the block to the train. While this chapter of the manual only addresses the brake test requirements, Inspectors and railroads should be mindful that, any time cars are added to a train, a pre-departure inspection (Part 215) must be performed on the cars.

When a through-train arrives at a location and splits into multiple sections, the railroad can only designate one of the sections as being the continuing train. The other sections of the train would require applicable air brake tests, depending on whether they are added as a solid block of cars to another **through-train** and have not been off air for more than twenty-four (24) hours, or they are part of a new train. If the railroad adds a locomotive to one of the sections, FRA considers this to be a new train, thereby requiring at a minimum a transfer brake test or a Class I air brake test. If the section added to a train is being made-up at that location, then the cars would have to receive the same test as the train that is being built. This would be the originating point of this type of train.

Title 49 CFR § 232.205(a)(3) permits trains to remain disconnected from a source of compressed air ("off air") for up to twenty-four (24) hours without triggering the requirement to perform a Class I brake test. This would permit a railroad to recharge a train before twenty-four (24) hours elapse, so the train would retain its on-air status. This could be accomplished by either using a locomotive or yard air.

Title 49 CFR § 232.205(a)(5) permits trains received in interchange to have a previously tested solid block of cars added to the train without requiring the performance of a Class I brake test. *Previously tested* means that the cars had to have received a Class I brake test and have not been off air for more than 24 hours.

See 49 CFR § 218, 221, and 232 Docket No. FRA-2018-0093, Notice No. 2, Page 143

Railroads are permitted to remove defective equipment at any location, at any time, without triggering the requirement to perform a Class I brake test on the entire train. This also includes the location where the Class I test is performed. If the inspection reveals a defective car, another Class I test is not required after the car is removed from the train.

Title 49 CFR § 232.205 permits using an end-of-train (EOT) device to verify rear car brake pipe pressure during a Class I brake test, provided the reading of the rear car air pressure is from the controlling or hauling locomotive of the train. Under no circumstances may the rear car brake pipe pressure be read from a remote highway vehicle, another locomotive not attached to the train, or from any other location such as a remote unit installed in an office or shop.

Handheld gauges that are used to verify the rear car brake pipe pressure are required to be accurate. That said, there are no Federal requirements that they be calibrated on a periodic basis. FRA expects a railroad to have some method in place to ensure their accuracy. This applies to all handheld gauges used for any and all brake tests.

At a minimum, the inspector for the railroad must observe both sides of the equipment at some time during the inspection process. FRA continues to believe that both sides of the equipment must be observed at some time after the occurrence of activities that have the likelihood of compromising the integrity of the equipment's brake components, such as: hump switching, multiple switching, loading, or unloading.

Title 49 CFR § 232.205 also requires that an adequate inspection of the brake components be conducted on both sides of the equipment at some time during the inspection process. This can occur before the brake pipe is charged and before hoses are connected. Both sides of the equipment do not have to be inspected while the brakes are applied. However, one side of the equipment must be inspected while the brakes are applied and the piston travel on each car must be inspected while the brakes are applied, which could require the individual conducting the inspection to cross the car to observe the piston travel. If an Inspector observes a railroad employee conducting the brake application portion of the inspection, some of the pistons are mounted on the opposite side of the equipment, and no attempt is made to cross over the equipment to observe the piston travel, then appropriate enforcement action (either an exception or violation based on the extent of non-compliance) should be considered for a "partial failure to inspect." Similarly, if an inspection is being conducted from a vehicle, then the railroad employee should be observed getting out of the vehicle to observe the piston travel on truck-mounted brake arrangements unless an indicator is plainly visible from the vehicle.

The presence of numerous power brake defects can be used as evidence of a railroad's failure to perform a required brake test. However, if the only evidence offered to establish a "partial failure to perform" a required inspection is the presence of one (1) car with inoperative brakes, for which a separate recommendation for violation is sought, then it would be **inappropriate** to submit a separate violation for a "partial failure to perform" referencing the involved inspection. Generally, in order to proceed with a violation for both a failure to perform a required inspection and for the underlying defective equipment, FRA would prefer additional direct evidence that some portion of the inspection was not performed (*e.g.*, actual observation, witness statement), or the presence of numerous non-complying cars. Otherwise, it is FRA's policy to only assess a civil penalty for either the substantive defects or a failure to perform the required inspection, not both.

Similarly, 49 CFR § 232.205 requires trains to have 100% operative brakes unless being properly hauled for repairs. Thus, if the only evidence offered to establish less than 100% operative brakes is the presence of 1 or 2 cars with inoperative brakes, for which separate recommendations for violation are sought, then it would be **inappropriate** to submit a separate violation for the train having less than 100% operative brakes. If at the initial terminal a freight car brake is found inoperative or ineffective as prohibited under 49 CFR § 232.103(f), then the involved train would not have 100% operative air brakes at the Class I inspection as required under 49 CFR § 232.103(d). It is FRA's policy not to assess multiple violations based solely on the same defective condition. However, if a high number of cars are found with inoperative brakes, or if a pattern of non-compliance is fully established, then it may be appropriate to pursue separate recommendations for violation on the individual cars as well as the train for having less than 100% operative brakes.

Title 49 CFR § 232.205(c)(4) permits a retest on a car that has a "no set." The brakes on a retested car must remain applied for at least three (3) minutes until the release is initiated. A car can be retested with the use of a suitable device positioned at the car being retested—rather than from the head of the consist or from the controlling locomotive—as long as the proper procedures are followed; while the brake pipe pressure must be charged, and a 20-psi reduction must be made, an emergency application and a gradual opening of the angle cock to initiate a brake application are not acceptable. A railroad may retest a car as many times as it wants, as long as the appropriate brake pipe pressures and reductions are made for each retest.

Title 49 CFR § 232.205(c)(5) requires that piston travel be adjusted during the performance of a Class I brake test, if it is found outside the nominal limits established for standard 8½-inch and 10-inch diameter brake cylinders or outside the limits established for other types, which will be contained on a stencil, sticker, or badge plate. For cars equipped with 12-inch stroke (8½-inch 10-inch diameter) brake cylinders, the piston travel limit is six (6) to nine (9) inches. If piston travel is found to be less than six (6) inches or more than nine (9) inches when conducting the Class I brake test, the piston travel shall be adjusted to nominally 7½ inches.

A "roll-by" inspection of the brake release is permitted, but it does not constitute an inspection of that side for purposes of inspecting both sides during the inspection. When conducting the "roll-by" inspection, the person on the ground only has to position themselves on one side of the equipment. There must be communication between the person on the ground and the locomotive engineer, so that the engineer can be told to stop the train if there are any problems.

Title 49 CFR § 232.205(c)(6) states that brake rigging shall be properly secured and shall not bind or foul or otherwise adversely affect the operation of the brake system. Wear or damage may cause all types of brake rigging to bind and foul. For instance, when components of a hook and eye arrangement wear, its angularity will change.

Types of Hook and Eye Brake Rigging

Hook and eye brake arrangements commonly found on freight equipment can include rigging with a vertical body lever (*see* **Figure 2**) or without a vertical body lever (*see* **Figure 3**).

Figure 2: Hook and Eye Brake Arrangement with Vertical Body Lever

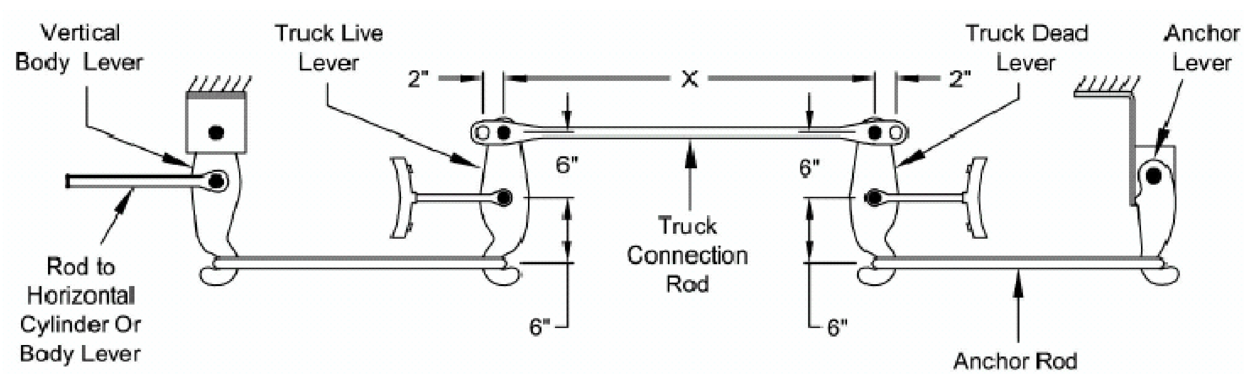
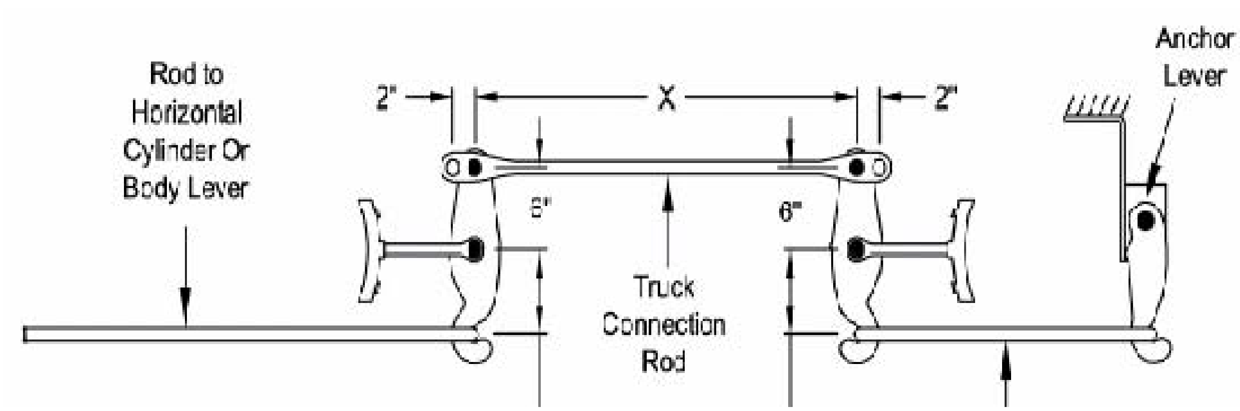


Figure 3: Hook and Eye Brake Arrangement without Vertical Body Lever

Hook and Eye Brake Rigging Fouling Conditions

Brake rods and levers which "foul" or interfere with brake rigging performance can render a brake system ineffective.



The only real observable indications in the field of brake serviceability are piston travel, brake shoe wear, and fouling. Fouling of the brake rigging will reduce brake performance to an unacceptable level. Inspectors should look for signs of ineffective brake shoes when the brakes are applied, brake shoe disorientation, the level of brake rigging wear, and any fouling or binding of the brake rigging.

Hook and Eye Brake Rigging Conditions

A freight car which has been recently built will have brake lever angularity in the positive (+) condition as shown below in **Figure 4**.

Note that all three (3) levers have positive (+) angularity.

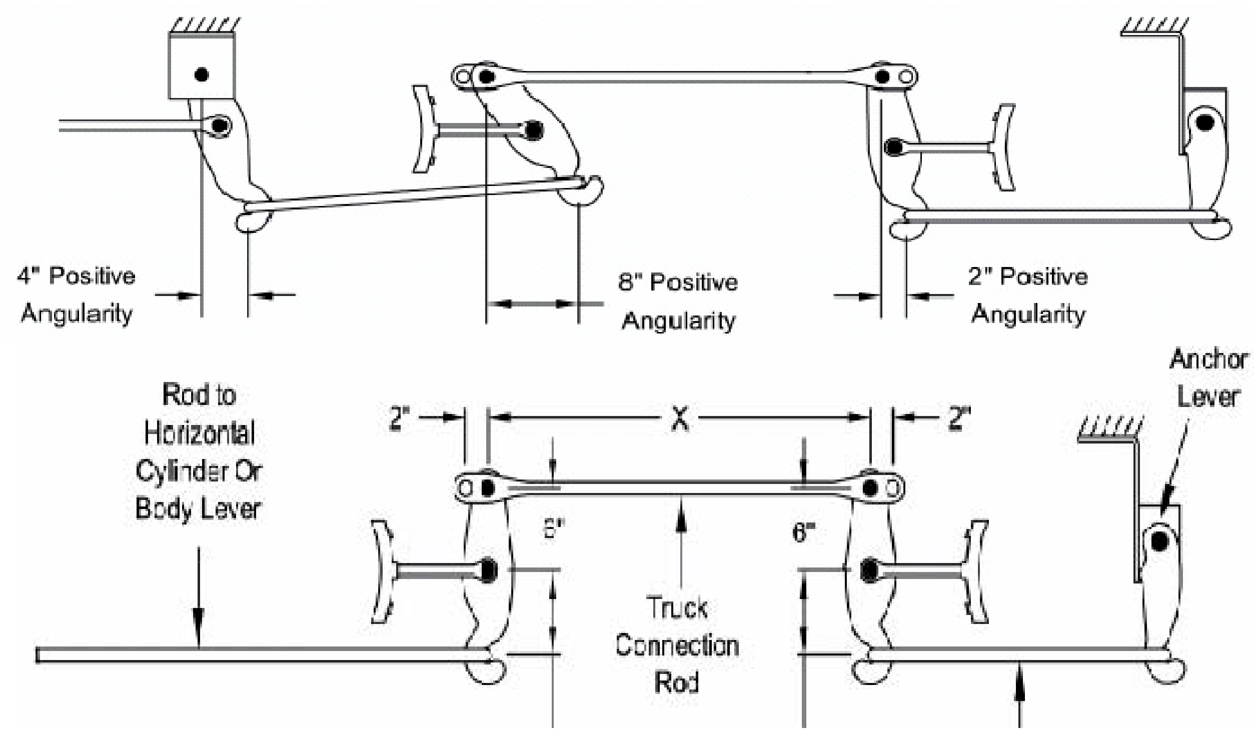


Figure 4: Brake lever angularity in the positive (+) condition

A freight car which has been in service and has a full worn brake rigging condition will have brake levers with a negative (-) angularity (*see* **Figure 5**).

Note that all three (3) levers have negative (-) angularity.

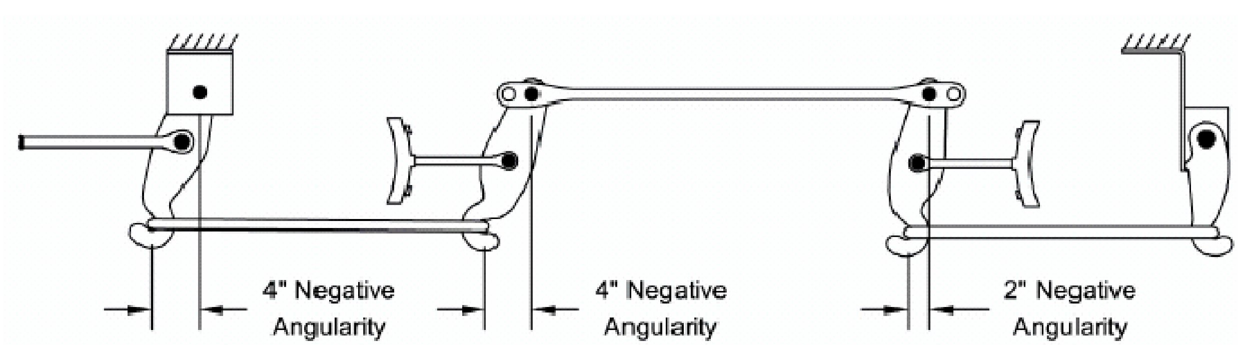


Figure 5: Brake lever angularity in the negative (-) condition

Field Inspection Criteria

Brake rigging is performing as designed and the brakes are in serviceable condition if a freight car has a hook and eye brake rigging arrangement, the brake shoes are serviceable, and the brake rigging is not binding or fouled.

If the rigging is binding or fouled, the Inspector should take a violation with the appropriate activity and violation code. The Inspector should note in the inspection report's comment section any negative condition of brake angularity.

Title 49 CFR § 232.205(c)(1)(i)(D) requires that the individual conducting the leakage test must wait 45 to 60 seconds before noting brake pipe leakage, as indicated by the brake pipe gauge in the locomotive, which shall not exceed 5 psi per minute. When FRA Inspectors are observing this test, they need to make sure that the 45 to 60 second window is followed by the person performing the test.

Title 49 CFR § 232.205(c)(1)(iii) contains the calibration requirements for the air flow indicator. Noncompliance with the required periodic calibration requirements for air flow indicators has been an issue. Noncompliance often results from using the wrong test orifice, testing at the wrong brake pipe or main reservoir pressure, or simply not performing the calibration test.

Air flow indicators used to conduct air flow method (AFM) tests must be tested and calibrated every 92 days, unless participating in the 184-day test waiver.[53] The following information is for FRA inspectors to use when observing railroad personnel qualifying air flow indicators based on manufacturers' instructions:

1. Brake pipe (BP) leakage must be below 2 psi, in order for the air flow indicator to be accurately tested and calibrated.

2. AFM indicators must be tested and calibrated at 90 psi BP pressure, using the correct calibrated orifice. The calibrated orifice must be marked with the 90 psi BP pressure, serial number, and manufacturer's part number. Verify that the correct calibration orifice is being used to perform the test. Since the manufacturers recommend that test orifices should be calibrated annually, inquire about the last calibration date. If it is beyond one year, advise the railroad supervisor in charge that the orifice should be calibrated as recommended by the manufacturer and notify the Regional MP&E Specialist.

    - Currently, there are two (2) calibration orifice products that are available for testing and calibrating AFM indicators at 90 psi BP pressure. They are Wabtec's Model #0650756-0090 and Strato's Model #BOC500-20-70.

    - There is also a calibrated orifice supplied by WABCO, Model #0650756-0100, which is used for BP pressure set at 100 psi. If this orifice is being used for

[53] FRA-2016-0086.

testing and calibration, the feed valve setting must be set at 100 psi and then verify that BP is being maintained at 100 psi.

NOTE: Strato makes six other calibrated orifices that do not comply with current Federal railroad safety regulations. These orifices are designed to be used at temperatures below 20 degrees Fahrenheit, which Federal railroad safety regulations do not allow.

3. To conduct the test, the correct test orifice must be applied to the BP hose glad hand (preferably the front). The angle cock is then opened to allow the BP to exhaust through the orifice.

4. It is very important that the BP pressure be maintained at 90 psi (or 100 psi if using the 100-psi test orifice) during the test. Therefore, it may be necessary to adjust the feed valve setting in order to maintain BP pressure at 90 psi. **NOTE**: The railroad should be testing BP pressure it normally uses for train operations.

5. It is also critical that the main reservoir is capable of obtaining a main reservoir (MR) pressure of 130 psi during the test. To be compliant, the main reservoir must be reduced to below 130 psi, and the test reading taken at 130 psi as the MR pressure rises. It may be necessary to increase engine speed on locomotives that have mechanical driven air compressors, in order to achieve an MR pressure of 130 psi.[54]

6. The air flow indicator must read 60 cubic feet per minute (CFM) and be accurate within ±3 CFM. On mechanical indicators, that is equivalent to the width of the gage pointer.

7. If the air flow indicator is not accurate within ±3 CFM, the indicator must be calibrated. The railroad may elect to perform this function on the locomotive or remove the indicator and send it out for calibration.

As noted in Technical Bulletin MP&E 04-01, when conducting an inspection at a location that performs periodic locomotive maintenance, special attention should be given to the performance of the air flow indicator testing and calibration procedures, and the testing and calibration of locomotive air gauges and displays. Inspectors should verify that the tests are properly performed by randomly checking locomotives released from the shop after undergoing a periodic maintenance inspection. On the random checks, request that the railroad properly perform a retest. If the air flow indicator is not in compliance, appropriate enforcement action should be taken. If a location has a high incidence of non-compliance with air flow indicators or air gauges, immediately notify the Regional MP&E Specialist to determine what additional enforcement action(s) should be taken.

Title 49 CFR § 232.205(d) states that a carman alone will be considered a qualified person if a railroad's collective bargaining agreement (CBA) provides that Carmen are to perform the inspections and tests required by this section. FRA lacks the authority to issue binding

[54] Repair or replacement is appropriate for an air compressor that is unable to maintain 130 psi.

interpretations of CBAs, or to settle a dispute between a railroad and its employees as to which group of its employees is to perform what work. In order for FRA to proceed with enforcement action under this provision, it must rely upon a decision from a duly authorized body interpreting the relevant agreement, specifically identifying the involved location, and adequately resolving all of the interpretative issues necessary for FRA to conclude that the work belongs to a particular group of employees. Without such a binding decision, FRA cannot make a case that the work belongs to one particular craft of workers.

Title 49 CFR § 232.205(e) states that when a Class I test is performed on an entire train, the engineer shall be notified of the successful test. While this notification is often provided in writing, it can be provided via a hand held radio, a mobile telephone, or communication with a train dispatcher, as long as it is provided to the crew prior to the train's departure and a written or electronic record is created and maintained in the cab of the controlling locomotive until the train either reaches destination or another Class I test is performed on the entire train. If a relieving crew takes charge of a train and the information is not available for the oncoming crew, then a violation of the regulation has occurred. Inspectors should apply appropriate enforcement action on a case-by-case basis based on whether this is a systemic or recurring problem. In order for the railroad to advance the train beyond the point where the information is not available to the oncoming crew, the railroad would have to obtain the correct Class I test information (*e.g.*, via fax, telephone, etc.) and provide that information to the crew, or conduct another Class I brake test and provide the crew with the new Class I information. The Class I test inspector must be identified on the Class I test information. FRA will accept a full name, the first initial and last name, or an employee ID number to satisfy this requirement. FRA will not accept just initials or "carmen in north yard" or "foreign line" for this requirement. Inspectors should take appropriate enforcement action when this is discovered. Inspectors should also make sure that the crew does not have a computer print-out that indicates the conductor of that crew as the individual making the Class I test, unless that individual performed the test.

The Class I brake test information is relevant only to the Class I test when it is performed on the entire train. Since the regulation requires the information to remain with the train until it reaches destination or another Class I test is performed on the entire train, the information shall not be altered. If a railroad changes the number of cars on the original slip, Inspectors should take appropriate enforcement action to correct the problem.

A car or solid block of cars picked up at the intermediate location must have had a Class I or Class II brake test performed and not been off-air for more than 24 hours. If only a Class II test was performed on picked up equipment, then the Class I brake test is required at the next suitable forward location. 49 CFR § 232.209(d).

The picked-up equipment brake slip must be kept in the cab of the controlling locomotive in addition to the original slip. Any changes to the train consist may be documented on the original slip, as an addendum, as long as the initial terminal information has been preserved. If the railroad employes electronic documentation format, it must be readily available to the train crew and inspectors.

§ 232.207 Class IA brake tests – 1,000-mile inspection

For Class IA test locations, the most restrictive car or block of cars in the train will determine the location where this test must be performed. For example, if a train departs point A and travels 500 miles to point B where it picks up a previously tested block of cars en route which has traveled 800 miles since its last Class I brake test and the crew does not perform a Class I brake test when entraining the cars, then the entire train must receive a Class IA brake test within 200 miles from point B even though that location is only 700 miles from point A.

Defective equipment may be moved from or past a location where a Class IA brake test is performed, only if all of the requirements contained in 49 CFR § 232.15 have been satisfied. If the location meets the criteria found in 49 CFR § 232.15, the car should not be moved until the repairs are completed.

In order to properly perform a Class IA brake test, both sides of the equipment must be observed sometime during the inspection process similarly as required with a Class I brake test. Title 49 CFR § 232.207(c) requires railroads to designate and maintain a list of locations where Class IA inspections will be performed. This list shall be made available to FRA upon request. If an Inspector needs this information, then the Regional Specialist must be contacted so that a written request can be made to the railroad.

When identifying Class IA test locations, FRA expects to see specific yard locations or mile markers. A railroad cannot just designate a major city, if there are multiple locations in and around the city where the Class IA test can be performed. FRA requires that it be notified at least 30 days in advance of any change to the list of Class IA test locations. FRA realizes that there may be occurrences or emergencies, such as derailments, that make it impossible or unsafe for a train to reach a location that the railroad has designated as a Class IA inspection site. Consequently, 49 CFR § 232.207(c)(2) permits railroads to bypass the 30-day written notification requirement in these instances provided FRA is notified within 24 hours after a designation has been changed. This section also makes clear that failure to perform a Class IA brake test at a designated location will constitute a failure to properly perform the inspection.

§ 232.209 Class II brake tests–intermediate inspection

A Class II brake test is intended to ensure that each added car's brakes apply and release and that the added cars do not compromise the train's brake system integrity. Therefore, a leakage or air flow test must be performed when the cars are added to the train to ensure the integrity of the train's brake system.

Both sides of the equipment must be observed sometime during the inspection process. The brakes shall apply on each car added to the train and remain applied until a release is initiated. A retest is allowed on those cars found with brakes not applied. It should be noted that defective equipment may be moved from or past a location where a Class II brake test is performed only if all of the requirements in 49 CFR § 232.15 have been satisfied.

Title 49 CFR § 232.209(a) contains the requirements relating to the adding of cars or blocks of cars while a train is en route. This paragraph provides that a railroad may elect to perform only a Class II brake test at the time that a car is added to the train en route, but FRA intends to make clear that when this option is elected, the cars or blocks of cars added in this fashion must be given a Class I brake test at the next forward location where facilities are available for providing such attention, pursuant to § 232.209(d), discussed below.

Title 49 CFR § 232.209(b) also requires that the release of the brakes on those cars added to the train and on the rear car of the train be verified and allows railroads to conduct “roll-by” inspections for this purpose.

In lieu of directly observing a brake application and release required under 49 CFR § 232.209(b), 49 CFR § 232.209(c) alternatively permits the locomotive engineer to rely on a rear car gauge or EOT device to confirm the train’s brake pipe pressure. In doing so, the gauge must show the pressure is being reduced and restored by at least 5 psi.

Title 49 CFR § 232.209(d) applies to the inspection of cars or blocks of cars added to a train while a train is en route. This paragraph makes clear that if cars are given a Class II brake test when added to a train, then the cars added must receive a Class I brake test at the next forward location where the facilities are available for performing such an inspection.

§ 232.211 Class III brake tests–trainline continuity inspection

The purpose of a Class III brake test is to ensure the integrity of the trainline when minor changes in the train consist occurs. Basically, a Class III brake test ensures that the train brake pipe is properly delivering air to the rear of the train. This inspection is designed to be performed <u>whenever the continuity of the brake system is broken or interrupted</u>.

When at least one car or locomotive is added to or removed from a train, and assuming a Class I brake test is not required, a Class III test must be performed as prescribed in 49 CFR § 232.211(b). A Class III test cannot be performed until the BP pressure at the rear of the train is at least 60 psi, as indicated by an accurate gauge or end-of-train device, and the engineer applies a 20-psi BP pressure reduction.

When the continuity of the brake pipe is broken or interrupted with the train consist otherwise remaining unchanged, the train may not proceed until the rear car gauge or EOT device shows that the BP pressure has been restored to the rear of the train. In the absence of a rear car gauge or EOT device, and <u>**only**</u> if the train consist—including cars and locomotives—remains unchanged, a visual application and release of the rear car’s brakes may be made.

While a Class III brake test has been completed once “the brake pipe pressure at the rear of the freight train is being restored,” the air flow or gradient requirement of the brake pipe must be met before the train may proceed.[55]

§ 232.213 Extended haul trains

[55] *See* 49 CFR § 232.103(m).

Railroads are permitted to designate trains as extended haul trains, which allows such trains to be operated up to 1,500 miles between brake inspections.

The designation of such trains must be in writing to the Associate Administrator for Railroad Safety (Associate Administrator). The designation must include the originating location and destination of the extended haul portion for each train. As trains are added or deleted, the railroad must submit the revisions to the Associate Administrator. Headquarters will electronically provide to the Regions the updated lists as they are submitted. Once a train is designated as an extended haul train, it must be operated as an extended haul train until the official list is revised and properly submitted to FRA. Except for emergency circumstances defined under 49 CFR § 232.213(a)(8), changes cannot be made on a daily basis by anyone, including a train dispatcher. All changes must be made in writing to the Associate Administrator, as explained above.

Extended haul trains are permitted one pick-up and one set-out en route, unless it has received an additional extended haul inspection. If more than one pick-up or one set-out occurs, the Inspector should submit a violation for each occurrence. Also, a Qualified Mechanical Inspector (QMI) must perform the appropriate inspections of all pick-ups and set-outs.

At no time will FRA penalize a railroad for setting out a defective car during the extended haul train movement. These types of set-outs do not count against the one set-out rule.

As long as a QMI has performed the appropriate inspections, the train crew can add equipment to its train and only have to perform a Class III brake test at that location. The QMI does not have to be at the location to add the equipment to the train.

If a train is operating on two extended haul segments, a QMI must perform another Class I inspection before the train departs on a journey that will not include an intermediate test within the next 1500 miles. Any permissible pick-up or set-out performed would be counted towards the first or second segment depending upon whether it occurred before or after the Class I inspection.

At the termination point of the extended haul portion of the extended haul run, unless this location is the final destination for the run, a Class I inspection of the train must be performed before the train can continue any farther.

§ 232.215 Transfer train brake tests

A “Transfer train” is defined by 49 CFR § 232.5 as a train that travels no more than 20 miles between a point of origin and a point of destination. The definition makes clear a transfer train may pick up or deliver freight equipment while en route to its destination.

Cars may be added to a transfer train while the train is en route, provided a transfer train brake test is performed at the location where the cars are added. The train is limited to a total of 20 miles from its point of origin, not from the location where new cars are added.

It is possible to operate a train for a distance in excess of 20 miles on transfer train brake tests, provided a transfer brake test is performed on the entire train at each 20-mile interval.

While 49 CFR § 232.215 permits that transfer test to be conducted when the brake pipe is charged to 60 psi as indicated by a gauge at the rear of the train, with a 15-psi brake pipe reduction, it is permissible to conduct the test at 90 psi brake pipe pressure. However, if 90 psi is used, FRA expects a 20-psi brake pipe reduction be made.

Any brake application during a transfer train retest should apply the same BP pressure used during the original transfer test. If the transfer test is performed at 60 psi brake pipe pressure, then the retest can be made after the car is charged to 60 psi with a 15-psi reduction. If the transfer test is performed at 90-psi brake pipe pressure, then the retest shall be made at 90 psi with a 20-psi reduction.

§ 232.217 Train brake tests conducted using yard air

When Inspectors encounter a location where the yard air is less than 80 psi, they must ensure the leakage or air flow test is conducted at the proper brake pipe pressure after the locomotives are attached.

While 49 CFR 232.217(d) contains the calibration requirements for yard test devices, it is FRA's intent that only the gauge be tested and calibrated every 92 days (or annually if an electronic gage). Industry devices such as the "Time-O-Test" or individual railroad manufactured devices use a fixed 1/4-inch or 5/16-inch orifice to increase air pressure and a 1/4-inch orifice to reduce brake pipe pressure. FRA does not believe that these orifices need to be calibrated unless there is physical evidence of damage to the device.

§ 232.219 Double-heading and helper service

Although the brake systems on locomotives are required to be inspected on a daily basis, FRA continues to believe that a visual confirmation of the proper operation of a helper locomotive's brakes is needed each time the locomotive is added to a train.

A helper locomotive found with inoperative or ineffective brakes must be repaired prior to use. Otherwise, it must be tagged and taken to the nearest location for repairs.

Title 49 CFR § 232.219(c) requires a Helper Link device or similar technology be designed with a distinctive alarm to notify the engineer of any loss of communication as well as reset capability in the cab of the locomotive available to the locomotive engineer. Such devices must be tested and recalibrated every 365 days and according to the manufacturer's instructions.

Subpart D – Periodic Maintenance and Testing Requirements

Subpart D provides the periodic brake system maintenance and testing requirements for equipment used in freight and other non-passenger trains. Inspectors need to periodically monitor the activities of car repair facilities to better ensure compliance. This monitoring includes ensuring that single car tests are being properly performed on cars that require such tests and that the daily and periodic testing is being performed on the single car test devices.

§ 232.303 General requirements

Title 49 CFR § 232.303(e) contains the provisions permitting cars to be moved from a location where necessary repairs are made to a location where a single car or repair track air brake test can be performed, if the air brake test cannot be performed at the location where the repairs are conducted. FRA disagrees with the assertions of many railroads that air brake repairs should not be required at locations that lack the ability to perform single car or repair track air brake tests. Therefore, inability to perform an air brake test does not constitute an inability to make the necessary repairs.

§ 232.305 Single car air brake tests

Pursuant to 49 CFR § 232.305, single car air brake tests must be performed by a qualified person in accordance with either: Section 3.0, "Tests-Standard Freight Brake Equipment," and Section 4.0, "Special Tests," AAR Standard S-486-18; Section 3.0, "Single-Car Test Requirements," Section 4.0, "Special Tests," and Section 13.0 "4-Pressure Single-Car Test Requirements," AAR Standard S-4027-18; an alternative procedure approved by FRA pursuant to 49 CFR § 232.17; or a modified procedure approved in accordance with the provisions contained in 49 CFR § 232.307.

Title 49 CFR § 232.305(b)(1) requires that a single car test be performed on a car that has its brakes cut-out or inoperative when removed from a train. This means that if the car is properly tagged with an inoperative brake and it is set-out of the train, it must have a single car test. If the railroad removes the car from the train with the brakes cut-out (with or without a defect tag), and the Inspector observes this, a single car test would have to be performed on that car. However, if the Inspector finds a car in a yard or siding with the brakes cut-out, the burden of proof is on the Inspector to establish whether the car was set out of a train with the brakes cut-out, or some yard crew cut the brakes out as they were switching the car in a yard. The Inspector cannot assume the brakes were cut out when the car was set out of the train. A defect tag or witness statement would suffice as evidence.

Title 49 CFR § 232.305(b)(5) identifies the various wheel defects that trigger a single car test on the car. This requirement applies when the railroad removes the wheel from the car for the defective wheel condition. This is especially important for the built-up tread condition, as there are no Federal regulations addressing built-up tread. The "why-made" code on the AAR billing record would have to be used for any enforcement action regarding non-compliance with performing a single car test for a built-up tread condition.

Title 49 CFR § 232.305(e) requires performance of a single car air brake test before any new or rebuilt car is placed into service. Inspectors should periodically monitor this activity at car manufacturing plants.

According to AAR Standard S-486, incorporated by reference under § 232.305(f)(1)(i), the piston travel must be checked when a car is on a shop or repair track. The limits for the piston travel range on cars equipped with 12-inch stroke (eight and one-half (8½) or ten (10) inch diameter) brake cylinders is six (6) to nine (9) inches. If piston travel is found to be less than six (6) inches or more than nine (9) inches when testing the brakes on the shop or repair track, the piston travel shall be adjusted to nominally 7½ inches.

Furthermore, each manual single car air brake test must comply with the relevant AAR Standard, as required by 49 CFR § 232.305(a). For instance, sections 4.6.1 through 4.6.5 of tAAR Standard S-486 require the car's empty/load valve be tested if so equipped, irrespective of whether the valve has been changed. This test is <u>not</u> required if the car is loaded, since the test can only be performed when the car is empty.

Inspectors should also ensure that, before releasing a car from a repair track, a qualified person complies with 49 CFR § 232.303(e) as it relates to the proper conditioning of the brake pipe, angle cocks, valves, reservoirs, and cylinders. The qualified person must also test and inspect each hand brake and ensure accuracy of any brake indicators. If an indicator is broken or unreadable, FRA expects corrections to take place while the car is on the shop or repair track.

§ 232.309 Equipment and devices used to perform single car air brake tests

Title 49 CFR § 232.309(b) states that mechanical test devices (e.g., pressure gauges, flow meters, orifices, etc.) shall be calibrated once every 92 days. Title 49 CFR § 232.309(d) requires that the test equipment and single car test devices placed in service shall be tagged or labeled with the date its next calibration is due. A tag or label can be affixed to a single car test device and a brake cylinder test gauge, but it is difficult to tag or label a test coupling. If the test coupling and single car test device are chained together, calibrated per S-486 by the same facility, and are inscribed with the same, unique identifying mark or number, FRA would consider them a single "unit" for the purposes of tagging or labeling.

<u>Subpart E - End-of-Train Devices</u>

Subpart E governs the maintenance and use of EOT devices. The information below is largely from Technical Bulletin MP&E 98-63, *Two-Way End-of-Train Device Questions and Answers*, and is provided in a question-answer format. Additional supplemental information has been added to provide clarity.

When does the EOT device have to be armed?

The EOT device must be armed and operable from the time the train departs the point of installation, until the train reaches destination. According to 49 CFR § 232.407(f), if communication cannot be established at the location where the device is installed, the train may move up to one mile from that location at restricted speed, in order to establish communication. If communication is not re-established within the one-mile movement, the train must be stopped.

For the train to continue, either the EOT device must be repaired or replaced with communication established, or the railroad must issue train orders restricting that train from exceeding 30 mph for the entire trip, provided the train does not traverse any defined heavy grade. If communication is established, the train must be stopped and the appropriate inspection and testing requirements of 49 CFR § 232.409(a) through (c) must be satisfactorily performed before the train can continue.

What tests must be performed at the point of installation?

It must be understood that installation includes both the front and rear device. When either of these devices is installed and before the train departs, the following must be performed:

1. It must be determined that the identification code entered into the front unit is identical to the unique code of the rear unit. 49 CFR § 232.409(a).

2. It must be determined that the quantitative value for brake pipe pressure displayed on the front unit is within 3 pounds per square inch of the reading displayed from either the rear EOT unit or a properly calibrated air gauge at the rear of the train. This reading must be compared after the train is charged. 49 CFR § 232.409(b).

3. A test must be made to ensure the device is capable of initiating an emergency power brake application from the rear of the train. 49 CFR § 232.409(c).

What is the test procedure to ensure the device is capable of initiating an emergency power brake application from the rear of the train?

There are currently four acceptable methods of performing an emergency brake application test. The first three methods require attaching the rear-of-train device to the last car of the train, establishing brake pipe pressure, and arming the device.

1. Method No. 1: Transmit an emergency brake application signal by applying the front unit manual switch from the controlling locomotive , causing the rear of the train to dump the whole train into emergency.

2. Method No. 2: Close the angle cock on the last or second-to-the-last car of the train and then have the front unit manual switch of the controlling locomotive transmit an emergency brake application signal. Under this method, only the last one or two cars of the train will effectuate an emergency brake application.

3. Method No. 3: Manually close the angle cock between the EOT device and the last car. Then have the front unit manual switch of the controlling locomotive transmit an emergency brake application, so that an individual at the rear of the train can determine whether the emergency valve functions properly by either observing the emergency

indicator pop out or observing the brake pipe pressure at the EOT device go to zero while hearing the exhaust of air from the device. It is important to ensure the brake pipe pressure drops to zero instantly.

4. Method No. 4: Perform a bench test of the device (front and rear) within a reasonable time period prior to the device being armed and placed on the train.

Can anyone perform these tests?

The EOT device regulations do not establish a specific requirement concerning who may perform the necessary tests. However, according to 49 CFR § 232.409(c), if anyone other than a crew member performs these tests, the locomotive engineer has to be informed that the test (both front and rear device) was successfully performed. This can be by any means determined by the railroad to be appropriate. However, from the point of installation, a written or electronic record of the notification has to be maintained in the cab of the controlling locomotive for the engineer. The notification must include the location, date, and time the test was performed, and the name of the individual(s) who performed the test. If one individual tested the front device and another individual tested the rear device, the notification would have to include information for the two separate tests. This written information is not required at subsequent crew change points.

Would these tests apply to a train using a distributive power unit (DPU) at the rear of the train?

No. This type of train is excepted from the two-way EOT device requirements, provided the train has a locomotive located at the rear of the train, capable of making an emergency brake application through a command effected by radio telemetry, or by a crew member in radio contact with the lead (controlling) locomotive.

What is a bench test?

The purpose of this particular test is to ensure that the front unit will transmit an emergency brake application signal to the rear device and that the rear device is capable of initiating an emergency brake application from the rear of the train, as required by 49 CFR § 232.405(a). The bench test has to consist of testing both the front and rear units (devices) that will be used on the train. They can be tested independently of each other, as long as the test is performed at the location where the device will be installed on the train.

Testing the rear unit requires applying air pressure to the device and then transmitting an emergency brake application from a front unit using the front unit manual switch. The individual performing the test would determine that the emergency valve functions properly by either observing the emergency indicator pop out or by observing the brake pipe pressure displayed on the gauge on the rear device go to zero and hearing the exhaust of air from the device. The front unit that will be used on the controlling locomotive of a train would be tested by transmitting an emergency brake application from the device using the front unit manual switch, and a rear device would have to successfully receive the signal and activate the emergency air valve.

Both tests must be performed within a reasonable time period prior to the device being armed and placed on the train.

What is a reasonable time period?

A reasonable time period must be determined on a case-by-case basis, based on the factual situation at a specific location, as there are numerous factors that impact the notion of "reasonable." The following discussion is intended as general information for Inspectors to consider in determining whether a bench test at a particular location was conducted within a reasonable time of EOT device installation on a train. This discussion is not intended to create or establish any strict time requirements. The following factors should be considered:

- The environment where the device is tested and stored:
  - Free from weather elements?
  - Free from excessive dust?
  - Free from dirt and grease?
  - Accessible to possible tampering?
- Physical treatment of the device after a successful bench test.
- Railroad's tracking and monitoring of devices after testing.
- Use of the locomotive after the testing of the front unit.
- Past effectiveness of bench testing procedures at the particular location.

For example, if the devices are tested and stored in a controlled environment free from weather elements, excessive dust, grease, and dirt, then a reasonable amount of time between the testing and installation of the device might be 8 hours or more. Whereas, in circumstances where the devices are haphazardly thrown into a corner of a shop or are placed in the rear of a truck to be bounced around a yard after being tested, then a reasonable amount of time may be one hour or less. Furthermore, the effectiveness of a railroad's bench testing procedures should always be considered in determining what constitutes a reasonable time period. Consequently, Inspectors should provide detailed evidence and fully describe a railroad's bench testing procedures in order to support any determination that the time period between the bench test and installation of a device on a train was not reasonable.

Can devices be bench tested and taken to other locations for application?

No, because 49 CFR § 232.409(c) requires the device shall be tested at the initial terminal or other point of installation. This requires that such EOT device tests be performed at the location or yard where it will be installed on the train.

What are the testing requirements if locomotive power is changed, and a different front unit is used?

At the point of installation, whether it is the front or rear device, all testing requirements apply. If the locomotive power is changed and a new front device is installed on the train, all testing requirements apply. If the front device is replaced with a device from a trailing locomotive, all testing requirements apply since this is a new installation of the front device.

What about the calibration requirements?

In accordance with 49 CFR § 232.409(d), both the front and rear units must be tested for accuracy and calibrated if necessary according to the manufacturer's specifications and procedures. If the manufacturer's specifications requires periodic calibration of the telemetry equipment, the date and location of the last calibration or test, and the name or unique employee identifier of the person performing the calibration or test must be legibly displayed on a weather-resistant sticker affixed to the outside of both the front unit and the rear unit. However, if the front unit is an integral part of the locomotive or is inaccessible, then the information may be recorded on Form FRA F6180-49A instead, provided that the serial number of the unit is recorded. The sticker information must be accessible to both FRA Inspectors and train crew members. Therefore, it cannot be locked in cabinets, out of view.

Are railroads required to keep spare batteries at specific locations?

No. It is within the railroad's discretion to determine when and where batteries will be kept and charged. There are sufficient incentives for railroads to ensure that the batteries are sufficiently charged at all times because of the speed restrictions imposed on trains that develop failures en route, and strict liability for failure of the batteries en route. If an Inspector can determine that a battery failed en route, submission of a violation should be strongly considered.

What actions have to be taken when the device develops a failure en route?

If the device develops a failure en route, the maximum authorized speed of the train must be restricted to 30 mph. In addition to observing the 30-mph speed restriction, the train is not permitted to operate over a section of track with an average grade of two percent or greater over a distance of two continuous miles, unless the conditions contained at 49 CFR § 232.407(g) are met.

On some units, front-to-rear and rear-to-front communications failures are displayed. Are both of these failures considered to be an en route failure?

Since the intent of the rule is to have the capability of initiating an emergency brake application at the rear of the train, only the front-to-rear communication failure is considered an en route failure. The rear-to-front communication failure does not affect the ability of the device to initiate the emergency from the rear of the train. If the engineer is unable to determine if the communications failure is front-rear or rear-front, then any communications failure must be considered an en route failure, and corrective action must be taken.

Is an intermittent communication failure considered to be an en route failure?

No, there has to be a continuous loss of communication between the front and rear unit for a period greater than 16 minutes and 30 seconds. However, based on existing designs of the devices currently used, anytime the display indicates a "**comm loss**," the 16 minutes and 30 seconds have elapsed, and the locomotive engineer must comply with the restrictions required for the failure en route requirements.

Can a train proceed over a heavy grade with a defective device?

A train cannot proceed over a heavy grade unless the defective device is replaced with a fully operational device, or one of the following alternative methods is used:

1. An occupied locomotive helper is attached to the rear of the train with the brake pipe connected and tested to ensure brake operation. The helper engineer will initiate and maintain two-way voice radio communication with the engineer on the head end of the train. If communication is lost prior to passing the crest of the grade, the train should be stopped until communication has been restored, if this can be done safely. If communication is lost once the descent has begun, the helper locomotive engineer and the head end engineer will act to stop the train if the train reaches a predetermined rate of speed that indicates a need for emergency braking. The predetermined rate of speed is established by the railroad and should be indicated in the railroad's timetable.

2. An occupied caboose is attached to the end of the train with a tested, functional brake valve capable of initiating an emergency brake application. The occupant of the caboose must establish and maintain radio voice communication with the head-end engineer in the same manner as prescribed for the occupied locomotive helper.

3. A radio-controlled locomotive is located in the rear third of the train and is under continuous control of the head end engineer by means of telemetry, and if the radio-controlled locomotive is capable of initiating an emergency brake application from the lead (controlling) locomotive.

Does this mean the train will have to stop on a grade if a failure occurs?

Whenever a failure occurs en route, the train is prohibited from operating over a section of track with an average grade of two percent or greater over a distance of two continuous miles. If the train develops the failure while traversing the grade, 49 CFR § 232.407(g)(2) allows the engineer to safely continue down the grade or to a specific siding, in accordance with the railroad's operating procedures for bringing the train to a stop at the first available location, rather than bring the train to an immediate stop.

If a helper locomotive is used on the head end of a train, does it have to be linked to the two-way EOT device?

If a locomotive helper is attached to the front of the train to help the train over a grade, it would not have to be linked to the two-way EOT device, *provided* the locomotive that was originally controlling the train is still armed and capable of initiating an emergency brake command to the rear device and two-way voice radio is initiated and maintained by both the helper and original lead locomotive engineers until the move is completed. If communication is lost, each engineer will immediately act to stop the train if the train reaches a predetermined rate of speed that indicates a need for emergency braking. The predetermined rate of speed is established by the railroad and should be indicated in the railroad's timetable. This only applies to the extent necessary for the helper unit to provide power to get the train over the grade.

If a train were to have problems and stalled in a tunnel where communication is lost, and it took longer than 16 minutes and 30 seconds to correct, could the train move out of the tunnel so that communications could be re-established, or is this a communications failure requiring other corrective measures?

If this incident occurred, the train would be allowed to move out of the tunnel. Once out of the tunnel, if communication is not re-established, the train would have to be brought to an immediate stop. Corrective action for a communication failure would have to be taken.

If a train has to be cut because it has insufficient power to get over a hill, what has to be done with regard to the two-way EOT device?

If a train has to be cut because there is insufficient power to pull it over a hill or grade, the device may remain in place on the car at the rear of the train. It does not have to be advanced to the moving section of the train. This only applies to the extent necessary to traverse the grade and only while the train is divided for this procedure.

Can a "local train" that is not equipped with a two-way EOT device operate above 30 mph?

A local train, as defined in 49 CFR § 232.407(a)(3), that does not operate over a section of track with an average grade of 2 percent for 2 continuous miles, can run at authorized track speed without a two-way EOT device. This could be above 30 mph.

Can a "work train" operate above 30 mph if it is not equipped with a two-way EOT device?

A work train, as defined in 49 CFR § 232.407(a)(4), that does not operate over a section of track with an average grade of 2 percent for 2 continuous miles, can run at authorized track speed without a two-way EOT device. This could be above 30 mph.

Can any train be dispatched without a two-way EOT device if it does <u>not</u> exceed 30 mph?

Only if the train will not travel over a heavy grade, as defined in 49 CFR § 232.407(a)(1), or is specifically excepted from the requirements. The list of trains excepted from the requirements is found at 49 CFR § 232.407(e).

If a train is equipped and operating with an electronically controlled pneumatic (ECP) brake system, would an EOT device be required?

Yes, because the currently operating ECP-braked trainsets utilize an overlay system over regular pneumatic brakes. Since these trains can run in either electronic or regular pneumatic mode, a two-way EOT device would have to be on the rear of the train. If the train is all-electronic, the railroad must comply with the ECP-EOT device requirements under 49 CFR § 232.613.

Technical Bulletin (TB) **MP&E 98-62**, **Two-Way End-of-Train Device Flowchart**

All trains operating over the general railroad system have to comply with subpart E, unless a specific waiver or regulatory alternative applies. Inspectors may refer to the following flowchart (*see* **Figure 6)** when applying some of the aforementioned EOT device requirements.

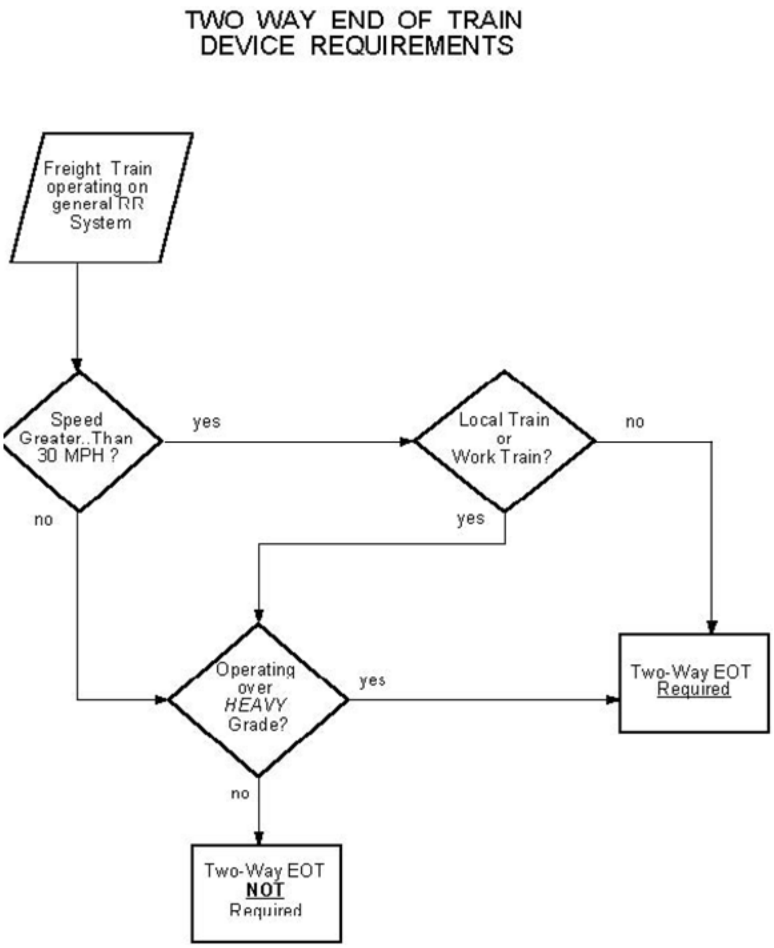


Figure 6: Flow chart to determine two-way end-of-train device requirements

<u>Subpart G – Electronically Controlled Pneumatic (ECP) Braking Systems</u>

Subpart G addresses ECP brake systems on freight trains and is designed to encourage the safe implementation and use of ECP brake system technologies. It contains specific requirements relating to design, interoperability, training, inspection, testing, handling of defective equipment, and periodic maintenance related to ECP brake systems.

The ECP brake system radically improves the operation of the automatic air brake by using electrical transmissions to signal the application and release of brakes on each car in a train while still using the force of the brake shoe against the wheel. ECP brakes also greatly simplify the brake system by eliminating multiple pneumatic valves used by conventional brakes and replacing them with a printed circuit board and microprocessor, one electrically operated application valve, and one electrically operated release valve, with feedback of brake cylinder pressure for control.

ECP brake technology requires adding equipment to locomotives and cars that is unique to the operation of ECP brakes. This system still requires a brake pipe to supply compressed air from the locomotive to each car's reservoir in a train. The similarities between conventional and ECP brakes end there. Instead of using reductions and increases of the brake pipe pressure to convey application and release signals to each car in the train, ECP technology uses electronic signals, resulting in a virtually instantaneous application and release of brakes on each car in the entire train. Since the brake pipe pressure no longer serves as the communication medium in ECP brake equipped trains, the brake pipe is constantly supplied, or charged with compressed air from the locomotive regardless of whether the brakes are applied or released. In addition, ECP brake equipped trains offer graduated release, where a partial brake release command provides a partial and proportional brake release.

The adopted method of transmission of the application and release signals is via a two-wire cable-based system. The electronic components are as follows:

- The Head End Unit (HEU) is the Engineer/ECP system interface that controls the brake application and release signals. On current ECP-braked locomotives, this has been incorporated into the WABTEC and NYAB (*see* **Figure 7**) electronic locomotive systems and displays (*see* **Figure 8**).
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Figure 7: New York Air Brake stand-alone head end unit

Figure 8: Integrated ECP locomotive display

- The Car Control Identification Device (CCID) (*see* **Figure 9**) and Car Control Device (CCD) (*see* **Figure 10**) are the microprocessor-based control units that receive the commands from the locomotive and send status information and faults back to the locomotive. The CCD is an electronic control device that replaces the conventional pneumatic service and emergency portions during electronic braking functions. The CCD acknowledges and interprets the signals from the HEU and sends a warning signal to the locomotive in the event any component fails to appropriately respond to a braking command. Each CCID has a unique electronic address located in the Car ID Module, which is keyed to the car's reporting mark and number including car type and configuration. Wabtec's CCID and manifold are separate components (*see* **Figures 9, 10** and **11**). The NYAB's CCID and manifold are a combined unit (*see* **Figure 12**).

Figure 9: Wabtec's Car Control & Identification Device (CCID)

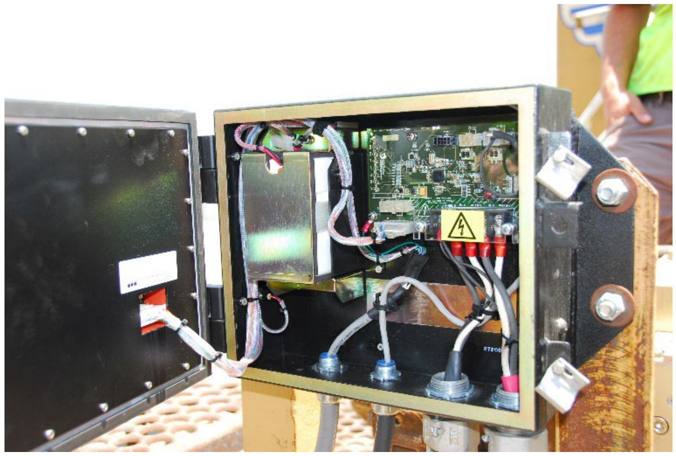

Figure 10: Wabtec's Car Control Identification Device CCID (with cover opened)

Figure 11: Wabtec's separate manifold

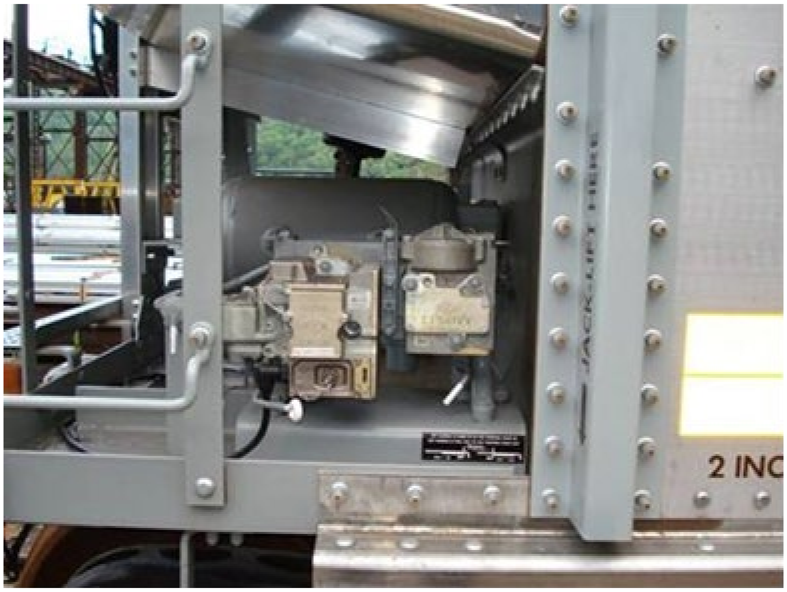

Figure 12: New York Air Brake's combined CCD and manifold

- The locomotive power supply (*see* **Figure 13**) which converts 74 VDC to 230 VDC, or 24 VDC (used for car sequencing), is used to power the HEU and CCDs. Under AAR standards, the single power supply will supply the necessary current and voltage to at least 160 CCDs and an ECP–EOT device.

Figure 13: Locomotive power supply

FRA defines *ECP–EOT device* in 49 CFR § 232.5 as the "end-of-train device for an ECP brake system that is physically the last network node in the train, pneumatically and electrically connected at the end of the train to the train line cable operating with an ECP brake system." Pursuant to 49 CFR § 232.613, the ECP–EOT device shall transmit a status message (EOT

Beacon) at least once per second and contain a means of communicating with the HEU, a brake pipe pressure transducer, and a battery that charges off the train line cable (*see* **Figure 14**).

Figure 14: ECP EOT device

Each car is connected to the locomotive via NYAB plug type connectors (*see* **Figure 15**) and junction boxes. Unlike a normal pneumatic two-way EOT device, an ECP-EOT device typically includes the following characteristics:

1. Is located and guarded to provide sufficient vertical clearance;
2. Does not cause tripping hazard;
3. Does not hang with one end free whenever the equipment is being used in train movements;
4. Is not positioned where it interferes with the use of safety appliances; and
5. Does not have any of the following conditions:
   - Badly chafed or broken insulations;
   - Broken plugs, receptacles, or terminals; or
   - Broken or protruding strands of wire.

Figure 15: Inter-car connectors

§ 232.602 Applicability

Subpart G applies to all railroads that operate a freight car or freight train governed by Part 232 and equipped with an ECP brake system. Unless specifically excepted or modified in subpart G, all of the other requirements contained in Part 232 are applicable to a freight car or freight train equipped with an ECP brake system.

§ 232.605 Training requirements

Inspection, testing, and maintenance. 49 CFR § 232.605(a) provides that any railroad or contractor operating an ECP-brake-equipped freight car or freight train must adopt and comply with a training, qualification, and designation program for its employees that perform inspections, testing, or maintenance of ECP brake systems. The training program required by this section shall meet the requirements under 49 CFR § 232.203(a), (b), (e), and (f).

Operating rules. 49 CFR § 232.605(b) requires a railroad or contractor operating a freight train or freight car equipped with an ECP brake system to amend its operating rules to govern safe train handling procedures related to ECP brake systems and equipment under all operating conditions, which shall be tailored to the specific equipment and territory of the railroad.

Locomotive engineers. 49 CFR § 232.605(c) establishes that a railroad operating a freight train or freight car equipped with an ECP brake system must incorporate safe train handling procedures related to ECP brake systems and equipment into its specific knowledge, skill, and ability criteria under 49 CFR Part 240.

§ 232.607 Inspection and testing requirements

Initial terminal. 49 CFR § 232.607(a) establishes that a freight train operating in ECP brake mode shall receive a Class I brake test as described in 49 CFR § 232.205(c) by a qualified mechanical inspector (QMI) and shall receive a pre-departure freight inspection pursuant to Part 215 by an inspector designated under 49 CFR § 215.11 at its point of origin (initial terminal).

Trains en route. 49 CFR § 232.607(b) provides that except for a unit or cycle train, a train operating in ECP brake mode shall not operate a distance that exceeds its destination or 3,500 miles, whichever is less, unless another inspection meeting the requirements of 49 CFR § 232.607(a) is performed on the train. A unit or cycle train operating in ECP brake mode shall receive the inspections required in 49 CFR § 232.607(a) at least every 3,500 miles.

A freight train operating in ECP brake mode shall receive a Class I brake test as described in 49 CFR § 232.205(c) by a qualified person at a location where the train is off air for a period of more than 24 hours, or 80 hours if the train remains inaccessible to the railroad and in an extended-off-air-facility.

Cars added en route. Each car equipped with an ECP brake system that is added to a train operating in ECP brake mode shall receive a Class I brake test as described in 49 CFR § 232.205(c) by a qualified person, unless all of the following are met:

- The car has received a Class I brake test by a QMI within the last 3,500 miles.
- Information identified in 49 CFR § 232.205(e) relating to the performance of the previously received Class I brake test is provided to the train crew.
- The car has not been off air for more than 24 hours; and
- A visual inspection of the car's brake systems is conducted to ensure that the brake equipment is intact and properly secured. This may be accomplished as part of the inspection required under 49 CFR § 215.13 and may be conducted while the car is off air.

Each car and each solid block of cars not equipped with an ECP brake system that is added to a train operating in ECP brake mode shall receive a visual inspection to ensure it is properly placed in the train and safe to operate and shall be moved and tagged in accordance with the provisions contained in 49 CFR § 232.15.

Class III brake tests. A freight train operating in ECP brake mode shall receive a Class III brake test as described in 49 CFR § 232.211(b), (c), and (d) at the location where the configuration of the train is changed, including:

- Where a locomotive or caboose is changed.
- Where a car or solid block of cars is added to the train.
- Where a car or solid block of cars is removed from the train.
- Whenever the continuity of the brake pipe or electrical connections is broken or interrupted with the train consist otherwise remaining unchanged.

Initialization. 49 CFR § 232.607(e) states that a freight train operating in ECP brake mode shall be initialized when the following occurs:

- Class I brake test.
- Class III brake test.
- When the ECP brake system is powered on.

The initialization process shall, at minimum, be in accordance with AAR Standard S-4200 and be performed in the sequential order of the vehicles (freight cars) in the train. Once the ECP brake system is initialized, the train crew must ensure that the total number of cars indicated by the ECP brake system is the same as the total number of cars indicated in the train consist.

Modification to existing brake tests. In lieu of the specific brake pipe service reductions and increases required in subpart C of this Part, an electronic signal that provides an equivalent application and release of the brakes shall be used when conducting any required inspection or test on a freight car or freight train equipped with an ECP brake system and operating in ECP brake mode.

In lieu of the specific minimum piston travel ranges contained in 49 CFR § 232.205(c)(5), the piston travel on freight cars equipped with ECP brake systems shall be within the piston travel limits stenciled or marked on the car or badge plate consistent with the manufacturer's recommended limits, if so stenciled or marked.

Exceptions. A freight car or a freight train shall be exempt from the requirements contained in 49 CFR §§ 232.205(a) and (b), 232.207, 232.209, and 232.211(a) when it is equipped with an ECP brake system and operating in ECP brake mode.

§ 232.609 Handling of defective equipment with ECP brake systems

Title 49 CFR § 232.609(a) requires ninety-five percent (95%) of the cars in a train operating in ECP brake mode to have effective and operative brakes prior to use or departure from the train's initial terminal or any location where a Class I brake test is required to be performed on the entire train by a QMI pursuant to 49 CFR § 232.607.

Title 49 CFR § 232.609(b) provides that a freight car equipped with an ECP brake system that is known to have arrived with ineffective or inoperative brakes at the location of a train's initial terminal or at a location where a Class I brake test is required under 49 CFR § 232.607(b) shall not depart that location with ineffective or inoperative brakes in a train operating in ECP brake mode unless:

- The location does not have the ability to conduct the necessary repairs.
- The car is hauled only for the purpose of repair to the nearest forward location where the necessary repairs can be performed consistent with the information contained in 49 CFR § 232.15(f).
- The car is not being placed for loading or unloading while being moved for repair unless unloading is necessary for the safe repair of the car.
- The car is properly tagged in accordance with 49 CFR § 232.15(b).

Pursuant to 49 CFR § 232.609(c), a freight car equipped with only conventional pneumatic brakes shall not move in a freight train operating in ECP brake mode unless it would otherwise have effective and operative brakes if it were part of a conventional pneumatic brake equipped train or could be moved from the location in defective condition under the provisions contained in 49 CFR § 232.15 and is tagged in accordance with 49 CFR § 232.15(b).

A freight train operating in ECP brake mode shall not move if less than 85% of the cars in the train have operative and effective brakes. However, after experiencing a penalty stop for having less than 85% operative and effective brakes, a freight train operating in ECP brake mode may be moved if all of the following are met:

- The train is visually inspected.
- Appropriate measures are taken to ensure that the train is safely operated to the location where necessary repairs or changes to the consist can be made.
- A qualified person determines that it is safe to move the train.
- The train is moved in ECP brake Switch Mode to the nearest forward location where necessary repairs or changes to the consist can be made.

Under 49 CFR § 232.609(e), a freight car or locomotive equipped with an ECP brake system that is found with inoperative or ineffective brakes for the first time during the performance of a Class I brake test or while en route may be used or hauled without civil penalty liability under this part to its destination, not to exceed 3,500 miles; provided, all applicable provisions of 49 CFR § 232.609 are met and the defective car or locomotive is hauled in a train operating in ECP brake mode.

A freight car equipped with an ECP brake system that is part of a train operating in ECP brake mode that is found with a defective non-brake safety appliance, may be used or hauled without civil penalty under this Part to the nearest forward location where the necessary repairs can be performed consistent with the information contained in 49 CFR § 232.15(f).

A train operating with conventional pneumatic brakes shall not operate with freight cars equipped with stand-alone ECP brake systems unless:

- The train has at least the minimum percentage of operative brakes required by 49 CFR § 232.609(h) when at an initial terminal or required by 49 CFR § 232.609(d) when en route; and
- The stand-alone ECP brake-equipped cars are:
    - Moved for the purpose of delivery to a railroad receiving the equipment or to a location for placement in a train operating in ECP brake mode or being moved for repair to the nearest available location where the necessary repairs can be made in accordance with 49 CFR § 232.15(a)(7) and (f);
    - Tagged in accordance with 49 CFR § 232.15(b); and
    - Placed in the train in accordance with 49 CFR § 232.15(e).

Title 49 CFR § 232.609(h) allows a train equipped and operated with conventional pneumatic brakes to depart an initial terminal with freight cars that are equipped with stand-alone ECP brake systems provided all of the following are met:

- The train has 100% effective and operative brakes on all cars equipped with conventional pneumatic brake systems;
- The train has at least 95% effective and operative brakes when including the freight cars equipped with stand-alone ECP brake systems; and
- The requirements contained in 49 CFR § 232.609(g) are met.

Tagging of defective equipment. A freight car equipped with an ECP brake system that is found with ineffective or inoperative brakes will be considered electronically tagged under 49 CFR § 232.15(b)(1) and (5) if the car is used or hauled in a train operating in ECP brake mode and the ECP brake system meets the following:

- The ECP brake system is able to display information in the cab of the lead locomotive regarding the location and identification of the car with defective brakes;
- The information is stored or downloaded, is secure, and is accessible to FRA and appropriate operating and inspection personnel; and
- An electronic or written record of the stored or downloaded information is retained and maintained in accordance with 49 CFR § 232.15(b)(3).

§ 232.611 Periodic maintenance

Title 49 CFR § 232.611(a) requires, in addition to the maintenance requirements contained in 49 CFR § 232.303(b) through (d), a freight car equipped with an ECP brake system to be inspected before being released from a shop or repair track to ensure the proper and safe condition of the following:

- ECP brake system wiring and brackets;
- ECP brake system electrical connections; and
- Car-mounted ECP brake system components.

§ 232.613 End-of-train (EOT) devices

An ECP–EOT device shall, at a minimum, serve as the final node on the ECP brake circuit, provide a cable terminal circuit, and monitor, confirm, and report train, brake pipe, and train line cable continuity, cable voltage, brake pipe pressure, and the status of the ECP–EOT device battery charge.

A railroad shall not move or use a freight train equipped with an ECP brake system unless that train is equipped with a functioning approved ECP-EOT device complying with 49 CFR § 232.613. The ECP–EOT device must be properly connected to the network and to the train line cable at the end of the train.

Exception. A freight train operating in ECP brake mode is excepted from the end-of-train device requirements contained in Subpart E of this part, provided that it is equipped with an ECP–EOT device complying with 49 CFR § 232.613.

For more information on ECP and out-shopped inspection activity, Inspectors should review MP&E TB 09-02, *New Source/Defect Codes for Electronically Controlled Pneumatic Brake Equipment Inspections and New Inspection Report Requirements on Out-Shopped Locomotives and Cars*.

<u>Subpart H–Tourist, Scenic, Historic, and Excursion Operations Braking Systems</u>

Subpart H is the recodification of former appendix B, which was the capture of Part 232 as it existed prior to May 31, 2001, as subsequently clarified. For ease of continuity and reference, FRA has numerically codified each section as § 232.700 *et seq*., with the last two digits remaining the same (*e.g.*, § 232.12 from former appendix B is § 232.712 in this subpart H). Subpart H remains applicable to tourist, scenic, historic, or excursion railroads on the general system of transportation that have not been required to operate under present Parts 232 or 238. The information below summarizes relevant technical bulletins and adds additional information based on FRA experience and expertise. NOTE: The following Technical Bulletins are also applicable to non-Tourist operations, but use the pre-2001 numbering system in some cases. If in doubt, please contact the MP&E HQ air brake specialist.

MP&E 98-59 Train Brake Inspections

When performing an initial terminal train air brake test under 49 CFR § 232.712(c) through (j), an inspection of the train brakes shall be made to determine that the brakes are applied on each car, the piston travel is correct, brake rigging does not bind or foul, and that all brake equipment is properly secured. The 1,000-mile train air brake test under 49 CFR § 232.712(b) also requires that the brakes apply on each car in response to a 20-pound service brake pipe pressure reduction and that the brake rigging is properly secured and does not bind or foul. For TMX Truck Mounted Brakes, see the Wabtec Indicator at the end of this section.

Although the regulation does not specify the physical actions necessary to conduct a proper inspection, a railroad may fulfill the inspection requirement only when its inspectors position themselves in a way that permits the required observations noted above to be made. Obviously, a railroad inspector can visually inspect only what they are in a position to see. As the vast majority of all freight cars are equipped with air brake equipment (brake cylinders, brake indicators, brake rigging, *etc*.) that cannot be observed when inspections are made from only one side of the car, ***a proper initial terminal or 1,000-mile train airbrake inspection shall be performed by inspecting both sides of every car in the train***.

The following inspection practice would satisfy the regulations. After cars are assembled, a qualified individual, while connecting the air hoses on one side, performs an inspection of the brake equipment to ensure that brake components are properly secured, the brake rigging is not binding or fouling, and that brake shoes are in proper condition. The brake system is then charged, and the air pressure at the rear of the train is checked to ensure it is at the required level. At that point, the brakes are applied, and the qualified individual then performs a brake inspection on the other (second) side of the train to ensure that the brake components and rigging are properly secured and do not bind or foul, and that the brake shoes are against the wheel. During this inspection, the individual will also check for proper piston travel, crossing over the cars to side one if the piston travel cannot be observed from side two. At the conclusion of this inspection, the brakes are then released, and the individual then walks the release of the brakes or observes the brake release as the train rolls by at a low speed. If a roll-by inspection of the brake release is performed, the individual performing the inspection must have some method of communicating with the train crew the results of the inspection. FRA believes that an inspection of the brake components, rigging, and shoes must be conducted on both sides of virtually every car at some time during the inspection process.

A moving utility vehicle may be used in the performance of these inspections. However, these inspections must be made at a speed and in a manner that will permit the qualified person to clearly observe and determine the condition of the air brake equipment and that the piston travel is within limits.

The general criteria for determining when enforcement action is appropriate, and which action to take, are set forth in 49 CFR Part 209, appendix A. A railroad's history of compliance with the relevant set of regulations, especially at the specific location involved, must be considered along with the kind and degree of potential safety hazard a condition poses in light of the immediate factual situation. Where compliance with train air brake testing requirements is poor, and improper inspections or no inspections are being performed, the failure to inspect or improper inspection can—along with the physical defects found on the cars—be strong enforcement candidates. Conversely, if a railroad is complying well with the train air brake testing requirements at a particular location, the one-time failure to conduct a proper inspection at that point is more likely not a condition that poses a significant safety hazard.

Violation reports alleging an improper train air brake test due to the failure to inspect both sides of the train as outlined above must specify precisely how the inspection was improper and include supporting evidence for review. For instance, detailed evidence that the brake equipment on one or more cars in the train—citing the specific component or components—could not be properly observed from only one side of the train.

MP&E 98-45 Interpretation of Initial Terminal Air Brake Tests at Remote Locations

This TB provides guidance to Inspectors regarding the performance of initial terminal air brake tests at remote locations. There appears to be some confusion as to what is required when a railroad performs initial terminal brake tests at these remote locations. Some trains at these remote locations, after receiving an initial terminal brake test pursuant to 49 CFR § 232.712, were departing locations with cars having inoperative or cut-out air brakes.

The regulation requires 100% operative brakes on trains departing initial terminals. FRA does not believe safety would be advanced by allowing something less than this at these remote locations. Therefore, when initial terminal brake tests are performed at these remote locations FRA expects the requirements contained in 49 CFR § 232.712 to be followed. Consequently, if a car is found to have defective or inoperative brakes when the initial test is performed, the car must either be repaired or set out of the train before the train departs.

MP&E 99-01 Clarification for Initial Terminal Road Train Air Brake Tests - Section 232.712(d)(1)

Periodically, FRA receives inquiries concerning the amount of brake pipe reduction required when performing an initial terminal brake test. In 1982, FRA issued a TB stating FRA's policy. The following information from the earlier TB is still in effect and should clear up any misunderstandings regarding this matter. Inspectors should be governed accordingly.

> In recognition of the objectives of the train air brake tests, the pressure-maintaining characteristics of the 26L locomotive air brake equipment, the greater sensitivity of modern control valves on freight cars, and good practice with respect to cutting the brake pipe pressure-maintaining feature out and in, an alternative brake pipe reduction sequence will provide an equally acceptable Initial Terminal Air Brake Test when 26L type equipment is utilized.
> A single brake pipe reduction of a minimum of 20 pounds, but not to exceed a full-service reduction, will produce similar results and may be made in place of the specified sequence required in Section 232.12(d)(1) of a 15-pound reduction followed by an increase to full service.

MP&E 00-01 Enforcement Guidance for Inspecting and Testing Brakes on Cars while on Shop or Repair Track[56]

The following was developed to alleviate confusion over the testing and repairing requirements of brakes on cars that are repaired on a shop or repair track. Particularly, when a mobile repair vehicle is involved.

Title 49 CFR § 232.717(a) contains certain inspection and testing requirements of a car's brake system, when a car is on a "shop" or "repair" track. For example, an application and release of brakes must be performed, piston travel must be inspected and adjusted (if necessary), and certain brake system components must be inspected to ensure they are properly positioned and secured. In addition, such cars must receive periodic attention in accordance with the requirements of the currently effective AAR code of rules for cars in interchange. AAR rules require that any car on a shop or repair track receive a repair track air brake test if such attention has not been provided to the car within the previous twelve months.

The current regulation does not define what constitutes a shop or repair track. Although the Field Manual of the AAR Interchange Rules contains a definition of a shop or repair track, FRA believes that AAR's definition is too narrow and does not adequately delineate what constitutes a repair track for the purposes of 49 CFR § 232.717(a). FRA believes the definition fails to adequately consider locations where mobile repair vehicles serve in the same capacity as a fixed repair facility and locations where railroads designate tracks as "expedite" or "light repair" tracks for the purpose of performing minor repairs.

In 1994, FRA provided guidance in TB MP&E 94-18 that only light or minor repairs are to be conducted on tracks designated as "expedite" or "light repair" tracks. Currently, FRA does not require railroads to perform air brake related inspections and tests, pursuant to 49 CFR § 232.717(a), on cars receiving minor repairs (i.e., straighten safety appliances, replace handholds, replace air hoses, adjust lading, replace coupler knuckle pin, knuckles, *etc*.), provided the repair work is performed on tracks located outside of a repair shop area. Nor does FRA require the performance of these inspections and tests on a car if a mobile repair vehicle is sent to a remote location to make necessary repairs to the equipment.

However, at locations where a railroad has designated specific tracks to perform repairs on a regular and consistent basis, and when the repairs conducted on those tracks include <u>major</u> repair work (*i.e.*, wheel change, coupler replacement, draft gear repair, repairs requiring an air jack, *etc*.), FRA considers those tracks to be repair tracks for the purposes of 49 CFR § 232.717(a). This includes locations where mobile repair vehicles have replaced a fixed repair facility or serve in the same capacity as a fixed repair facility. FRA believes it is both illogical and inconsistent with the intent and meaning of the existing regulations to exempt tracks at locations where repairs of all types are <u>regularly</u> and <u>consistently</u> performed, from being considered repair tracks merely because they are serviced by a mobile repair vehicle. Furthermore, it would be inconsistent with previous guidance provided by FRA to allow major repair work to be performed on the "expedite" or "light repair" tracks, merely because the repairs are performed by a mobile repair vehicle. It should be stressed that FRA does not intend to prevent a railroad from

[56] This guidance is also applicable to 49 CFR § 232.303.

designating certain tracks for conducting minor repairs and certain tracks for conducting major repairs at the same location.

Consequently, FRA considers the provisions of 49 CFR § 232.717(a) applicable to fixed repair facilities and any location where repairs of all types are regularly and consistently performed, regardless of whether a mobile repair vehicle is used to conduct the repairs. FRA does not consider tracks that are designated only for minor repairs to be a repair track pursuant to 49 CFR § 232.717(a), provided such track is used only to conduct minor repairs. However, if a major repair is performed on a car located on a track designated for minor repairs, then the car is subject to the provisions of 49 CFR § 232.717(a) before it can be placed in service.

MP&E 98-46 Handling of Defective Cars at Intermediate Inspection Locations

This technical bulletin provides guidance to Inspectors when considering enforcement action for the improper handling of cars found with inoperative or cut-out air brakes at locations where intermediate air brake inspections are performed. FRA is concerned that some railroads are moving cars found with inoperative or cut-out air brakes during intermediate brake inspections from that inspection location, when repairs of those cars could possibly have been made at that location. Therefore, FRA feels that some general guidelines should be provided to Inspectors in the field to aid them in determining whether the location is a place where the repairs could be effectuated.

The statutory provisions contained in 49 U.S.C. § 20303 (previously 45 U.S.C. § 13) governs the movement of equipment with defective power brakes. This only allows the railroad to move the defective equipment from the place where the defect is first discovered to the nearest location where the necessary repairs can be made. This movement can either be on the railroad where first discovered or at the option of the connecting railroad, on the line of the connecting railroad if the move is no farther than the location where the defect was first discovered. Thus, in order to properly move a car for repairs, the railroad must know the defect exists. Although regulations provide for tagging requirements in 2004, there are currently no tagging requirements for power brake defects. At interchange, a railroad can refuse to accept a defective car. Until the receiving railroad accepts the car by moving it or otherwise exercising control over it, it is not liable for civil penalties nor is it required to make any repairs. It should be noted, however, that the delivering railroad remains liable for each defective car it receives in interchange.

The statutory provision contained in 49 U.S.C. § 20303 is an affirmative defense to be established by the railroad. There are seven elements which must be established:

- The car was properly equipped with power brakes.
- The car became defective while being used by railroad on its line.
- The railroad discovered the defect prior to movement.
- The movement was from the place where the defect was first discovered.
- Repairs could not be made at the location where the defect was first discovered.
- Movement was necessary to make the necessary repairs.
- The car moved only to the nearest available point where the necessary repairs could be made.

Title 49 CFR § 232.15(f) contains guidelines to be considered by FRA Inspectors and railroads in determining what constitutes the nearest location where necessary repairs can be performed. The guidelines are equally applicable to determining such locations for all safety appliance defects. The guidelines must be applied on a case-by-case basis to determine if the railroad acted in good faith in moving defect equipment. The following locations should be considered when applying the guidelines discussed in detail below:

- Locations where a mobile repair truck is used on regular basis;
- Locations where a mobile repair truck originates or is permanently stationed;
- Locations with an operative repair track or repair shop; and
- Locations where the railroad performs mechanical repairs other than power brake repairs.

When determining whether a location, noted above, is capable of making a particular repair, the Inspector must consider the:

- Accessibility of the location to persons responsible for making repairs;
- Presence of hazardous conditions that affect the ability to safely make repairs of the type needed at the location;
- Nature of the repair necessary to bring the car into compliance;
- Need for railroads to have in place an effective means to ensure the safe and timely repair of equipment; and
- Relevant weather conditions at the location that affect accessibility or create hazardous conditions.

In making such a decision, the Inspector should <u>not</u> consider whether the location:

- Can effectuate every type of safety appliance repair;
- Is staffed continuously;
- Can perform a single car test; and
- Exhibits any work congestion.

In addition to considering the factors noted above, the following factors must be considered in determining whether the location is the nearest location where the necessary repairs can be made:

- Distance to the location;
- Employee safety; and
- Intermediate safety hazards.

If the location where an intermediate inspection is performed is not a location where the necessary repairs can be made, then the car may be moved for repair in accordance with 49 U.S.C. § 20303.

MP&E 98-06 Bottom Rod Safety Support

"Bottom rod safety supports" are only required on those cars that have the bottom rod or handbrake bottom rod below the bolster. There are normally three types of bottom rod safety supports in use. The most common is the heavy wire type (Creco) that fits over the brake beam, with underslung loops to cradle the bottom rod should it become disengaged from the rest of the rigging. The handbrake bottom rod used with the brake beam mounted cylinder generally has a loop or strip attached to each side of the truck bolster. This allows the handbrake to operate freely and acts as a safety guard. There is an older type that can be attached to the spring plank and a newer cable type.

MP&E 98-08 Air Brake System - Reservoir Connecting Pipes

Inspectors have detected freight cars in-service with incorrectly applied reservoir connecting pipes. The reservoir's auxiliary portion was connected to the brake valve's emergency portion and the reservoir's emergency portion was connected to the brake valve's service portion. Inspectors should be alert to this condition and take appropriate action when detected.

MP&E 98-11 Testing of Handbrakes on Locomotives Equipped with an Air Release Valve

On some locomotives, the application of the handbrake actuates a neighboring brake cylinder's air release valve to ensure the piston does not interfere with the cylinder body. When the release valve is functioning properly, it will relieve the pressure and allow the piston to retract so that the application of the handbrake will force the cylinder body toward the wheel. If the release valve does not function as intended, and the handbrake is applied with the piston extended, the locomotive will not have any holding brakes when the air leaks off. FRA has been advised that there have been incidents of roll-away locomotives because of the failure of this release valve. In many cases, employees have applied the handbrake and shut down locomotives, only to discover later that the handbrake was not applied after the air leaked off.

All Inspectors are reminded that they are not to involve themselves in the manipulation of any apparatus that may cause or allow an adverse condition in any way. Testing for the above-described condition must be done only by carrier personnel.

MP&E 98-15 Conditional Use of Air Flow Method for Train Air Brake Qualifications as an Alternative to the Leakage Test for Trains

The following conditions apply to the use of the AFM for train air brake qualifications:

1. Each controlling locomotive on a train qualified by the AFM shall be provided with an operational air flow indicator.

2. Participating railroads shall provide an operational EOT device (*see* 49 CFR §§ 232.19 - 232.25) on all trains except transfer and yard trains with movements not exceeding 20 miles.

3. The AFM will apply only to trains using locomotives that are equipped with an air flow indicator that conforms with FRA's conditions, AAR specifications and calibration procedures, and 26-L freight locomotive air brake equipment.

4. When the AFM is used for train air brake qualifications, the air brake system shall be charged within 15 psi of the highest locomotive feed valve pressure used by that railroad and air flow shall not exceed 60 cubic feet per minute (CFM).

5. The air flow indicator must be calibrated for accuracy at periodic intervals not to exceed 92 days.

6. The air flow indicator shall be clearly visible and legible in daylight and darkness from the engineer's normal operating position.

7. The air flow indicator gauge shall be clearly and uniformly marked to indicate direct reading of air flow in 10 CFM increments from at least 10 CFM to 80 CFM, with numerals indicating, at a minimum of 20, 40, 60, and 80 CFM for continuous monitoring of the air flow into the brake pipe.

8. The air flow indicator calibration test orifices shall be calibrated at temperatures of not less than 20-degrees Fahrenheit.

9. When a train qualified by the AFM is in operation and experiences an increase in brake pipe air flow or an increase in brake pipe gradient and the movable pointer does not return to the limits established in the initial terminal train air brake test within a reasonable time, the train crew shall stop the train for inspection and repair leaks, if detected. If unable to make repairs the crew should arrange to set out defective cars or proceed with due caution to the next location where corrective action can be taken.

10. All participating railroads shall provide FRA a list of locations where calibrations will be performed and of locations which will be provided with test orifices. Changed, deleted, or additional locations will be reported to FRA within 92 days.

11. All personnel involved with the AFM of testing of train's air brake systems and operating such trains must be given training and be aware of and understand the conditions of the waiver.

MP&E 98-27 Locomotive Handbrakes - Stencil Requirement for Canadian Railroads

Title 49 CFR § 232.710(f)(2) requires that locomotive handbrakes be inspected and repaired as often as service requires with the date suitably stenciled or tagged. Completion of Transport Canada's Cab Form 22 ("yellow card"), Item 8(a), includes this same information and would satisfy FRA's requirement of having "the date suitably stenciled or tagged."

MP&E 98-41 Locomotive Brake Cylinder Pressure

Each locomotive brake cylinder must maintain a minimum pressure in accordance with 49 CFR § 229.55(c) ("The minimum brake cylinder pressure shall be 30 pounds per square inch") and 49 CFR § 232.710(n)(1)(viii) ("Air pressure regulating devices must be adjusted for the following pressures: Self-lapping portion for independent air brake (full application pressure)" at 40-60 pounds).

These regulations were written when cast iron brake shoes were the standard and the brake cylinder relay air valve delivered 100 percent of the control pressure to the brake cylinders. With the advent of the high friction composition brake shoe, various relay valves have been used, depending on whether the rigging was designed for cast iron or composition shoes. To best match the stop distance of cast iron, a two-step relay valve is used for composition shoes. One level is used for the automatic brake where speeds are generally above "switching" speeds and a higher level for the independent brake which is normally used in switching. By tailoring the relay valve to the locomotive, a standard independent brake valve setting can be used universally on a railroad. This setting is usually 45 psi. The resulting brake cylinder pressure may vary 27 psi (with a 60 percent relay) to 72 psi (with a 160 percent relay). The 60 percent relay valves (J-46 or J-64) are normally found on older locomotives which were converted from cast iron shoes with clasp rigging to composition shoes with clasp rigging. FRA considers such locomotives to be in compliance with the regulations.

MP&E 98-55 Brake Hoses on Cars Equipped with 15" End-of-Car Cushioning Units

Some freight cars have undergone modifications that include the installation of a 15" end-of-car cushioning unit that, if not properly installed and maintained, can develop a crimped brake hose condition. Often when the draft system is converted or improperly maintained, brake hose free play can be reduced, thus causing the brake hose to bind in either full buff or full draft positions.

Inspectors must vigilantly monitor signs of brake hose deterioration, especially on cars with modified draft systems. If such conditions are found, immediately report them to the railroad. Also forward these findings to the Regional MP&E Specialist, so data can be collected to determine if a widespread problem exists with a specific series of cars.

MP&E 98-56 Sloan Model 3050-A and 3200-A Angle Cocks

Defective Sloan Model 3050-A and 3200-A Angle Cocks have caused injuries to railroad workers. These injuries occurred when employees turned the angle cock handle past the fully closed position due to a broken mechanical stop. Without this stopping mechanism functioning properly, the handle and ball assembly can violently separate when under train line pressure, causing injury to workers.

FRA contacted the AAR regarding this safety hazard. In response, AAR re-issued instructions for the proper handling and repairing of Sloan Model 3050-A and 3200-A Angle Cocks (Maintenance Advisory, (c-8502) MA-27, dated March 14, 1996).

During routine inspections, all field personnel should be familiar with the AAR's instructions, cognizant to the potential safety hazard, and verify that all angle cocks have an effective body stop for the handle.

Information on Truck Mounted Brakes and Indicators

Information regarding procedures to follow when truck mounted brakes and indicators shown below are not within the limits required for their applicable tests (*e.g.*, Class I, Class IA, yard inspections with brakes applied, repair track).

How to View Piston Travel Indicators on Cars with TMX Truck Mounted Brakes

Cardwell Westinghouse
A Wabtec company

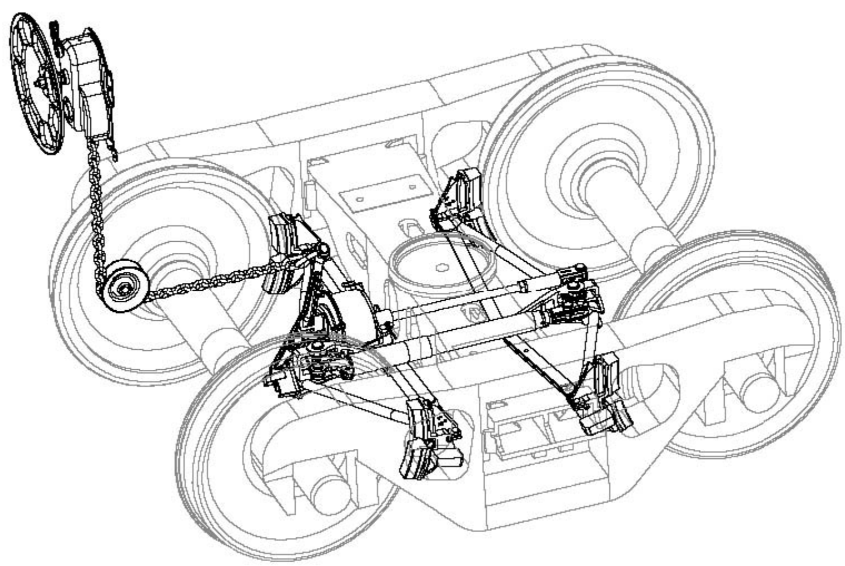

Figure 16: TMX truck mounted brake assembly

TMX Truck Mounted Brake Assembly

As seen in **Figure 16,** the TMX Truck mounted brake assembly is completely independent of the truck bolster and is attached by means of the brake head end paddles into the side frame brake beam guide slots. The brake cylinder is also shown mounted to one of the brake beams towards the center of the truck bolster with the hand brake lever (on trucks connected to the hand brake), cylinder lever, automatic slack adjuster, and return push rod connected to the transfer lever of the second brake beam.

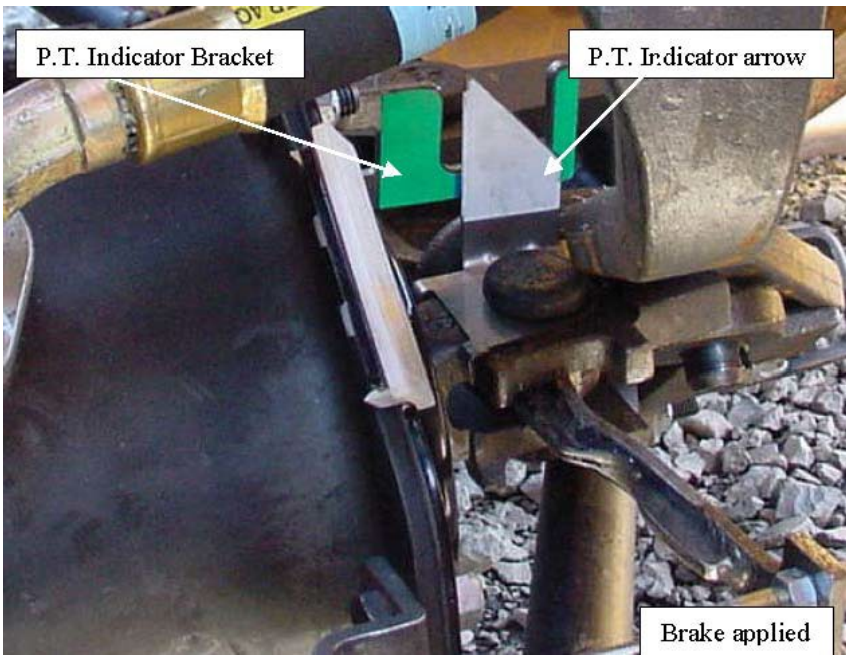

Figure 17: Piston travel indicator arrow is mounted to the piston rod (brake applied)

Figure 17 shows the piston travel indicator arrow mounted to the cylinder piston rod. When brakes are applied, this arrow passes in front of a piston indicator bracket attached to the cylinder non-pressure head. As the piston extends, **Figure 17** illustrates that brakes are applied as indicated by the arrow location between the two vertical edges of the bracket window.

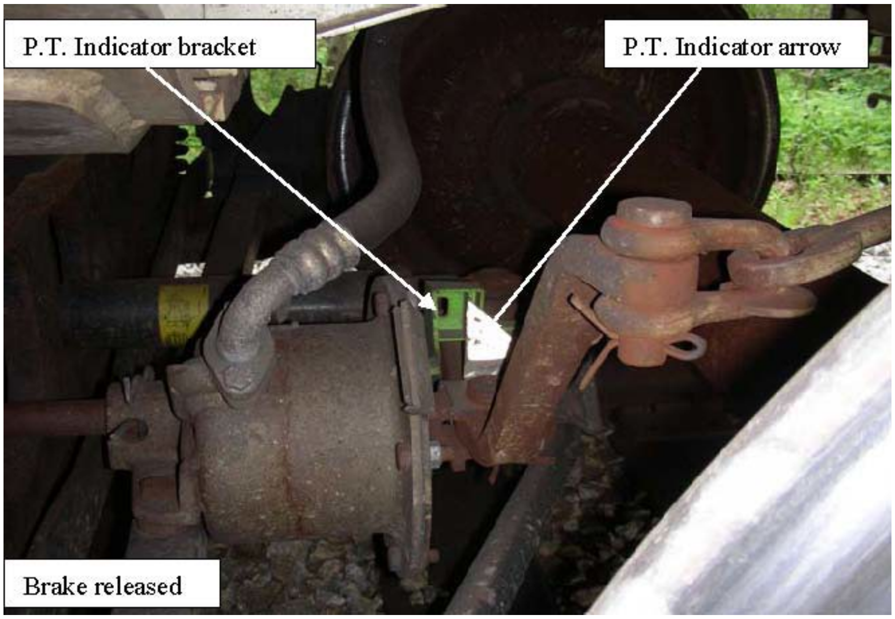

Figure 18: Piston travel indicator arrow (brake is released)

When the brakes are released, this arrow will be located out of the bracket window closer to the cylinder as shown in **Figure 18**.

Figure 19: TMX piston travel indicator inspection

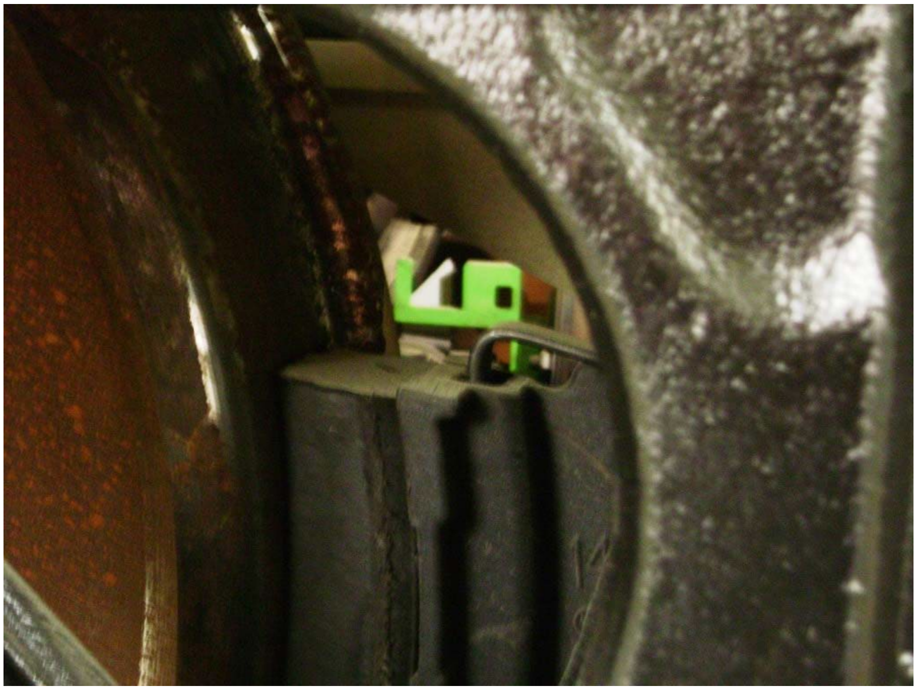

Figure 20: TMX piston travel indicator inspection

TMX piston travel indicators can best be observed by looking through the windows next to the spring nest in the side frame of standard AAR three-piece trucks just over the brake heads ahead of the cylinder and towards the center of the truck. *See* **Figure 19** and **Figure 20.**

Chapter 12 – Passenger Equipment Safety Standards, Part 238

Introduction

The Federal Railroad Administration added Part 238 – Passenger Equipment Safety Standards (PESS) on May 12, 1999 (64 FR 25540), effective July 12, 1999, and issued responses to petitions for reconsideration through final rules published on July 3, 2000, April 23, 2002, and June 25, 2002, (65 FR 41284, 67 FR 19970, and 67 FR 42892, respectively). On October 19, 2006, FRA published a final rule that addressed various mechanical issues relevant to the manufacture, efficient utilization, and safe operation of passenger equipment and trains that had arisen since the issuance of Part 238 (71 FR 61836). Additionally, on February 1, 2008, and January 8, 2010, FRA published final rules further amending Part 238 to enhance and add requirements regarding Passenger Train Emergency Systems (PTES) (73 FR 6370) and enhance requirements for the structural strength of the front end of cab cars and multiple-unit locomotives (75 FR 1180), respectively.

On November 21, 2018 FRA published a final rule amending the passenger equipment safety standards using a performance-based approach to adopt new and modified requirements governing the construction of conventional- and high-speed passenger rail equipment (83 Fed. Reg. 59182). Among other things, the final rule added a new tier of passenger equipment safety standards (Tier III) to facilitate the safe implementation of nationwide, interoperable high-speed passenger rail service at speeds up to 220 mph and established crashworthiness and occupant protection performance requirements in the alternative to those currently specified for Tier I passenger trainsets.

[Reserved for 2nd Tier III rule which is expected to be published in 2026.]

The information contained in this chapter of the compliance manual addresses specific issues or questions raised since the issuance of these rules. For information on a specific provision not covered in this manual, the preamble discussions contained in the publications noted above should be consulted and reviewed, along with any other related chapters in FRA's compliance manuals (*e.g.*, Chapter 15 of the Operating Practices Manual, which includes information regarding the PTES final rule). FRA intends to update this portion of the manual on a regular basis to include new issues concerning any of the PESS provisions.

The following provides information to be used by Federal and State inspectors when conducting inspections of passenger equipment for compliance with Federal railroad safety laws. Although Inspectors have enforcement discretion regarding whether or not to recommend a defect for violation, it is important that agency enforcement policies be adhered to by every inspector when conducting inspections, so that uniformity of enforcement activity can better be achieved.

The procedures provided in both this manual and FRA's General Manual should be observed when assessing the need for appropriate corrective actions regarding noncompliance with the passenger equipment safety standards. It should be noted that there is significant interplay between the provisions contained in this Part and provisions contained in other parts of the Federal railroad safety regulations. These include: the Locomotive Safety Standards (LSS) in

Part 229; the Safety Appliances Standards in Part 231; and the Passenger Train Emergency Preparedness regulations contained in Part 239. When an MP&E Inspector determines that a defect exists on passenger equipment which may not be conducive to safe operation, the inspector must decide if the defect—

- Is a Part 238 defect.
- Should be documented on the F6180.96 - Inspection Report.
- Warrants the issuance of a violation.
- Warrants the issuance of a Special Notice for Repairs under Part 216.
- Should be reported to the railroad as an unsafe condition, not encompassed in the Federal regulations.

The following discussion addresses various issues that have arisen during the implementation of the Passenger Equipment Safety Standards and provides information on the enforcement of those issues.

49 CFR Part 238

Subpart A – General

§ 238.3 Applicability.

The requirements of Part 238 do not apply to tourist, scenic, historic, or excursion operations even if they operate over the general railroad system. Transportation of passengers to a particular destination is not the principal purpose of a tourist or scenic railway. The requirements also do not apply to circus trains.

§ 238.5 Definitions.

For the complete list of definitions, please refer to 49 CFR § 238.5. The following definitions are the most relevant or most often inquired about for purposes of conducting an MP&E inspection:

Actuator means a self-contained brake system component that generates the force to apply the brake shoe or brake pad to the wheel or disc. An actuator typically consists of a cylinder, piston, and piston rod.

The actuator moves as a direct action of the brake piston when applying retarding force or from a load cell that reads brake shoe pressure.

Brake indicator means a device, actuated by brake cylinder pressure, which indicates whether brakes are applied or released.

This device is operated by means other than directly off the piston movement, such as pressure switches located in the brake pipe or low-pressure head.

Calendar day means a time period running from one midnight to the next midnight on a given date.

This is the same as a calendar day inspection required in the Railroad Locomotive Safety Standards. One inspection for each day, or part of a day, the equipment is used in service.

Locomotive, MU means rail rolling equipment self-propelled by any power source and intended to provide transportation for members of the general public; however, this term does not include an MU locomotive propelled by steam power unless it is used to haul an intercity or commuter passenger train.

Unlike the definition in the Railroad Locomotive Safety Standards, MU in this Part includes MU passenger locomotives powered by a number of sources.

Passenger car means rail rolling equipment intended to provide transportation for members of the general public and includes a self-propelled car designed to carry passengers, baggage, mail, or express. This term includes a passenger coach, cab car, and an MU locomotive. In the context of articulated equipment, "passenger car" means that segment of the rail rolling equipment located between two trucks. This term does not include a private car.

Passenger car, as defined, includes MU locomotives. Thus, whenever the term "passenger car" is used, then MU locomotives are included unless expressly excluded. MU locomotives, as well as traditional locomotives, remain under the requirements found in Part 229 with the exception of those items in Part 238 not expressly addressed in Part 229. MU locomotives are required to be inspected by a qualified maintenance person (QMP). Such an inspection may satisfy the requirements for a locomotive daily inspection under Part 229, if it includes all items addressed in that Part. However, a locomotive daily inspection under Part 229 will not satisfy the need for the exterior mechanical inspection required by the Passenger Equipment Safety Standards unless it is performed by a QMP and also covers all components and parts addressed in Part 238. If a traditional locomotive receives a daily inspection under Part 229 by an employee other than a QMP, then those items that are not covered in the Railroad Locomotive Safety Standards (Part 229) but are addressed in the Passenger Equipment Safety Standards (Part 238) must be re-inspected by a QMP (ex: dynamic brake, alerter/deadman pedal).

Power car means a rail vehicle that propels a Tier II passenger train or is the lead vehicle in a Tier II passenger train, or both.

Power cars (whether occupied or unoccupied) are considered to be Passenger Equipment and must comply with the inspection, testing, and maintenance (ITM) requirements in 49 CFR § 238.503. FRA review and approval of the railroad's ITM program is contingent on it meeting or exceeding the requirements of the Locomotive Inspection Act for power cars.

Private Car means rail rolling equipment that is used only for excursion, recreational, or private transportation purposes. A private car is not a passenger car.

Private railroad cars operating in an intercity passenger (e.g., Amtrak, Alaska Railroad) or commuter train are regulated under Part 238 as a type of "passenger equipment.[56]" Private cars are subject to a number of requirements in Part 238, principally to protect the safety of the passenger trains hauling the private cars and the railroad employees handling the cars. These include requirements for daily (49 CFR § 238.303) and periodic (49 CFR § 238.307) exterior mechanical inspections, air brake inspections (49 CFR §§ 238.309 and 238.311), safety appliances (49 CFR § 238.229, referencing Part 231), and suspension system safety (49 CFR § 238.227).

Passenger cars (which, by definition, do not include private cars) are subject to numerous, additional requirements, including requirements for daily interior inspections (49 CFR § 238.305), interior fittings (49 CFR § 238.233), fire safety (49 CFR § 238.103), and emergency lighting (49 CFR § 238.115). Private cars are not directly subject to fire safety requirements or emergency preparedness requirements in Part 239. Nonetheless, passenger railroads that haul private cars need to consider the possible presence of such private cars when they are developing their fire safety analyses and Part 239 emergency preparedness plans.

FRA notes that Amtrak requires a detailed annual inspection of the private cars it operates (Amtrak Form MAP PC-1), as well as a comprehensive running gear inspection and overhaul of all private cars over 40 years old (Amtrak Form MAP PC-2). FRA considers a completed Amtrak MAP PC-1 to meet the requirements for records of periodic maintenance for private cars required in 49 CFR § 238.307.

If a private car is <u>not</u> being operated in an intercity passenger or commuter train, it is still subject to various requirements, depending on the nature of the railroad operation. For instance, a private car operating in a freight train is subject to the air brake maintenance requirements in Appendix B to Part 232 and the safety appliance standards of Part 231 (sill steps, handholds, handrails, uncoupling levers, and handbrake), and/or other statutory requirements in Title 49 of the United States Code. In addition, private cars are generally subject to the safety glazing standards of Part 223, unless the cars are "historical" or more than 50-year old and used only for excursion, educational, recreational purposes, or private transportation purposes (see 49 CFR § 223.3(b)(3)). In addition, certain requirements apply to operation of the cars in an intercity passenger or commuter train subject to Part 238 (see 49 CFR § 223.3(c)).

Private Railcars Regulatory Compliance: Q&A

Must private railcars follow the same regulations as other passenger cars in terms of safety? Do the private railcar owners need to report to FRA, and does FRA ever inspect their equipment/records?

[56] For purposes of Part 238, "passenger equipment" generally includes private cars used to transport passengers. See the definition for "passenger equipment" in 49 CFR § 238.5.

In general, private railroad cars (or *private cars*) operating in Amtrak or commuter trains are regulated under Part 238, as *passenger equipment*, which includes *passenger cars* transporting the general public, locomotives, baggage cars, mail cars, and *private cars*. As such, and as discussed above, *private cars* are subject to the requirements that apply to all *passenger equipment*, including requirements for daily and periodic exterior mechanical inspections, air brake inspections, safety appliances (sill steps, handholds, and handrails), suspension system safety, and wheel inspections—which are all items that if not in compliance with the Federal railroad safety laws could endanger the safety of the passenger train hauling the private car.

Private railcar owners do not have to report railcar maintenance and/or other mechanical-related information to FRA. However, they could be held responsible for a failure to maintain proper records, which is subject to inspection and review by FRA MP&E inspectors. The operating railroads have the primary responsibility for operating compliant equipment in their trains, and that is where FRA's inspectors generally focus their attention. Subsequently, if a railroad has any questions regarding compliance, they often follow up with the owners of the equipment so as to avoid liability from FRA, which helps to better ensure compliance with Federal railroad safety laws.

§ 238.9 Responsibility for compliance.

This section establishes two levels of liability depending on the nature of the defect or inspection for which noncompliance with this Part is being alleged. A strict liability standard is applied to non-conformity with any of the safety appliance and power brake provisions of Part 238, including the inspection provision addressing such components. Title 49 CFR § 238.9(a)(1) makes clear that a railroad may not use, haul, permit to be used or hauled on its line, offer in interchange, or accept in interchange any train or equipment with one or more conditions not in compliance with Part 238's power brake or safety appliance provisions or the involved inspection provisions. A reasonable person standard is applied to all other conditions not in compliance with Part 238, other than the safety appliance and power brake provisions. Title 49 CFR § 238.9(a)(2) makes clear that for other than safety appliance or power brake defects, a railroad may not use, haul, permit to be used or hauled on its line, offer in interchange, or accept in interchange any train or equipment with one or more conditions not in compliance with Part 238 if the railroad has actual knowledge of the facts giving rise to the violation, or a reasonable person acting in the circumstances and exercising reasonable care would have that knowledge.

Strict liability applies to the use or haul of equipment with defective safety appliances. If a piece of passenger equipment is discovered with a defective safety appliance or power brake and it is not being used or hauled pursuant to the statutory provisions contained in 49 U.S.C. § 20303 and the movement of defective equipment provision of 49 CFR § 238.15, appropriate enforcement action must be taken. If a railroad is unaware of the existence of a defective condition, it cannot be considered to be properly hauling the equipment for repairs under either the statute or 49 CFR § 238.15. Knowledge of the defect need not be established. Inspectors are expected to use sound judgment together with the information outlined in the General Manual and Chapter 3 of this manual when deciding whether recommending the issuance of a violation report is appropriate.

The reasonable person liability standard is a somewhat lower standard of liability than the strict liability standard noted above. Under this standard a railroad subject to this Part is liable only if it knew, had noticed, or should have known of the existence of either a defective condition on the equipment or the failure to inspect and test the equipment as prescribed in this Part. Thus, when seeking a violation of a requirement or provision, other than a safety appliance or power brake requirement, FRA must establish that the railroad had actual knowledge of the condition or a reasonable person exercising reasonable care would have such knowledge. Consequently, a violation report must discuss the inspector's basis for finding that the railroad knew or reasonably should have known of the presence of the defective condition. Inspectors should be as specific as possible when detailing this information.

Title 49 CFR § 238.9(b) limits when FRA considers passenger equipment subject to potential civil penalties under Part 238. This paragraph is not intended to establish or explain all parameters for determining when passenger equipment or other vehicles are in use under the Safety Appliance Act (SAA),[57] other laws, or the extent of authority provided by the Federal Railroad Safety Act of 1970,[58] but makes clear FRA is not required to wait for non-compliant equipment to depart or engage in an actual "haul" to assess a civil penalty violation. Generally, as a matter of policy, violation recommendations under Part 238 are only appropriate when any passenger equipment or train is used, hauled, permitted to be used or hauled on the railroad's line, offered in interchange, or accepted in interchange, while in service.[59]

Title 49 CFR § 238.9(c) clarifies FRA's position that the requirements of this part are applicable not only to any railroad subject to the Part but also to any person, as defined in 49 CFR § 238.5, that performs any function required by Part 238. Although various sections of the regulation address the duties of a railroad, FRA intends that any person who performs any action on behalf of a railroad or any person who performs any action covered by the rule is required to perform that action in the same manner as required of a railroad or be potentially subject to FRA enforcement action.

§ 238.15 Movement of passenger equipment with power brake defects.

Title 49 CFR § 238.15(b) provides that any equipment that is found with a defective air brake during a Class I or IA brake test may only be moved in a non-revenue train (i.e., without passengers) after meeting all additional conditions for the movement of passenger equipment with brakes that become defective en route. That is, the train movement must comply with the applicable operating restrictions in 49 CFR § 238.15(d) and (e), and the defective equipment must be tagged (or information recorded) pursuant to 49 CFR § 238.15(c)(2). Secondary braking systems, such as dynamic braking, may be continued in service under the conditions found in 49 CFR § 238.303(e)(15)(i) and (ii).

[57] Codified at 49 U.S.C. § 20301 *et seq.*
[58] Codified at 49 U.S.C. § 20101 *et seq.*
[59] The approach for determining whether equipment is "in use" for purposes of safety appliance laws related to passenger equipment (as generally expressed in 49 CFR § 238.9(b)) is different from how FRA determines whether a locomotive is "in use" under the Locomotive Inspection Act (LIA). For further discussion about the application of the LIA, *see* chapter 8 of this manual.

When railroads move equipment with brakes that become defective en route, inspectors should consider more than just the equipment conditions to decide if it is safe to unload passengers at the next station. They should look at the location as to the safety of passengers, overloading platforms or equipment, weather, and a number of other concerns. Railroads should not be cited for exercising good judgment to ensure the safety of their passengers.

If the train reaches its final destination and all passengers have detrained, the railroad must then move the equipment for repair while out of service and without passengers. This includes trains that operate to a final destination where the crew would normally change ends and then perform a Class II brake test to operate the equipment towards a repair facility; in such circumstances, the return trip must be conducted while out of service and without passengers.

Title 49 CFR § 238.15(e) places operating restrictions on passenger trains with "completely inoperative" power brakes on the front or rear unit. Coupler mates or similar equipment that are physically joined by a trailer or container operated at the rear of a passenger train that has a braking problem resulting in a truck brake system being cut out does not constitute "completely inoperative" brakes at the rear of the train unless both trucks are cut out.

§ 238.17 Movement of passenger equipment with other than power brake defects.

The off-site QMP could make required determinations when defective running gear is involved and report via radio or telephone without being on the scene.

Subpart B – Safety Planning and General Requirements

§ 238.109 Training qualification, and designation program.[60]

49 CFR § 238.109(a): Beginning on January 1, 2002, each railroad shall have adopted a training, qualification, and designation program for employees and contractors that perform any of the inspections, tests, or maintenance required by Part 238, and shall have trained such employees and contractors in accordance with the program.

If the railroad uses a contractor or another railroad to provide required training the railroad should adopt the training plan being used and keep good records. FRA believes that maintaining good records is the cornerstone of the training requirements.

The test, inspection, and maintenance required to be performed by a QMP is identified in each section where it is required. An example would be when a person who is QMP-qualified to perform an exterior calendar day mechanical inspection (49 CFR § 238.303) finds a wheel with a condemnable defect. After the condition is reported, the car moves to a wheel true machine for repair. While the rule requires that the inspector be a QMP to perform the exterior calendar day mechanical inspection, there is no such requirement for the wheel true operator, and no requirement that a QMP inspect the equipment upon release from the wheel true facility

[60] Note that 49 CFR Part 243 contains requirements for the training, qualification, and oversight for safety-related railroad employees. Please consult your Regional specialist should there be questions as to the application of both sets of requirements.

(although the wheel would be again subject to regular QMP inspection if placed back on a piece of passenger equipment in service).

Title 49 CFR § 238.109(b)(8) requires supervisors to complete the program that covers the employees whom they supervise, including refresher training. Supervisors, as discussed in the requirement are first-line supervisors of QMPs, and these supervisors must complete a program that covers the same material as the QMP employees they supervise. This requirement is only for the first-line supervisor.

Title 49 CFR § 238.109(b)(1) requires the railroad to designate in writing that each employee and contractor has the knowledge and skills necessary to perform the safety-related tasks that are part of his or her job. Employees are not required to carry a card that lists their qualifications, but railroads must maintain a list of its employees' qualifications and be able to provide that information to FRA upon request.

§ 238.119 Rim-stamped straight-plate wheels.

Title 49 CFR § 238.119(a)(1) provides that except as provided in 49 CFR § 238.119(a)(2), on or after November 8, 1999, no railroad shall place or continue in service any vehicle, other than a private car, that is equipped with a rim-stamped straight-plate wheel if a brake shoe acts on the tread of the wheel for the purpose of slowing the vehicle. This is only for rim-stamped straight-plate wheels with tread braking; this does not include hub-stamped straight-plate wheels.

Subpart D – Inspection, Testing, and Maintenance Requirements for Tier I Passenger Equipment

§ 238.303 Exterior calendar day mechanical inspection of passenger equipment.

Title 49 CFR § 238.303(a)(1) provides that except as provided in 49 CFR § 238.303(f), each passenger car and each unpowered vehicle used in a passenger train shall receive an exterior mechanical inspection at least once each calendar day that the equipment is placed in service. Note that definition of a "passenger car" in § 238.5 is broader than a passenger coach and includes cab or control car and MU passenger locomotives. This requirement also applies to all other equipment hauled in a passenger train.

A calendar day inspection (or "daily inspection") is required for any calendar day the passenger equipment is used in service. A calendar inspection is not governed by the amount of time the equipment is used. A passenger car that arrives at 12:20 in the morning on any given day would be required to receive a calendar day mechanical inspection on that day.

If a long-haul passenger car receives a daily mechanical inspection and departs, and sometime after midnight the car becomes defective and is set out, the railroad would not be responsible to perform a daily inspection for the day that it was used in service and set out but would have to perform an inspection prior to placing the car into another train or before moving the car for the purpose of repair.

The daily inspection of MU locomotives and control car locomotives performed under the requirements of a locomotive daily inspection (49 CFR § 229.21) does not fulfill the requirements for a daily mechanical inspection of passenger equipment unless performed by a QMP qualified for that inspection. Conventional locomotives can be inspected by people the railroad deems qualified (49 CFR § 229.21(c)) who are not QMPs with the exception of those items specifically addressed in the Passenger Equipment Safety Standards not covered in the Locomotive Safety Standards, such as dynamic brakes and alerters.

§ 238.305 Interior calendar day mechanical inspection of passenger cars.

Title 49 CFR § 238.305(c)(5) requires that, as part of the interior calendar day mechanical inspection, the railroad verify that the words "Emergency Brake Valve" are legibly stenciled or marked near each brake pipe valve or shown on an adjacent badge plate. The required language "Emergency Brake Valve" is preferred, but inspectors should use good judgment when encountering similar verbage on the stencil or marking, as a large number of these valves are marked "Brake Emergency Use Only." Inspectors should not take exception to this or other markings that meet the intent of 49 CFR § 238.305(c)(5).

§ 238.307 Periodic mechanical inspection of passenger cars and unpowered vehicles used in passenger trains.

Title 49 § 238.307(a)(1) requires that railroads conduct periodic mechanical inspections of all passenger cars and all unpowered vehicles used in a passenger train as required by this section or as warranted and justified by data developed pursuant to 49 CFR § 238.307(a)(2). A periodic inspection conducted under Part 229 satisfies the requirement of this section with respect to the features inspected.

As the requirement applies to passenger cars, it includes cab or control car locomotives and MU passenger locomotives. Those items of inspection that are performed as part of the 92-day, annual, or biannual inspection required as part of the Locomotive Safety Standards are not required to be included under the periodic inspection for compliance with these Passenger Equipment Safety Standards.

Title 49 CFR § 238.307(b) provides that each periodic mechanical inspection required by 49 CFR § 238.307 shall be performed by a QMP. If a defect has been identified, it must be repaired before the equipment is returned to service. However, there is no requirement that a QMP make the repairs or re-inspect the equipment when repairs are completed.

Title 49 CFR § 238.307(c) requires that the periodic mechanical inspection include a list of specified, interior and exterior mechanical components, which shall be inspected not less frequently than every 184 days.

Title 49 CFR § 238.307(d)(2) requires that at an interval not to exceed 368 days, the periodic mechanical inspection specifically include inspection of the hand or parking brake as well as its parts and connections, to determine that they are in proper condition and operate as intended.

The date of the last inspection shall be either entered on Form FRA F 6180-49AP,[61] suitably stenciled or tagged on the equipment, or maintained electronically provided FRA has access to the record upon request.

(MP&E 07-02) During the drafting of the rule text, the requirements for testing and recording were copied from similar requirements applicable only to locomotives. As a result, the form specified in the rule, Form F 6180.49A (Blue Card), is a locomotive form. However, FRA did not intend to limit use of an on-board record to a Blue Card for keeping test information under this section, especially for equipment that is not a locomotive. Therefore, FRA makes clear that the on-board record may be kept in any manner chosen by the railroad as long as it contains all the required information and is legible. The record does not have to be a Blue Card. Further, railroads may also stencil the information or keep the information electronically, as provided in the section.

§ 238.309 Periodic brake equipment maintenance.

<u>Locomotive air dryers</u>.

Locomotive air dryers ("air dryers") are not specifically addressed by Federal railroad safety laws (*see* 49 CFR Part 229 and 49 U.S.C. § 20103), nor has FRA determined that air dryers are an appurtenance to the locomotive for purposes of 49 CFR § 229.7. Because air dryers are not addressed by Federal railroad safety laws, no violations should be taken for defective air dryers.

In a number of the waivers granted by FRA's Railroad Safety Board ("Board") to extend the intervals between brake maintenance (similar to the cleaning, repairing, and testing commonly referred to as COT&S) on both freight (49 CFR § 229.29, Air brake calibration, maintenance, and testing) and passenger (49 CFR § 238.309, Periodic brake equipment maintenance), the Board required a functioning air dryer as a condition of the waiver. If a locomotive covered by a waiver that requires a functioning air dryer is beyond the current brake maintenance interval in the regulation, and is found to have a defective air dryer, the locomotive would be noncompliant under 49 CFR § 229.29 or 49 CFR § 238.309 because of the overdue brake maintenance, and not for the defective air dryer. The waivers do not explain how FRA will determine whether an air dryer is defective. Violation reports must explain the basis for the inspector's determination that the air dryer is defective and must include a copy of the applicable waiver with the report. As a note, inspectors should not rely only on the air dryer's color indicator to make the determination.

§ 238.311 Single car test.

Title 49 CFR § 238.311 provides that each single car test required by this section shall be performed by a QMP, the same as in the previously discussed inspection requirements above (*see* 49 CFR §§ 238.109 and 238.307). It should be noted that, as also discussed above, the regulation does not require associated work, such as removal or replacement of valves, to be performed in itself by a QMP or to be re-inspected by a QMP after repairs have been completed.

[61] Although 49 CFR § 238.307(d)(2) refers to Form FRA F 6180-49A, the updated form is Form FRA F 6180-49AP.

The American Public Transportation Association (APTA) requested and was granted approval of an alternate standard for performing single car tests of passenger equipment. The approval allows the railroad to use the original APTA Code of Tests identified in the Passenger Equipment Safety Standards, or the alternate test standard dated July 27, 2018, which allows the test to be performed at the pressure at which the brake system is operated. Railroads are free to use either test as needed. This request was assigned docket number FRA-2005-20053." A copy of the alternate test standard is available from APTA at: https://www.apta.com/wp-content/uploads/Standards_Documents/APTA-PR-M-S-005-98_Rev-4.pdf

§ 238.313 Class I brake test.

The requirement to conduct a Class I brake test in 49 CFR § 238.313(a) includes all passenger coaches, MU locomotives, cab or control cars, and all non self-propelled vehicles that are part of a passenger train. This includes passenger equipment carrying mail and passenger equipment without passengers on board being moved by a passenger railroad. FRA would consider these cars to be either in revenue service or available to carry passengers. If a train is used in service on any given day, regardless of time used, it must receive a Class I brake test. This test can be performed before the service begins or upon completion of service. Do note that certain conditions and exceptions apply to equipment being moved by a passenger railroad in compliance with 49 CFR § 238.15, Movement of passenger equipment with power brake defects.

Title 49 CFR § 238.313(d) requires that each Class I brake test must be performed by a QMP qualified for that particular test. The QMP may use the assistance of a non-QMP to manipulate the brake valves during the performance of the test.

Title 49 CFR § 238.313(g) and (g)(7) require that a Class I brake test be performed at the air pressure at which the train's air brakes will be operated and that brake pipe leakage not exceed 5 pounds per square inch per minute if leakage will affect service performance. Brake pipe leakage may not exceed 5 pounds per square inch per minute but does not need to be tested unless the leak will affect the operation of the train brakes. Accordingly, any violation reports based on this section must include an explanation of how the leakage will affect service performance of the brakes.

Additionally, 49 CFR § 238.313(g)(14) requires that during Class I brake tests required by this section, the brake indicator must operate as intended if the equipment is provided with a brake indicator. Most passenger cars and MUs are equipped with indicator lights, but some are equipped with multiple indicators located on each side of the equipment. In such cases, only one set of these indicators per side of car must operate to be in compliance.

§ 238.315 Class IA brake test.

Under, 49 CFR § 238.315(a)(1)(iii), the expectation for the minimum pressure of ground compressed air to be considered sufficient is 60 psi.

Title 49 CFR § 238.315(b) allows a commuter or short-distance intercity passenger train that provides continuing late-night service that begins prior to midnight to complete its daily operating cycle after midnight without performing another Class I or Class IA brake test. A Class I or Class IA brake test shall be performed on such a train before it starts a new daily operating cycle.

Some commuter systems operate service beyond midnight, and the requirement to perform a Class IA prior to the first morning departure was written to make clear that a train is not required to be stopped during its operating cycle in order to receive a Class I or Class IA brake test prior to its first departure of a calendar day. This provision does not, however, relieve a railroad from its responsibility under 49 CFR § 238.313 to perform a Class I brake test on each calendar day that the train is in use—the train operating past midnight must receive a Class I brake test sometime on each of the two days it is in use. Inspectors should use good judgment when determining if a train requires a Class IA brake test prior to the first morning departure. In contrast to the trains that are not operated through the night (for which the railroad has plenty of time to conduct required tests), the trains that operate throughout the night may only lay up for short periods of time, an hour or two, and requiring a test before the first morning departure may not be practicable.

Title 49 CFR § 238.315(e) requires that, except as provided in 49 CFR § 238.15(b), a railroad not use or haul a passenger train in passenger service from a location where a Class IA brake test has been performed, or was required by this Part to have been performed, with less than 100 percent operative brakes. For additional information, see § 238.15 and the earlier discussion of the conditions for the movement of passenger equipment with power brake defects for repair. Failure to observe any condition for the movement of such equipment will deprive the railroad of the benefit of the movement-for-repair provision and make the railroad and any responsible individuals liable for a civil penalty under this section.

Title 49 CFR § 238.315(f) requires a Class IA brake test be performed at the air pressure at which the train's air brakes will be operated. The Class IA brake test does not require trains equipped with electro-pneumatic brakes to have the electro-pneumatic feature tested. This is only required at the Class I test. If the electro-pneumatic feature is defective and is cut out, it is not considered defective until the Class I is performed, and the equipment may be continued in service.

Pursuant to 49 CFR § 238.315(f)(1), the Class IA brake test performed under 49 CFR § 238.315(f) must determine and ensure that brake pipe leakage does not exceed 5 pounds per square inch per minute if brake pipe leakage will affect service performance. Brake pipe leakage may not exceed 5 pounds per square inch per minute but does not need to be tested unless the leak will affect the operation of the train brakes. Accordingly, any violation reports based on this section must include an explanation of how the leakage will affect service performance of the brakes.

Additionally, pursuant to 49 CFR § 238.315(f)(3), the Class IA brake test performed under 49 CFR § 238.315(f) must determine and ensure that for MU locomotives that utilize an electric signal to communicate a service-brake application and only a pneumatic signal to propagate an emergency brake application, the emergency brake application functions as intended.

Railroads are not required to physically test the deadman pedal or other emergency control devices during the Class IA or II brake test with the exception of electric MU equipment that uses an electric signal to communicate a service application and uses only a pneumatic signal for an emergency application; such MU equipment must have the emergency application of its emergency control devices tested to determine that the devices function as intended. Railroads operating such MU equipment are required to test the deadman pedal or other emergency control devices during the Class IA brake test.

§ 238.317 Class II brake test.

The Class II brake test does not require trains equipped with electro-pneumatic brakes to have the electro-pneumatic feature tested; this is only required at the Class I test. If the electro-pneumatic feature is defective and is cut out, it is not considered defective until the Class I is performed, and the equipment may be continued in service.

Title 49 CFR § 238.317(a)(5) requires that a Class II brake test be performed on a passenger train when an operator first takes charge of the train, except for face-to-face relief. Face-to-face relief would include a QMP, or other persons participating in the Class I brake test, relieving a crewmember, as well as a crew relieving another crew.

Title 49 CFR § 238.317(d)(1) requires that when performing a Class II brake test on a train, a railroad determine that the brakes on the rear unit of the train apply and release in response to a signal from the engineer’s brake valve or controller of the leading or controlling unit, or a gauge or similar device located at the rear of the train or in the cab of the rear unit indicates that brake pipe pressure changes are properly communicated at the rear of the train. If the railroad places a device at the rear of the train that provides a visual indication of changes in brake pipe pressure, and this indication can be viewed from the front of the train, it fulfills this test requirement.

Title 49 CFR § 238.317(d)(2) requires that when performing a Class II brake test on a train, a railroad determine that for MU locomotives that utilize an electric signal to communicate a service-brake application and only a pneumatic signal to propagate an emergency brake application, the emergency brake application functions as intended.

Railroads are not required to physically test the deadman pedal or other emergency control devices during the Class IA or II brake test with the exception of electric MU equipment that uses an electric signal to communicate a service application and uses only a pneumatic signal for an emergency application; such MU equipment must have the emergency application of its emergency control devices tested to determine that the devices function as intended. Railroads operating such MU equipment are required to test the deadman pedal or other emergency control devices during the Class IA brake test.

Subpart F – Inspection, Testing, and Maintenance Requirements for Tier II Passenger Equipment

§ 238.503 Inspection, testing, and maintenance requirements.

Title 49 CFR § 238.503(d)(3) allows that trains that miss a scheduled Class I brake test or mechanical inspection due to a delay en-route may proceed to the point where the Class I brake test or mechanical inspection was scheduled to be performed. Inspectors need to be very careful in applying this provision. In FRA's view, a "delay en-route" can only occur between terminus points. Boston and Washington would be considered "terminus points," since at those locations the trains lay-up and are given new train symbols. FRA believes this approach is consistent with the intent of the rule. Thus, if an Acela train is delayed en-route it may proceed to either Washington or Boston but may not be turned if it cannot complete a return trip within the provided time frame.

Chapter 13 – Passenger Train Emergency Preparedness, Part 239 and Emergency Provisions in Part 238

Introduction

Passenger Train Emergency Preparedness stretches across several railroad safety disciplines. The information for inspectors in this chapter focuses on MP&E elements of the requirements. Communication about emergencies as close to the event as possible is critical to ensure proper corrective actions are taken in a timely manner to minimize and control adverse effects and to avert the escalation of situation.

According to the regulation, each passenger railroad shall have an emergency plan approved by FRA.[62] If passenger railroad train service is hosted by other railroads, then a single emergency preparedness plan must be adopted by all parties.[63] This requirement is clearly outlined in Subpart C – Review, Approval and Retention of Emergency Preparedness Plans.[64] Plans include periodic maintenance and replacement of first-aid kits, on-board emergency equipment, and on-board emergency lighting.[65]

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[62] 49 CFR § 239.201.
[63] *Id*.
[64] *Id*.
[65] 49 CFR § 239.101.

PA and Intercom Systems

Inspectors should inspect the condition and operation of the PA system in each passenger revenue service car inspected. Inspectors should also verify PA and intercom system operation in back-up power mode when the car is taken of an external power source.

The regulation requires each passenger car to be equipped with the functional intercom system on each side (half) of the car allowing reliable two-way voice communication between passengers and crewmembers.[66] This applies to Tier I cars ordered on or after April 1, 2008, or placed in service for the first time on or after April 1, 2010, and all Tier II cars. Cars less than 45 feet in length or Tier II cars ordered prior to May 12, 1999, may have just one intercom system installed.[67] PA and intercom systems must have a back-up power system to power both systems for a minimum of 90 minutes.[68]

The regulation does not have specific requirements for PA and intercom system loudness (sound pressure level, measured in dB) and frequency range (microphone, speaker or amplifier response range, measured in Hz), but it is expected that both systems provide effective and quality one- or two-way means of communication.

Generally, 75 dB(A) is a typical, expected level of loudness or, if background noise exceeds 75 dB(A), 20dB(A) above maximum background noise should suffice. The narrowband frequency range for the customary telephony systems is 300 Hz to 3.4 kHz.
Inspectors should evaluate the condition of handset, cable, connector and amplifier (maximum volume level) and quality of the speaker sound (clarity) to assess loudness. Most modern speakers can reproduce sound in the 45 Hz – 20 kHz frequency range, unless they are damaged.

The regulation requires that the location of each intercom intended for passenger use shall be conspicuously marked with luminescent material and legible and understandable operating instructions shall be posted at or near each such intercom. On or after January 28, 2016, the standard marking/instructions per section 5.4.2 of APTA PR–PS–S–002–98, Rev. 3, “Standard for Emergency Signage for Egress/Access of Passenger Rail Equipment,” or equivalent must be used.[69]

Inspectors should recommend a violation if: (1) the PA and/or intercom systems are not functional and one or more of their components are missing; (2) the back-up power is not capable of maintaining steady power supply to PA and/or intercom systems; or (3) marking and/or instructions are missing/not readable or do not meet manufacturer’s guidance concerning application for that specific car. To recommend a violation, inspectors must document deficiencies in as much detail as possible.

On-board Emergency Equipment

[66] 49 CFR § 238.121.
[67] *Id*.
[68] *Id*.
[69] *Id*.

Non-compliance with emergency equipment requirements[70] often indicates inadequate inspections at the train originating location and/or maintenance points. When non-compliance is found, inspectors should observe the inspection process at such locations and evaluate the effectiveness of the railroad's inspections and maintenance protocols.

Inspection should be focused on the following items:

1. At least one fire extinguisher per car. Fire extinguisher must be in-date and if equipped with the indicator, the dial must be in green sector.

2. At least one pry bar in good order per car.

3. At least one flashlight per on-board crewmember. Flashlight should be operated to verify its functionality. If the flashlight has a rechargeable battery, then it should be turned on for 15 minutes to ensure it maintains its brightness for the entire duration of that time.

4. For intercity passenger trains, at least one first-aid kit accessible to the crewmembers with the minimum required contents listed in the regulation.[71] Some railroads supply sealed first-aid kits to crewmembers. If the kit is sealed, inspector should not unseal it, but rather ask railroad representative to provide the list of contents for each kit and compare it with the minimum required list of items as outlined in this part.

On-board Emergency Lighting

Inspectors should verify the operation of the back-up power system to ensure it can power the emergency lighting for at least 90 minutes without the loss of more than 40% of the minimum illumination levels, as required by regulation,[72] including:

1. Minimum average of 1 foot-candle (lumen per square foot) measured at floor level next to each exterior door and each interior door providing access to an exterior door.

2. Minimum average of 1 foot-candle measured 25" above floor level along the center of each aisle and passageway.

3. Minimum of 0.1 foot-candle measured 25" above floor level at any point along the center of each aisle and passageway.

The measurement of illumination by a calibrated/certified tester is warranted only if the inspector directly observes the emergency lighting dim to a level he or she reasonably believes is creating an unsafe condition.

FRA relies on APTA standard PR–E–S–013–99, Rev. 1, "Standard for Emergency Lighting System Design for Passenger Cars," or its equivalent, for the detailed design and performance of

[70] 49 CFR § 239.101(a)(6).
[71] 49 CFR § 239.101(a)(6)(ii).
[72] 49 CFR § 238.115(a).

the emergency lighting systems, as well as testing requirements for each individual element of the entire system.[73]

Inspectors can request records of railroad testing to confirm compliance with the required illumination levels, and the railroad should provide an illuminance meter to measure the level of illumination, per the inspectors' request.

Passenger Safety Information

According to the regulation, instructions to passengers for emergency situations must be posted conspicuously and legibly inside all passenger cars.[74] Inspectors should evaluate the state/condition/legibility of the methods of emergency awareness procedures utilized by the railroad. A violation should be recommended if the inspector observes vandalized (*e.g.*, graffiti), torn, faded or otherwise damaged or illegible signs/decals/stickers.

[73] *See* https://www.apta.com/research-technical-resources/standards/.
[74] 49 CFR § 239.101(a)(7).

Chapter 14 – Reflectorization of Rail Freight Rolling Stock, Part 224

Introduction

The Federal Railroad Administration published the final rule for *Reflectorization of Rail Freight Rolling Stock*, 49 CFR Part 224 on October 28, 2005.

The effective date of the rule is November 28, 2005. The purpose of the rule is to require the application of retroreflective material to the sides of freight rolling stock (freight cars and locomotives) to enhance the visibility of trains during times of limited visibility. The rule provides guidelines for the characteristics of the material, the dimensions, and the quantity to be applied as well as locations for consistent application.

Years of research and public involvement have been devoted to the issue of making trains more visible at road crossings especially when visibility is limited due to weather or nighttime conditions. The rule addresses the need for the reflectorization of rail equipment as well as a description of FRA's research and public outreach efforts aimed at identifying the most effective method for implementing a nationwide reflectorization program.

On September 22, 2015 AAR petitioned FRA[75] for a waiver from compliance with 49 CFR § 224.111 to extend the life of existing sheeting past 10 years so that they could finalize a performance-based method to evaluate sheeting based on its actual brightness rather than an arbitrarily set 10-year life span. On November 25, 2015 the Safety Board granted AAR relief from the 10-year replacement cycle for three years to complete this work. On October 10, 2018 the Safety Board granted the petition finding that the comparator panel proposed by AAR could be used to reliably evaluate the effectiveness of the installed retroreflective sheeting.

AAR proposed to create a "comparator panel" that would essentially be calibrated to a specific retroreflective value and used during SCABT or annual locomotive inspection (as prescribed under 49 CFR § 224.109). When placed adjacent to or overlapping sheeting (that is cleaned) on freight rolling stock and illuminated with a light source, an individual would be able to determine if the existing installed sheeting matches or exceeds the comparator panel's brightness. If so, the installed sheeting would be deemed still performing up to standard and could remain on the freight rolling stock until the next SCABT or annual locomotive inspection, at which time it would be cleaned and evaluated again. If the installed sheeting appeared duller than comparator panel, then that individual sheeting would warrant immediate replacement before that equipment went back into service.

On January 27, 2026 FRA published a final rule [91 FR 3375] amending part 224 to adopt AAR's comparative panel as an alternative method for replacing retroreflective sheeting and also

[75] Docket Number FRA-2015-0105, Document No. 1 (available at https://www.regulations.gov/document/FRA-2015-0105-0001).

removed the outdated implementation schedule (formery § 224.107).[76] FRA also updated the applicability of part 224 to exclude equipment used exclusively for Tourist, Historic, Excursion, Educational, Recreational, or Private (THEERP) purposes, with the exception of incidental freight service.

49 CFR Part 224

§ 224.3 Applicability

The Reflectorization Standards were developed because low visibility, particularly at highway-rail grade crossings, can contribute to motorists colliding with rail equipment (run-into train (RIT) accidents). Adding reflectorization to rail equipment reduces the likelihood of RIT accidents for conventional freight operations. Locomotives and passenger cars used exclusively in passenger service are excluded because the conspicuity of equipment used in conventional passenger service is significantly better than the conspicuity of equipment used in freight service.

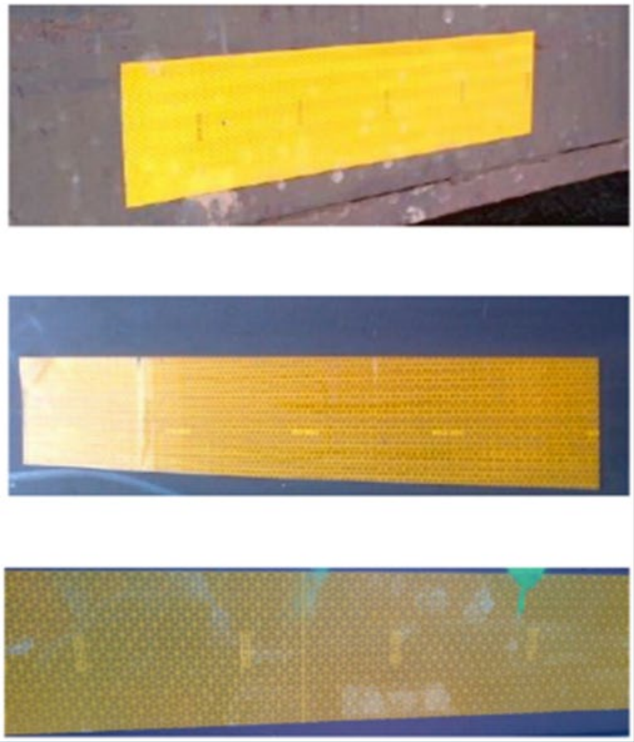
Similarly, retroreflective sheeting provides no clear safety benefit for equipment used exclusively for THEERP purposes because, like other passenger equipment, equipment used exclusively for THEERP purposes is generally more highly visible than conventional railroad equipment and is used in a more protected operating environment. For these reasons, the 2026 Final Rule added an exclusion for equipment used for THEERP purposes, except for incident freight service.

§ 224.103 Characteristics of retroreflective sheeting.

Retroreflective sheeting applied pursuant to Part 224 shall be yellow, fluorescent yellow, or white as specified by the chromaticity coordinates of ASTM International's Standard D 4956-04.[77] For the most part, yellow and fluorescent yellow are predominantly the color choice for retroreflective material throughout the railroad industry. However, at least one Railroad (Northern Southern) continues to use white retroreflective material on their locomotives.

As stated in the regulation, the characters "FRA-224", constituting the manufacturer's certification that the retroreflective material conforms to the requirements of paragraphs (a) through (c) of 49 CFR § 224.103, shall appear at least once on the exposed surface of each piece of sheeting in the final application. The characters shall be a minimum of three (3) millimeters high, and shall be permanently stamped, etched, molded, or printed within the product and each certification shall be spaced no more than four (4) inches apart. Examples of commercially available Part 224 compliant retroreflective sheeting (typically 4" x 18" strip) and their characteristics are provided in **Figure 14-1**.

[76] For further details on the NPRM and Final Rule see Docket No. FRA-2021-0080 at https://www.regulations.gov/search?filter=fra-2021-0080.
[77] The American Association of Railroads Field Manual Rule 66, 2006 Issue, specifies, "yellow only" for applications.



3M Product:
- Diamond shaped pattern
- Striped appearance longitudinally
- FRA-224 stamp laterally

Avery Denision:
- Rows of small squares
- FRA-224 stamp longitudinally

Reflexite:
- Overlaid hexagon pattern
- FRA-224 stamp laterally

Figure 14-1: Characteristics of commercially available part 224 retroreflective sheeting.

§ 224.105 Sheeting dimensions and quantity.

The amount of retroreflective sheeting to be applied to each car or locomotive subject to Part 224 is dependent on the length of the car or locomotive and the color of the sheeting. At minimum, all freight cars and locomotives less than 50 feet long must have at least 3.5 square feet of yellow material (or 4.0 square feet of white material) on each side. For purposes of this Part, the length of a railroad freight car or locomotive is measured from endsill to endsill, exclusive of the coupler and draft gear. Every additional 10 feet of length requires an additional 0.5 square foot of material per side. Table 2 to Subpart B of Part 224 provides the minimum quantity requirement for retroreflective sheeting on freight rolling stock.

Commercially available Part 224 retroreflective material typically comes in sheets measuring 4x18 inch (0.5 square foot) or 4x36 inch (1 square foot). Each end of the car or locomotive on each side must have 1 square foot of material per side, with the remaining 0.5 square foot strips spaced in between as evenly as possible.

§ 224.106 Location of retroreflective sheeting.

Generally, retroreflective sheeting shall be applied along the length of each railroad freight car side in the manner provided by a uniform industry standard accepted by the FRA's Associate Administrator for Safety that provides for distribution of material along the length of each car and as close as practicable to 42 inches above the top of rail. Diagrams are included in 49 CFR § 224.106 as a guideline for general applications.

On railroad freight cars other than flat cars and tank cars, retroreflective sheeting shall be applied in either a vertical or horizontal pattern along the length of the car sides (but not mix-matched), with the bottom edge of the sheeting as close as practicable to 42 inches above the top of rail. Retroreflective sheeting shall not be applied below the side sill.

If retroreflective sheeting is applied in a vertical pattern, at least one 4x36 inch strip or two 4x18 inch strips, one above the other, shall be applied as close to each end of the car as practicable. Between these two vertical end strips, a minimum of one 4x18 inch strip shall be applied at least every 12 feet, as practicable.

If retroreflective sheeting is applied in a horizontal pattern, at least one 4x36 inch strip, or two 4x18 inch strips, one above or next to the other, shall be applied as close to each end of the car as practicable. Between these end strips, a minimum of one 4x18 inch strip shall be applied at least every 12 feet, as practicable.

These are the general specifications for freight cars. The specifications vary for tank cars, flat cars, cars of special construction, and locomotives. In some configurations, the strips may be overlaid side-by-side due to space constraints (**Figure 14-2**). However, the orientation of all strips along the side of the freight rolling stock shall be the same (i.e., all horizontal or all vertical) and not mix-matched.

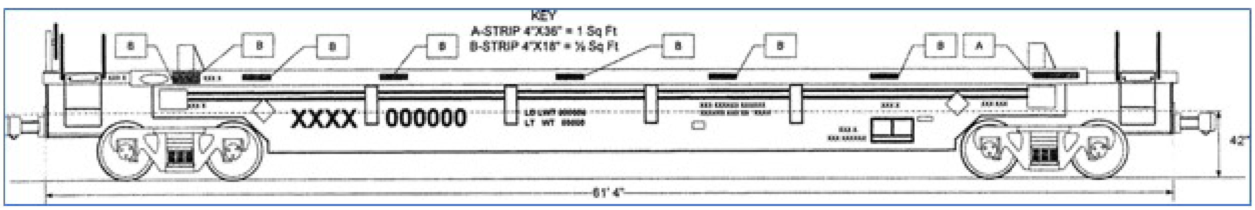


Figure 14-2: Longitudinally applied sheeting that consists of both side-by-side and end-over-end applications.

§ 224.107 [Removed and Reserved]

This section was removed in the 2026 Final Rule because the implementation schedule to bring 100% of the existing and in-service locomotive and freight car fleet into compliance has already expired.

§ 224.109 Inspectionand Replacement of Missing, Damaged, or Obscured Retroreflective Sheeting.

This section was revised in the 2026 Final Rule.

Inspection, and replacement of missing, damaged, or obscured retroreflective material should be performed when freight rolling stock undergoes a Single Car Airbrake Test (SCABT) or annual locomotive inspection. This is to ensure that there is not less than 80 percent of the amount of sheeting required under § 224.105 on either side of freight rolling stock. Traditonally, the railroads are not required to inspectand/or replace at any time other than SCABT or annual locomotive inspection when operating under the original 10-year blanket renewal/replacement requirement (previously § 224.111), and any person notified of a defect under this section has 9 months (270 calendar days) to replace the missing, damaged, or obscured sheeting.

As an alternative to the 10-year blanket renewal/replacement requirement, the 2026 Final Rule allows for a performance-based approach using a retroreflective comparator panel. Under this new approach, any individual sheeting that fails to perform comparatively to the panel or that is found damaged, missing, or obscured (and therefore cannot be compared to the panel) during SCABT or annual locomotive inspection shall be replaced prior to the equipment returning to service. Equipment evaluated under the comparator panel approach are not allotted the 9 months (270 calendar days).

Thus, inspectors should exercise discretion if they find equipment in service with sheeting that is damaged, obscured, or missing outside of these discrete timeframes. Inspectors should not require the railroad to replace or apply sheeting unless they find that the equipment was never initially applied with retroreflective sheeting or if they witness that the inspection andreplacement of sheeting on the equipment was not performed, or performed inadequately, during SCABT or annual locomotive inspection.

§ 224.111 Evaluation and Replacement of 10-year-old or Underperforming Retroreflective Sheeting.

This section was revised in the 2026 Final Rule.

(a) This paragraph provides the option of renewing all retroreflective sheeting traditionally under the blanket 10-year approach (b), or allows replacement based on actualy sheeting performance during SCABT or annual locomotive inspection (c). Note that equipment operating under AAR Interchange Rules are required to use the performance-based comparator panel option. Shortlines and private car owners may choose either option.

(b) Retroreflective material on freight rolling stock shall be replaced with new material no later than 10 years from the date of initial application, or 10 years from date of last renewal, regardless of the condition of the installed sheeting. Since November 28, 2005 is the earliest initial date of installation for any equipment, then the requirement to renew retroreflective material would have begun commencement on November 28, 2015.

(c) Retroreflective material on freight rolling stock shall be inspected, and if deemed necessary, tested with a properly calibrated comparator panel to ensure each individual sheeting meets the minimum retroreflective values, whenever a car undergoes a SCABT or a locomotive receives an annual inspection. The comparator panels are constructed to the specifications outlined in Table 1 to § 224.111(c)(1)(iv) and shall be 4 inches wide by 4 inches high with magnetic backing so the panel can be attached directly to freight rolling stock. Any shop location that performs SCABTs or locomotive inspections that opt for the comparator panel approach must have a valid comparator panel on premise matching the sheeting color under evaluation.

Sheeting on a car or locomotive is first cleaned and pre-screened. Pre-screeening includes the process of a properly trained and experienced person who will inspect each sheeting by placing a light source adjacent to either left or right eye and shining the light at each sheeting in order to make the initial determination if further evaluation is necessary. If the person deems the sheeting performs adequately and is obviously compliant, they will move onto the next sheeting along the length of the car or locomotive. If the person cannot make the determination that the sheeting is obviously complaint or noncompliant, then the sheeting must be evaluated using a comparator panel. If the sheeting is missing, obscured (e.g., graffiti), or damaged, and for obvious reason cannot be evaluated, then that missing, obscured, or damaged sheet must be replaced prior to the equipment returning back to service.

When the comparator panel is placed adjacent to or overlapping sheeting (that is cleaned) on freight rolling stock and illuminated with a light source, an individual would be able to determine if the existing installed sheeting matches or exceeds the comparator panel's brightness. If so, the installed sheeting would be deemed still performing up to standard and could remain on the freight rolling stock until the next SCABT or annual locomotive inspection, at which time it would be cleaned and evaluated again. If the installed sheeting appeared duller than comparator panel, then that individual sheeting would warrant immediate replacement before that equipment went back into service. Examples can be seen in **Figure 14-3**.

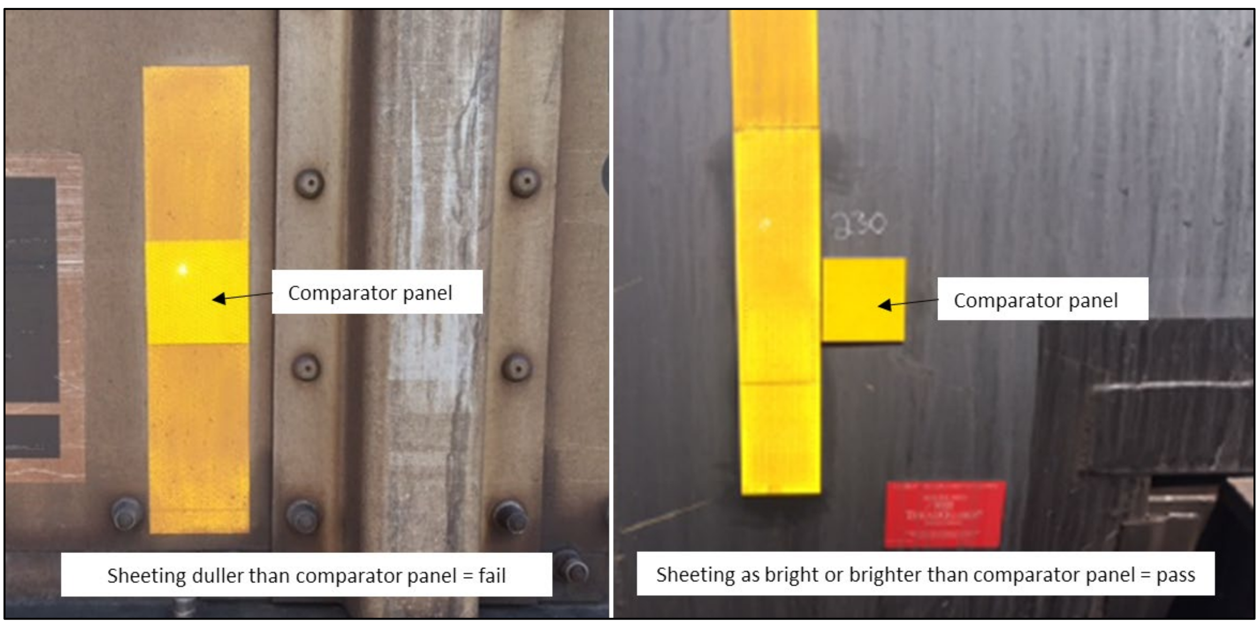


Figure 14-3: Comparator panel for evaluating retroreflective sheeting performance.

Again, inspectors should exercise discretion if they find equipment in service with sheeting that is damaged, obscured, or missing outside of these timeframes (SCABT or annual locomotive inspection). However, if an inspector suspects that comparison panel evaluation was not performed, or performed inadequately, during SCABT, annual locomotive inspection, then the inspector can request that the railroad reperform the comparison panel evaluation on the sheeting(s) in question. For example, if an inspector comes across equipment that has suspiciously dull sheeting or shows signs of internal degradation (*i.e.*, black mold – *see*

Figure 14-4) and the equipment had just undergone SCABT or annual inspection several days or weeks previously, then the inspector can request the Railroad to reevaluate that sheeting because the comparison panel evaluation was likely not performed or performed inadequately. Simply, retroreflective material does not degrade to that extent in that short length of time.

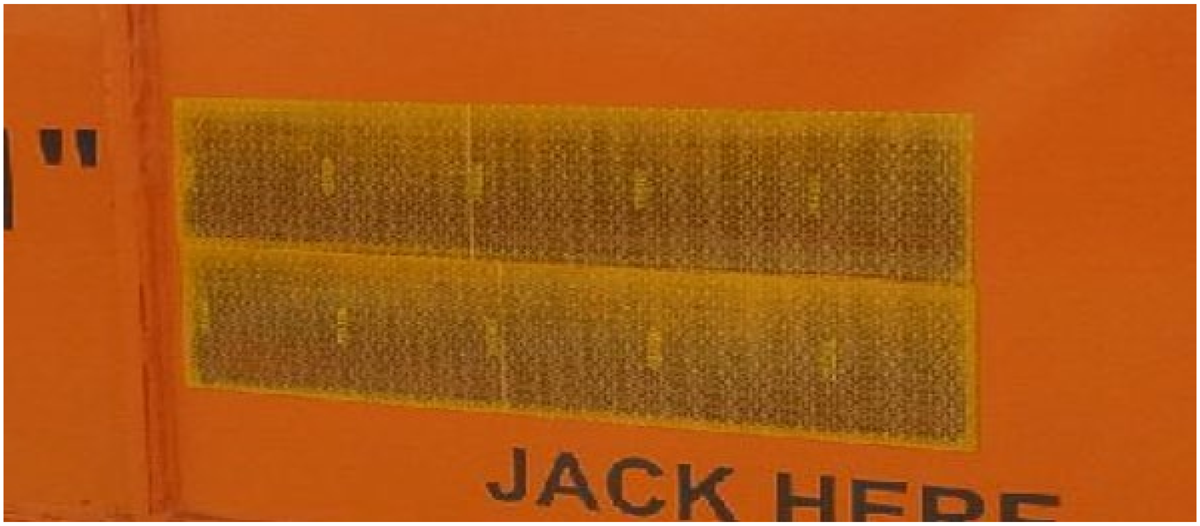


Figure 14-4: Example of retroreflective sheeting with internal degradation (mold).

Lastly, a shop facility may choose to use a properly calibrated handheld retroreflectometer in lieu of a properly calibrated comparator panel. However, these devices are cost prohibitive and are not likely to be used.

Chapter 15 – Guidelines for Enforcement of Mechanical Requirements for Rail Grinding Equipment[78]

Introduction

This chapter incorporates Technical Bulletin (MP&E 07-03). To better ensure its accuracy, the language and formatting have been largely retained from the original document, which may not be consistent with other portions of this manual.

Subsequent to an incident in November 2006 that involved a rail grinder (rail grinding set), and corresponding investigations by the Federal Railroad Administration (FRA), there have been several inquiries about the proper application of regulatory and statutory requirements to the type of equipment involved in the incident. Rail grinding sets are unique and warrant different treatment than self-propelled vehicles that are considered locomotives under Federal regulations. The two major U.S. operators of rail grinding trainsets are Loram and Harsco. Major railroads also operate their own rail grinding equipment. Typical configurations for rail grinding trainsets are noted on the next page as (1) locomotive powered grinding trains, and (2) self-powered rail grinding units. The following are guidelines for enforcing the various requirements that apply to the rail grinding sets:

Guidelines for Enforcement of Mechanical Requirements

- 49 U.S.C. § 20701 (Locomotive Inspection Act) – The power unit and the location of the control stand in the rail grinding sets each constitute a locomotive under the statute, but not the regulations.

  49 CFR Part 229 (Railroad Locomotive Safety Standards (RLSS)) does not apply to rail grinders because the locomotives regulated under Part 229 do not include specialized maintenance equipment. The Locomotive Inspection Act permits FRA to write violations when a "locomotive or tender and its parts and appurtenances are [not] in proper condition and safe to operate." To determine whether a power unit or the location of the control stand is safe to operate, FRA may use regulatory provisions including those contained in Part 229 as guidelines. FRA inspectors commonly make safety determinations based on observations of equipment and records, as well as industry and regulatory experience. After determining that a power unit or the location of the control stand is unsafe to operate, FRA should cite only the statute, and not the regulation when recommending a violation.

  Although Part 229 does not apply to rail grinding sets, the regulation should not be ignored when assessing the safety of the equipment. The safety rationale supporting regulatory requirements, particularly those contained in Part 229, Subpart C, may be relevant to rail grinding sets, because the equipment is being used in a similar manner. FRA may frame a violation of the statute using facts that would commonly support a

[78] For additional information about specialized maintenance equipment, *see* FRA Safety Advisory 2007-02,72 *FR* 3907 (January 26, 2007).

violation of the Federal regulations. For example, if FRA discovers a rail grinding set with a 3-inch flat spot on wheel R1 of the power unit, it would be proper for a violation report to state that "the power unit of the rail grinding set is not safe to operate as required by 49 U.S.C. § 20701, because "Wheel R1 has a 3-inch flat spot. Running this rail grinding set with a flat spot of this size could lead to a derailment." This is not a Part 229 violation, but it is a defective condition that makes the power unit, or the location of the control stand unsafe to operate. In this example, FRA is using the wheel requirement from 49 CFR § 229.75 to inform its safety assessment of the equipment and describe the violation. Other defective conditions under Part 229 may not make the power unit or the location of the control stand unsafe to operate. For example, it would be very difficult to argue that a defective step light makes the power unit, or the location of the control stand unsafe to operate. Ultimately, the FRA inspector is responsible for explaining in the violation report why the defect makes the power unit or the location of the control stand unsafe to operate.

- 49 U.S.C. § 20302 (Safety Appliance Act) - Rail grinding sets are a train under the statute, but not the regulations.

    - The power brake portions of the statute apply to the rail grinding sets. The specific requirements in 49 CFR Part 232 are not applicable. Section 20302(a)(4) requires that a locomotive be equipped with a power-driving wheel brake and appliances for operating the train-brake system.

        - 50% equipped brake requirement: Section 20302(a)(5) requires that at least 50% of the vehicles in a train be equipped with power brakes and that all the vehicles on an associated train line that are equipped with power brakes shall have their brakes used and operated by the engineer.

        - 100% operative brake requirement: As all of the units in a rail grinding set are equipped with power brakes and are on an associated train line, the statute requires that 100% of the vehicles in the train have operative brakes unless they are being moved for repair under 49 U.S.C. § 20303.

    - Brake inspections: Because rail grinding sets are subject to Section 20302(a)(5), FRA expects the railroads and operators of this equipment to have an inspection regimen in place that will ensure that the crews operating the equipment are aware of whether the brakes are in compliance with the applicable statutory requirements.

    - Other safety appliance requirements: Sections 20302(a)(1) and (a)(2) require that vehicles be equipped with efficient hand brakes, sill steps, and other safety appliances that ensure the safety of employees as they mount and dismount equipment. Except for those appliances addressed by 49 CFR Part 231 (see discussion below), FRA should cite only the statute for violations of this type.

- 49 U.S.C. § 20303 (Safety Appliance Act) – Section 20303 (which restricts the use and movement of vehicles with defective or inoperative safety appliances) only permits the movement of a vehicle with defective safety appliances to the nearest available place where the necessary repairs can be performed.

  If power brakes are discovered defective at a location where repairs are routinely made, repairs are required to be made before the vehicle departs that location. Similarly, if the brakes become defective enroute, the rail grinding set may be moved only for the purpose of repair to the nearest location where the necessary repairs can be made. Guidelines for determining locations where necessary repairs can be performed can be found at 49 CFR § 232.15(f). FRA should cite only the statute for violations of this type.

- 49 CFR Part 231 (Safety Appliance Regulation) – Due to their unique design and purpose, rail grinding sets are considered "cars of special construction" under 49 CFR § 231.18. Therefore, they are required to have (as nearly as possible based on the design limitations of the vehicle) the same complement of handholds, sill steps, ladders, hand brakes, and running boards as required for a car of the nearest approximate type. As with any equipment covered by 49 CFR Part 231, any additional safety appliances on the equipment must comply with the requirements of 49 CFR Part 231.

Guidelines for Enforcement of Roadway Maintenance Machine Requirements

49 CFR Part 214 (Railroad Workplace Safety) – Rail grinding sets must comply with 49 CFR Part 214, Subparts C and D.

Subpart D, *On-Track Roadway Maintenance Machines and Hi-Rail Vehicles*, contains various requirements regarding the safety equipment required to be on such machines as well as provisions related to their design and operation. Subpart C, *Roadway Worker Protection*, includes training requirements that apply to operators of rail grinding sets. These requirements are intended to prevent accidents and casualties. For convenience, the attached chart "Application of 49 CFR Part 214, Subpart D," summarizes the most significant provisions of 49 CFR Part 214, Subpart D that have traditionally been applied to on-track roadway maintenance machines (RMMS). It is not intended to be all-inclusive. It should be noted that additional or more stringent requirements in the CFR or in the railroad safety statutes may also apply. For example, when rail grinding sets are moved over the road, 49 U.S.C. §§ 20302 and 20303 apply. Recommendations of violations involving a rail grinding set should be based on the same supporting facts and cite the same pertinent regulatory provisions as other equipment covered by 49 CFR Part 214.

Guidelines for Enforcement of Operating Practices Requirements

49 CFR Part 240 (Qualification and Certification of Locomotive Engineers) – Rail grinding sets constitute specialized roadway maintenance equipment.

Rail grinding sets, like most specialized maintenance equipment, are unique in both design and operation. Requiring a certified locomotive engineer to operate such equipment when it is moved from one work site to another would be operationally restrictive and potentially unsafe since, in most instances, a locomotive engineer certified under Part 240 will not be familiar with the specific operation of specialized maintenance equipment. Safety is better served by permitting an individual familiar with the specific piece of equipment to operate it from one work site to another with the aid of a pilot, where appropriate. Although Federal regulations do not specifically address the territorial qualifications of either the operator or any pilot that may be used when operating specialized maintenance equipment, FRA believes that safe railroading dictates that such individuals should be qualified and familiar with the territory over which the equipment will be operated. FRA strongly recommends and encourages the use of individuals that are qualified on the territory over which the equipment will be operated when such equipment is traveling to and from a work site.

Application of 49 CFR Part 214, Subpart D

(Note: There may be additional or more stringent requirements applicable to this equipment, its owner, and its operator in this or other subparts or parts of the CFR or in the railroad safety statutes, particularly, 49 CFR Part 232 and 49 U.S.C. §§ 20302 and 20303. This chart is not intended to be all-inclusive and is provided as a helpful summary of the requirements in Subpart D of Part 214 and should be used in conjunction with the regulatory text to determine compliance with this subpart).

Requirement	On-track RMMs - non-highway and light weight greater than 7,500 lbs. and not used exclusively for inspection of track		
	Pre 1/1/91	Existing – Post 1/1/91	New – ordered after 12/26/03 and completed after 9/27/04
Beacon (360-degree warning light)	Not Required*	Not Required*	509(c) (RMM without fixed roof and less than 17,500 lbs. exempt)
Brake light (or reflective material, or reflective device)	Not Required*	517(d) - retrofit - brake light or reflective material, or reflective device	509(d) - brake light
Braking system	Not Required* but see 529	Not Required* but see 529	507(a)(5)
Change-of-direction alarm	Not Required*	517(a) - retrofit *If adds safety value	511(b)
Daily inspection	527(a)	527(a)	527(a)
Fire extinguisher	Not Required*	Not Required*	507(a)(7)
First aid kit	Not Required*	Not Required*	507(a)(6)

Requirement	On-track RMMs - non-highway and light weight greater than 7,500 lbs. and not used exclusively for inspection of track		
	Pre 1/1/91	Existing – Post 1/1/91	New – ordered after 12/26/03 and completed after 9/27/04
Flagging equipment	521 (lone, or lead and trailing piece in roadway group if RR rules require flagging equipment)	521 (lone, or lead and trailing piece in roadway group if RR rules require flagging equipment)	521 (lone, or lead and trailing piece in roadway group if RR rules require flagging equipment)
Headlight	513(c)	513(c)	509(a)
Heating and ventilation	Not Required*	517(b) - retrofit (required if operated at temp. less than 50 deg. and equipped or has been equipped)	505(g) for RMMs other than 505(a)(1)-(5), regulators, etc. with enclosed cabs
Horn	513(b) permanent or portable	513(b) permanent or portable	511(a) permanent
Light weight display	Not Required*	517(c) - retrofit	507(d)
Operator seat (or position, if standing)	527(c)(5)	527(c)(5)	507(a)(1), except as required under 507(b) (operator standing)
Record of defective conditions	533(d)	533(d)	533(d)
Rearward viewing devices	Not Required*	Not Required*	509(e)
Safe and secure position - handholds, handrails, or a secure seat for workers transported on machine; protection from moving parts	513(a) - retrofit	513(a) - retrofit	507(a)(2)
Safe and secure position for riders - identification by stenciling or other written notice (if used)	518	518	518
Safety glass & wipers	Not Required*	517(e) - retrofit/replace	507(a)(4)

Requirement	On-track RMMs - non-highway and light weight greater than 7,500 lbs. and not used exclusively for inspection of track		
	Pre 1/1/91	Existing – Post 1/1/91	New – ordered after 12/26/03 and completed after 9/27/04
Secure footing for floors, decks, stairs, and ladders	519	519	519
Speed indicator	Not Required*	Not Required*	507(c) - more than 32,500 lbs and speed greater than 20 mph
Tag defective item(s)	527(b)	527(b)	527(b)
Towing	525	525	525
Work lights	Not Required*	Not Required*	509(b)

* NOTE on "not required": If an existing on-track RMM is equipped with a device only required on new equipment, the device should be in proper working condition. If inspectors encounter a broken or inoperable "not required" device, they should write a comment to the railroad describing the defective condition and indicate that a machine with "a condition that inhibits its safe operation" is subject to a good faith challenge, especially where roadway workers working on or near the machine may be relying in part on such a device to alert them to a machine's presence or proximity. FRA expects that any such inoperable device shall be discussed in the job briefing.

Chapter 16 – Wayside Detection Systems for Train Inspections[79]

Terms and Definitions

- **ABD:** Acoustic Bearing Detector. Measures acoustic signatures, indicates bearing defects, and signifies derailment prevention.

- **ACWD:** Automated Cracked Wheel Detector. Identifies wheel flange cracks and wheel internal defects.

- **AI:** Artificial Intelligence. Machine based logic identifying areas of interest through the collection and processing of various wayside detection system datasets. Such datasets include data from Machine Vision technologies as well as other wayside detector technologies.

- **AISC:** Automated Inspection of System Components.

- **AOA:** Angle of attack of a wheel set is defined as the angle between the track radial line and the center line of the wheel set's axle. It is a measure of the lateral creepage, and lateral loads exerted on the track. It indicates the dynamic behavior and curving performance of the bogie. High value indicates a vehicle with defects and potential for wheel climb derailment.

- **ASAIS:** Automated Safety Appliance Inspection System. Measures dimensions, detects missing appliances, and compares standards; and signifies set-out performance.

- **BOJ:** Burnt-off Journal results when a roller bearing overheats and seizes. This condition generally results in missing a portion of the affected axle. The axle journal along with the associated bearing may be discolored and completely separated from the rest of its wheel set.

- **Broken Rail Detection:** Acoustic method or fiber optics or strain gages or track circuit. Signifies derailment prevention from broken rail.

- **BSM:** Brake Shoe Module. Measures thickness and missing parts using video machine vision, indicates brake shoe defects, and signifies damage prevention.

- **CAD:** Cracked Axle Detector. Uses laser to generate surface waves along the length of the axle, measures amplitudes of generated waves by air coupled ultrasonic transducers, detects cracks as reflected waves by signature cracks; signifies derailment prevention.

- **CWD:** Cracked Wheel Detector. Uses Laser-Air Hybrid Ultrasonic Technique (LAHUT) to create surface and body waves in the wheel which are then recorded using air-coupled ultrasonic transducers. Modification of waves by reflection and refraction at the crack is then detected as a combination of peaks in the frequency domain; signifies derailment prevention.

[79] This chapter is generally intended to provide information about the functioning of wayside detection systems for train inspection used in the railroad industry.

- **DED:** Dragging Equipment Detector. Signifies damage and derailment prevention.
- **EHMS:** Equipment Health Management System. Web-based application that receives and analyzes the data from wayside detection systems and communicates the condition of railroad equipment and alerts the responsible parties when repairs are needed.
- **HBD:** Hot Box Detector. Measures temperature change, indicates roller bearing defects, and signifies derailment prevention.
- **HWD:** Hot/Cold Wheel Detectors. Measures wheel temperature, indicates potential airbrake system defects, and signifies brake performance.
- **IAM:** Inter-axle misalignment is the internal misalignment between the two-wheel sets in a bogie and is measured as the AOA of the leading wheel set minus the AOA of the trailing wheel set. IAM measures the dynamic performance such that a higher value indicates a vehicle with defects.
- **LAD:** Low Air-hose Detector. Measures air-hose height above rail using video machine vision, indicates coupler/air-hose defects, and signifies train stop performance.
- **LIOD:** Load Imbalance/Overload Detector. Measures wheel load imbalance using WILD weigh-in-motion, indicates shifted loads, and signifies curving performance and derailment prevention.
- **MV:** Machine Vision. 2D & 3D systems and technologies (hardware and software) designed to perform automatic inspections of the railway equipment.
- **MV-AID:** Machine Vision Artificial Intelligence Defect detection alert.
- **Rail Flaw Detection:** Laser based ultrasonic NDT. Signifies damage prevention of rails with flaws.
- **RIP:** Railcar Inspection Portal. A machine vision wayside railcar inspection system.
- **SuperSite:** An assembly of various wayside detectors installed within close proximity and interconnected/intercommunicating within the same installation.
- **TAD:** Trackside Acoustic Detector. Measures acoustic signatures, indicates roller bearing defects, and signifies derailment prevention.
- **TBOGI:** Truck/Bogie Optical Geometry Inspection. Measures geometric faults in the alignment and tracking of bogie wheel sets using laser/optical means, indicates bogie performance deficiencies, and indicates set-out performance.
- **TBOGI-HD:** Has the same functionality as TBOGI plus the capability of identifying truck lateral instability.

- **TE:** Tracking error is the lateral distance between the center lines of the axles in the bogie and is defined as the tracking position of the leading wheel set minus the tracking position of the trailing wheel set. A higher value of the TE also represents a degraded dynamic performance of the vehicle.
- **THD:** Truck Hunting Detector. Measures lateral instability in terms of poor lateral dynamic performance, indicates truck and suspension defects, and signifies derailment prevention.
- **TI:** Thermal Imaging. A technique to measure railway equipment component heat radiation. AI Detection Algorithms are used to process the data generated by thermal sensors with the goal of identifying electrical and mechanical components operating outside of a specified temperature range.
- **TP:** Tracking is defined as the center line of the wheel set compared to the track center line. This is an interim parameter which is used to define the Tracking Error (TE) of a bogie.
- **TPD:** Truck Performance Detector. Measures lateral/vertical wheel loads and angle of attack (AOA), indicates truck and suspension defects based on curving performance, and signifies derailment prevention.
- **TS:** Thermal Scan. Using thermal sensors detects heat generated at the interface between the brake shoe and the wheel to determine brake application, is a complement to BSM to assess brake shoe condition and signifies damage prevention.
- **Umler:** Universal Machine Language Equipment Register. Repository system of critical data of North American railway equipment.
- **WBT:** Warm Bearing Trending. Measures bearing temperature between detectors and identifies excessive trends.
- **WILD:** Wheel Impact Load Detector. Measures impact loads, indicates wheel tread defects, and signifies damage prevention.
- **WIM:** Weigh-in Motion Detector. Same as LIOD.
- **WPM or WPD:** Wheel Profile Module or Wheel Profile Detector. Measures wheel profile dimensions using laser/video scanners, indicates wheel rim/tread shape defects, and signifies set-out performance.
- **WTD:** Wheel Temperature Detector (Hot/Cold Detector). Measures wheel temperatures using thermal sensors with the goal of identifying anomalous wheel temperatures which may indicate an improperly functioning brake system.

Background

To reduce or mitigate the adverse effects of heavy axle loads on track infrastructure, degradation of freight car components and as tools for enhanced train inspections, the railroads have started leveraging the emerging wayside detection technology. Besides addressing the higher or distressed-and-unsafe “stress state” of equipment and track, the railroads intend to achieve, at a minimum, an equivalent or enhanced level of railroad safety by using the wayside detection technology. To achieve this goal, the Advanced Technology Safety Initiative (ATSI) was implemented on October 1, 2004, by the Association of American Railroads (AAR) Technical Services Working Committee. ATSI is a predictive and proactive maintenance system that uses the best available technology to detect and report potential safety problems and poorly performing equipment before they result in accidents or undue rail damage. The overall objectives of the railroads are to enhance the quality, efficiency, and safety of the train inspection processes through this technology including any assessment of the underlying causal issues. It is believed that a mature wayside detector system can provide remote intervention capabilities by combining facets of this technology that relate to the prevention of incidents, detection of incidents, notification of incidents, and recovery from incidents.

Under the auspices of the AAR, the Class I railroads and private car owners have already embarked upon technology-driven train inspections. There are a variety of wayside detectors already deployed throughout the U.S. and the deployment list is rapidly growing. The initial objective of this undertaking was to reduce the “stress state” of the railroads, that is, to fix or remove from revenue service problematic equipment (poorly performing and defective equipment) before it severely damaged the track infrastructure. That is, the “predictive and proactive maintenance system” of in-service equipment is to identify the component’s deteriorating performance through different levels of degradation to the final level, at which time operations must be interrupted to mitigate the condition. The concept consists of successive “triggers” to indicate progressive degradation and preventive action(s) to be taken.

The wayside detector technologies consist of three general categories:

1. wayside performance detection
2. machine vision
3. wayside condition detection

Under the ATSI initiative all of these technologies will eventually feed the Transportation Technology Center Incorporated’s (TTCI’s) Integrated Railway Remote Information Service (InteRRIS®) system, which will then feed the “sorted” data into the Equipment Health Monitoring System (EHMS) at the Railinc. Railinc, which is AAR’s IT provider headquartered in Cary, North Carolina, then generates equipment alerts to the car owners through the EHMS.

InteRRIS® is a data warehouse, accessible through the Internet. It is designed to assemble and integrate data from all types of devices that monitor vehicle performance and return added value to its users by giving quantitative evaluations of rail vehicle performance by enabling planned maintenance and monitoring post maintenance performance to provide quality control checks on the maintenance performed. Railinc located in Cary, North Carolina is the industry’s largest and most accurate source for real-time interline rail data. Railinc maintains Industry Reference Files (IRFs) and Umler data. Umler is the electronic resource that contains critical data for North American transportation equipment depicting list of all nationwide fleet by car initials and numbers and specific car data. Railroads, equipment owners, agents, shippers, ports, suppliers, industry consultants, government agencies, and car maintenance facilities are all users of Umler. However, not all car data fields are viewable by all users; only the specific car owner has access to all the data fields.

The first effort under this new initiative was the use of data from Wheel Impact Load Detectors (WILD) to monitor the health of in-service railcar wheels. When a freight car wheel exerts a peak impact load of 90 kips or above as measured by a WILD site, it is not operating effectively, is considered "out of round," and on the path to failure. The program provides a window of opportunity that opens when a wheel reaches a peak impact load of 65 kips. The very first WILD detectors started appearing at Conrail in the early 1990's to protect against flat wheel impacts on concrete ties. It appears that WILD technology has been quite useful in indicating progressive component degradation using successive wheel impact load thresholds as "alert" levels (*see* WILD description later).

As detection technologies evolved and expanded to a variety of railway equipment components/subcomponents, the Wayside Detectors became known as a web of wayside detectors and transferred raw and/or processed critical railway equipment data from individual railroads to Railinc's Equipment Health Management System (EHMS). Advancements in machine vision technology and newly developed AI Detection Algorithms can identify unsafe conditions of railway equipment and issue alerts in real-time, which enables the operating railroad to immediately evaluate the reported defect(s) and act upon the severity of identified conditions.

Wayside Detector Treatise

There are three aspects of wayside monitoring of a railway vehicle:

1. Its present condition and required maintenance
2. Detection and diagnosis of developing faults
3. Trending for future performance for preemptive, preventive, and proactive maintenance strategies.

In this context, there are two types of wayside detectors, reactive systems and predictive systems. Reactive systems detect actual faults on the vehicles. Generally, the information from reactive systems is not suited for trending but is of importance to protect the equipment from further damage due to the fault. Some examples of reactive detector technology are the DED, HBD, and HWD. Predictive systems, on the other hand, are capable of measuring, recording, and trending the ride performance of the vehicles and specific components. From the collected information it is possible to analyze the condition of the equipment to predict possible failures and faults that may occur in a near or distant future. This makes it easier to plan the maintenance activity and, also, to utilize the equipment in a more efficient and effective way. Some examples of predictive detector technology are the ABD, TPD, T/BOGI, THD, TAD, WILD, WPM, WPD, AISC, ASAIS, and BSM.

- **Wheel Impact Load Detector (WILD)**

WILD is an electronic data collection device that measures vertical wheel forces (impacts from damaged wheels (**Figure 1**) on the rail via rail mounted strain gages. It consists of a system of strain gauges placed on the web of the rail (**Figures 2** and **3)**, to measure rail deformation under traffic. It measures impact forces caused by <u>flat</u>, <u>shelled</u>, <u>spalled</u>, <u>out-of-round</u>, <u>built-up-tread,</u> and <u>damaged</u> wheels. The high impact forces damage vehicles, cargo, and infrastructure. Preemptive reduction of high impact forces by truing faulty wheels and removing damaged wheels entails benefits due to reduction in derailments, rail fatigue, bearing damage, cold weather rail fractures, car and truck damage, concrete tie cracking, and wood tie plate cutting; and incrementally increasing wheel tread life and improving fuel efficiency.

Figure 1: A Damaged Wheel

Figure 2: A Typical Strain Gage Installation on Rail Web over a Crib

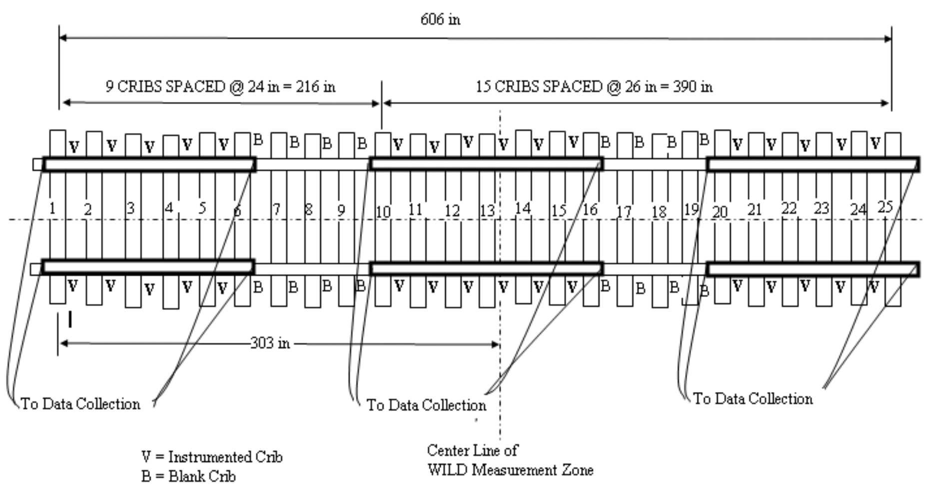


Figure 3: A Typical Layout of WILD Measurement Site

The various features of WILD detectors (**Figure 4)** may include: impact force monitoring, train-vehicle-wheel information, bi-directional traffic, automatic car counting and identification (with valid car library), self-diagnostics, instrumentation layout optimization for fleet wheel diameters, and AAR Rule 41 Standard compliance. The corresponding measurements may include car IDs, wheel IDs, nominal, peak and dynamic wheel loads, axle loads, train speed and length, and tonnage (by train, week, and month).

The data collected by the WILD detector network in the U.S., Canada, and Mexico resides in the Equipment Health Management System (EHMS), which is the AAR approved reference file maintained by Railinc (www.railinc.com). The various thresholds, per AAR's Field Manual, indicating progressive component degradation are as follows:

1) WILD reading of 65 kips to less than 80 kips for a single wheel indicating an *appropriate* maintenance/repair attention, termed as the "Window of Opportunity" alert level requiring issuance of *first* Maintenance Advisory from EHMS;
2) WILD reading of 80 kips to less than 90 kips for a single wheel indicating a *warranted* maintenance/repair attention, termed as the "Opportunistic Repair" alert level requiring issuance of *second* Maintenance Advisory from EHMS;
3) WILD reading of 90 kips to less than 140 kips for a single wheel indicating an *urgent* maintenance/repair attention, termed as the "AAR Condemnable" alert level requiring issuance of *third* Maintenance Advisory from EHMS; and
4) WILD reading of 140 kips or greater for a single wheel indicating *required* maintenance/repair, termed as the "Final Alert" level resulting in the issuance of *fourth* Maintenance Advisory from EHMS.

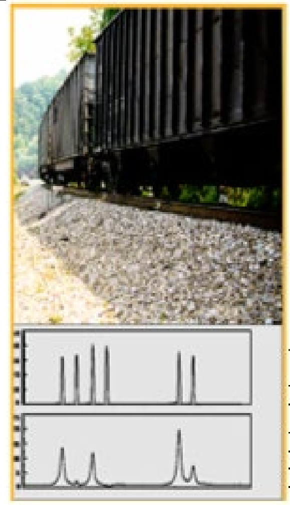
Figure 4: A Typical WILD Deployment on Revenue Track indicating Instrumented Rail over Cribs

- **Truck Performance Detector (TPD)**

  TPD detectors monitor the response of car's suspension system along curved track to signal worn or defective component conditions. Conditions detected by TPD are:

  1) Truck warp/mismatched sideframes
  2) Poor steering ("stiff truck")
     a. Bolster
     b. Center bowl
     c. Springs
     d. Twisted carbody
  3) Hollow worn wheels
  4) Poor wheel load equalization

  Detection of these ailments adds to the security against derailments. TPDs measure wheel/rail forces (vertical and lateral) via strain gauge sensors on the rails in selected reverse curves (**Figure 5)**. They also measure the angle of attack (AoA – the angle taken by the axle relative to the direction of motion) of each axle with respect to the rail, which in combination with measured vertical and lateral forces provides information regarding the steering capability of the truck through curves. TPDs identify suspension systems that do not perform optimally in (or after negotiating) curves. Poor performance may result in derailments due to wheel climb, gauge spreading, rail rollover or track panel shift. Poor performance also contributes to wear on rail, special track work, wheel profiles, and flanges. By identifying poor performers through performance-based monitoring, preventive maintenance can be performed, reducing derailment risks and improving the overall safety of rail operations.



Flange Climb → High L/V and AoA; Warped Truck → High AoA; Track Panel Shift → High NAL (Net Axle Load); Rail Roll Over → High TSLV (Truck Side L/V).	Gage Spreading → High L; Wheel Unloading → Low V; Track Damage → High V.

Figure 5: A Typical TPD Deployment on Revenue "S-Curve" Track Showing Vertical and Lateral Load (Collected) Data, and Indicating the Outcome of Their High Magnitudes

A typical TPD site may consist of an "S" curve arrangement where two curves (typically 4 to 6 degrees) are in the opposite direction relative to each other (i.e., a right-hand and a left-hand curve with a tangent section separating them) as shown in (**Figure 6)**. This gives the possibility to collect data on the vehicle's behavior in both right and left curves as well as in the tangent track.

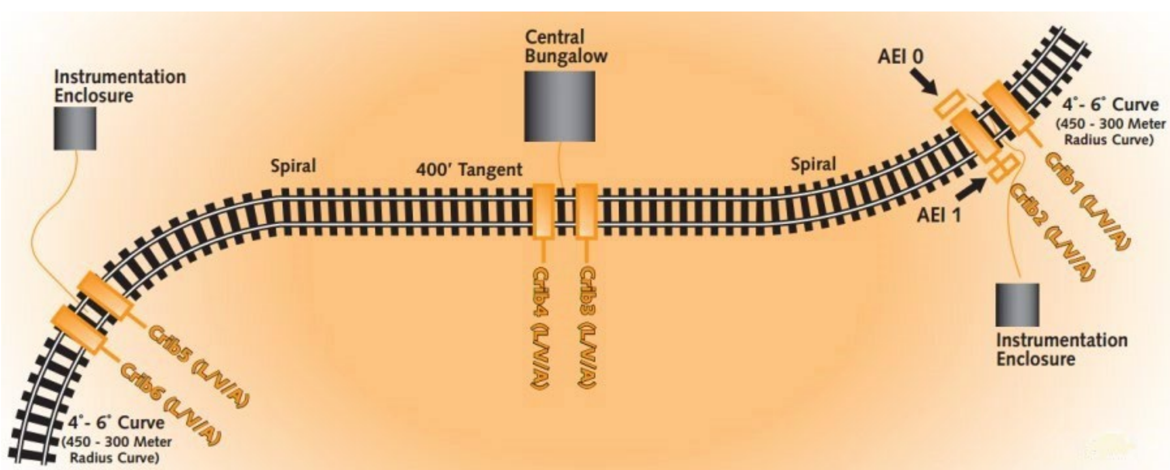


Figure 6: A diagram Showing the "S-Curved" track and location of instrumented cribs

- **Trackside Acoustic Detector (TAD)**

TAD wayside detectors monitor bearings by automatically detecting flaws in wheel bearings by evaluating the acoustic signature of the noise (1 kHz and above) created by the flaw, (**Figures 7 and 8)**, before the bearing becomes hot or seizes in service and results in accidents due to burned-off roller bearings. The most problems in roller bearings occur due to flaws such as cup spalls; cone spalls; spalled, etched, seamed rollers; water etched raceways; and spun or loose cones. Arrested center plate rotation, defective side bearings, and hollow tread wheels add to the roller bearing woes. TADs can detect symptoms of bearing failure at a much earlier stage than hot box detectors (HBDs) and can spot flaws that a visual inspection may not detect. The TAD detectors may find internal roller bearing defects, long before a hotbox detector will detect the problem and so avoid possible derailments with the inevitable consequences of cost, safety, and disruption to the network.

TAD wayside detectors use an optimized array of microphones located on each side of the track (**Figure 9)**. The microphones are spaced vertically and horizontally. The microphones simultaneously record signals and sensors identify each wheel of the passing train. The acoustic signals are analyzed over a wide range of frequencies. Since roller bearing flaws create noise, they produce an acoustic signature. The data is analyzed to ascertain the presence or absence of these signatures. Trains pass the TAD detector sites at 30 to 50 mph.

These detectors are used to mitigate failures, determine high risk bearings, and identify severe defects using growler software. AAR has developed Rule 36A.3.c Cause for Removal (AAR Field Manual) for industry. This detection pertains to reducing burn-off derailments. It can be used for customized alarming for the high-risk bearings and correlating hot bearings setouts with acoustic alarms.

Figure 7: Damaged Cups and Cones of Bearings

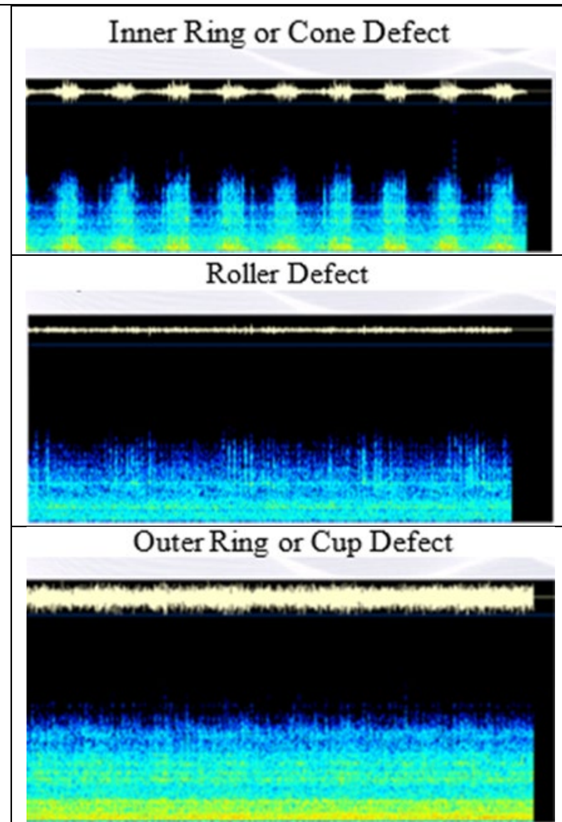


Figure 8: Sound Signatures of Defects (Graphic illustration)

Figure 9: A Typical TAD Site in Revenue Service consisting of Microphone Array, Wheel Sensors and AEI

- **Low Air-Hose Detector (LAD)**

Rail car braking systems depend upon the operational integrity of the coupling hoses that connect air pipes. By design, if a coupling hose fails or becomes otherwise uncoupled, a moving train is put into an emergency braking condition. Unintentional de-coupling can and does occur due to low-lying hoses (**Figure 10)** hitting obstructions in the roadbed. At a minimum, the resulting emergency stop causes delays but may also damage wheels by creating flat spots and damage lading. The current solutions to this problem incorporate a non-contact, optical sensing approach.

Using infrared light curtains (sensors) to visually inspect each air hose, the Low Air-Hose Detector measures the distance between the top of rail and bottom of each hose (**Figure 11**).

Figure 10: Air Hose State in a Train

Figure 11: A Typical Low Air-Hose Detector

This examination is performed only in the appropriate area between vehicles to minimize the possibility of false alarms. It then identifies the leading and trailing tags nearest each hose that lies below user defined thresholds. The Low Air-Hose Detector integrates AEI tag readers to provide a complete record of offending vehicles, so corrective action can be taken at the most convenient location.

- **Truck Hunting Detector (THD)**

Hunting trucks underneath rail cars can violently oscillate (**Figure 12)** from one rail to the other as they traverse along tangent track, inducing excessive lateral forces that significantly contribute to the rapid wear of rail and rail cars in a relatively short time. In the worst case, such hunting may lead to vertical wheel unloading and wheel climb derailment. Also, this particular type of degraded vehicle performance is a leading cause of damage to delicate lading. At a minimum, hunting trucks cause increased fuel consumption. Unchecked, severe damage to truck components and derailment can result.

By measuring the lateral instability that indicates truck and suspension defects, THD wayside detectors (**Figure 13)** can be used to identify inspection and maintenance procedures for bad acting cars to reduce derailments due to flange climb. The hunting data collected by TTCI was used to confirm both the hunting conditions and the condemnable defects. The representative cars at various levels of hunting performance were sent to TTCI for inspection, test, teardown, and repair. The teardowns showed that the suspect cars had worn truck components, couplers & coupler carrier plates, and door mechanisms. Also, these cars showed signs of either (or both) low truck warp restraint (high/worn wedges/column wear liners) or low truck/car body rotational constraint (no constant contact sides bearings (CCSBs), no CCSB preload, melted or damaged CCSBs). This data consisting of approximately 300 cars/year with a hunting index (HI) > or = 0.65 and approximately 450 cars/year with a hunting index (HI) > or = 0.50 in a 12-month period confirmed that a car with either of the above noted hunting indices was condemnable at any time. As such, the car hunting condemnable indices (two HI readings above 0.50 in a twelve-month period or a single HI reading above 0.65) are stipulated in AAR Field Manual Rule 46.

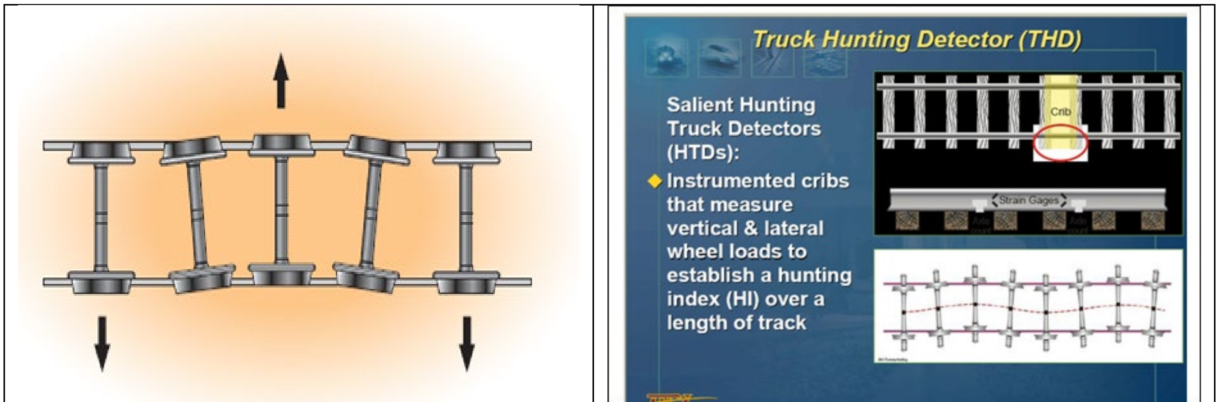


Figure 12: Lateral Displacements of an Axle in Hunting Truck

THD Measurements:
- Vehicle ID & Type (with valid car library)
- Train Speed
- Vehicle Hunting Index

Figure 13: Typical THD Deployment on Revenue Track Indicating Instrumented Cribs

Similar in design to the wayside Wheel Impact Load Detector (WILD), THD wayside detectors can reside at the WILD detector locations. This add-on capability provides measurements of both the array of lateral forces, by the THD, exerted by a hunting truck on a passing train and the simultaneous readings of vertical forces from the WILD. As such, the dynamic relationship between vertical and lateral forces is fully accounted to identify those critical instances where the wheel flange and rail gage face geometry may promote flange-climb derailments. These measurements are transformed into the “hunting index” to identify excessive side-to-side motion of bad acting cars.

Some empty or lightly loaded cars are susceptible to truck hunting when operated at speeds over approximately 50 mph. To reduce the severity of truck hunting, trucks can be equipped with features such as constant contact side bearings, center plate extension pads, hydraulic snubbers, or frame bracing. The restoration of worn truck components also mitigates truck hunting.

- **Hot Box Detector (HBD)**

The function of hot box detectors is to detect overheated journals. Overheated roller bearings occur when inadequate lubrication or mechanical flaws result in an increase in bearing friction. This phenomenon is called a "hot box" in railway jargon. The bearing temperature can continue to rise and lead to complete failure of the axle, commonly referred to as a "burnt-off journal" (BOJ). A BOJ normally results in the derailment of the car on which it occurs. Should axle failure happen while the train is proceeding at a high speed, the derailment frequently results in multiple cars derailed and/or damaged. A hot box condition on roller bearing-equipped rail cars can elevate quickly and become a BOJ within a few miles.

The HBD senses radiant infrared heat energy emitted from the bearing as it passes over the detector scanner (**Figures 14)**. The heat energy is converted to an electrical output proportional to the amount of heat and relative to the ambient temperature. Ambient temperature is determined by scanning the bottoms of the rail cars as they pass. Data is then processed to “warm” and “hot” levels. If the amount of energy sensed by the HBD exceeds preset values, then the appropriate action is warranted.

The HBDs are rated to work in ambient temperatures. Severe environmental conditions, such as snowstorms and blowing snow conditions or heavy rain and ice, can affect the quality of the scan data. The type of housing used for the roller bearings within the truck assembly can have an impact on the ability of the scanners to sense infrared heat energy.

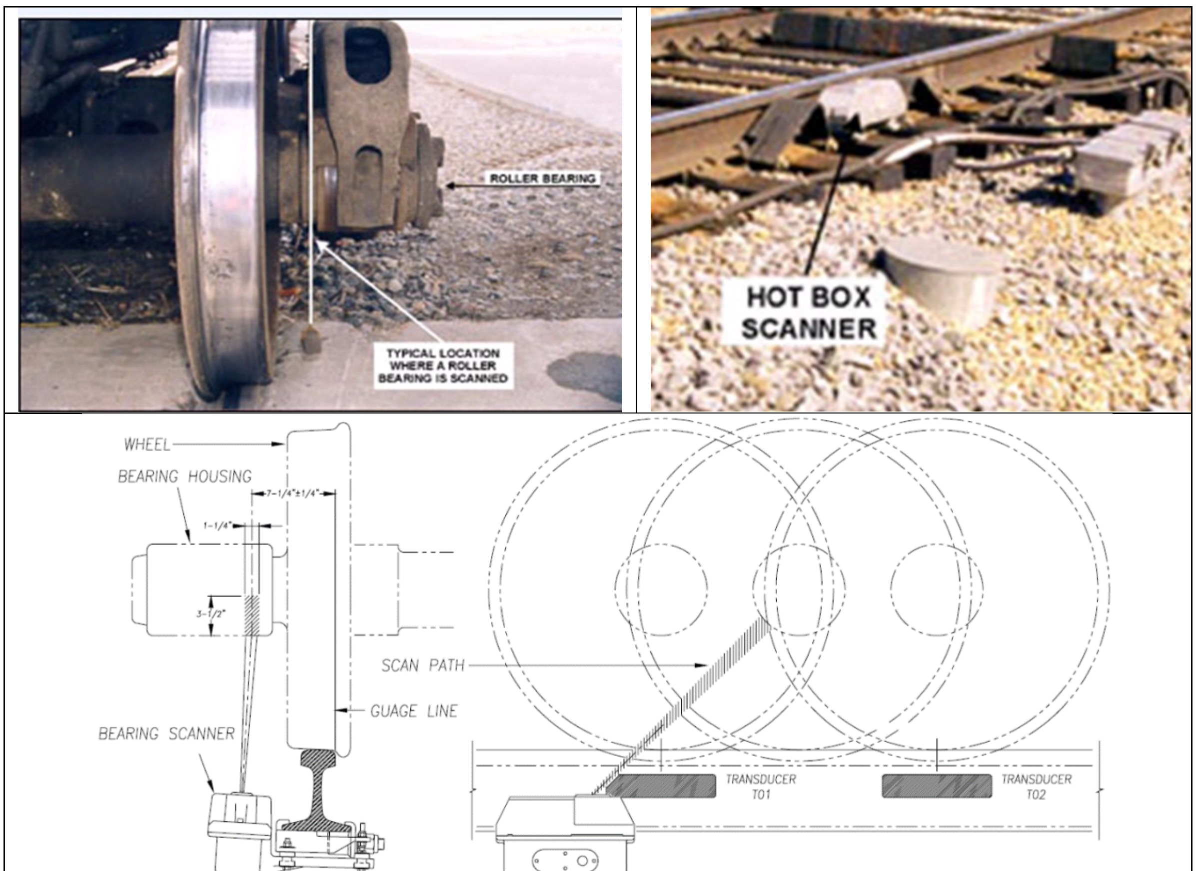


Figure 14: Typical Location for a Bearing Scanner – 7.25” from the gauge line

- **Dragging Equipment Detector (DED)**

The dragging equipment detector detects any object hanging under a car or locomotive. The DEDs may be of two different designs: paddle (mechanical) style (**Figure 15)**, or impactor (electronic) style (**Figure 16)**. The paddle style consists of strike plates, both inboard and outboard of the rails, attached to a shaft with a cam-operated switch and a return spring. An object striking the paddles in either direction would rotate the shaft, momentarily opening the switch contacts. An open circuit would trigger an alarm. The impactor style is designed to alleviate the problems associated with the paddle style under deep snow conditions and has no moving parts. Stationary strike plates between and outboard of the rails are fitted with accelerometers which detect impact energy. Sufficient impact energy creates an electrical output that generates an alarm. MV systems can detect dragging components using an AI algorithm **(Figure 17).**

Figure 15: Paddle style DED

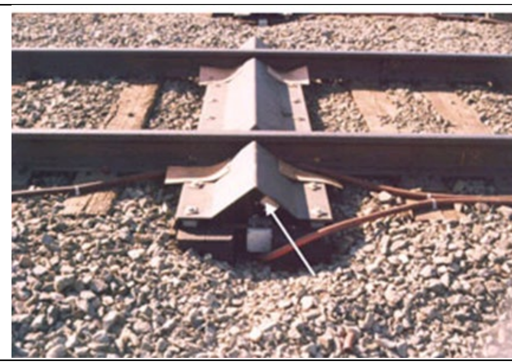


Figure 16: Impactor style DED showing location of an accelerometer on the underside of the strike plate

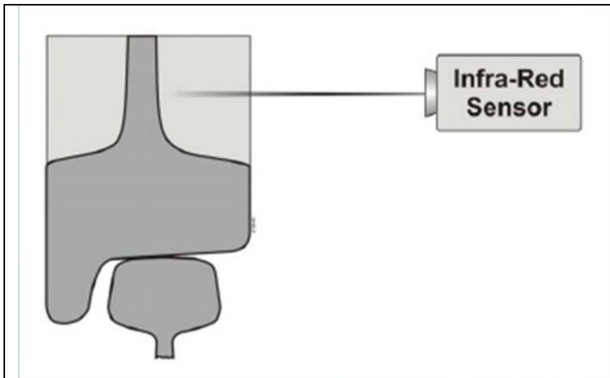
Figure 17: Dragging detection by MV-AID and DED

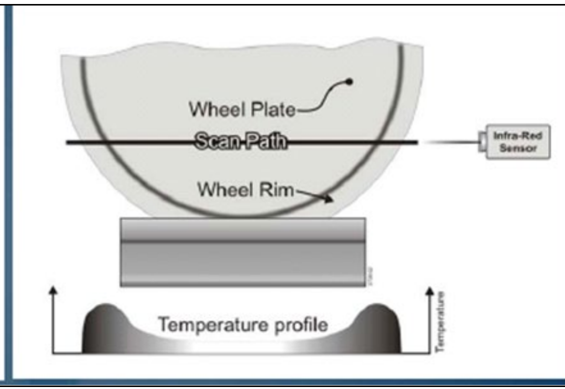
- **Hot Wheel Detector (HWD)**

The function of hot wheel detector is to detect overheated wheels. Abnormally high temperatures indicate brake pads stuck to wheel treads. This condition causes a significant increase in friction resulting in hot wheels indicating brake problems. The

HWD is similar to the HBD in that it senses radiant heat energy using infrared scanner technology. However, the target in this instance is the wheel plate area near the tread, approximately 2 1/2 inches above the rail (**Figure 18)**. Some systems use an HWD scanner on both sides of the track, but most use only one scanner on one side of the track. When only one HWD scanner is used (**Figure 19)**, to scan wheels on both the near and far rail, it is normally set at an angle to the track. The outboard wheel plate surface of a wheel on the near rail can be scanned, as can the inboard wheel plate surface of a wheel on the far rail. A reference temperature is established by placing a white board on the far side of the track opposite the HWD scanner. The reference board is used as a base value in order to produce semi-absolute wheel plate temperature readings. These readings are then compared to preset alarm thresholds.

If a wheel is cold during a brake application (e.g., in a run going down the grade) then its brakes are not working correctly. In addition, there is a deployment of Hot/Cold Wheel Temperature Detectors on instrumented tracks to utilize WTD logic in determining cars with underperforming brake systems. WTD sets an alert for a car that is expected to be braking but is not braking and vice versa. For example, the measured wheel temperature may be below the expected wheel temperature given past wheel temperature measurements as well as known track conditions, including the track grade. WTD alerts can be automated to generate an incident in a railroad's mechanical maintenance system.





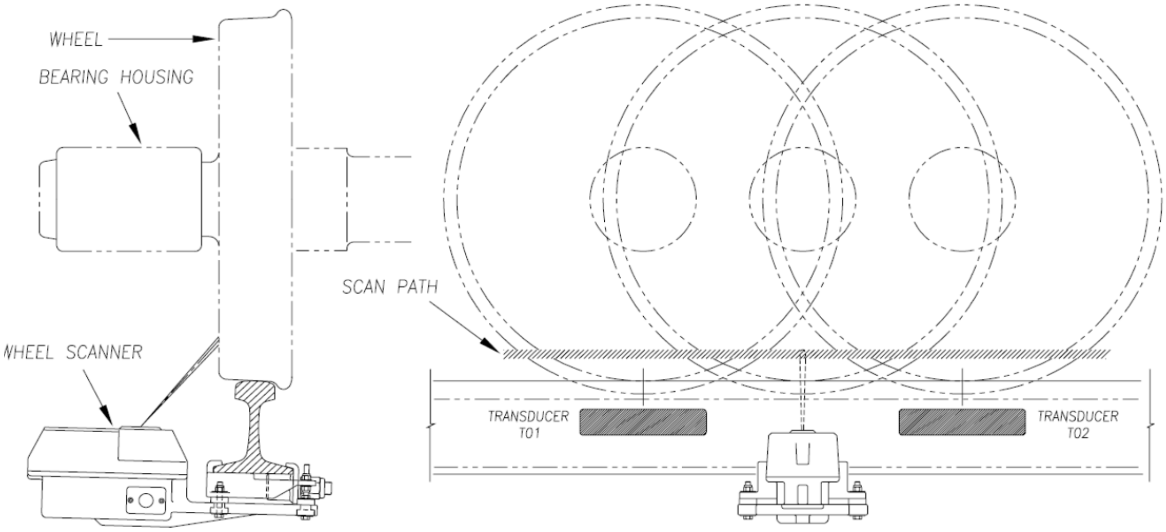


Figure 18: Two typical arrangements of HWD scanner to measure wheel plate temperature.

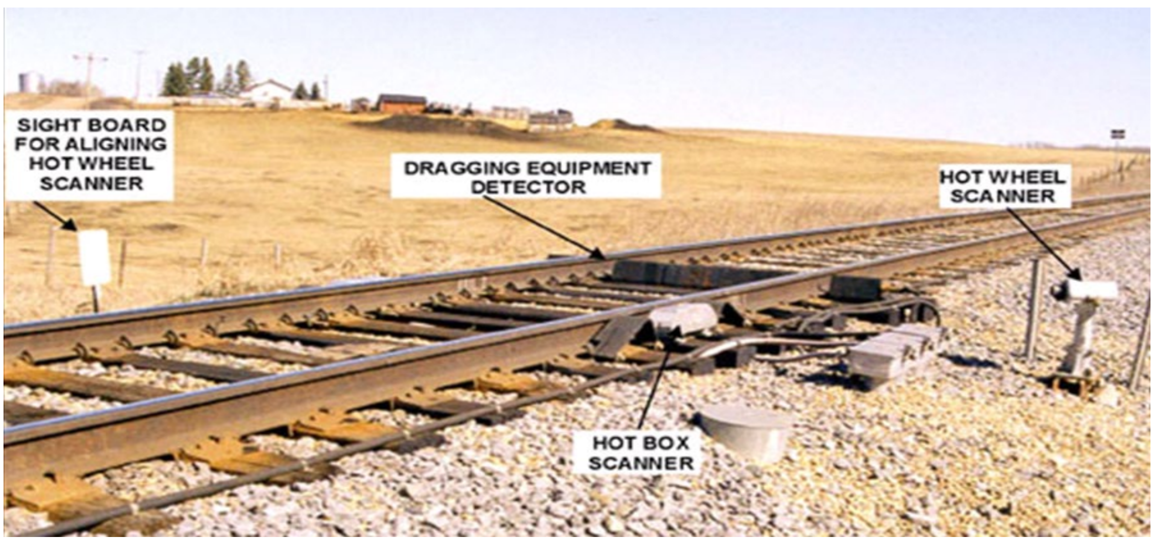


Figure 19: A SuperSite on Revenue Track showing HWD, HBD, and DED. The HWD has only One Scanner at an Angle to the Track with a White Reference Board on the Far Side.

- **Load Imbalance and Overload Detector (LIOD)**

  These detectors are used to reduce derailment conditions and infrastructure damage by measuring vertical loads on all wheels of a car at track speeds. LIOD measurements detect and alarm for overloaded rail cars or imbalanced rail cars (**Figure 20)**. Since only vertical wheel loads are essential for these detectors (**Figure 21)** they lend themselves well as add-on capabilities to the Wheel Impact Load Detectors. However, stand-alone wayside installations of these detectors may sometimes be required. Using statistical analysis of multiple vertical load measurements recorded by the detector, an estimate of the static weight of a rail car is derived to determine if the rail car is overloaded or imbalanced beyond safe operating limits. These detectors may also provide the weigh in-motion capability at track speed so that the need to take individual rail cars out of service for weighing is reduced. The corresponding weigh-in-motion measurements may however be affected by defective wheels, and sometimes by hunting trucks or other degraded conditions that reveal themselves in the process. As such, the weighing accuracy of these detectors, as compared to the low speed or revenue-scale weigh bridges, is debatable. Their use as alternative weigh-in-motion systems is the prerogative of the railroads, their customers, and the AAR.

Figure 20: A Case of Imbalance Loading of car

Figure: 21: Shown LIOD consists of an Angle Iron bolted to Rail at every Tie Location and anchored with Rail to Ties with Elastic Clips. The Angle Iron is instrumented on Crib Locations to measure Wheel Loads. As shown, the LIOD can be detached and anchored as needed

- **Truck / Bogie Optical Geometry Inspection (TBOGI)**
  Wear of the worn wheels on an axle will always be non-symmetrical. Maintenance of trucks then requires that this non-symmetry in wear of profiles of wheel-pairs on axles of the truck be reduced to a minimum. The TBOGI, by monitoring bogie performance on straight track, provides means to access the asymmetric wheel-pair wear of an axle in terms of racking position (TP), inter-axle misalignment (IAM), tracking error (TE), truck rotation, and truck shift (**Figure 22)**. The TBOGI is a laser-based inspection system manufactured by WID Inc. that scans trains passing at track speed to determine by optical means the geometric faults in the alignment and tracking of bogie wheel sets on straight (tangent) track.

  The TBOGI operates on the tangent track eliminating the need for a special track layout. Non-contact laser sensors are installed at a safe distance (**Figure 23)**, from passing trains in order not to interfere with any track maintenance work. The measurement method embodied in TBOGI provides a wide dynamic range and yields consistent results. Wide dynamic range allows TBOGI to identify very subtle bogie performance deficiencies while also capturing gross defects. The consistency of data provided by TBOGIE allows users to trend the health of rolling stock, thereby enabling the scheduling of maintenance interventions to correct impending defects before an exception is raised or other damage is caused.

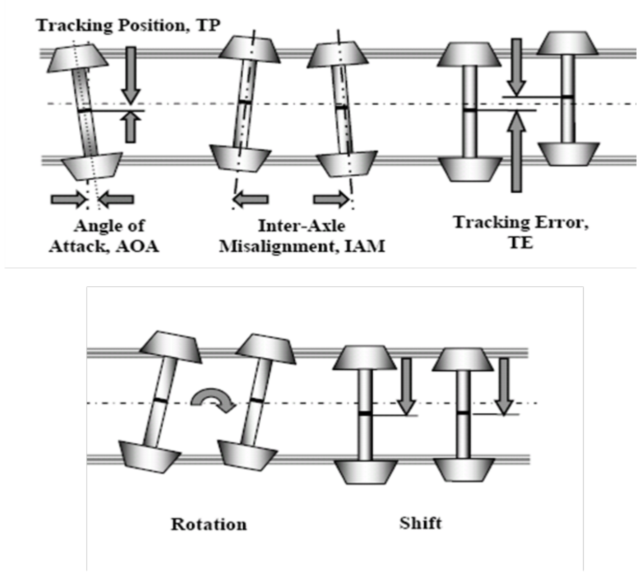


Figure 22: Definitions of Possible Displacements and Rotations in a Moving truck

Double track TBOGI system at Amtrak near Princeton, NJ. Characteristics of this site:
- High Speed 230 km/h (140 mph)
- Electrified track
- Mixed traffic (high speed passenger, freight)
- Integrated with Teknis WCM wheel condition monitor.

Figure 23: A typical TBOGI Deployments in Freight & High-Speed Amtrak Services

Some recent installations that are equipped with TBOGI-HD instrumentation are capable of monitoring the stability of the trucks due to hunting conditions on passing cars. This is accomplished through measuring the lateral distance using a multiple-box configuration **(Figure 24)**.

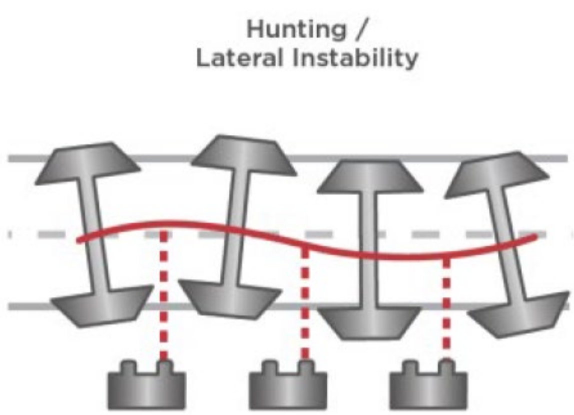


Figure 24: A typical arrangement of TBOGI-HD (triple-box configuration)

TBOGI features include:

1. Identifies skewed and “warped” trucks.
2. Identifies misaligned trucks.
3. Identifies trucks with incorrect wheel set tracking.
4. Identifies trucks that wear their wheels asymmetrically (“diagonal wheel wear”) even before severe wear sets in.

5. Identifies trucks displaying lateral instability "truck hunting."

6. Non-contact sensors installed at a safe distance from passing trains do not interfere with track maintenance work.

7. Installed on tangent track, no need for special track layout.

8. Measurements are insensitive to change in weather and rail lubrication conditions.

9. Measure at train speed up to 250 km/h.

10. Laser based sensor provides high accuracy wheel set angle of attack and tracking position information.

Acting on data produced by the TBOGI can enhance safety, reduce wheel set replacement, prolong truck component life, reduce rail wear, reduce fuel consumption, and optimize maintenance resources.

Use of Wayside Detector Data Discussion

In May 2019 FRA's Office of Research, Development, and Technology (RD&T) published "An Implementation Guide for Wayside Detector Systems" (The Guide). The Guide includes a description of wayside detector systems available at the time of the conducted research and final publication, but it is not all inclusive. The overarching objective was to identify opportunities for further safety improvements. The data collected by wayside detection systems might be very valuable in identifying a principal root cause(s) in case of railroad accidents and should be included in the accident investigation process.

FRA has no regulations pertaining to the data collected by the wayside detectors at present and collaboration with respective railroad(s) is strongly encouraged in finding the causes of equipment and/or infrastructure failures during accident investigations.

Detections include, but are not limited to:

1. Wayside condition detections

    a. Cracked Axle Detector (CAD)

    b. Cracked Wheel Detector (CWD)

    c. Thermal Scan (TS)

    d. Acoustic Bearing Detector (ABD)

    e. Low Air-hose Detector (LAD)

    f. Dragging Equipment Detector (DED)

2. Wayside performance detections

   a. Truck Hunting Detector (THD)

   b. Truck Performance Detector (TPD)

   c. Wheel Impact Load Detector (WILD)

   d. Overload/Imbalance Load Detector (OILD)

   e. Warm Bearing Trending (WBT)

   f. Wheel Temperature Trending (WTT)

3. Wayside machine vision technologies

   a. Wheel Profile Module (WPM)

   b. Brake Shoe Module (BSM)

   c. Automated safety appliance inspection system (ASAIS)

   d. Automated inspection of system components (AISC)

At a minimum, and if available, the following data from wayside data detection system may be reviewed during the accident investigation process:

Defective Component/Condition	**Detector Data/Trending Data**
Journal Bearing	MV-AID; ABD; TAD; HBD; WBT
Wheel Axle	MV-AID; CAD
Wheel	MV-AID; WILD; WTT
Wheel Climb/Lift	MV-AID; TBOGI; THD; TPD; WPM; WPD
Sideswipe	MV-AID; DED; OILD
Brakes	MV-AID; LAD
Draft System	MV-AID

AAR's Field Manual provides guidelines on detector calibrations and thresholds on collected data. Some of these thresholds (*e.g.*, for WILD and THD) are also mentioned in prior detector descriptions. As an example, the AAR condemnable alert (WILD - 90 kips to less than 140 kips for single wheel) represents the regular Field Manual Rule 41 <u>condemnable level at any time</u>. The <u>final alert level</u> (WILD - 140 kips and greater for single wheel) represents a wheel having an impact force on the rail so great that it places undue stress on both the wheel and the rail.

Hunting usually occurs on empty cars at speeds greater than 50 mph. Truck hunting detector limits are given in Interchange Rule 46. The responsible party is notified through the EHMS system when a car has a truck with a single THD detector reading (Salient Systems force-based Truck Hunting Index (HI)) greater than or equal to 0.20. This is considered the Window of Opportunity when car is in its home shop. However, <u>condemnable at any time</u> using THD detector data is defined when either:

1. A single HI absolute value reads above 0.65, or

2. Two HI absolute values read above 0.50 in a twelve-month time period. Rule 46 requires home shop disposition to be requested from the car owner when a truck exceeds condemning limits detected by a THD wayside detector. Consequent corrective steps require that:

a. The affected trucks be qualified and/or repaired to AAR Specification M-214;

b. Condemnable friction wedges be replaced;

c. If equipped with constant contact side bearings, resilient or spring elements be replaced;

d. Roller or block type side bearings be replaced with AAR M-948 approved long travel steel capped constant contact side bearings; and

e. Side bearing adjustment or component replacement be made per Rule 62. New sections were added to Field Manual Rule 46 addressing truck inspection and repair, and especially side bearing adjustment and repair Rule 62.

AAR Field manual Appendix F addresses WILD and THD detector calibration, validation, and data requirements. The truck performance detector (TPD) alert criteria are given in Field Manual Rule 46.

Rules related to the acoustic roller bearing defect detectors (ABD) were added to Field Manual Rule 36. Appendix G covers initial and continuous ABD wayside detector site validation. Field Manual rule states that an ABD wayside detector Level 1 alarm represents a specific minimum amount of bearing damage corresponding to at least one of the following:

1. Two square inches or more of spalled area on any one cup or cone running surface;
2. One square inch of spalled area on any one cup or cone running surface and ½ square inch or more of spalled area on any one other cup or cone running surface;
3. Any orange peel surface (resembling the look and texture of an orange);
4. Any roller spall or seam;
5. Any loose component indication:
    a. Cone race backface wear greater than 0.010 inch,
    b. Indication of spun cone on the corresponding axle journal,
    c. Oversize cone bore from dynamic growth and evidence of turning on axle journal; or
6. Two square inches or more of heavy water etched area, with indented surface(s),on cup or cone running surfaces.

If an ABD wayside detector shows a Level 1 alarm on a bearing, the car can be sent to a repair track to perform a hand roll inspection for removal or further inspection. As a rule of thumb, the reasons for hot bearings attributable to various failure progression modes, in descending order of magnitude or significance, are:

- Water etching
- Loose
- Fatigue spalling
- Bearing destroyed
- Wheel defect
- Mechanical
- Adapter
- Lubrication
- Displaced seal
- Application
- Truck related
- Manufacturing defect

Of these above modes, spalling and water etch are detected easily by acoustics. ABD wayside detectors are an evolving technology such that with additional development, some percentage of the other failure modes may also be detectable acoustically.

Appendix A – Instructions for Completing MP&E Violation Reports

Motive Power & Equipment Technical Bulletin MP&E 05-01, Guidelines for Preparing New MP&E Violation Reports – FRA, F6180.109 "Motive Power & Equipment Violation Report Form," which is embedded below under header **Motive Power & Equipment Report Form F6180.109**, is used for violation reports covering 49 CFR Parts 209, 210, 215, 223, 224, 229, 230, 231, 232, 238, 239, 40 CFR Part 201, (noise violations, EPA), and statutory violations of 49 U.S.C. Subtitle V, Chapters 203 & 207. MP&E violation recommendations associated with Parts 218 and 221 will use Form FRA F6180.67.

Form FRA F6180.109 and a help guide are components of the RISPC program and can be accessed from within RISPC or the shortcut icon. The software automatically transfers some of the information from the F6180.96 Inspection Report over to Form F6180.109.

Note: A narrative section is still required and shall be inserted in Item 44 (Violation Narrative) of the form. Any attachments such as photographs or other supporting documentation should be included in the F6180.109 package.

Inspectors are required to create paperless, digital documents of violations for submitting to the regional specialist. This process is intended to provide uniformity in submitting digital violations throughout FRA. All documents currently produced by MP&E field inspectors, using applications such as Microsoft Word, Microsoft Excel, Photographs, etc., can be converted into a PDF file. This is "built-into" the applications in either the file pull-down menu, printing options, or the toolbar. It allows the documents to be converted into a PDF file, which will be saved as a digital file.

If you have any questions regarding the use of this form, or the process to complete the digital violation, please contact your Regional Specialist.

The RISPC Program, F6180.96 and Forms F6180.109; F6180.67 Forms

F6180.96 Inspection Report preparation is mandatory for all inspections where a civil penalty action (violation report) is recommended. Inspectors should complete the Remedial Action portion of the inspection report, as soon as the report (railroad copy), is received from the railroad. Federal regulations require railroads to submit notification of Remedial Action to FRA for all violations within 30 days after the end of the calendar month in which notice of violation occurred. In this regard, it is recommended that inspectors update all inspection reports containing violations on a regular basis to help ensure the integrity of FRA's inspection report database. When using the RISPC inspection report program, some of the items will automatically transfer from the F6180.96 inspection report to the F6180.109 and F6180.67 violation report.

Submission of Photographs as Evidence

Photographs can sometimes be very strong evidence in support of a violation. If photographs are included in the violation, the inspector will attach each photograph using a medium which can be converted to a digital attachment (PDF file) and explain what each photograph shows.

Photographs which have been altered in any way should not be included as violation evidence. Adding digital "arrows" or other methods of pointing out the location of the defect or area to be viewed to photographs are acceptable and are not considered enhancements or alterations and are thus allowed. In addition, be certain that the photo clearly depicts the defect and location of the defect(s) in question. Sometimes multiple photos can help show both the details of the defect and its location within the context of larger pieces of equipment.

Statements of Witness or Reports of Interview

Statement of Witness: If the inspector does not have personal knowledge of the violation and there are no company documents that prove the violation, the violation report should be accompanied by one or more witness statements on the appropriate, current FRA-approved "Statement of Witness" form.[80] The witness statement must clearly substantiate any element(s) of the violation not established by other evidence.

- As in any case where a violation report is based on information received from a complainant, neither the report nor any of its attachments should reveal that the case arose from a complaint or identify any person as a complainant.

- Federal law (49 U.S.C. 20109(i)) prohibits revealing the identity of anyone who brings a safety complaint to FRA without that person's written permission or until litigation occurs.

- Each witness statement must contain the time, date, full name, title, signature, and mailing address of the person interviewed.

Reports of Interview: If the inspector does not have personal knowledge of the violation and there are no company documents that prove the violation, the violation report should be accompanied either by a witness statement (discussed above) or a Report of Interview.[81]

[80] The Statement of Witness form states that a railroad carrier engaged in interstate or foreign commerce may not discharge, demote, suspend, reprimand, or in any other way discriminate against an employee if such discrimination is due in part to the employee's lawful, good faith act done (or perceived by the employer to be done) to: (1) file a complaint; (2) notify the Secretary of Transportation of a work-related personal injury or work-related illness of an employee; (3) cooperate with a safety or security investigation by the Secretary of Transportation, the Secretary of Homeland Security, or the National Transportation Safety Board; (4) furnish information to the Secretary of Transportation, the Secretary of Homeland Security, or the National Transportation Safety Board, or any Federal, State or local regulatory or law enforcement agency as to the facts relating to any accident or incident resulting in injury or death to an individual or damage to property occurring in connection with railroad transportation; or (5) accurately report hours on duty.

[81] Inspectors should use a witness statement (as opposed to a Report of Interview) for non-manager railroad employees not only to protect against unintentional non-compliance with disclosure laws, but also to ensure the strongest case possible. The law does not require inspectors to withhold a Report of Interview with an employee unless, through a formal or informal complaint, the employee is truly a whistleblower. Nevertheless, FRA should remain sensitive to the possibility of retaliation against employees who divulge information. If that possibility appears well founded based on specific allegations set forth in a violation report, FRA should either: (i) protect the employee's name; or (ii) obtain a signed witness statement consenting to the references made.

- Like the Statement of Witness, if a Report of Interview is attached to a violation report, the inspector must be careful not to unintentionally disclose the name of a complainant, and, thus, be in noncompliance with the requirements of the law that prohibits disclosure of railroad employees who report railroad safety violations without their written consent.

- When using a Report of Interview, the inspector must do the following: (1) advise the person the interview is voluntary; (2) advise the person that the interview will be attached to a violation report and submitted to the railroad or company when a penalty demand is issued; and (3) have the person being interviewed review and approve the Report of Interview, preferably by e-mail.

- Each Report of Interview must contain the time, date of interview and the full name, title, and mailing address of the person who was interviewed. FRA may need to provide a redacted version of a Report of Interview to a railroad if the report would disclose the name of a complainant.

Copies of Railroad's Records

When applicable, the violation report must be accompanied by legible copies of the railroad's applicable records, containing information that will provide FRA's Office of the Chief Counsel with substantiating documentation and a clear understanding of the violation of Federal safety regulations.

All supporting documents to the violation must be scanned and included as a PDF file or master file, which is the complete digital violation package.

Digital Violation Master File

Use of the mandatory master filename format to name the violation package is as follows and the case type list you will need is included.

File Format:
Region-Case Type-Inspector Initials-Violation No.

Example:
D5-FCS-DC-200.pdf

Case Type List

Code	Type
AD	Alcohol and Drug Use Regulations
AR	Accident Reports Regulations
BSS	Bridge Safety Standards
BW	Bridge Worker Safety Standards
CC	Conductor Certification Regulations

CIS	Critical Incident Stress
EO	FRA Emergency Order
EO1	FRA Emergency Order No. 23
EP	Railroad Enforcement Procedures
EQ	Engineer Qualification Regulations
FCS	Freight Car Safety Standards
GC	Grade Crossing Signal Safety Regulations
GS	Safety Glazing Standards
HMT	Hazardous Materials Regulations
HS	Hours of Service Laws
HSPT	Hours of Service – Passenger Train Employees
HSR	Hours of Service Record Keeping Regulations
LI	Locomotive Safety Standards and Statutes
LIS	Steam Locomotive Safety Standards and Statutes
NE	Railroad Noise Emission Compliance
ONS	Occupational Noise Exposure Standards
PEP	Passenger Train Emergency Preparedness Regulations
PEQ	Passenger Equipment Safety Standards
REF	Reflectorization of Railroad Rolling Stock
REM	Rear End Marking Device Regulations
RMM	Roadway Maintenance Machines
ROP	Railroad Operating Practices
ROR	Railroad Operating Rules
RSP	Railroad Communications Regulations
RW	Roadway Worker Protection Regulations
SA	Safety Appliance Statutes and Regulations
SI	Signal Inspection Regulations and Statutes
TH	Train Horn/Quiet Zone
TS	Track Safety Standards

List of Exhibits Requirements

1. The Exhibits List should not be labelled as an “Attachment List”.
2. The Exhibit List must be a separate document titled “List of Exhibits”.
3. Inspectors MUST NOT place the Exhibit List in the narrative of the Violation Report.
4. List all of your exhibits in order of relevance and order in the package.

Identification of Exhibits

All documents/pages, including each exhibit that is in your violation package must contain a means of identification (ID). This ID is to be placed in the lower right-hand corner of each page of the document.

Note: Inspectors must use the following mandatory identification process.

Inspector Initials – Violation No.
Example: DC-200

Sequence of Master Digital Violation

Inspectors must use the following arrangement when completing the master digital violation.

- Violation Report F6180.109 (not an exhibit)
- List of Exhibits Page with exhibits noted in order of relevance.
- Inspection Report F6180.96 – Railroad Copy
- Other attachments as noted on List of Exhibits page in order of relevance.

PDF Violation Package – Bookmarking Documents

Violation packages are required to have bookmarks embedded in the master file that will identify each exhibit or document separately.

This process can be accomplished using the Adobe program once the violation package master file is complete.

Violation Package

The entire violation package contains the following:

- Cover letter regarding extraordinary penalties (if applicable).
- Master violation report file.

Note: The cover letter does not require digital signature by the inspector.

Digitally Signing the Completed Violation Package

Inspectors are expected to sign the completed violation package with a digital signature. The violation package will be accepted with a written signature that is scanned into a PDF document, but FRA would prefer a digital signature.

This process can be accomplished using the Adobe program once the violation package master file is complete.

Motive Power & Equipment Violation Report Form F6180.109

Each of the 47 Items and Field descriptions/requirements are outlined in detail.

Item/Field

1. **Subject:** The program will automatically generate this field when the CFR/USC entry is made in Item #2. Completion of this field is mandatory.

2. **Violation Of:** Check the appropriate box (e.g., 40 CFR, 49 CFR, or Statute). Enter the exact Part or Statutory section, Rule, or Subrule for the violation of the CFR. The CFR Part, Statutory Section, Rule, and Subrule will be automatically generated from the inspection report line item, but may be changed. The CFR Part and Rule will be checked against the RISPC CFR reference file. Only one line entry is allowed in this field. Completion of this field is mandatory.

3. **Report No.:** This field is entered for each violation report. Any report number will be accepted as long as it does not create a duplicate report. The report number can only be edited from the start window. It cannot be edited once the violation form is open.

4. **Related Violation Report No.(s):** Related violation report numbers should only be entered when multiple violations are issued and related to one another (e.g., more than one locomotive or car in the same train movement). Completion of this field is optional. It can contain up to 20 characters.

5. **Inspection Report No.- Report Date:** This field is auto-populated from the F6180.96 Inspection Report. Inspection reports are required for all violations, a violation report may not be prepared unless a corresponding inspection report has been created and present in the program. This is a non-editable field.

6. **Additional Regulations Violated:** If applicable, enter other sections of the CFR or statute that the locomotive or car may be in violation of. Since field 2 will only allow for one line of text, this field is the location where additional sections of the CFR may be cited. Locomotives and cars with multiple defective conditions could affect the aggregate amount of the civil penalty assessed on a railroad. Completion of this field is optional. It consists of four sub-fields, with 23 characters per sub-field. If additional space is needed, use the narrative section (Item 44) to detail additional regulations violated. When inspectors create the MP&E Violation Form F6180.109, they may choose to include from the inspection report up to four additional line items in Item #6 for the same locomotive or car.

7. **Operating Railroad:** This field is auto-populated from the F6180.96 Inspection Report. It may be changed, but it may not be left blank.

8. **RR Initials:** This field is auto-populated from the F6180.96 Inspection Report. It may be changed, but it may not be left blank.

9. **RR Division:** This field is auto-populated from the F6180.96 Inspection Report. This is a non-editable field.

10. **Name of Inspector(s):** This field is auto-populated from the F6180.96 Inspection Report. The name of the primary inspector cannot be edited. Clicking and entering the appropriate names directly into the field may enter two additional inspectors' names. Each sub-field can hold up to 25 characters.

11. **ID Number:** This field is auto-populated from the F6180.96 Inspection Report. This is a non-editable field. Only one inspector ID is necessary for this field.

12. **Date(s) of Violation:** This field consists of two sub-fields. Completion of the top field is mandatory and is auto-populated from the F6180.96 Inspection Report. The default date will be the same date used on the inspection report. However, if it is necessary to change the date, click on the arrow and select the appropriate date from the drop-down calendar. The date of the violation may not be later than the inspection report date in item #5. The second sub-field can hold up to 25 characters and should only be used when citing violations for multiple days.

13. **Time of Violation:** This is the time when the violation occurred based on personal observation, Statement of Witness (signed), or records. Click in the field and enter the appropriate time. This field is limited to 20 characters. Completion of this field is mandatory.

14. **Inspection Point:** This field is auto-populated from the F6180.96 Inspection Report. This is a non-editable field.

15. **Track No. / Name:** Enter the appropriate track number or track name by clicking and entering the appropriate information. Completion of this field is optional.

16. **Location of Inspection (City, County & State):** This is the location where the inspection was conducted. This field is auto-populated from the F6180.96 Inspection Report. The default City and/or County and State will be the same City and/or County and State used on the inspection report. For some violations, this location may differ from the location indicated in Item 17 (e.g., inbound train movement violations). The State code will be the two-character abbreviation. This is an editable field. **Note:** For violations based on signed witness statements, this is the location where the witness observed the violation. The location information entered here must be valid.

17. **Location of Violation (City, County & State):** This is the location where the violation occurred. This field is auto-populated from the F6180.96 Inspection Report. The default City and/or County and State will be the same as Item 16. The State code will be the two-character abbreviation. This is an editable field. **Note:** For violations based on signed witness statements, this is the location where the witness observed the violation. The location information entered here must be valid.

18. **Location Where Equipment Originated (City, County & State):** Enter the City and/or County and State where the locomotive, car, or train originated. This information may be the same as indicated in Item 16 or 17. The purpose of this field is to identify where the train received its initial terminal inspection and test. Completion of this field is mandatory if the violation is related to defective equipment or if Item 21 is completed. The location information entered here must be valid.

19. **Location Where Locomotives Are Maintained and Previous Periodic & Daily Inspection Information:** This field consists of three sub-fields. For locomotive violations, enter the City and State where the locomotive is maintained or assigned (if applicable), in the top line or first field. This field is limited to 25 characters of text. The second line requires information pertaining to the previous periodic and daily inspection. Enter the appropriate date, City, and State for each. The information for this field should be obtained from form F6180.40A and daily record on the locomotive. Previous periodic and daily inspection information is mandatory if the subject of the violation is related to Parts 229 or 230. The dates entered here must not be later than the inspection date. The location information for previous periodic and daily inspections must be valid.

20. **Line Item:** This field is auto-populated from the F6180.96 Inspection Report. When the violation program is launched, the user is required to choose from the reference table which line item to import from the inspection report. Once this action is complete, pertinent data from the inspection report will auto-populate this field as well as the information required for Items 21, 22, & 23 when applicable. Completion of this field is mandatory.

21. **Equipment Initials & No.:** This field is auto-populated when applicable from the F6180.96 Inspection Report. This is a non-editable field.

22. **Equipment Description:** This field is auto-populated when applicable from the F6180.96 Inspection Report. This is a non-editable field.

23. **Train ID:** This field is auto-populated when applicable from the F6180.96 Inspection Report. This is an editable field and must be completed if field 32 is checked yes.

24. **Type of Service:** Check the appropriate box. Completion of this field is mandatory.

25. **Name of Defective Component:** Manual entries may be entered directly into the field. Use descriptions from the CFR to identify the defective component whenever possible. Completion of this field is mandatory if fields 21 and 22 are completed. This field is limited to 150 characters of text.

26. **Location of Defective Component:** Manual entries may be entered directly into field. Enter a description that clearly explains the location of defective component. For example, "Facing side of car to the left" or "Facing end of car to the left". It is also appropriate to use AAR descriptions to locate a particular appliance on a locomotive or

freight car. For example, “Left front bottom switching step, or “AR sill step.” Completion of this field is mandatory if fields 21 and 22 are completed.

27. **Equipment Status:** This field will be completed from a drop-down menu that will contain eight commonly prepared descriptions. Completion of this field is mandatory if fields 21 and 22 are completed. This field is limited to 80 characters of text should the inspector need to use other than one of the eight already prepared descriptions.

28. **Position of Equipment and/or Train with Relation to Some Fixed Object at Time of Inspection and/or Violation:** Orient the equipment or train with a fixed object in the yard or track at the time of violation. For example, BNSF 8888 on main track 200 feet east of the yard office. If unknown indicate “Unknown.” Completion of this field is mandatory. This field is limited to 130 characters of text.

29. **Defect is:** Check the appropriate box: “Old” or “New.” Completion of this field is mandatory if fields 21 and 22 are completed.

30. **How Long Had Equipment been at Place of Violation:** Enter the amount of time the equipment in violation of Federal regulations had been at the location identified above. For example, if the equipment observed in violation had just arrived in a train, enter “just arrived.” If the equipment in violation has been there for about two hours from the time of initial observation and then departs in a train enter “Approximately two hours to my knowledge.” Completion of this field is mandatory if fields 21 and 22 are completed.

31. **Equipment Marked for Repairs:** Check the appropriate box. This also includes automated tracking. Completion of this field is mandatory if fields 21 and 22 are completed.

32. **Failure to Perform Air Brake Test:** Check the appropriate box. Completion of this field is mandatory.

33. **Type of Brake Test Required:** Click on the arrow to select the appropriate subject text from the drop-down list. The text chosen for this field must be selected from the drop-down list; manual entries are not allowed. Completion of this field is mandatory when field 32 is checked “Yes.”

34. **Brakes Overdue for Periodic Attention:** Check the appropriate box. Completion of this field is mandatory.

35. **Brakes Overdue for Single Car Test:** Check the appropriate box. Completion of this field is mandatory.

36. **SCT Device Available:** Check the appropriate box. Completion of this field is mandatory.

37. **Time:** This field consists of four sub-fields for entering times relating to improper brake tests or trains operating with inoperative brakes or air brakes due for periodic attention. Enter the appropriate times under each of the sub-fields. If the brakes were never applied or released, enter a hyphen (-). Completion of this field is optional but must be completed when the violation is related to an improper brake test and/or a train operating with inoperative brake(s) or has air brake(s) due for periodic attention. Each sub-field is limited to eight characters of text.

38. **Train Consist – Locomotives – Cars – Operative Brakes:** This field consists of six sub-fields for entering information relating to train make-up and percentage of operative brakes. When entering the percentage of operative brakes, be sure to use the appropriate calculations. The calculation methodology differs between passenger and freight operations. Completion of this field is optional but must be completed when violation is related to improper brake test and/or trains operating with inoperative air brakes. The six sub-fields are limited to the following characters of text, from left to right: 9, 2, 3, 3, 3, & 4.

39. **State Facts Which Determine Type of Air Brake Test Required:** Manual entries may be entered directly into the field. Enter an appropriate statement that definitively describes the type of brake test required. For example, in the case of brake(s) cutout, inoperative, or failure to perform an Initial Terminal Brake Test, the correct entry would be "Train originally made up at this point." Completion of this field is mandatory when field 32 is checked "Yes." This field will accommodate as much text as desired by user. The preferred typing "font" and size is "Times New Roman" size 12.

40. **Description of Use, Movement, or Events Constituting Violation:** Manual entries may be entered directly into the field. Use descriptions that affirmatively describe observed use or movement of equipment. With some exceptions, like the Noise Emission pass-by standards and Safety Glazing Standards, actual movement of equipment is not necessary for the railroad to be in violation of FRA regulations. However, violations citing actual movement will generally make a stronger case for railroad safety. Completion of this field is mandatory. This field will accommodate as much text as desired by user. The preferred typing "font" and size is "Times New Roman" size 12.

41. **Describe Repair Facilities:** Indicate whether or not repair facilities are available. Provide a detailed description of the facilities available. For example, if a location only has wheel trucks available for making repairs, specify what type of equipment (tools, compressed air, welding equipment, etc.) is available. If a location has a fixed repair facility, provide as much detail regarding what type of repairs are made to equipment on a daily basis. If repair facilities are not available, indicate "None." Completion of this field is mandatory. This field will accommodate as much text as desired by user. The preferred typing "font" and size is "Times New Roman" size 12.

    Note: If "None" is entered be certain to explain in detail under Violation Narrative why the locomotive, power car, or car (passenger or freight), is in violation of Federal regulations. The laws and regulations related to safety appliances require defective safety

appliances to be repaired when found to be defective. However, the law does allow for the movement of defective safety appliances to the nearest location where the necessary repairs can be made if repairs cannot be made in a safe and reasonable manner at the location where they are originally found defective. Prevailing case law suggests that neither knowledge of the defect(s) nor convenience mitigates a railroad's responsibility for compliance with the Safety Appliance Laws and Regulations. The key here is whether or not repairs can be made at the location where the equipment is originally found defective in a safe and reasonable manner. If a wheel truck at a particular location routinely makes repairs of the type needed, then FRA will generally consider that location a location where those repairs can be made. Conversely, FRA does not expect a railroad to conduct repairs at a location that exposes its employees to unnecessary danger or risk of personal injury. Thus, inspectors are reminded to consider these facts and weigh the circumstances carefully when determining "safe and reasonable."
(For a listing of factors to consider when determining whether a location is one where repairs can be made, see the Power Brake Regulations at § 232.15(f).)

42. **Description of Non-compliance:** Manual entries may be entered directly into the field. This field must contain a detailed narrative description pertaining to the issue in non-compliance. For safety appliance violations, use any of the following three adjectives to describe the defective condition: inoperative, ineffective, or insecure. For example, "Insecure end-handhold account one of two fasteners missing, or "ineffective end-handhold as 14" of its 16" clear length crushed against the car." Completion of this field is mandatory. This field will accommodate as much text as desired by user. The preferred typing "font" and size is "Times New Roman" size 12.

43. **Railroad Response or Remedial Action Taken in Response to Violation:** Manual entries may be entered directly into the field. Be certain to describe any agreement or disagreement with respect to findings and notification of violation and note remedial action taken by the railroad. Completion of this field is mandatory. This field will accommodate as much text as desired by user. The preferred typing "font" and size is "Times New Roman" size 12.

44. **Violation Narrative:** In chronological order, write a thorough description of the violation. This should include factual information that clearly articulates the violation in detail, as well as a summary of defects observed in the train. Describe all circumstances surrounding the violation, such as movement, use, or prior inspection by railroad mechanical forces. Use statements such as "I observed" or "This violation is based on personal observation."

    Consider including details that will counter any mitigating factors that railroad attorneys might submit during claims conferences. For example, if the violation is recurring and the inspector has had little or no success in achieving compliance with the railroad or individual, it would be extremely important for the inspector to include details about compliance history if not adequately detailed in field 44.

The inspector may quote a portion of the applicable regulation if this will assist the reader's understanding of the nature of the violation. This field will accommodate as much text as desired by user. The preferred typing "font" and size is "Times New Roman" size 12.

Note: If known, include a brief description of the overall compliance history at location where inspection and/or violation occurred. Enter, in percentages, if possible, the overall compliance history for the last year and current year at the location where the violation occurred. It is also acceptable to use narrative descriptions to illustrate situations concerning current and/or past egregious and/or recurrent non-compliance.

45. **Date of Report:** Enter date the violation report was prepared. Completion of this field is mandatory. This date may not be earlier than the inspection date.

46. **Signature of Inspector(s):** Inspectors are expected to sign the completed violation package with a digital signature. The violation package will be accepted with a written signature that is scanned into a PDF document, but FRA would prefer a digital signature.

47. **Railroad Notification:** This field has four sub-fields for entering information relating to time, date, person and title of the railroad person notified about this violation. Enter the appropriate information. Completion of this field is mandatory. The notification date may not be earlier than the inspection date.

Digital Violations FAQ

1. Q. Has FRA's Office of the Chief Counsel (RCC) and the Office of Railroad Safety approved this document and the new processes implied herein?

   A. Yes.

2. Q. How should I attach supporting documents (exhibits) to violations?

   A. Do not provide a list of supporting exhibits in the body of a violation narrative. Please use a separate sheet titled "List of Exhibits," and list supporting exhibits without numbers or letters. Supporting exhibits should be listed and attached in order of relevance.

3. Q. Can inspectors reference a specific exhibit in the narrative of the violation even though inspectors were previously instructed **NOT** to put the "List of Exhibits" in the body of the violation itself?

   A. Yes. In fact, RCC strongly requests that inspectors should reference exhibits when it is needed to provide clarity. FRA attorneys will be in a better position to defend the merits of the violation because they will better understand the entire circumstances surrounding the case. Nonetheless, inspectors should be cognizant that if a specific exhibit is referenced in the *narrative, and then that same exhibit needs to be removed, the violation package will likely have to be returned to the inspector for editing.*

4. Q. How should each document in the “List of Exhibits” be named and identified?

   A. In the “List of Exhibits” inspectors should use a name that corresponds to what the exhibit actually is - e.g., Inspection Report, Train Consist, Hours of Service Record, Photo Sheet, etc. (Do not use a letter or number designation, which will be problematic if an exhibit needs to be moved or removed from the violation report package.) For the identifier, each exhibit should use the same identification procedure as the other documents in the violation package. That identifier should be in the lower right-hand corner and formatted as: Inspector’s initials-violation number, e.g., PLM-121.

5. Q. Is it necessary to attach an entire train consist, timetable, track chart, etc. when using a voluminous document as an exhibit?

   A. No. Only attach the relevant pages such as the cover page and the actual page(s) needed to support the violation. Inspectors should be sure to provide a clear explanation of the relevance the exhibit has to the violation. This explanation should include where and when the inspector obtained the document. This is necessary in the event that the railroad produces conflicting documents.

6. Q. Are there any special considerations I should be aware of when preparing violations associated with complaints?

   A. Yes. Nothing in the violation report package should reference the complainant’s name, complaint control number, source code, or the fact that the violation is based on information obtained from a complainant. The only exception is when the violation report is accompanied by a signed witness statement on the approved form. <u>Note: Inspectors should only attach the Railroad Copy of the F6180.96 to the violation report package, not the FRA Copy</u>.

7. Q. Is it necessary to wait for the Remedial Action report to be completed by the railroad prior to submitting the violation package?

   A. No, but inspectors should always attempt to resolve remedial action reports in a timely manner.

8. Q. Is the F6180.96 Inspection Report valid without a signature from a railroad official?

   A. Yes. An inspection report does not need a railroad official’s signature to be considered valid. However, inspectors should endeavor to obtain the railroad official’s signature acknowledging receipt of the report when practicable and must always indicate in the violation report the name and title of the railroad official notified of the violation. This signature should be obtained on the <u>Railroad Copy</u> of the F6180.96.

9. Q. Can FRA inspectors accept an e-signature of the railroad official on the F6180.96 Inspection Report? (Like an Adobe e-signature, or similar)

   A. Yes. Also, a copy of a "read receipt" indicating the railroad official received the report via email is adequate and can be included in the violation package. A "read receipt" can be requested when the FRA inspector sends the railroad official an email with the F6180.96 report attached. The "read receipt" could then be printed out or saved as a PDF file.

10. Q. Can FRA inspectors use Adobe's e-signature in lieu of scanned copies of violation reports and inspection reports that contain original, handwritten signatures?

    A. Yes.

11. Q. If I can't sign my name digitally, will RCC still accept a document that I have signed and then scanned into the violation report?

    A. Yes.

12. Q. Should a Form 8 (Special Notice for Repairs) be included in the violation report package?

    A. Yes, as well as Form 8A, if available.

13. Q. How do I handle electronic media (wav files, videos, etc.)?

    A. RCC will handle on a case-by-case basis (Regional management should inquire to RCC for guidance).

14. Q. Is it necessary to create a separate 6180.96 report for each violation cited when there are multiple violations found on a railroad or shipper that day?

    A. No. However, RCC prefers to see all the defects associated with the violation on one inspection report.

15. Q. Does the violation package have to be bookmarked?

    A. Yes.

16. Q. Is each document in the violation package required to contain a header identifying the document as pertaining to that specific violation?

    A. Yes. Use the required format: Inspector's initials-violation number, e.g., PLM-121.

17. Q. What is the difference between the digital violation package master filename and the identification of the documents in the digital violation package?

A. The digital master filename identifies the violation package's master PDF file. The identifier associates each document within the master PDF file with a common name, e.g., PLM-121, preferably in the lower right corner of each page.

18. Q. Are there any documents that should not be included in the violation package's master PDF file?

    A. Yes. Any memorandum addressed to RCC regarding any requested extraordinary penalties is a separate document and should not be included in the violation package's master PDF file.

19. Q. Are there any other resources that I can read to help me improve my violation reports?

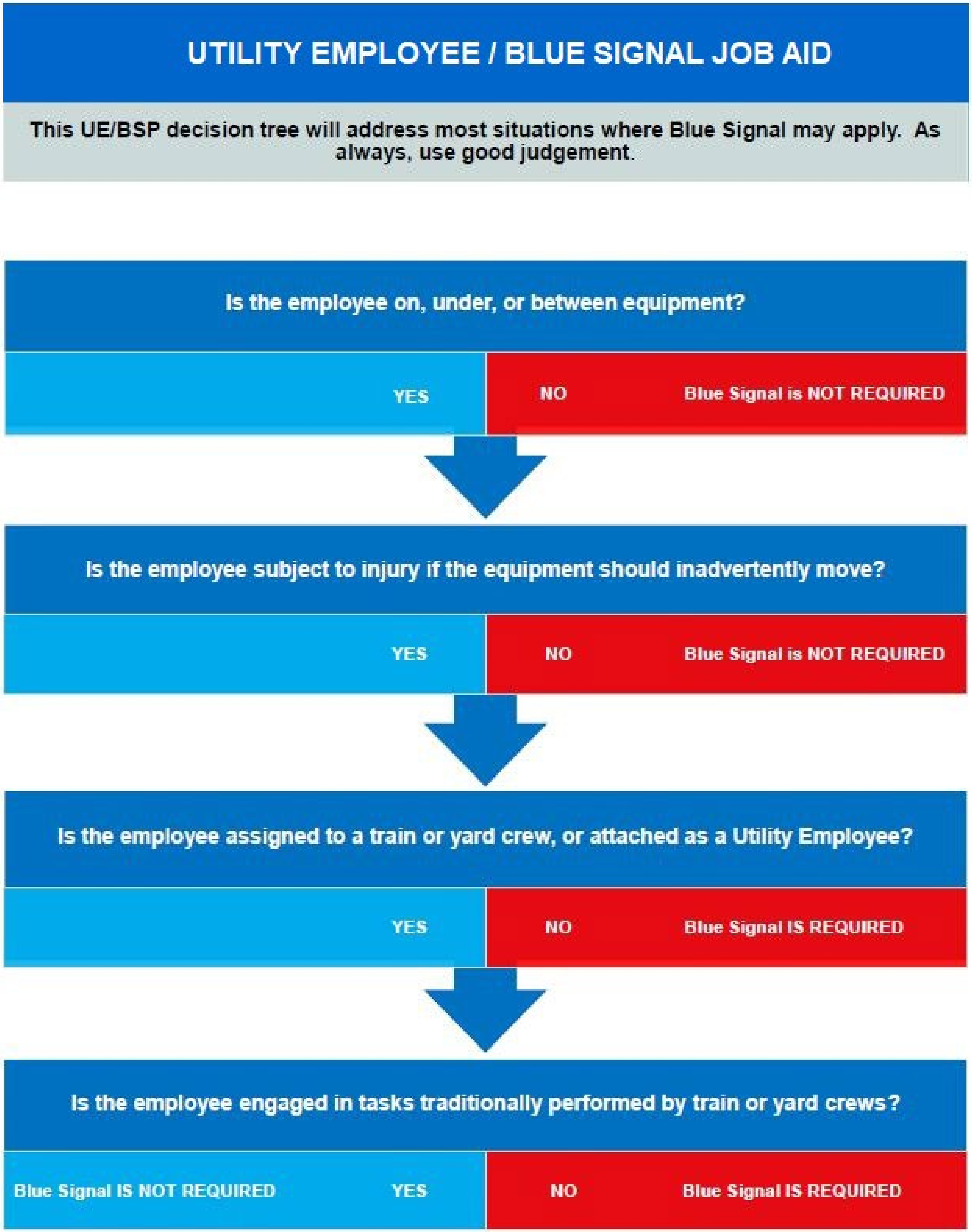
    A. Yes. Refer to the General Manual.

Contact your Regional Specialist if you have additional questions regarding Form F6180.109.

Appendix B – Reserved

This appendix is being reserved for future updates of the Compliance Manual.

Appendix C – Blue Signal Job Aid



This job aid is intended to highlight the routine findings of 49 CFR 218 – Subpart B and does not encompass all elements of that regulation.

Memorandum

U.S. Department of Transportation

Federal Railroad Administration

Date: August 20, 2021

Subject: Technical Bulletin MP&E 21-02, Failure to Comply with Blue Signal Protections: Title 49 Code of Federal Regulations Section 218.22.

From: Mr. Charles King
Director, Office of Railroad Infrastructure and Mechanical Equipment

To: All Safety Management Teams, Specialists, State Program Managers, and all Federal and State MP&E Inspectors

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The purpose of this Technical Bulletin (TB) is to advise Federal Railroad Administration (FRA) and participating State MP&E inspectors regarding the scope of functions a member of a train or yard crew, or a utility employee properly attached to a train or yard crew, may perform without establishing blue signal protection (BSP). This TB also reinforces the requirement that any assigned utility employees must meet all the conditions provided in § 218.22 to perform tasks without BSP.

Background: Recent shifts in the railroad industry have resulted in the reassignment of tasks, traditionally performed by railroad car inspectors, to train or yard crews or utility employees without either the protection of an attached locomotive or BSP. In addition, recent incidents involving utility employees, including an amputation and fatality, have raised safety concerns about continued industry changes and the proper interpretation of what both train or yard crews, and utility employees attached to those crews, are permitted to do without BSP. These incidents also highlight the importance of compliance with all requirements of the utility employee regulation.

Title 49 CFR Part 218 delineates which railroad employees may be excluded from BSP as utility employees (§ 218.22) and defines "train or yard crew" (§ 218.5). In § 218.22(g), FRA states that any railroad employee not assigned to a train or yard crew or authorized to work with a crew as a utility employee, is a worker required to have BSP. The definition of "train or yard crew" provides in part that train or yard crews must be "involved with the train or yard movement of railroad rolling equipment they are to work with as an operating crew; reporting and working together as a unit that remains in close contact."

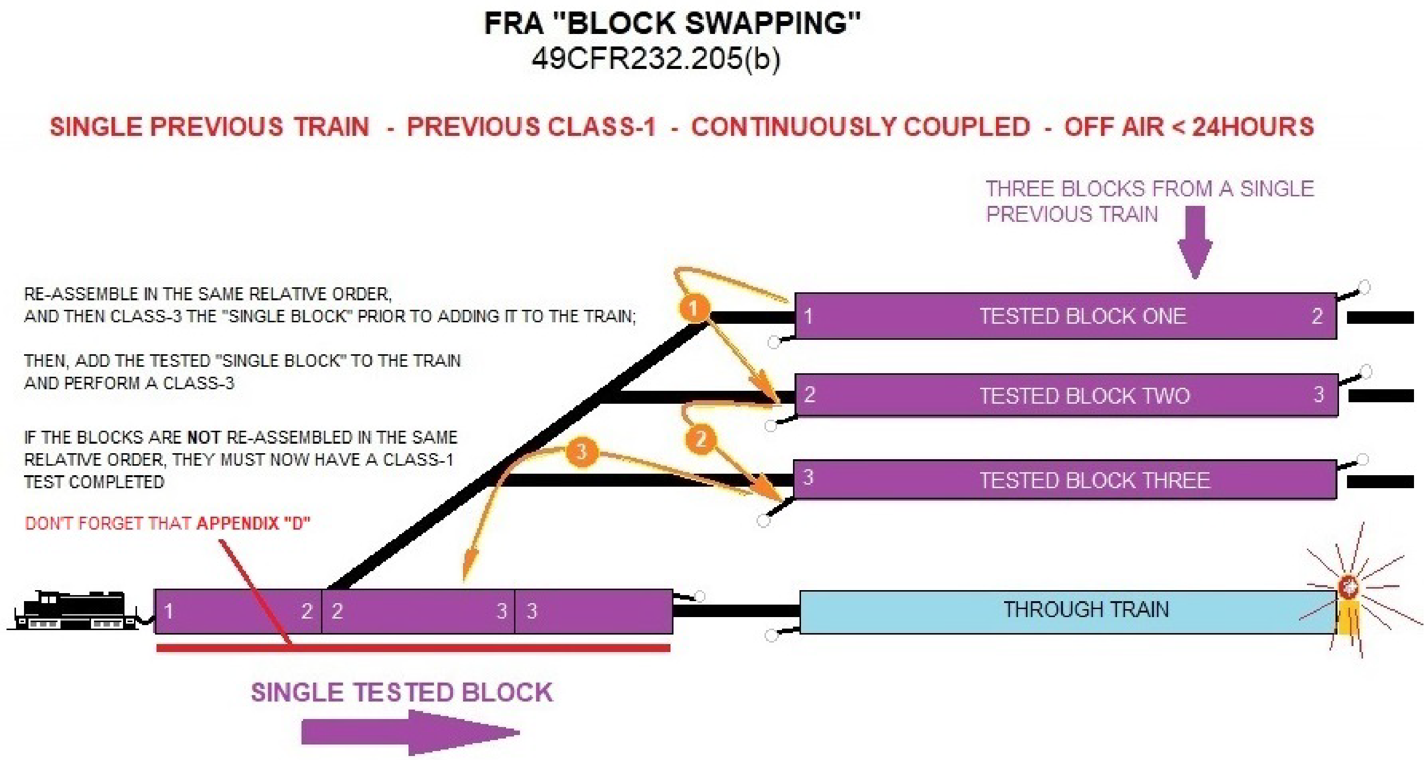
Utility employees are excluded from BSP only when assigned to and functioning as temporary members of a specific train or yard crew under all the conditions set forth in § 218.22, which are essential to the employees' safety. These conditions include measures to properly attach to a train or yard crew and establish and maintain clear communications in such a manner that each member of the train or yard crew understands the duties to be performed and whether those duties will cause any crewmember to go on, under, or between the rolling equipment. Further, § 218.22(c)(5) limits the tasks that an assigned utility employee may perform without BSP. In all other circumstances, utility employees working on, under, or between railroad rolling equipment must be provided with BSP.

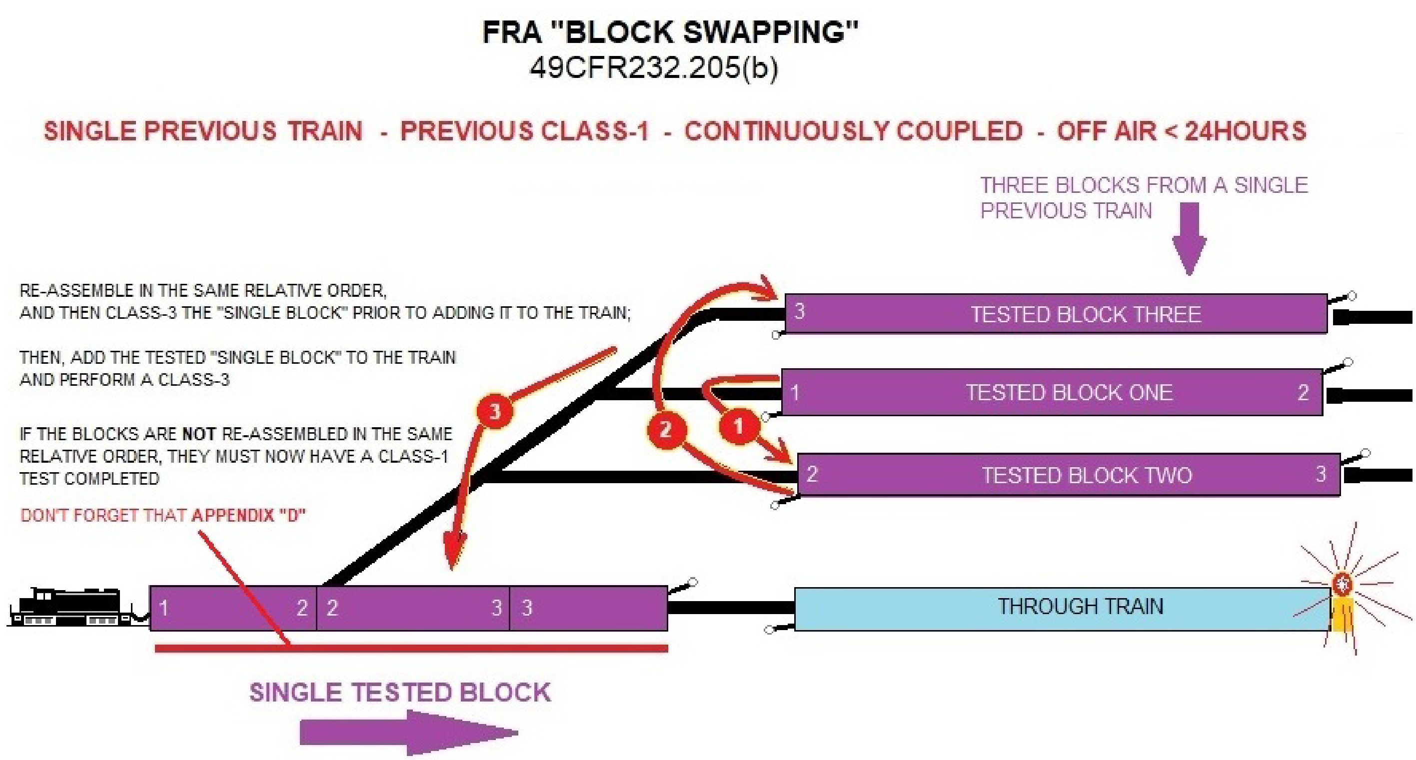
Guidance: FRA has recently found that railroads have occasionally utilized train or yard crewmembers or utility employees, rather than car inspectors, to complete tasks traditionally performed under BSP, under the mistaken impression that the exclusion from BSP for train or yard crews extends to all work assigned to these employees.

In addition, FRA has become aware that railroads have directed train or yard crews, and assigned utility employees, to perform work on equipment not part of the train to which such crewmembers or utility employees were assigned. FRA reaffirms its position, as codified in § 218.22, that the BSP exclusions apply only to tasks involving equipment that is part of the train to which a crewmember or utility employee is assigned. Safety can be assured only by providing protection against unexpected movement of equipment equivalent to a crewmember occupying the cab of an attached locomotive. FRA believes that crews need to have complete control over the equipment that is part of the train on which they are working. Accordingly, a yard airbrake test performed without a locomotive on equipment not part of the train to which train or yard crewmembers or utility employees are assigned, for example, can only be performed under BSP.

If there are any questions or concerns regarding this TB, please contact Mr. John D. Brahaney, Railroad Safety Specialist (SME), FRA Motive Power & Equipment Division, at (202) 805.5359 or john.brahaney@dot.gov.

Appendix D – Block Swapping and Brake Testing Graphics

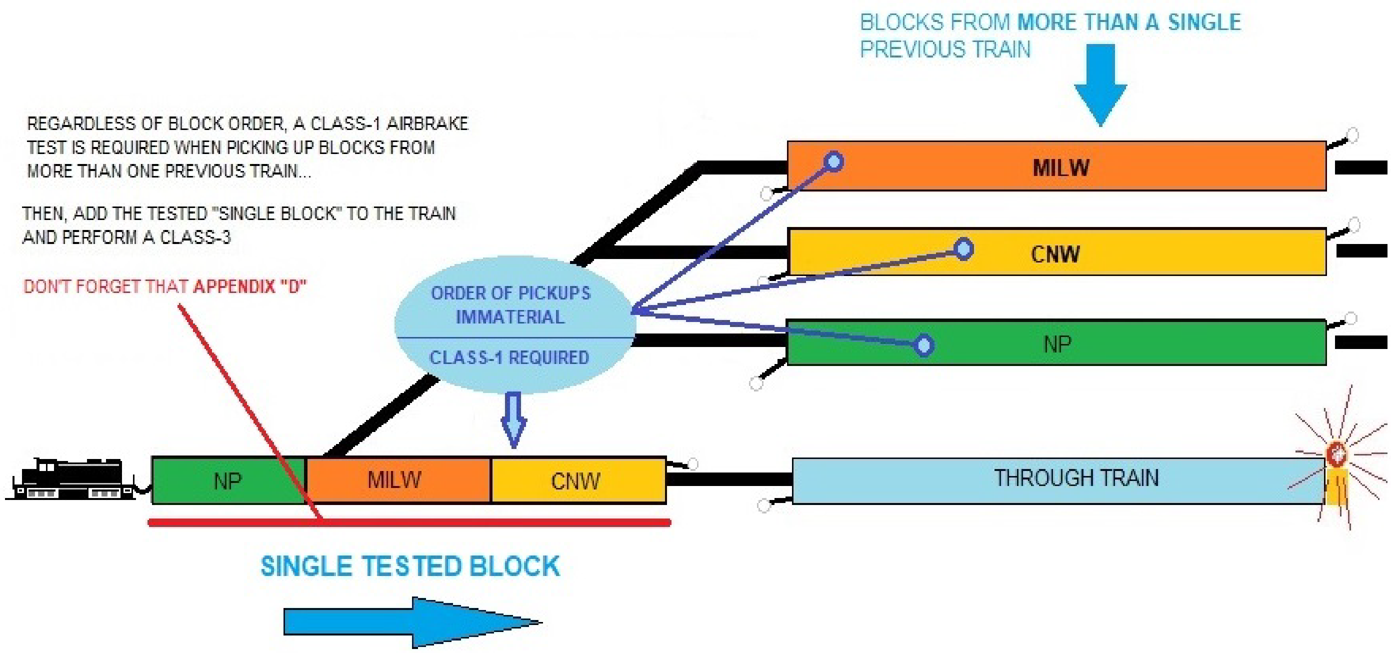




FRA "BLOCK SWAPPING"

49CFR232.205(b)

MORE THAN ONE PREVIOUS TRAIN - PREVIOUS CLASS-1 - CONTINUOUSLY COUPLED - OFF AIR < 24 HOURS



FRA TRAIN BRAKE TESTS CONDUCTED USING YARD AIR (232.217)

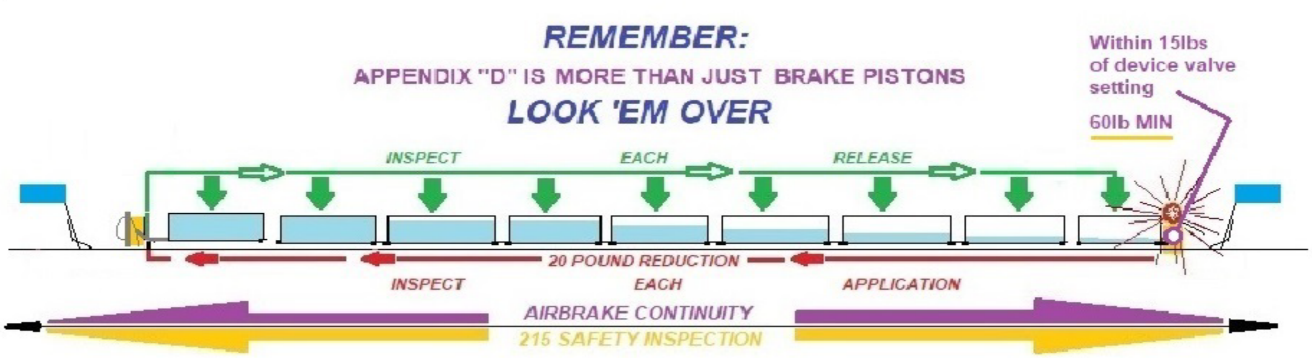
> Charged and tested in accordance with 232.205(c), and kept charged.

> If off air more than 24 hours...shall be tested IAW 232.205(c).

> Test devices & gauges calibrated every 92 days; electronic - ANNUALLY ; shall be accurate (+/- 3psi) and function as intended.

> Motive power coupled - Class III performed.

> If pressure at device is less than 80psi, BP leakage or AFM test conducted when the locomotives are attached (232.205(c)(1).



FRA CLASS ONE BRAKE TEST - INITIAL TERMINAL INSPECTION (232.205)

> Leakage Test - BP within 15 psi of feed-valve setting, but not less than 75 psi

> 20-lb reduction; wait 45-60 seconds; note leakage; NTE 5 psi/minute or 60 CFM.

> INSPECT each SIDE of each CAR; "Roll-by" does NOT constitute a side for inspection;

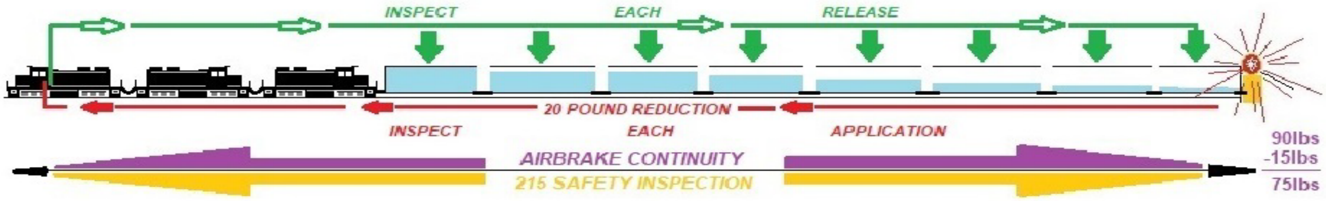
> EACH CAR SHALL APPLY and remain applied until the release is initiated;

> Re-Tests may remain in the train if brakes apply and remain applied until the release is initiated after a period which is no less than 3 minutes.

REMEMBER:

90-lbs ON THE REAR DOESN'T MEAN YOU HAVE "AIR"

LET 'EM CHARGE



FRA CLASS ONE BRAKE TEST - INITIAL TERMINAL INSPECTION (232.205)

> Nominal piston travel adjusted 6" to 9" or as stenciled;

> Release on EACH CAR shall be verified; "Roll-by" NTE 10mph

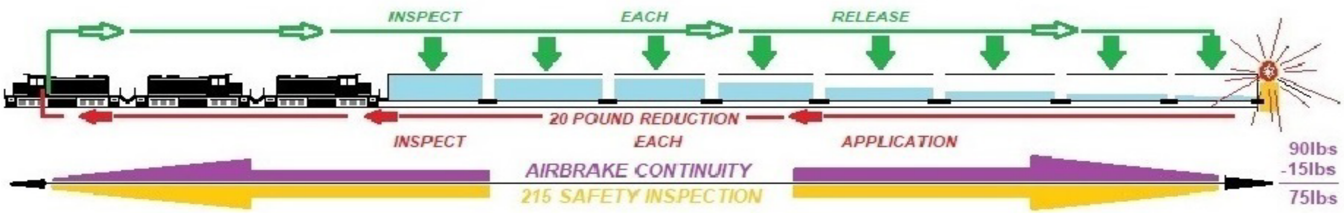
> NOTIFY the operator of the train of the results of the test;

> Maintain a written or electronic record in the cab.

REMEMBER:

APPENDIX "D" IS MORE THAN JUST BRAKE PISTONS

LOOK 'EM OVER



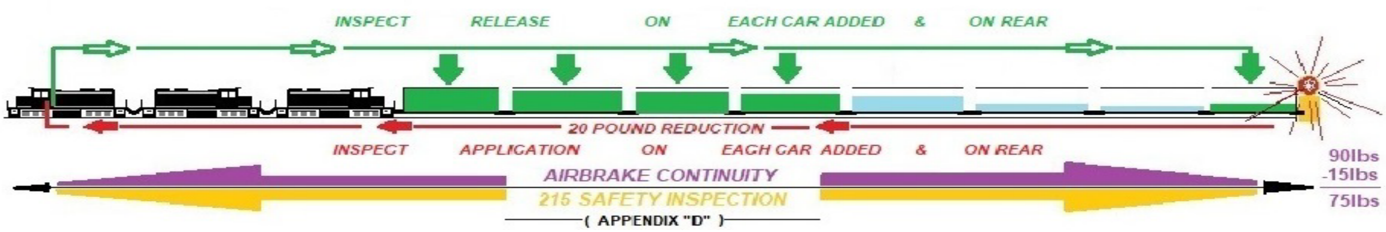
FRA CLASS TWO BRAKE TEST - INTERMEDIATE INSPECTION (232.209)

> At a location other than the initial terminal of a train, a Class II shall be performed;

> When added, each car or solid block of cars that has not received a Class I brake test, been off air for >24 hours, or comprised from more than one previous train;

> A car or solid block of cars added from a single previous train that received a Class-One Brake Test and have been off air < 24 hours, but NOT remaining continuously & consecutively coupled except for the removal of defective equipment, or not added in the same relative order.

INITIAL TERMINAL CLASS ONE 100% BRAKES —— OR —— OTHER-THAN-INITIAL-TERMINAL CLASS TWO 85% BRAKES



FRA CLASS TWO BRAKE TEST - INTERMEDIATE INSPECTION (232.209)

> Leakage Test - must be performed on the entire train pursuant to 232.205 (c)(1). BP within 15 psi of feed-valve setting, but not less than 75 psi;

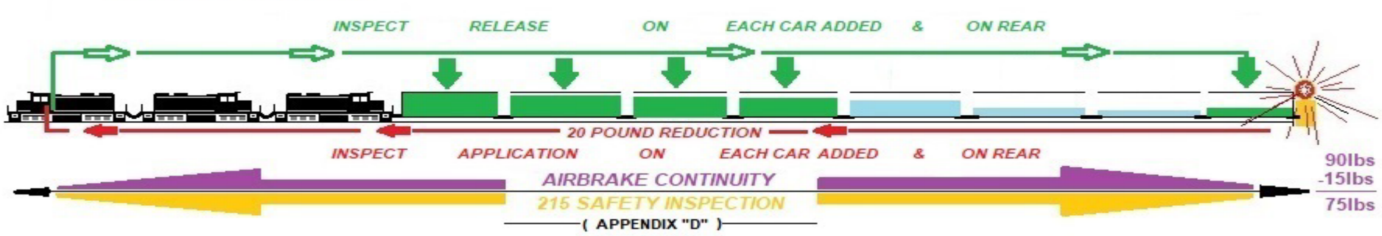
> 20-lb reduction; wait 45-60 seconds; note leakage; NTE 5 psi/minute or 60 CFM.

> INSPECT each SIDE of each CAR ADDED for application and release. A "Roll-by" inspection not exceeding 10mph constitutes an inspection for that side;

> EACH CAR ADDED shall apply and remain applied in response to a 20lb reduction until the release is initiated;

> Re-Tests may remain in the train if brakes apply and remain applied until the release is initiated after a period which is no less than 3 minutes.

> Defective equipment may be moved pursuant to 232.15, maintaining 85% operative brakes.



FRA CLASS THREE BRAKE TEST
TRAINLINE CONTINUITY INSPECTION - (232.211)

> Where a locomotive or caboose changed;

> Car or solid block of cars is removed with rest of the consist unchanged;

> At other-than-initial-terminal, a car or solid block of cars added from a single previous train that received a Class-One Brake Test and have been off air < 24 hours, continuously & consecutively coupled except for the removal of defective equipment, and added in the same relative order.

> Whenever the continuity of the brake pipe is broken or interrupted, with the train consist otherwise remaining unchanged.

REMEMBER:

AS INDICATED BY AN EOTD, ACCURATE AIR GAUGE, OR VISUAL INSPECTION OF THE BRAKES ON THE REAR CAR.

FRA TRANSFER TRAIN BRAKE TEST (232.215)

> DEFINED: A train that travels between a point of origin and point of final destination not exceeding 20 miles. Such trains may pick up or deliver freight equipment while en route to destination. (232.5)

> System charged to not-less-than 60 PSI, as indicated by an accurate gauge or EOTD.

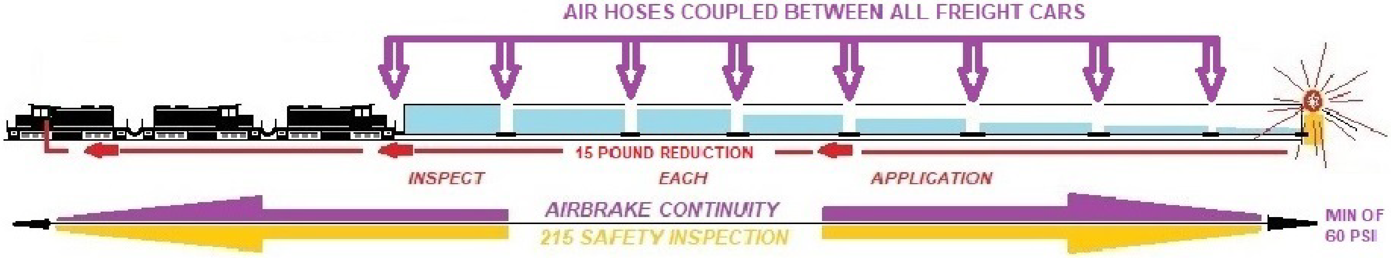
> 15-lb service brake pipe reduction. Each car must apply and remain applied until the release is initiated. Retests made in accordance with 232.205 (c)(4).

> Not exceeding 20 miles. If the train's movement will exceed 20 miles, or isn't a Transfer Train, it shall receive a Class One air brake test.

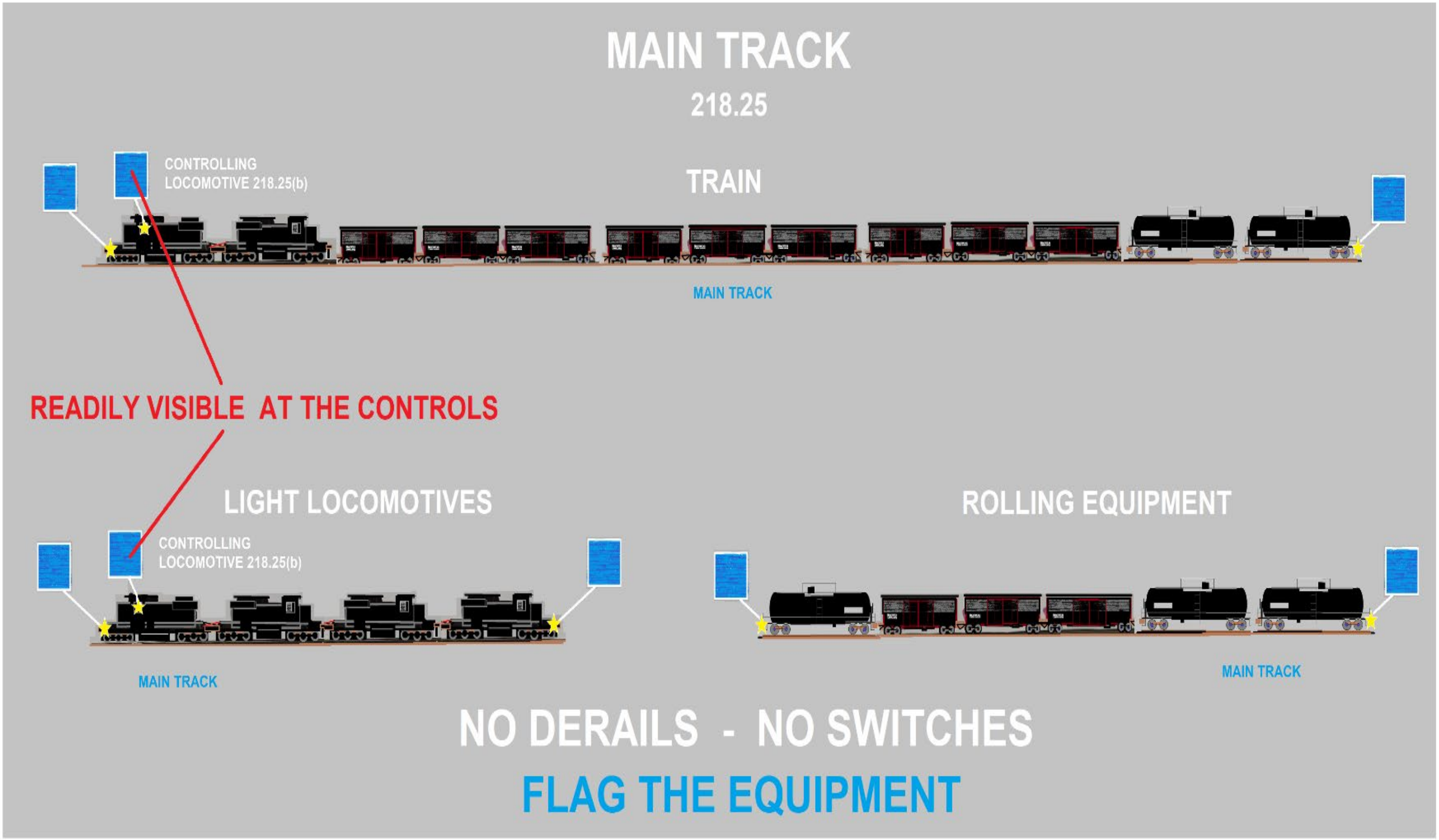
REMEMBER:

APPENDIX "D" IS MORE THAN JUST BRAKE PISTONS

LOOK 'EM OVER

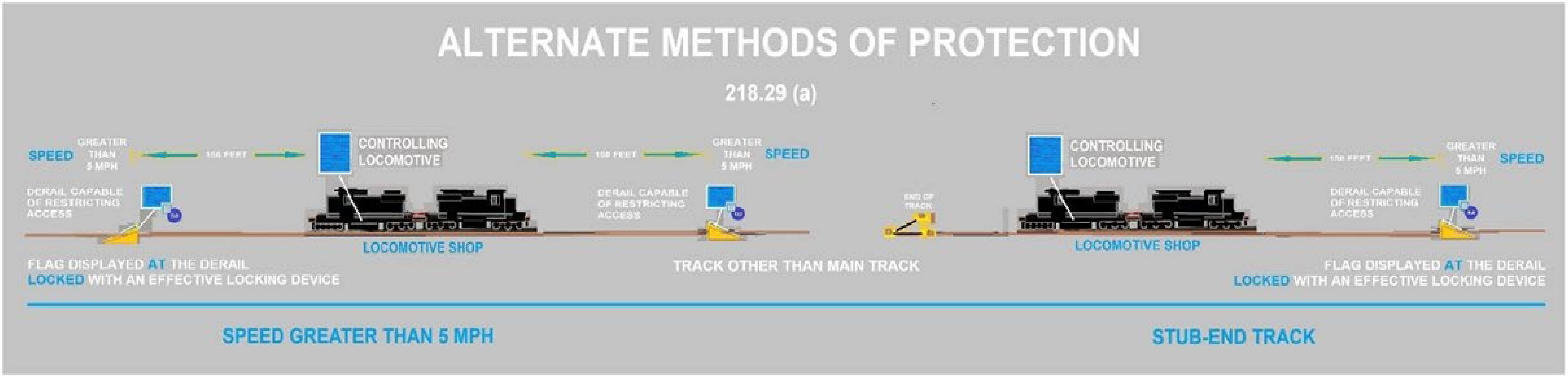


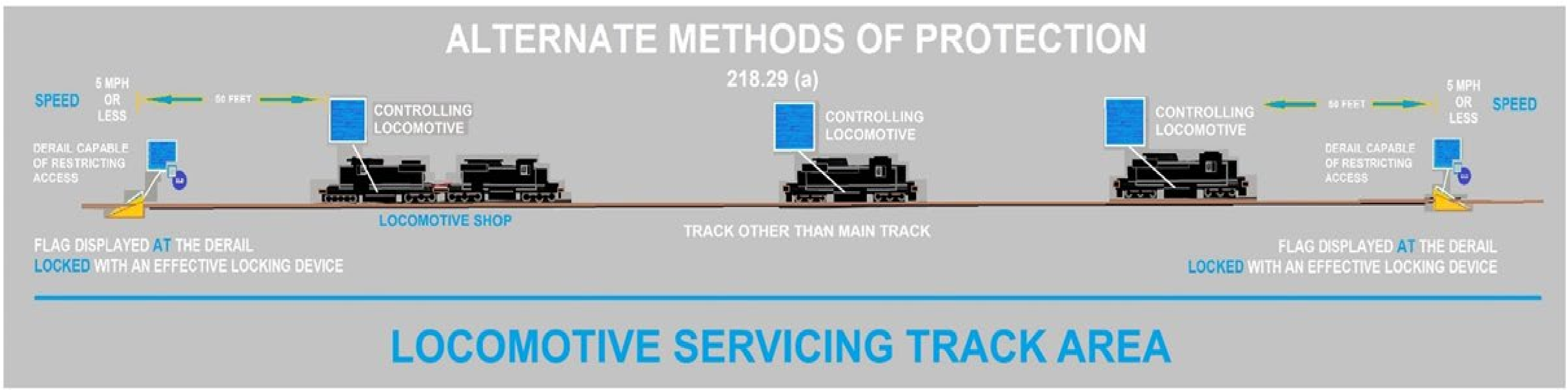
APPENDIX E – BLUE SIGNAL DISPLAY

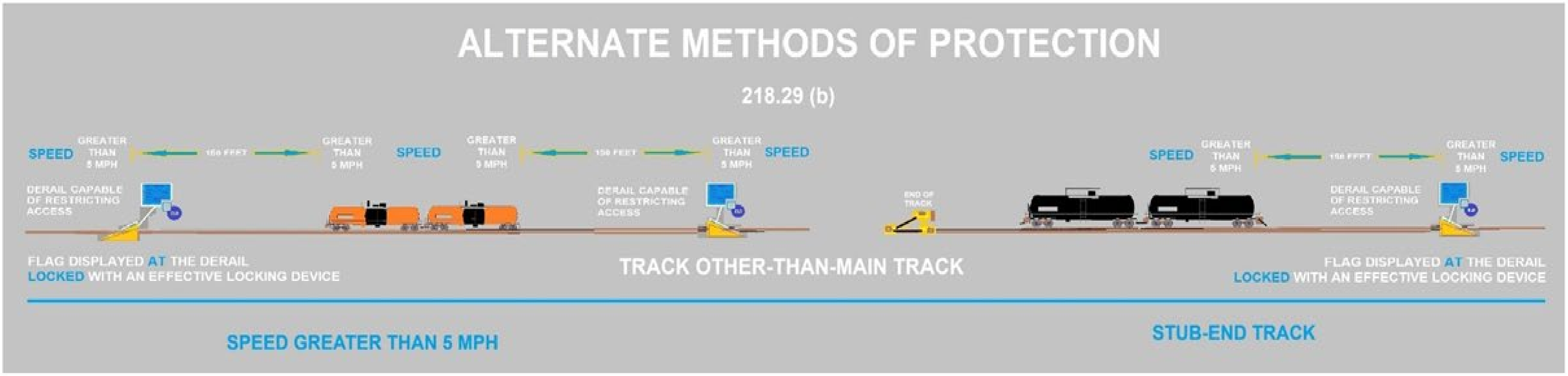



TRACK OTHER THAN MAIN TRACK
218.27
CONTROLLING LOCOMOTIVE
SWITCH PROVIDING ACCESS (218.5)
BLUE FLAG DISPLAYED NO FURTHER INTO THE TRACK THAN THE CLEARANCE POINT
LINED & LOCKED AGAINST MOVEMENT
OTHER-THAN-MAIN TRACK
BLUE FLAG DISPLAYED NO FURTHER INTO THE TRACK THAN THE CLEARANCE POINT
SWITCH PROVIDING ACCESS (218.5)
LINED & LOCKED AGAINST MOVEMENT
INCLUDING LOCOMOTIVES

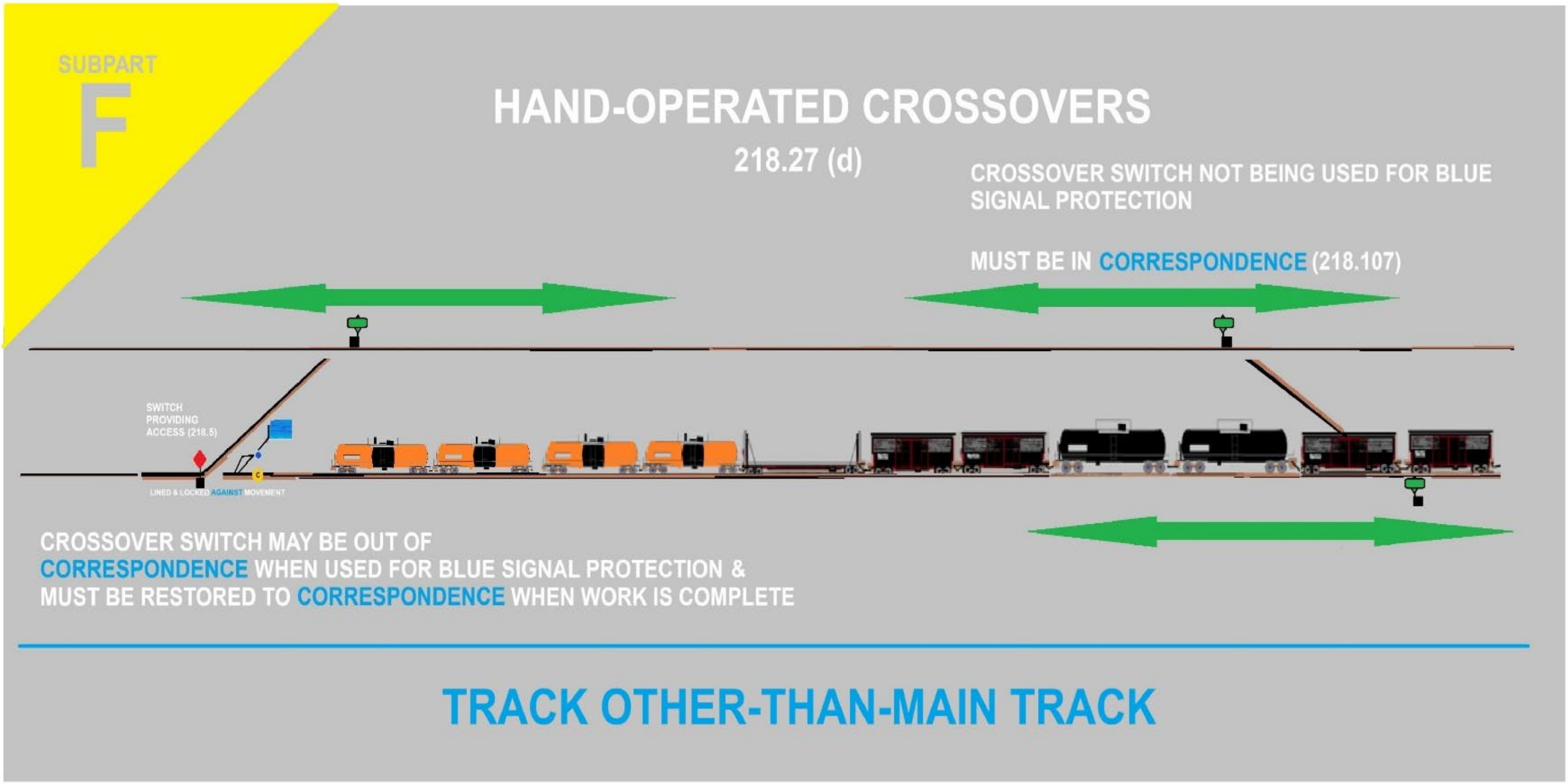

TRACK OTHER THAN MAIN TRACK
218.27
SWITCH PROVIDING ACCESS (218.5)
BLUE FLAG DISPLAYED NO FURTHER INTO THE TRACK THAN THE CLEARANCE POINT
LINED & LOCKED AGAINST MOVEMENT
BLUE FLAG DISPLAYED NO FURTHER INTO THE TRACK THAN THE CLEARANCE POINT
SWITCH PROVIDING ACCESS (218.5)
LINED & LOCKED AGAINST MOVEMENT
ROLLING EQUIPMENT


ALTERNATE METHODS OF PROTECTION
218.29 (a)
SPEED
GREATER THAN 5 MPH
150 FEET
CONTROLLING LOCOMOTIVE
150 FEET
GREATER THAN 5 MPH
SPEED
DERAIL CAPABLE OF RESTRICTING ACCESS
LOCOMOTIVE SHOP
DERAIL CAPABLE OF RESTRICTING ACCESS
FLAG DISPLAYED AT THE DERAIL
LOCKED WITH AN EFFECTIVE LOCKING DEVICE
TRACK OTHER THAN MAIN TRACK
END OF TRACK
CONTROLLING LOCOMOTIVE
LOCOMOTIVE SHOP
150 FEET
GREATER THAN 5 MPH
SPEED
DERAIL CAPABLE OF RESTRICTING ACCESS
FLAG DISPLAYED AT THE DERAIL
LOCKED WITH AN EFFECTIVE LOCKING DEVICE
SPEED GREATER THAN 5 MPH
STUB-END TRACK


ALTERNATE METHODS OF PROTECTION
218.29 (a)
SPEED
5 MPH OR LESS
50 FEET
CONTROLLING LOCOMOTIVE
DERAIL CAPABLE OF RESTRICTING ACCESS
LOCOMOTIVE SHOP
FLAG DISPLAYED AT THE DERAIL
LOCKED WITH AN EFFECTIVE LOCKING DEVICE
CONTROLLING LOCOMOTIVE
TRACK OTHER THAN MAIN TRACK
CONTROLLING LOCOMOTIVE
50 FEET
5 MPH OR LESS
SPEED
DERAIL CAPABLE OF RESTRICTING ACCESS
FLAG DISPLAYED AT THE DERAIL
LOCKED WITH AN EFFECTIVE LOCKING DEVICE
LOCOMOTIVE SERVICING TRACK AREA


ALTERNATE METHODS OF PROTECTION
218.29 (b)
SPEED GREATER THAN 5 MPH
SPEED GREATER THAN 5 MPH
DERAIL CAPABLE OF RESTRICTING ACCESS
DERAIL CAPABLE OF RESTRICTING ACCESS
DERAIL CAPABLE OF RESTRICTING ACCESS
END OF TRACK
FLAG DISPLAYED AT THE DERAIL
LOCKED WITH AN EFFECTIVE LOCKING DEVICE
TRACK OTHER-THAN-MAIN TRACK
FLAG DISPLAYED AT THE DERAIL
LOCKED WITH AN EFFECTIVE LOCKING DEVICE
SPEED GREATER THAN 5 MPH
STUB-END TRACK


ALTERNATE METHODS OF PROTECTION
218.29 (b)
SPEED 5 MPH OR LESS
50 FEET
5 MPH OR LESS SPEED
SPEED 5 MPH OR LESS
50 FEET
5 MPH OR LESS SPEED
DERAIL CAPABLE OF RESTRICTING ACCESS
DERAIL CAPABLE OF RESTRICTING ACCESS
FLAG DISPLAYED AT THE DERAIL
LOCKED WITH AN EFFECTIVE LOCKING DEVICE
TRACK OTHER-THAN-MAIN TRACK
FLAG DISPLAYED AT THE DERAIL
LOCKED WITH AN EFFECTIVE LOCKING DEVICE
CAR SHOP REPAIR TRACK AREA


SUBPART
F
HAND-OPERATED CROSSOVERS
218.27 (d)
CROSSOVER SWITCH NOT BEING USED FOR BLUE SIGNAL PROTECTION
MUST BE IN CORRESPONDENCE (218.107)
SWITCH PROVIDING ACCESS (218.5)
C
LINED & LOCKED AGAINST MOVEMENT
CROSSOVER SWITCH MAY BE OUT OF CORRESPONDENCE WHEN USED FOR BLUE SIGNAL PROTECTION & MUST BE RESTORED TO CORRESPONDENCE WHEN WORK IS COMPLETE
TRACK OTHER-THAN-MAIN TRACK